Ca' Foscari University of Venice

Master's Degree Programme

in Comparative International Relations

Final Thesis

From fossil to green: reshaping EU's energy security and diplomacy

Supervisor
Ch. Prof. Carlo Frappi

Assistant supervisor
Ch. Prof. Alessandro Spiganti

Graduand
Francesca Masiero
Matriculation Number 868748

Academic Year
2021 / 2022

“The world as we have created it is a process of our thinking.

It cannot be changed without changing our thinking.”

Albert Einstein

INDEX

SINTESI

Sulla base dei cambiamenti strutturali che la crisi energetica ha indotto in Europa stimolando un riorientamento delle priorità dell'Unione Europea nel campo dell'energia, questa tesi si è sviluppata attorno all'obiettivo generale di comprendere la natura delle interazioni tra politiche e mercati verdi e fossili, nonché le modalità attraverso le quali tali interazioni stanno contribuendo a rimodellare i concetti di sicurezza e diplomazia energetica. La metodologia usata per affrontare queste tematiche è di tipo comparativo, giacché si è visto come una simile prospettiva sia stata sinora poco studiata all'interno della letteratura europea afferente all'area di ricerca in questione e, in particolare, alla diplomazia energetica, dato il suo stato ancora non maturo in UE. Il processo di crescente politicizzazione, che ha interessato entrambi i concetti di sicurezza e diplomazia energetica negli ultimi due anni, è stato colto come un'opportunità per discutere più a fondo in senso comparativo le dinamiche e le interazioni sottostanti la transizione verde europea in un'ottica di medio termine e, specialmente, in riferimento alla mobilità pulita. Quest'ultimo focus ha permesso di analizzare un settore tanto cruciale quanto esemplare, per il suo contributo alle emissioni di gas serra, e per le dinamiche tra politiche e mercati verdi e fossili che già lo caratterizzano. A questo proposito, rispettando la logica comparativa, si è analizzata la declinazione assunta dai concetti e dalle determinanti di sicurezza e diplomazia energetica nell'ambito delle materie prime critiche, essenziali per l'elettrificazione della mobilità.

La struttura argomentativa della tesi ha seguito una linea omogenea nell'affrontare dapprima le definizioni teoriche e la letteratura disponibile sulle due categorie interpretative scelte, la sicurezza e la diplomazia energetica, calandole successivamente nel contesto europeo, per analizzarne evoluzione, deficit, opportunità e tendenze future, sia in riferimento alle fonti fossili sia alle materie prime critiche. A tal proposito, il primo capitolo, incentrato sulla sicurezza energetica ha dato spazio a un focus sull'attuale crisi energetica e le sue diverse concause, quale esempio contingente delle fragilità delle relative strategie europee implementate in passato. Il secondo capitolo, invece, si è concentrato sulla diplomazia energetica, fornendo un'ampia panoramica circa le misure legislative e le iniziative lanciate dalla Commissione Europea per esportare l'idea europea di transizione incarnata *in primis* dal Green Deal, alimentando l'ambizione dell'Unione di essere leader globale della stessa e di fissare standard internazionali.

I capitoli terzo e quarto hanno progressivamente spostato l'accento sull'analisi dei mercati di interesse per il focus tematico scelto, quello della mobilità pulita. Si è quindi dapprima esplorato il mercato delle auto elettriche e delle batterie agli ioni di litio (o comunemente, batterie al litio), ripercorrendo le relative catene di approvvigionamento e valore, e, conseguentemente, valutando il posizionamento dell'Unione europea e del suo settore industriale anche rispetto al peso delle iniziative in ricerca e innovazione. Il quarto e ultimo capitolo ha ulteriormente approfondito parte della catena di approvvigionamento delle batterie al litio, ovvero l'estrazione del minerale, che dal 2020 fa parte della lista di materie prime critiche stilata dalla Commissione Europea, e più limitatamente le successive fasi di raffinazione. Si sono messi così in luce gli aspetti più controversi dell'estrazione del litio, contestando la natura verde del processo di elettrificazione della mobilità. Aspetti come le esternalità negative delle attività minerarie, ovvero l'impatto socio-ambientale, e l'esistenza di una forte asimmetria informativa, nonché di sistemi di governance deboli, sono emersi come punti cruciali a partire dai quali l'Unione Europea dovrebbe forse iniziare una discussione più profonda per la sostenibilità a lungo termine della sua transizione alla mobilità pulita. In ultima istanza, il capitolo quarto si è concluso con una breve analisi comparativa del posizionamento dell'industria statunitense del litio rispetto a quella europea, offrendo una panoramica sulle misure che l'amministrazione Biden ha preso rispetto alle materie prime critiche, nonché un confronto circa le priorità e le iniziative intraprese sia dagli Stati Uniti sia dall'Unione Europea, per valutare le possibilità di coordinamento, piuttosto che di competizione.

Sin dalla fase di documentazione, è emerso come i concetti di sicurezza e diplomazia energetica siano caratterizzati da una certa vaghezza, se non proprio dall'assenza di una definizione condivisa, specie nel caso della diplomazia energetica. Tali concetti sono stati e continuano ad essere il risultato di un accumulo di aspetti, determinanti e variabili che ne hanno modellato i contorni lungo il corso del tempo, in particolare con l'intensificarsi delle interazioni fra priorità e politiche climatiche e/o ambientali ed energetiche. Conseguentemente la portata semantica dei termini si è estesa, andando ad inglobare aspetti talvolta confliggenti tra loro, diminuendo la capacità dell'Unione Europea di rispondere alle sfide del presente. Ad alimentare ulteriormente questa debolezza intrinseca ai concetti, vi sono altre concause non meno rilevanti, come la frammentazione politica, la riluttanza degli Stati Membri ad approfondire il processo di integrazione, la generale miopia dell'attività legislativa europea che non ha saputo implementare i necessari correttivi all'adozione di un approccio verso i mercati energetici di tipo liberale, nonché la preponderanza di misure di controllo della domanda interna di risorse energetiche rispetto a misure di salvaguardia e di diversificazione dell'offerta.

Si è però visto che la crisi energetica attuale ha avuto delle ricadute positive in tal senso, promuovendo l'assunzione di una prospettiva più strategica, come suggerito dal piano di azione congiunto REPowerEU e dalla comunicazione congiunta "Strategia UE di mobilitazione esterna per l'energia in un mondo che cambia", pubblicati nel 2022. Tuttavia, l'approccio messo in campo dal Consiglio per rispondere alle minacce alla sicurezza energetica europea derivanti dalla guerra in Ucraina, mettono ancora una volta in evidenza la persistente mancanza di armonizzazione delle priorità energetiche tra Stati Membri e la lentezza di risposta e di messa in moto dei meccanismi di resilienza, si vedano ad esempio i casi del tetto al prezzo del gas e la prevalenza di negoziazioni bilaterali, non di negoziazioni centralizzate, capeggiate dagli Stati Membri per la diversificazione delle forniture e per il riempimento delle riserve di gas. Pertanto, si è sottolineata l'urgenza di applicare misure correttive sul modello liberale che l'Unione Europea ha adottato sin dagli anni Novanta, con l'ambizione allora di migliorare l'efficienza e la trasparenza nel mercato energetico interno, seppur non contribuendo a garantire più resilienza e flessibilità nello stesso. Agendo sulla resilienza del sistema attraverso dei correttivi, si può aumentare la capacità di risposta dell'Unione circa le dinamiche globali dei mercati dell'energia e la sua capacità di attrarre investimenti. L'ostacolo che sembra, tuttavia, più difficile da superare è quello della frammentazione politica, motivo alla base dell'assenza di una diplomazia energetica comune matura.

Questi primi risultati sono stati fondamentali per la seconda parte dell'argomentazione riguardante il significato e le dinamiche della diplomazia e della sicurezza delle materie prime critiche. Si è riscontrato che ci sono molte più somiglianze che differenze nelle conseguenze che una loro cattiva gestione può avere, come lo è stato nel caso delle fonti fossili. Le materie prime critiche si contraddistinguono infatti per una spiccata concentrazione geografica, seppur con le dovute differenze tra minerali, sia per quanto riguarda la loro estrazione sia per la lavorazione. La Repubblica Popolare Cinese domina attualmente tutte le fasi della catena di approvvigionamento delle batterie al litio, a differenza di Stati Uniti e Unione Europea, che solo recentemente hanno intensificato i loro sforzi per contrastare questa situazione. Stanno entrambi puntando a guadagnare una maggiore competitività a livello globale, espandere la loro penetrazione nel mercato, investire in progetti di ricerca e sviluppo pioneristici e promuovere la sostenibilità e la trasparenza. A questo proposito, si è segnalato come un approccio maggiormente collaborativo fra Unione Europea e Stati Uniti avrebbe il potenziale di creare opportunità più favorevoli per competere contro la Cina per avanzare più rapidamente verso il raggiungimento degli obiettivi prefissati, sviluppando, ad esempio, progetti di ricerca e innovazione congiunti o diffondendo a livello globale standard comuni.

Oltre alla necessità di bilanciare competitività e collaborazione per contrastare posizioni dominanti nel mercato, è altrettanto importante che l'Unione Europea riveda in un'ottica più lungimirante e sostenibile le relazioni esterne già esistenti, specialmente quelle con i paesi vicini, come il Nord Africa. Si deve mettere in atto un processo di riqualificazione vera e propria delle relazioni che si sono fondate per lo più sull'importazione da parte europea di fonti fossili, investendo nel potenziale rinnovabile di tali paesi per guidare cambiamenti strutturali che saranno inevitabili nel lungo termine. In questo senso, la diplomazia energetica e quella per le materie prime critiche saranno sempre più legate ad altri ambiti di politica e intervento, come gli obiettivi di sviluppo, la cooperazione internazionale, il *capacity building*, e le strategie di competitività industriale.

Dal punto di vista interno, l'avvio di iniziative a favore di una maggiore penetrazione nelle catene di approvvigionamento delle batterie e delle materie prime critiche è stato abbastanza prolifico. Le principali iniziative si sono contraddistinte per l'adozione di un approccio inclusivo di tutti i portatori di interesse, creando dei partenariati pubblico-privati a forte trazione industriale diretti a rafforzare la componente di ricerca e innovazione. I risultati sinora sono ancora purtroppo trascurabili. Attualmente, il litio estratto in Europa è interamente destinato alle industrie della ceramica e del vetro; di conseguenza, se la priorità generale cui guardare è quella dell'autonomia strategica, la struttura del mercato del litio in Europa dovrebbe cambiare, o per lo meno nuove miniere dovrebbero essere aperte per far fronte all'aumento di domanda della materia prima. Allo stesso modo, per quanto concerne le iniziative di ricerca e innovazione, ci dovrebbe essere maggiore enfasi nel promuovere l'ottenimento di soluzioni che abbiano l'effettivo potenziale di creare economie di scala. In questo senso, un terreno ancora inesplorato per diverse ragioni è quello del riciclo delle batterie delle auto elettriche, che dovrebbe più facilmente svilupparsi a rigor di logica nei paesi dove tali batterie sono consumate e dismesse, ponendo l'Asia e l'Europa in condizioni di vantaggio rispetto al resto del mondo.

L'aspetto sicuramente più controverso che è emerso da questa tesi riguarda la necessaria espansione delle attività minerarie, anche in Europa, di fronte ad una transizione molto focalizzata sull'elettrificazione. Le prospettive dei progetti estrattivi in Europa si trovano a fare i conti con la mancanza di consenso popolare, radicato nel territorio e nella cultura della maggior parte dei Paesi. Al contempo, laddove oggi avviene l'estrazione del litio, principalmente in America del Sud, Australia, Cina e Stati Uniti, l'impatto socio-ambientale di tali attività porta le popolazioni locali a migrare verso altri luoghi, a rivedere le proprie tradizioni e attività economiche, o a essere integrate come forza lavoro all'interno delle stesse in cambio di salari medi superiori, costruzione di scuole o attribuzione di assicurazioni mediche, che, tuttavia, non risolvono alla radice il problema delle esternalità negative generate dall'estrazione del litio. Ad alimentare ulteriormente la situazione, il contesto di asimmetria informativa, la trascuratezza verso gli impatti ambientali e la mancanza di trasparenza nei rapporti tra governi centrali e/o locali e industrie minerarie porta a creare in determinate situazioni un sistema di governance estremamente debole. L'Unione Europea potrebbe di per sé garantire standard ambientali, sociali e di governance molto elevati, anche se la sua sola produzione di litio non basterebbe a far fronte alla domanda interna. Del resto, però, una transizione basata sull'approvvigionamento di materie prime critiche da riserve lontane site in ecosistemi molto fragili non può essere ritenuta sostenibile, starebbe infatti tradendo i suoi stessi principi.

Oggigiorno, la narrativa dominante sulla transizione alla mobilità pulita tramite l'elettrificazione tende ad insistere maggiormente sui suoi vantaggi in termini di inferiori emissioni di gas serra ponendo in secondo piano tutti gli altri impatti ambientali che ne derivano. Questo deriva anche dalla preponderanza della lotta contro il cambiamento climatico a livello internazionale sulle altre problematiche ambientali, come le più diverse forme di inquinamento e alterazione degli ecosistemi sulla Terra. Come riporta il documento ufficiale del Green Deal, l'obiettivo della Commissione Europea è quello di disaccoppiare la crescita economica dall'uso di risorse, attraverso la transizione verde e digitale. Tuttavia, anche tale affermazione sembra tralasciare tutta una serie di aspetti ambientali che non interessa soltanto il litio, ma di per sé la maggior parte delle componenti alla base delle tecnologie pulite. C'è il rischio che il passaggio dallo sfruttamento di fonti fossili a quello dei minerali porti a conseguenze non migliori di quanto già visto in passato, specialmente laddove non ci sono solide regolamentazioni, riproponendo il solito modello di business. Su questo frangente, l'Unione Europea sembra per il momento più concentrata ad assicurarsi l'accesso alle materie prime, piuttosto che a regolare e responsabilizzare i propri consumatori - fattore fondamentale se si vuole basare la transizione su un modello di business migliore, più consapevole e auspicabilmente rispondente a criteri di circolarità.

INTRODUCTION

The coronavirus pandemic has thrown us in a period of deep uncertainty, the consequences of which are emerging day by day, leaving but a little space for planning. And yet planning is indeed one of the main resources we have to face future challenges and minimize the risks deriving from these. One of our greatest, if not the greatest, challenge we are currently struggling with is undoubtedly climate change. For this reason, the European Union, as a leader in some ways, together with the rest of the world have been promoting the need for a green transition, with the ultimate goal of reaching carbon neutrality. Still, "transition" is no newly coined term, it was first used in the 1970s as a way out of the energy insecurity crux that was produced by mainly the first oil crisis in 1973. Back then, this term was used to express the need to become more independent energetically, with the purpose to escape what could be called a "domino effect" in an interdependent world, where a localized disruption in the energy supply ends up expanding its consequences on a much larger scale.

In these terms, it is argued that, today, transition represents our opportunity to minimize the increasing and disruptive insecurity caused by climate change, by curbing carbon emissions in the atmosphere. But, for the EU, transition means much more. It means, or could potentially mean, a solution to its long-lasting energy security problem, that is its excessive dependence on, or lack of diversification of, natural gas foreign supplies, with Russia having been the main supplier for a long time. Owing to the centrality of this issue, the driver of the discussion will be the current energy crisis, in particular natural gas price skyrocketing increases, which have been causing deep frustration in Europe and inspiring many institutional speeches on the need to advance energy transition in the continent. It is in this context that the EU has been defining the regulatory framework, the tools, and the core values through which the transition should take place, with the purpose, to some extent, to accelerate it, by taking advantage of the economic recovery that is currently pulling European countries and that is in part shaped by Next Generation EU.

With these premises, it emerges clearly that the EU, as the whole world, is experiencing an exceptional period marked by exceptional hurdles. For the complexity of this moment and of the dynamics that necessarily will develop in the near future, this thesis will move in two complementary directions. The main interpretive categories will be energy security and energy diplomacy. Their theoretical aspects will be provided in the first two chapters and will be essential for both the in-depth analysis of the European gas market and of the characteristics of critical raw materials. In doing so, these two categories will be analysed diachronically, taking into consideration the last 20 years, and the current energy crisis will be discussed only as a contingent example to understand the mechanisms that drive energy security concerns and shape energy diplomacy in the European Union.

Nevertheless, following the various early calls to go green faster, today's crisis will also serve as a starting point for the discussion around the transition.[1] Of course public speeches are not sufficient to pull an entire transition, which needs more structural changes, especially at national level, to be brought about; yet, as narratives, they contribute to the discourse, that is a more general and broad framework in which the transition, fossil fuels, market disruptions and insecurity concerns, among other aspects, are nowadays discussed. It is precisely in this discourse that two major points of view tend to clash: the EU institutions and the International Energy Agency's posture in support of an accelerated transition, based on the presupposition that today's crisis is not caused by it; and the posture of whom argue that this crisis is going to persist, becoming somehow structural, up until the transition won't be finalized. Because of the constant evolution of the discourse and because of our involvement in it, as consumers above all, it is difficult to get a detached and objective understanding of it.

Hence, this thesis will attempt to consider such diverse positions, in the framework of the mobility sector, to actually provide insight into the risks and opportunities of the ongoing transition process, following a comparative approach. The choice of this sectoral focus, obviously, doesn't mean that the transition process is hereby reduced to it, rather it comes from the fact that this sector is perhaps going to experience the major clash between green and fossil sources and the respective markets and policy frameworks. For this reason, the categories of energy security and diplomacy will serve to understand the increasingly intertwined nature between those two markets and the disruptive load of this sector, in a context of transition. Taking the impulse to electrification as a starting point, and the subsequent rise in demand for energy storage materials, especially lithium, this thesis will analyse the prospects of the electrification of the mobility sector, with a focus on the lithium market and the prospects of its development in consideration of the EU green transition.

In this regard, there will be a first outline of the diverse tools and regulatory frameworks that the European institutions have created to lead the change, for instance, the European Green Deal (EGD), the EU taxonomy for sustainable activities and the European Battery Alliance. Afterwards, a broader analysis of the global lithium market will be advanced, and attention will be given to its implications for the EU. This part will be pivotal, for it will expose the controversies of a transition that is questionably being "green" and "sustainable" for everybody, by studying the negative externalities caused by the extractive industry in countries where lithium is currently produced. In this context, two case-studies will be proposed. The first one will describe the variety of socio-environmental impacts caused by the most traditional lithium extracting methods, compared to the most innovative ones.

[1] Reuters, (6.10.2021), "We must invest in renewables for more stable energy prices", https://www.reuters.com/business/energy/eus-von-der-leyen-we-must-invest-renewables-more-stable-energy-prices-2021-10-06/.

This case will take as an example mining practices in South America's Lithium Triangle (Chile, Argentina and Bolivia), Australia, the United States and Europe. While the second will focus more on presenting the main characteristics of the US lithium industry to then advance a comparison with the EU's positioning in the market. Altogether, the presentation and further deepening of these issues will provide an overview on the challenges that the EU's transition to green mobility will face, particularly in relation to public acceptance of new mining projects and global competition.

While it is impossible to ignore the continuous changes that have occurred in the energy domain in the last years, let alone the post-pandemic economic recovery and recession and the war in Ukraine, this thesis will focus to orient its conclusions towards the medium term, given the current speed of technological progress, constantly reshaping and improving the prospects for the transition. The present apparent acceleration of efforts to meet climate and environmental goals amid the energy crisis has been hereby interpreted as an opportunity to assess the interplay between green energy markets and traditional fossil fuels markets, to understand how the concepts of energy security and diplomacy are being reframed and what kind of repercussions this will have for EU's competitiveness. This will allow to describe the current clash between short-term and long-term energy needs and policy priorities, in the attempt to find balance and to define to what extent a more accelerated transition might actually result in a disruptive factor for the energy diplomacy and security of the EU, while also aiming to be the global leader for the green transition.

1. ADRIFT IN THE POST-PANDEMIC ENERGY MARKET

1.1 ENERGY SECURITY: DEFINING THE UNDEFINABLE

In today's world, energy is regarded as the vital engine of global economies, modern societies, and armies, with considerable consequences on economic growth, security, and foreign policy. The centrality of energy issues in politics has varied over time, since energy markets, like any other market, experience boom-and-bust cycles. It is of course in times of turbulence that energy resumes its centrality in the public opinion and political discussions, sometimes causing a widespread neurosis over (often unfounded) fears of lack of availability, especially when prices rise. Precisely in these cases, worries about disregarded and inefficient energy security strategies take the lead. But what is exactly energy security? Noticeably, a multifaceted concept, and yet vague and sometimes confused term, which plays a peculiar role in the EU, given the structure and players of its energy market. Owing to the largeness of the field, the wide range of often conflicting interests and actors, "energy security" lacks a shared and straightforward definition.

In a volume published in 2011, Sovacool reported 45 definitions by scholars, international institutions, governmental agencies and ministries, each highlighting converging or contrasting aspects of energy security as of their own view of international relations and energy markets, and with the main goal to underpin and justify national energy policies.[2] As concerns the European Union, the European Commission has defined it as the "uninterrupted physical availability of energy products on the market at an affordable price for all consumers".[3] More extensively, the International Energy Agency (IEA) has explained it as the "adequate, affordable, and reliable access to energy fuels and services, it includes availability of resources, decreasing dependence on imports, decreasing pressures on the environment, competition and market efficiency, reliance on indigenous resources that are environmentally clean, and energy services that are affordable and equitably shared".[4]

These two conceptualizations reflect how the concept has been evolving and expanding to include aspects that were previously overshadowed by the preponderance of availability and affordability of the energy supply. In the European institutions, this process was particularly heightened due to the increasingly leading role that the EU has been assuming concerning climate change and environmental protection. This in turn produced a convergence between energy security policies and environmental legislation, resulting in a broader conceptualization embracing fossil fuels sectors, renewables

[2] B. K. Sovacool, (2011), "Introduction. Defining, measuring, and exploring energy security", in B.K. Sovacool (ed.), *The Routledge Handbook of Energy Security*, New York, Routledge, pp. 3-6.
[3] Ibidem.
[4] Ibidem.

development, storage capacity, energy efficiency, affordability, sustainability, and governance. Hence, the expansion of the term has coincided with a greater confusion over different aspects, that could be regarded both as partially complementary with energy security and as conflicting with it.

For this reason, while attempting to identify a broadly acceptable definition of energy security, most scholars have adopted diverse approaches to recognize its main components and variables. For instance, Sovacool (2011) tries to define energy security starting from the consideration of the main threats, to which it answers, as a critique of previous conceptualizations, that reduced energy security to a "merely direct national control over energy supply".[5] The author instead maintains that energy security should better consider the interconnections between its primary dimensions: availability, affordability, efficiency, and stewardship (also known as acceptability).[6] Availability refers to the relative independence from foreign suppliers and diversification of sources, suppliers, and routes, in order to minimize the exposure to risks of disruption. Affordability means the possibility for consumers to afford paying for their energy needs. Efficiency concerns the role of technology and innovation in reducing energy consumption, changing consumers' behaviour, and optimizing the use of energy sources. Finally, stewardship, or acceptability, refers to the impact of energy on societies and the environment.

The interconnections among these four dimensions are defined and amplified by the common threats that they face, which can emerge at a macro, meso, or micro level.[7] In general terms, there can be global, mid-level or local threats, that can strain energy markets and systems, affecting the availability of supply, the energy price, the energy demand, or the social and natural environment. The historical and most traditional posture on energy security was based on the linkage between energy and international politics, which contributed to the securitization of any discussion on energy policies, given their association with national interests and security. At the same time, this approach tended to significantly politicize the issue, turning energy policy into a rhetorical rather than pragmatic and efficient tool for governments, which fed misinformation and the lack of transparency in the energy sector.

Thus, the aggregation of new meanings of energy security can be regarded as an attempt to partially de-securitize it and move away from an anachronistic posture, which would not be able to convey the complexity of today's interactions and interdependencies characterizing the energy field. In this sense, Sovacool (2011) has included threats that comes from trade and investments' nature and structure, that is the existence of barriers, intellectual property rights constraints and externalities, the

[5] Ivi, pp. 9-20.
[6] Ibidem.
[7] Ivi, p. 11.

combination of which tends to highlight the weaknesses of an energy security strategy that aims to couple the growth and protection of fossil industries with environmental protection, influencing both the dimensions of affordability and accessibility.[8] At the same time, these latter are undermined at the local level, when energy poverty rates are high, also meaning that there is a lack of energy efficiency among the poorest together with often negative environmental impacts of available energy sources.[9] One last threat mentioned by Sovacool (2011) is connected to technology and energy systems and intervenes at the meso-level.[10] This includes disruption of energy supply caused by local malfunctions, terrorist attacks, accidents or human error, shortages of fuel and supply chains disruptions, which can have a variable fallout on availability, affordability, and accessibility.

Yet, the approach proposed by Sovacool (2011) is shared by other scholars, like Winzer (2012), who affirmed that "the common concept behind all energy security definitions is the absence of, protection from or adaptability to threats that are caused by or have an impact on the energy supply chain".[11] But he also criticizes the largeness of the term, which forces to focus on just a few of the threats when it comes to measuring the energy security performance of a country. To tackle this problem, Winzer (2012) suggests a new approach based on a resemantization of energy security into "energy supply continuity", which transcends from several of the various meanings otherwise attributed to energy security, such as energy efficiency and sustainability, maintaining that these are better included in separate policy goals.[12] According to the author, this would improve the reliability of energy security indexes and de-securitize the concept. Yet, an insight into the mathematical methods that are currently used to determine the level of energy security of a country goes beyond the scope of this thesis, but what is here interesting to notice is the tension between postures that would best support a more extensive conceptualization and those claiming a more restricted one.

This contentious aspect has been well explained by Luft et al. (2011) in relation to the controversial inclusion of climate change issues in energy security strategies.[13] The linkage is explained as the shared goal of a low carbon economy, that would arguably push climate policy and energy security in the same direction. Nevertheless, this connection appears to be insubstantial to some extent. Supporters of a "holistic" conceptualization encompassing climate change posit that "climate change is a threat multiplier [which] has the potential to cause multiple chronic, destabilizing conditions to occur globally", meaning that "climate change should therefore be recognized as an international security

[8] Ivi, p. 14-15.
[9] Ivi, p. 17-20.
[10] Ivi, p. 20.
[11] C. Winzer, (2012), "Conceptualizing energy security", *Energy Policy,* n.46, p. 41.
[12] Ivi, p. 36.
[13] G. Luft, A. Korin and E. Gupta, (2011), "Energy security and climate change", in Sovacool (ed.), *The Routledge Handbook of energy security",* New York, Routledge, pp. 43-55.

problem".[14] According to the authors, this affirmation is not completely true, because while it can have a negative impact on the energy sector and represent a threat to the security of highly exposed countries, climate change isn't necessarily a threat for energy security and including it in national energy security strategies could also be counterproductive.[15]

By doing so, Luft et al. (2011) affirm that there are some main cruxes. First, climate change policies tend to address public goods issues, given the transboundary fallout of climate change and the need for international cooperation; whereas, energy security strategies focus on nationalist interests, which are governed mostly by interactions among private or semi-private actors, in the attempt to respond to national directives.[16] Second, climate change and energy security policies compete for resources and public support, especially in times of market shocks or disruptions. According to Toke and Vezirgiannidou (2013), "interests on either side of the spectrum are fighting on a discursive level over which priorities should take precedence in policymaking".[17] In case of market turbulence, when economic and/or security threats are felt by the society, "environmental concerns are pushed to the back burner in favour of more immediate needs like employment, shelter, and security", as it was the case during the great financial crisis in the period stretching from 2008 to 2013.[18] For these reasons, extending the concept of energy security might result in the failure of climate change policies, reaching suboptimal solutions or making energy security needs more difficult to be met.

Interestingly, the controversies highlighted by these scholars can be observed in the case of the European Union, which has decided to adopt a holistic approach, including climate and environmental concerns in its energy security strategies and policies, as a consequence of its leading role in global climate negotiations and the evolution of global and regional energy markets. A choice that did not immediately produced a positive outcome, due to the difficulty of combining traditional energy security requirements, often subject to powerful lobbying pressure groups, with environmental commitments.[19] According to Proskuyakova (2018), this difficulty derives from the so-called "energy trilemma", that is a situation where energy leaders need to strike a balance among three main aspects of energy: energy security, energy equity and environmental sustainability; given that there are trade-offs among them.[20] In other terms, leaders need to find their optimal combination, which will in turn reflect their approach to energy issues, also at the international level.

[14] Ivi, p.45.
[15] Ivi, p. 46-47.
[16] Ivi, p. 52; D. Toke and S.-E. Vezirgiannidou, (2013), "The relationship between climate change and energy security: key issues and conclusions", *Environmental Politics*, no. 22(4), p. 548.
[17] Ibidem.
[18] G. Luft et al., (2011), "Energy security and climate change", p. 53.
[19] D. Toke and S. Vezirgiannidou, (2013), "The relationship between climate change and energy security", p. 550.
[20] L.N. Proskuyakova, (2018), "Updating energy security and environmental policy: energy security theories revisited", *Journal of Environmental Management*, no. 223, p. 203; World Energy Council, "World Energy Trilemma Index", https://www.worldenergy.org/transition-toolkit/world-energy-trilemma-index.

In her article, Proskuyakova (2018) analyses how the main IR theories (neorealism, neoliberalism, political economy, and constructivism) have been reshaping their postures on energy security issues. Consistently with its holistic approach, the EU has been focusing on the neoliberal doctrine, emphasizing the centrality of international cooperation among states and non-state actors, and of key institutions, such as the International Energy Agency and the International Energy Forum.[21] These help establish rules, standards, and best practices to influence members' behaviour and policy objectives, the outcome of which should be positive sum, and not negative sum as it would be the case in the security and competitiveness-centred neorealist doctrine.[22] Following the neoliberal approach, the EU has been focusing on the importance of enhancing energy security through a more interdependent energy system, where risks can be better distributed and therefore minimized, fostering competitiveness and cooperation with neighbouring countries too. Yet, the process of liberalization of energy markets, especially those related to electricity and gas, took a long time, and produced an actual revolution with consequences outreaching the initial scope of a more efficient and transparent market, and that partially explains current price volatility and turbulence. In order to understand the magnitude of these disruptive changes, it is necessary to go back in time to the 1990s, when the European Union was funded, to analyse the composition of its energy mix and observe how energy security conceptualizations and strategies have been evolving.

1.2 THE EU ENERGY SECURITY: AN UNRESOLVED DILEMMA

A first attempt to understand the role of this concept in the EU should consider the average energy mix, which demonstrates the variety of energy sources available deriving both from domestic production and importations. As in Figure 1.2a, in 1990 the EU primary energy sources for consumption were oil (38%), followed by coal (27,4%) and natural gas (18%). According to the European Commission's Green Paper for a European Union Energy Policy, domestic energy production in the European Community peaked in 1986 and afterwards started to decrease.[23] In particular, internal oil production had been growing from 1974, and decreased by 21% in 1992 compared to 1986, while in the same period natural gas production began to grow. In 1992, energy independence, an index based on the relationship between total internal production and gross consumption, amounted

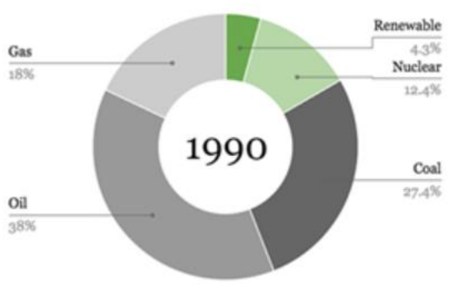

Figure 1.2a: *EU energy mix in 1990. [Source: Carbon Brief]*

[21] L.N. Proskuyakova, (2018), "Updating energy security and environmental policy", p. 205-206.
[22] Ibidem.
[23] European Commission, (11.01.1995), "Green Paper - For a European Union Energy Policy", COM(94) 659 final, EUR-Lex, https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A51994DC0659&qid=1488204560202.

to 49%, compared to 57% in 1986.[24] At that time, the strongest dependence was attributed to oil imports from the Middle East (78%) and, more slightly, to natural gas imports (36%) from three main suppliers: Russia, Algeria, and Norway.[25] Alongside these data, the European Community's gross domestic consumption increased by 0,8% yearly, as a consequence of the expansion of the transport sector and electricity production.[26] These latter contributed to a lower energy efficiency rate, that, according to the study, would have been compensated by the positive effect of an improved energy intensity ratio in industries.

Two decades after, the situation has changed following some of the forecasts that were made in the 1990s, which means an increased dependency on energy imports (see Figure 1.2b) vis-à-vis a rapid decrease in domestic energy production, a limited and cyclical reduction in energy consumption, a rising natural gas demand, and overall improvements in energy efficiency.[27] According to Eurostat, in 2019 the EU met only 39% of its energy needs through domestic production, with the rest being imported from abroad.[28] In 2020, domestic production further decreased by 7.1% compared to 2019, having a major impact on domestic gas production (-62.4%).[29] As concerns the range of energy sources, 36,3% of EU energy needs was covered by petroleum products, 22,3% by natural gas, 15,5% by renewables, 13% by nuclear power and 13% by solid fossil fuels.[30] The critical importance of natural gas derives from EU's reliance on importations (83,50%), 50% of which depends on Russian supplies.[31]

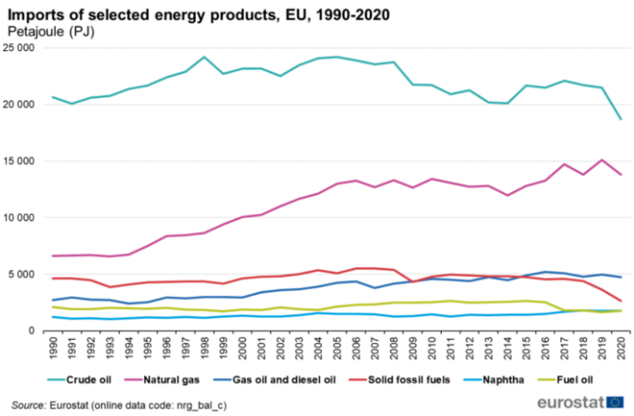

Figure 1.2b: *EU imports of energy products from 1990 to 2020. [Source: Eurostat]*

Obviously, these data hide the significant differences that exist among the various energy mixes of Member States.[32] There are in fact countries with a strong dependence on oil imports (i.e., Cyprus and Malta), others depending more on natural gas imports (i.e., Germany, Italy, and the Netherlands),

[24] Ivi, p. 78.
[25] Ibidem.
[26] Ivi, p.77.
[27] Eurostat, "Energy Statistics – an overview", https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Energy_statistics_-_an_overview#Primary_energy_production.
[28] Eurostat, [date not available], "Where does our energy come from?", https://ec.europa.eu/eurostat/cache/infographs/energy/bloc-2a.html?lang=en.
[29] Eurostat, "Energy Statistics – an overview".
[30] Eurostat, "Where does our energy come from?".
[31] A. Gili, (14.01.2022), "La crisi europea: cosa ci aspetta?", *Istituto per gli Studi di Politica Internazionale*, https://www.ispionline.it/it/pubblicazione/la-crisi-europea-cosa-ci-aspetta-32865.
[32] Eurostat, "Energy Statistics – an overview".

countries with a higher energy independency due to a more diffused nuclear power production (i.e., France and Sweden) and, finally, countries depending on solid fossil fuels (i.e., Estonia and Poland). From this very general overview, it appears immediately clear how these broad differences among countries and the overall predominance of imports on domestic production represent two of the main issues affecting EU energy security, that have been making it difficult to combine member states' interests and translate them into an efficient common energy policy and market.

Yet, these issues were already at the heart of the first Green Paper, published by the European Commission in 1995, aimed at opening a discussion among member states on energy policy. Before analysing the evolution of the main challenges and objectives that have informed Green Papers between the 1990s and the 2000s, the first observation that needs to be made concerns art. 2 of the Treaty establishing the European Community signed in 1957, that set the goal of a "sustainable and non-inflationary growth respecting the environment".[33] This article embodied the holistic approach chosen at a later time by the EU in relation to energy security. As it was already mentioned before, energy is the engine of modern expanding economies, thus, if economic growth is subordinated to the achievement of sustainability goals, so does energy. But of course, this goal had a long way to go back in the 1990s, and it had to compete with other priorities in the energy field: competitiveness and security of supply.

These three objectives were pivotal to the first Green Paper, where the Commission made explicit the need for more cooperation between the actors involved, harmonization between national and EU strategies and legislations, a clarification of the Commission's responsibilities on energy policies and, finally, the development of an internal energy market.[34] As concerns the security of supply, the Commission had suggested that the increasing reliance on external supplies would have to be counterbalanced by a greater diversification of energy sources and suppliers together with a reinforcement of the solidarity principle to better cope with potential disruptions. While, insisting on energy efficiency policies, market deregulation and the development of an internal market would have promoted market competitiveness and flexibility.[35] Finally, as regards environmental protection, the Commission had underlined the importance of determining a long-term strategy against climate change and of building a system to internalize environmental externalities, so that energy prices could convey more accurate information to markets.[36] Among these three objectives, the most emphasized was competitiveness,

[33] European Union, (10.11.1997), Document 11997E/TXT, "Treaty establishing the European Community (Amsterdam consolidated version)", Official Journal C 340, 10/11/1997, EUR-Lex, p. 9, https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=uriserv%3AOJ.C_.1997.340.01.0173.01.ENG&toc=OJ%3AC%3A1997%3A340%3ATOC.

[34] Commissione Europea, (11.01.1998), "Per una politica energetica dell'Unione Europea", COM (94) 659 def., EUR-Lex, p. 6-7, https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A51994DC0659.

[35] Ivi, p. 15-22.

[36] Ivi, p. 28.

which had implications for both availability and affordability of the energy supply and focused on the demand side and on the structure of a still undeveloped EU energy market.

The stress on demand policies was maintained, and even reinforced, in the second Green Paper, published in 2000, that reads "only a policy geared to controlling demand can lay the foundations for a sound energy supply security policy".[37] It registered the inefficiency of consumption control policies, the inability of the EU to make its voice heard in global markets and the persisting lack of political consensus over an EU common energy policy.[38] The tools that were hereby identified focused on a more efficient fiscal policy, able to reshape consumers' behaviour, diversification of sources and routes, and expansion of strategic reserves. Overall, it can be argued that from 1995 to 2009 these were the focuses of energy discussions within the European institutions, which tended to stress the dimension of sustainability, that is the need to better manage the interactions between energy efficiency, emissions reductions, and renewables deployment, vis-à-vis the progressive environmental disengagement caused by the great financial crisis.[39]

In the wake of Russian-Ukrainian disputes over gas prices and supplies and subsequent interruptions by Gazprom of the flows towards Europe, the European Commission warned against the obsolescence of the trans-European transport network.[40] As a matter of fact, worries about prolonged uncertainty about supplies fuelled reforms of the TEN-E regulation, the primary tool through which the EU can channel its support to energy networking projects – and that underwent further reviews more recently towards the end of 2021.[41] At that time, according to this regulation, the EU could finance viability studies for selected projects deemed of European interest by Member States. A role that was considered insufficient in 2008, and that should have been improved with particular regard to its funding system. In this sense, the Commission stressed the importance of prioritizing networks in energy policies, insofar as they could improve EU energy security.[42] In this same context, the following year, the EU adopted the third energy package, which entailed an acceleration of the creation of the common energy market, in response to the need to maintain competitiveness and to strengthen

[37] European Commission, (29.11.2000), "Green Paper – Towards a European strategy for the security of energy supply", COM(2000) 769 final, EUR-Lex, p. 82, https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A52000DC0769&qid=1488204560202.
[38] Ivi, p. 2-4.
[39] European Commission, (27.03.2013), "Green Paper – A 2030 framework for climate and energy policies", EUR-Lex, p. 2, https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A52013DC0169&qid=1488204560202.
[40] European Commission, (13.11.2008), "Green Paper – Towards a secure, sustainable and competitive European energy network", COM(2008) 782 final, EUR-Lex, p. 4, https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52008DC0782&qid=1488204560202&from=EN.
[41] Ivi, p. 11-13; A. Gili, (14.01.2022), "La crisi europea: cosa ci aspetta?".
[42] European Commission, (13.11.2008), "Green Paper – Towards a secure, sustainable and competitive European energy network", p. 12.

the solidarity principle.[43] In 2010, the EU adopted various reforms aimed at increasing its energy security in the gas field, such as the establishment of new standards, the creation of an emergency mechanism based on solidarity, and the obligation for each state to rely on minimum three different gas suppliers.[44] The demand for more stability, security and competitiveness was reflected in the Commission's Roadmap for Energy 2050, published in 2011, where the transformation of the energy system and the rethinking of energy markets were deemed pivotal.[45]

And yet, just three years later, in 2014, the Commission found itself to discuss once again the same topics in light of a renewed escalation of tensions between Russia and Ukraine, proving the insufficiency of EU's efforts in guaranteeing its energy security.[46] Albeit criticism, with this occasion, the EU succeeded in accelerating the path towards an integrated energy market and in deepening international interconnections among states.[47] In the wake of a new enthusiasm for EU's future opportunities, President of the Commission Jean-Claude Juncker enhanced the adoption of an Energy Union Package in 2015, that was centred on the typical goals of improving energy security and accelerating decarbonization, yet failing to reorient energy policies towards an actual coordinated vision among Member States and non-state actors aimed at improving EU's leverage on the supply side, rather just on the demand side, as it was done since the EU's foundation.[48]

More recently, the European Commission has provided a major impulse to the green transition in light of EU's environmental commitments, as the latest reform of the TEN-E regulation, the adoption of the fifth energy package and the new gas package show. In these last three years, the EU has tried to increase its competitiveness and energy security by acquiring a greater presence in the renewables field, since clean energy sources can be produced domestically, thereby contributing to decreasing external reliance and risk exposure. As a matter of fact, in 2020 the Commission proposed a revision of the TEN-E regulation, with the purpose to include mandatory sustainability criteria in the selection process of so-called Projects of Common Interest (IPCEIs).[49] This reform is particularly important, since it establishes the commitment to progressively end EU's support to oil&gas projects, setting an expiration date (31 December 2029) for gas infrastructures' conversion projects.[50] In this way, the

[43] European Commission, "Third Energy Package", https://energy.ec.europa.eu/topics/markets-and-consumers/market-legislation/third-energy-package_en.
[44] A. Gili, (14.01.2022), "La crisi europea: cosa ci aspetta?".
[45] European Commission, (15.12.2011), "Tabella di marcia per l'energia 2050", COM(2011) 885 definitivo, EUR-Lex, pp. 10-18, https://eur-lex.europa.eu/legal-content/IT/TXT/PDF/?uri=CELEX:52011DC0885&from=EN.
[46] European Commission, (28.05.2014), "Strategia europea di sicurezza energetica", EUR-Lex, https://eur-lex.europa.eu/legal-content/IT/TXT/PDF/?uri=CELEX:52014DC0330&from=SK.
[47] A. Gili, (14.01.2022), "La crisi europea: cosa ci aspetta?".
[48] European Commission, (25.02.2015), "Energy Union Package", COM(2015) 80 final, EUR-Lex, https://eur-lex.europa.eu/resource.html?uri=cellar:1bd46c90-bdd4-11e4-bbe1-01aa75ed71a1.0018.01/DOC_1&format=PDF.
[49] A. Wilson, (2022), "Trans-European energy infrastructure", *European Parliamentary Research Service*, https://www.europarl.europa.eu/RegData/etudes/ATAG/2022/729335/EPRS_ATA(2022)729335_EN.pdf.
[50] A. Gili, (14.01.2022), "La crisi europea: cosa ci aspetta?".

EU is trying to combine the need of a rapid transition with the need to maintain energy security, which means having natural gas playing the role of bridging fuel. Similarly, the fourth and fifth energy packages, released in 2019 and 2021 respectively, have a major focus on renewables and on the delivery of the European Green Deal launched in 2019. Finally, the new gas package adopted in December 2021 aims at decarbonising the gas market by favouring a progressive substitution of fossil natural gas with the use of clean gases and hydrogen.[51] The package establishes an expiration date for long-term gas contracts, which shouldn't exceed 2049, albeit recognizing the role of natural gas as a transition and back-up fuel.

The need of long-term planning and investments in the gas industry seems to clash with both the demand for more gas to fuel the transition and that of decarbonisation. At the same time, renewable and low-carbon gases are intended to provide more energy security thanks to their integration in the natural gas grid, and to the reinforcement of the solidary principle among Member States. In doing so, resilience and competitiveness will be strengthened, and EU's import dependency downsized. The way towards the achievement of these goals seems now to be more confused than before. The escalating tensions between Russia and Ukraine and the outbreak of war in this latter have reinvigorated discussions on energy security, fuelling already high energy prices and the securitization and politicization of the concept.

In March 2022, the Commission has adopted a new strategy for the security of supply in Europe, "REPowerEU", recalling the traditional priorities: affordability, security, and sustainability.[52] The goal is to make Europe independent from Russian fossil fuels supplies before 2030 and to contain energy prices. The tools indicated so far regard the diversification of gas supplies, an accelerated deployment of renewable gases and the substitution of gas with other sources in heating and power generation. According to the Commissioner for Energy, Kadri Simson, "the new geopolitical and energy market reality requires us to drastically accelerate the clean energy transition and increase Europe's energy independence from unreliable suppliers and volatile fossil fuels".[53] Yet, the ambition of this statement has and is still facing a harsh realty, that was already strained by post-pandemic dynamics and that is showing greater volatility and uncertainty due to the war and speculation. In this context, differences in import dependence among EU countries have been felt by governments and the public opinion, which have determined political frictions at the EU level, in the aftermath of the beginning of war. As a matter of fact, after months of intense negotiations, which saw Germany and

[51] European Commission, (15.12.2021), "Questions and Answers on the Hydrogen and Decarbonised Gas Package", https://ec.europa.eu/commission/presscorner/detail/en/QANDA_21_6685.

[52] European Commission, (8.03.2022), "REPowerEU: Joint European action for more affordable, secure and sustainable energy", https://ec.europa.eu/commission/presscorner/detail/en/ip_22_1511.

[53] Ibidem.

the Netherlands being the fiercest opponents, last December, EU Member States agreed on the imposition of a price cap on the natural gas price, to protect European industries and citizens from extremely volatile energy prices.[54]

Albeit considerable efforts to move away from Russian gas, such a sudden diversification has presented many obstacles, and it is still to be seen on what extent EU countries will actually be able to intercept and receive the "alternative" gas supplies they have been negotiating for. The continuous political tensions together with the imminent economic recession make it difficult to forecast how the situation will evolve. But these last two years' market turbulence was not a by-product of war, rather the result of the shocks that the pandemic and the post-pandemic recovery have introduced at all levels. Understanding the interactions between these phenomena will help define the nature of EU energy (in)security and the role that transition policies have had and arguably will continue to have in a context of market turmoil.

1.3 Post-pandemic gas market turmoil: nature and consequences

In these last two years, the pandemic has inevitably impacted on the way people live their lives, move and work. An in-depth analysis of the current gas prices surge, and subsequent energy crunch, cannot transcend an outline of the main changes and trends that the pandemic brought about in these last years. In this regard, it is appropriate to keep separated the dynamics that took place during the first year of the pandemic, that were marked by a broad economic recession, from those that unravelled since mid-2021 in the wake of the economic stimulus packages and the gradual easing of mitigation measures.

In a special focus published in April 2020, the World Bank analysed the consequences of the pandemic on commodity markets, identifying the main shocks that affected these latter.[55] As concerns the year after the breakout of the pandemic, the World Bank reported that, on the demand side, the combination of mitigation measures, for instance, lockdowns, further restrictions to transport and remote working, and the general economic recession caused a steep decline in energy and metals

[54] Deutsche Welle, (19.12.2022), "EU agrees to gas price cap", https://www.dw.com/en/eu-agrees-to-gas-price-cap/a-64154256#:~:text=After%20months%20of%20negotiation%2C%20the,180%E2%82%AC%20per%20megawatt%20hour.

[55] World Bank, (April 2020), "A Shock Like No Other: The Impact of Covid-19 on Commodity Markets", Special Focus, Commodity Markets Outlook, https://thedocs.worldbank.org/en/doc/558261587395154178-0050022020/original/CMOApril2020SpecialFocus1.pdf.

demand, which drove energy prices downwards in comparison to 2019 (see Figure 1.3a). As for the supply side, production was curbed by disruptions of supply chains and of industrial commodity production, as a result of the shutdown of several production plants. More importantly, the World Bank has highlighted the different nature of this crisis compared to past disruptive events. In particular, the

World Bank Commodities Price Data (The Pink Sheet) **2-Feb-2022**

Commodity	Unit		Annual Averages Jan-Dec 2019	Jan-Dec 2020	Jan-Dec 2021	Quarterly Averages Oct-Dec 2020	Jan-Mar 2021	Apr-Jun 2021	Jul-Sep 2021	Oct-Dec 2021	Monthly Averages Nov 2021	Dec 2021	Jan 2022
Energy													
Coal, Australia	$/mt	a/	77.9	60.8	138.1	68.6	89.5	109.7	169.1	183.9	157.5	169.7	197.0
Coal, South Africa	$/mt		71.9	65.7	119.8	71.9	86.8	100.5	135.4	156.7	128.0	142.5	168.5
Crude oil, average	$/bbl		61.4	41.3	69.1	43.6	59.3	67.1	71.7	78.3	79.9	72.9	83.9
Crude oil, Brent	$/bbl	a/	64.0	42.3	70.4	44.5	60.6	68.6	73.0	79.6	80.8	74.3	85.5
Crude oil, Dubai	$/bbl	a/	63.2	42.2	68.8	43.8	59.5	66.4	71.4	77.9	79.8	72.8	83.1
Crude oil, WTI	$/bbl	a/	57.0	39.3	68.0	42.6	57.8	66.1	70.6	77.3	79.2	71.5	83.1
Natural gas, Index	2010=100		61.1	45.5	130.7	59.2	78.7	83.2	140.3	220.5	202.6	236.5	197.5
Natural gas, Europe	$/mmbtu	a/	4.80	3.24	16.12	5.19	6.52	8.79	16.93	32.23	27.62	38.03	28.26
Natural gas, U.S.	$/mmbtu	a/	2.57	2.01	3.85	2.46	3.43	2.91	4.32	4.74	5.02	3.73	4.33
Liquefied natural gas, Japan	$/mmbtu	a/	10.56	8.31	10.76	6.90	8.93	8.94	10.87	14.32	15.25	15.32	15.57

Figure 1.3a: *Energy commodity prices published by the World Bank in February 2022 [Source: International Energy Agency].*

crisis that unravelled during the first year of the pandemic presented an unprecedented combination of demand shocks and supply shocks, which wasn't the case before, when crises used to be either demand- or supply-driven.[56]

Yet, these factors had a heterogeneous impact on the various energy commodities. According to the International Energy Agency (IEA), in 2020, oil experienced the greatest decline in demand, amounting to 8.8%, and was followed by coal, with a decrease by 4%. While natural gas demand dropped by around 1.9%.[57] On the contrary, renewables registered a 3% consumption increase for electricity generation, enhanced by "long-term contracts, priority access to the grid, and continuous installations of new plants", which ultimately allowed to contain the fallout from supply chains disruptions.[58] In the immediate aftermath of the first pandemic outbreaks, IEA's analysts and the European Parliamentary Research Service observed with particular concern the implications for clean energy resources, which led them respectively to stand for a more rapid and decisive action by national governments to accelerate transition and to affirm how the pandemic would have inevitably slowed it down.[59]

Similarly, the World Bank warned over long-term implications for energy markets, especially deriving from a possible persistence of mobility restrictions and continuing supply chains disruptions. These latter would primarily cause the "re-shoring" of those activities that strongly rely on global

---

[56] Ivi, p. 11.
[57] International Energy Agency, (April 2021), *Global Energy Review 2021*, Paris, International Energy Agency, p. 14-20. https://www.iea.org/reports/global-energy-review-2021.
[58] Ivi, p. 22.
[59] A. Wilson, (April 2020), "Impact of coronavirus on energy markets", *European Parliamentary Research Service*, https://www.europarl.europa.eu/RegData/etudes/ATAG/2020/649372/EPRS_ATA(2020)649372_EN.pdf.

supply chains and that had undergone considerable insecurity. Last, but not least, according to the report, major changes in consumers' behaviour would have kept affecting energy demand in the long run, with a persistent negative impact on countries dependent on energy export revenues.[60]

Hence, in brief, during the pandemic there was a general downward trend in energy demand and prices. This is, yet, no more the case for the post-pandemic period. The easing of restrictions and the roll-out of vaccines in the first half of 2021 contributed to a major sense of hope and certainty towards the future, which was ultimately reflected in the gradual economic recovery. In light of this, the energy demand has started to soar again, which produced a 16% growth in energy prices in the third quarter of 2021, according to the data gathered by the World Bank.[61] A trend that is going to stay until 2023, according to the organization, when the energy supply will adapt to demand, and prices will go down.[62]

Starting from these general considerations, the focus will now shift to the natural gas market, in order to grasp the main post-pandemic dynamics that are affecting it and to understand the interplay of factors that are fuelling the current energy crisis. Already subject to substantial changes before 2020, the multifaceted consequences of the pandemic on the natural gas market have been peculiar due not only to its increasing exposure to global variables, but also to its interplay with the green transition as a bridging fuel or enabler, which will be discussed in the next section.

The gas market has been notably expanding during the last decade, a period in which it went from being characterized by multiple regional markets, each preserving a certain level of autonomy, to becoming an increasingly globally integrated market, where local outages can be no more contained locally, and their effects spread in other regions too.[63] According to Hafner (2020), this rapid evolution should be seen as the by-product of the US gas shale revolution, which from 2010 has been gaining considerable market share, and of the introduction of Liquefied Natural Gas (LNG) in the market, which has registered an average annual growth of 6.6% in the last 20 years and came to cover 46% of the global gas market in 2019.[64] New players, like Qatar and Australia, have been joining this market, and other players, especially Russia, are eying this possibility. In addition to this, major changes have been occurring in contractual models, which helped instil more flexibility in the market. As a matter of fact, the linkage to oil prices has been progressively abandoned and take-or-pay

[60] World Bank, (April 2020), "A Shock Like No Other", p. 14.
[61] World Bank, (October 2021), *Commodity Markets Outlook. Urbanization and Commodity Demand*, Washington, p.1, https://openknowledge.worldbank.org/bitstream/handle/10986/36350/CMO-October-2021.pdf.
[62] Ivi, p. 30-31.
[63] M. Hafner, (2020), "The Geopolitics of Gas: Main Players and Dynamics", in A. Belladonna and A. Gili (ed.), *The great game of gas: geopolitics & new technologies*, Istituto per gli Studi di Politica Internazionale, p. 5-6, https://www.ispionline.it/sites/default/files/pubblicazioni/ispi_dossier_gas_5_0.pdf.
[64] Ibidem.

contracts have been reduced.[65] These latter offered minimum guarantees to the seller, who, in case of non-compliance by the buyer, would have equally received an agreed payment, as a way of sharing risks. In this sense, it can be argued that the traditional rigidity of conventional gas has been offset by the innovative and more flexible market design of LNG, which specifically tends to rest on spot prices, albeit fuelling competitiveness between importers to obtain supplies.[66]

It is clear how the market itself is undergoing a major revolution, which acquires and even more relevant meaning in light of the fact that natural gas is the fossil fuel that has been seeing the greatest expansion the world over. Noticeably, the implications of the pandemic on the gas market were not as marked as for oil or coal. As mentioned before, gas demand dropped by only 1.9% and significantly rebounded in the second quarter of 2021. In the EU, the rapid economic expansion that followed the vaccine roll-out and the easing of contention measures gave a strong impulse to energy demand both for electricity generation and for industrial use. Yet, the explosion of the energy crunch has to be seen in this context, for it is inextricably tied to the shocks produced by the pandemic, but, also, it must be seen from a wider point of view, in order to grasp the implications of those variables that crosscut the pandemic and originated before it. The diverse causes that contributed to the unprecedented gas price surge, that began in the third quarter of 2021, can be classified in three categories, that, in any case, are strictly correlated: local causes, market-rooted causes and, finally, causes driven by the European climate policy.

As concerns local causes, last year weather conditions were detrimental to power generation through renewables in Europe, especially with respect to wind power. According to Jason Bordoff (2021), professor at Columbia University, unexpected cold winters in the Northern Hemisphere have hampered gas production and unprecedented heat waves have boosted gas demand in summer.[67] The prolonged absence of wind in the Northern Sea considerably curbed wind power generation, which was substituted by a rising consumption of gas and coal. The interplay between the frequent occurrence of these events in different regions of the world and the major global integration of gas markets have resulted in a general increase of LNG demand, also from Europe, which had to face significant competition especially from Asian countries. Due to its flexibility, LNG was used to cover temporary energy needs and supplies were diverted towards Asia and Latin America, pushing up prices.[68]

[65] Ibidem.
[66] Ibidem.
[67] J. Bordoff, (24.09.2021), "Why this energy crisis is different", *Foreign Policy*, https://foreignpolicy.com/2021/09/24/energy-crisis-europe-gas-coal-renewable-prices-climate/#.
[68] International Energy Agency, (January 2022), *Gas Market Report*, *Q1-2022*, IEA Publications, p. 8. https://iea.blob.core.windows.net/assets/4298ac47-e19d-4ab0-a8b6-d8652446ddd9/GasMarketReport-Q12022.pdf

In addition to this, the second "local" cause can be identified in the low levels of inventories in Europe. Due to the variability of energy demand, natural gas stocks tend to grow during summer and are depleted during the cold seasons. Yet, between 2020 and 2021 colder winter temperatures caused the stocks to rapidly drop (see. Figure 1.3b), without the possibility to increase them as needed in the months ahead: the US had to reduce their production of gas, due to weather conditions, and Russia couldn't or, arguably, wouldn't send further supplies.[69] According to Gili (2022), in the third quarter of 2021, Gazprom didn't deliver optional gas volumes to Europe, as per contract, marking a reduction of 25% in comparison to the previous year; a behaviour that the IEA explains as the attempt by the Russian government to put pressure on the Ukrainian situation and on the completion of the controversial Nord Stream II pipeline.[70]

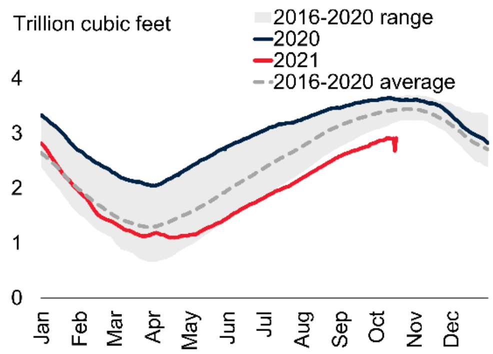

***Figure 1.3b:** European natural gas inventories [Source: Commodity Markets Outlook, October 2021, World Bank].*

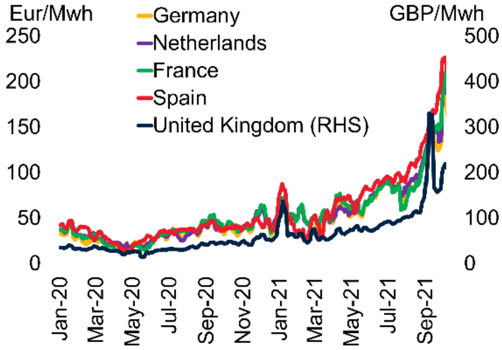

***Figure 1.3c:** Electricity prices in Europe [Commodity Markets Outlook, October 2021, World Bank].*

Insufficient stocks and the already ongoing decline of gas production in the EU played a central role in ramping up gas prices, which, for its use in electricity generation, translated into higher electricity prices (see Figure 1.3c). In Europe, spot natural gas prices increased four times from July to September 2021 in comparison to price levels early that same year, and average electricity prices soared by 200% with respect to 2020 levels.[71] This has ultimately resulted in the shutdown of some energy-intensive industrial plants and the cutback of consumers' electricity use.[72]

Other major causes that frustrated the efforts of the EU to obtain more supplies were rooted in the gas market itself. On the one hand, the effects of local causes have been exacerbated by the increasing competition with Asian importing countries for attracting LNG supplies. As mentioned above, LNG prices are determined in the spot market; therefore, supplies will be guaranteed to the highest bidder, that is to the market where prices are higher. Perhaps the main reason behind German and Dutch

[69] World Bank, (October 2021), *Commodity Markets Outlook*, p. 30; D. Sheppard, (11.10.2021), "Gas shortages: what is driving Europe's energy crisis?", *Financial Times*, https://www.ft.com/content/72d0ec90-29e3-4e95-9280-6a4ad6b481a3; J. Bordoff, (24.09.2021), "Why this energy crisis is different".
[70] A. Gili, (14.01.2022), "La crisi europea: cosa ci aspetta?".
[71] World Bank, (October 2021), *Commodity Markets Outlook*, p. 28; W. Mathis and J. Starn, (30.12.2021), "Europe's never paid so much for power as 2021 breaks record", *Bloomberg*, https://www.bloomberg.com/news/articles/2021-12-30/europe-has-never-paid-so-much-for-power-as-2021-costs-hit-record.
[72] J. Bordoff, (24.09.2021), "Why this energy crisis is different".

harsh scepticism around the imposition of a European price cap.[73] In these last two years, the highest bidder was indeed Asia, where the incredible economic recovery of China pushed its gas demand upwards, transforming the country into "the world largest LNG importer" in 2021.[74] This year, China grew its LNG demand by 17%, which made it very difficult for Europe to get new procurements. In an attempt to meet its energy needs, the European Union increased its imports of pipeline gas, in particular from Norway, North Africa and Azerbaijan. On the contrary, European imports of Russian gas declined vis-à-vis higher Russian exports towards China. Paradoxically, Europe has significant LNG storage capacity, which was developed as a result of a greater reliance on LNG imports, especially from the US and Qatar, but it is now seriously struggling to attract those LNG shipments headed eastward. As a consequence, rising competition and market integration came to aggravate the European energy crunch and, according to Bordoff (2021), are hints that the volatility that Europe is now experiencing is not a one-off but is expected to expand or to occur with more frequency in the future.[75]

On the other, the gap between gas demand and supply was fuelled by the decline in investments, which was caused by the more compelling shift towards green transition in the Western world, especially in Europe.[76] Even if there is still a long way to go to finalize the transition, the establishment of more pressing legal frameworks and investment priorities gradually produced a decrease in upstream activities. Added to the restrictive effects of the pandemic in 2020, this led to a production decline and to a higher rigidity when it comes to increase output, as it would be needed now. Concerns about lower investments were expressed at the Dubai Conference in September 2021, where energy executives met to discuss the developments of energy markets. On this occasion, Qatar and UAE's energy ministers agreed on the negative impact of the lack of sufficient investments in the gas industry, which would derive from a general "euphoria around energy transition".[77] This could sound convenient, as this affirmation was said by the representatives of two countries that are notably energy exporters. Yet, this issue was underlined by the IEA Gas Market Report too. According to this study, after 2019 LNG final investments decisions substantially declined and there was just one large-scale expansion project approved in Qatar, with the other being smaller or less significant. The upward trend of LNG prices might suggest new prosperous investment opportunities, but the expiration of existing contracts for high amounts of supply seems to hinder this possibility.[78]

[73] Deutsche Welle, (19.12.2022), "EU agrees to gas price cap".
[74] International Energy Agency, (January 2022), *Gas Market Report, Q1-2022*, p. 17.
[75] J. Bordoff, (24.09.2021), "Why this energy crisis is different".
[76] International Energy Agency, (January 2022), *Gas Market Report*, *Q1-2022*, p. 16.
[77] A. Cornwell, M. Rashad, and N. Chestney, (21.09.2021), "Another headwind?: global energy price spike worries energy execs", *Reuters*, https://www.reuters.com/business/energy/another-headwind-global-gas-price-spike-worries-energy-execs-2021-09-21/.
[78] International Energy Agency, (January 2022), *Gas Market Report Q1-2022*, p. 14.

Perhaps, at the European level, the recent approval by the European Commission of the Complementary Climate Delegated Act, in the framework of the European taxonomy for sustainable activities, have made clearer the prospects of gas production and consumption until 2035, when producers should shift to renewable or low-carbon gases. The European taxonomy was designed to divert investments towards sustainable activities or activities that are crucial for the transition. The inclusion of gas was obviously seen by many climate activists and observers as unjust and potentially harmful for actually sustainable energy sources and for the fulfilment of the EU climate agenda.[79] Still, according to the IEA, the absence of sufficient investments in the gas industry and of adequate policies to limit demand growth might pose a problem of supply adequacy in the medium term.[80]

As a third market-driven cause, various analysts have underlined the role of Russia in doing almost nothing to help alleviate the European energy crisis. The crisis the EU is living through today was not exacerbated by a voluntary disruption of gas supplies by Russia, in a possible attempt to "weaponize" this energy source. On the contrary, gas kept flowing in the pipelines connecting Europe to Russia, as agreed in the existing long-term contracts, yet at lower quantities. This was due to different factors. According to the *Financial Times*, the Russian state-owned gas industry, Gazprom, played a major role in exacerbating supply shortages in Europe, because it wasn't willing to send further supplies to Europe.[81] Nevertheless, this supposed unwillingness was also due to a drop of Russian inventories as a consequence of the colder winter. In addition to this, it is reported that the EU itself pushed for market-based prices, no longer linked to oil prices, which eventually fuelled the upward trend. Yet, the element that is mostly questioned is the opportunism of Gazprom in using the European energy crunch to its advantage, in order to put pressure on Germany to proceed with the approval of Nord Stream 2 pipeline.

Whether Gazprom acted out of strategy or necessity, it remains clear that the EU is still strongly dependent on Russian gas and that this crisis has been giving Russia a significant leverage on Europe, considering the difficulty of diversifying energy partners. A leverage that has been further increasing in light of escalating tensions with Ukraine, that ultimately translated in war in February 2022, causing widespread fear over the future of European gas supplies, economies, and security, apart from Ukraine's future, also considering its role as transit state for Russian gas pipelines. Nevertheless, the outbreak of war is not to be regarded as a cause itself of the energy crunch in Europe, even if it is exacerbating it, given the decision of Western countries to hit Russian vital economic sectors through

[79] M. Strauss, (2.02.2022), "European Commission declares nuclear and gas to be green", *Deutsche Welle*, https://www.dw.com/en/european-commission-declares-nuclear-and-gas-to-be-green/a-60614990; K. Taylor, (04.02.2022), "Investors warn 'green' label for gas undermines EU taxonomy", *Euractiv*, https://www.euractiv.com/section/energy-environment/news/investors-warn-green-label-for-gas-undermines-eu-taxonomy/.
[80] International Energy Agency, (January 2022), *Gas Market Report Q1-2022*, p. 14.
[81] D. Sheppard, (11.10.2021), "Gas shortages: what is driving Europe's energy crisis?", *Financial Times*.

heavy sanctions. More importantly, the increasingly eastward orientation of Russian gas supplies together with the project of building a Power of Siberia 2, that is a second pipeline that would connect Russia to China by 2030, pose major risks for secure supplies for Europe.

Finally, as concerns the determinants deriving from climate policy and the impulse to the green transition, there are different and opposite postures that will be better elucidated in the next section. Nevertheless, it is obvious that the underperformance of renewables between 2020 and 2021 contributed to the shift towards other back-up energy sources, like natural gas and coal, for electricity generation. As a consequence, according to Bordoff (2021), this led to an increase of carbon permit prices, which are ruled under the framework of the European Emission Trading System.[82] Recent climate policies brought a restriction in the emission of these permits, which pushed up prices. Yet, the spike in both natural gas and coal, whose markets are strictly interconnected, added to the increasing carbon permit price, weighing on consumers. This vicious cycle has been criticized by representatives of the gas industry, who call for a policy change by the EU to correct the burden produced by carbon permit prices on investments in the gas sector.[83]

From these considerations, it is possible to understand how the current energy crunch is relevant for multiple aspects, that go from the European strategy for the green transition to the function that hydrocarbons will keep playing in the future, and from the European energy security crux to energy partnerships. For many, this crisis has revealed once again the fragility of the EU energy security, an aspect that is being aggravated by the increasing global scale of the gas market, subsequent difficulties in securing supplies and renewed hostilities in Ukraine. In moments of energy crisis, the need for diversification arises and comes to be rhetorically prioritized. But, as it emerged, today's crisis was not merely a by-product of the lack of diversification. It mostly stemmed from the insufficient gas stocks and, partially, the still intermittent reliability of clean energy sources - this doesn't necessarily mean that the transition is responsible for the crisis, rather that further investments and research should be directed to clean energy technologies, in order to make them more integrated and reliable.

Nicolazzi (2020) analysed for ISPI the evolution of the traditional energy security mantra in the EU and observed how it can be no more reduced to the attempt to avoid political risks or unilateral price-setting by a dominant supplier.[84] This scholar particularly highlights a broader meaning of diversification, which happens when "security becomes a synonym for the ability to switch producer and/or to resort to storage or some other available spare capacity so as to avoid in terms of available

[82] J. Bordoff, (24.09.2021), "Why this energy crisis is different?".
[83] D. Sheppard, (11.10.2021), "Gas shortages: what is driving Europe's energy crisis?", *Financial Times*.
[84] M. Nicolazzi, (2020), "The Redundancy of Energy Security in the EU", in A. Belladonna and A. Gili (ed.), *The great game of gas: geopolitics & new technologies*, Istituto per gli Studi di Politica Internazionale, p. 18-20. https://www.ispionline.it/sites/default/files/pubblicazioni/ispi_dossier_gas_5_0.pdf.

gas the consequences of major disruptions, be they of technical, political or whatever nature". This was not possible in Europe, for, as stated by the *Financial Times*, its swing suppliers became almost progressively less reliable.[85] Also, according to Nicolazzi (2020), in order to increase the security level in a market, countries need to spend, which in the aftermath of the pandemic and with the pressure upon the gas market may result in a further burden for citizens.

And yet, as affirmed by Gilbert et al. (2021), the need for more investments on security is precisely what this crisis is showing.[86] Volatility should be seen as an intrinsic aspect of today's energy systems, "created by energy systems design choices that value short-run marginal optimization, largely ignore interconnected markets, and fail to balance between central regulatory control and decentralized market forces".[87] Governments and energy organizations should, in this sense, change their response to natural gas markets, for it will of course be crucial for the green transition, and improve their governance on increasingly global market dynamics that could potentially result in a burden not only for consumers, but also for the environment.

1.4 Towards a structural turbulence? The impact of transition on today's crisis

The current energy crunch is obviously testing EU's energy security, that is an optimal combination of market competitiveness, sustainability targets and security of supply, as the European Commission has repeatedly defined it. There are contrasting opinions with what or who lays the most responsibility for the crisis, and yet, a more urgent question emerges: will this crisis be a one-off or is it just the beginning of a much larger period of volatility? The answer depends on various factors and perspectives. What is clear is that nowadays the EU has undertaken to accomplish two major tasks: protect its citizens from eye-watering energy prices and move away from its dependence on Russian gas supplies as fast as possible. Both commitments face several challenges, some of which have been discussed previously, such as underinvestment and stalemate in new gas facilities and development projects, heightening competition among increasingly global gas markets, intermittence of renewable sources and the consequences of the liberalisation of European gas and electricity markets.

In this context, European leaders and governments have been trying to accelerate changes that would take decades, as a response to Russian aggression of Ukraine, that is in the name of those values like freedom and democracy with which the EU has decided to align. Of course, this decision

[85] D. Sheppard, (11.10.2021), "Gas shortages: what is driving Europe's energy crisis?", *Financial Times*.
[86] A. Gilbert, M.D. Bazilian and S. Gross, (December 2021), "The emerging global natural gas market and the energy crisis of 2021-2022", *Brookings*, p.6 https://www.brookings.edu/research/the-emerging-global-natural-gas-market-and-the-energy-crisis-of-2021-2022/.
[87] Ibidem.

has clashed with EU-Russian energy relations, that have also created a controversial situation, in which the EU has been receiving Russian gas supplies while sending arms and aid to Ukraine. This is to say, while on the ideological field there is no doubt which side to take, on the more pragmatic one the differences in energy external dependence among Member States are emerging as primary obstacles to a common response to Russia as concerns energy. But in the rush to diversify suppliers and routes and to protect consumers from skyrocketing prices, there is confusion over what measures to implement and in the interest of whom. If, on the one hand, the situation requires urgency and timeliness to adequately respond to Russia, on the other, diversification of suppliers and the opening of new routes won't show their impact in a very short time, which could keep unaltered energy relations with Russia. But diversification is just one piece of the puzzle and is strictly connected with energy diplomacy, that will be discussed in the following chapter.

There are even more urgent challenges to tackle, that will define the continuity and intensity of the crisis. One of these is speculation. One major distortion that is driving prices upwards is the market-based pricing, according to which the EU benchmark gas price (Dutch TTF) is set in the Amsterdam Stock Exchange. The reliance on this mechanism can be seen as a by-product of the influence of LNG spot prices in gas markets, exposing gas prices to more fluctuations and volatility.[88] Adding to this, since the recovery in 2021, speculators have contributed to turn volatility into an issue for European consumers. As the enthusiasm produced by the recovery and the following fears over the aggression of Ukraine suggest, markets haven't been responding rationally, which has resulted in extremely high prices, already hit by inflation. According to Greek Prime Minister, Kyriakos Mitsotakis, and the former Italian Minister for the Ecological Transition, Roberto Cingolani, the decoupling of gas pricing from gas and electricity markets would need to be urgently tackled by the EU has a whole. [89] A measure that has not been adopted yet, even if the imposition of a price cap on TTF, a temporary public intervention in the market, do represent a step forward.

Related to this, a second distortion that explains the incredible fallout of the gas price surge in the electricity market is the mechanism of marginal cost pricing, meaning "the practice of setting the price of a product to equal the extra cost of producing an extra unit of output".[90] In the case of gas, this mechanism links electricity prices to the price of the source that is more extensively used to produce it, generally natural gas. The exposure of gas to increasing volatility, its coupling with

[88] Energia Oltre, (06.11.2020), "Gas, perché l'hub olandese Ttf sta spopolando nel mondo", https://energiaoltre.it/gas-perche-lhub-olandese-ttf-sta-spopolando-nel-mondo/.
[89] K. Mitsotakis, (09.03.2022), "A '6-point plan' to save Europe's gas market", *Politico*, https://www.politico.eu/article/europe-russia-gas-trade-energy-ukraine-war/; C. Brusini, (16.03.2022), "Rincari dell'energia, Cingolani: 'colpa della speculazione sul mercato europeo'. Ma non parla degli extra-profitti degli imprenditori", *Il Fatto Quotidiano*, https://www.ilfattoquotidiano.it/2022/03/16/rincari-dellenergia-cingolani-colpa-della-speculazione-sul-mercato-europeo-ma-non-parla-degli-extra-profitti-degli-importatori/6527218/.
[90] Encyclopaedia Britannica, "marginal-cost pricing", https://www.britannica.com/topic/marginal-cost-pricing.

electricity markets, and its preponderance in electricity production overshadow the positive impact of renewables in the same process, albeit their lower cost. It appears clear that in the absence of corrections to these distortions, speculators could keep being an unbearable burden for consumers in the future too.

In brief, according to *Bruegel*, current price spikes can't be resolved through a *lassez-faire* approach, because their causes suggest that they aren't a one-off.[91] So, in this context, short-term and long-term measures are competing to achieve a containment of the effects of the crisis, while at the same time talks at the national and regional level suggest a more decisive approach towards renewables, which are thought to provide more independence. Yet, the role of renewables in this crisis has been questioned too, given that one of the causes of the original price spike was to be found in insufficient wind power, due to bad weather conditions, and in the (relative) pressure exerted by increased carbon prices. As affirmed by *Time*, EU climate sceptics like President Orban or President Putin have stated that the price surge was determined by EU commitments to curb carbon emissions, subsequently influencing investors to reduce their participation in fossil industries.[92] On the contrary, the IEA has assertively affirmed that "these assertions are misleading to say the least. This is not a renewables or a clean energy crisis; this is a natural gas market crisis", then adding that "while today's market fluctuations cannot be traced back to climate policies, that does not mean that the road to net zero emissions will be smooth".[93]

This is precisely the most critical dilemma for today's policymakers: on the one hand, natural gas will continue to a be a back-up source, up until other greener sources will progressively substitute it or renewables' intermittence will be resolved; on the other, the speed at which changes in energy security policies and markets will take place will define future exposure to volatility and uncertainty. Of course, whether rapid or not, the transition represents a disruptive element that inevitably contributes to market fluctuations, but, according to the IEA and other scholars, the intensity of these fluctuations will be contained if the transition is accelerated.[94] Still, it must be also recognized that there

[91] S. Tagliapietra, G. Zachmann, (13.09.2021), "Is Europe's gas and electricity price surge a one-off?", *Bruegel*, https://www.bruegel.org/2021/09/is-europes-gas-and-electricity-price-surge-a-one-off/.

[92] C. Nugent, (13.10.2021), "The fight to control the narrative over climate and energy security", *Time*, https://time.com/6106450/europe-gas-crisis-climate-change/.

[93] F. Birol, (13.01.2022), "Europe and the world need to draw the right lessons from today's natural gas crisis, Paris, *International Energy Agency*, https://www.iea.org/commentaries/europe-and-the-world-need-to-draw-the-right-lessons-from-today-s-natural-gas-crisis.

[94] Ibidem; S. Tagliapietra, G. Zachmann (13.09.2021), "Is Europe's gas and electricity price surge a one-off?"; J. Bordoff, (24.09.2021), "Why this energy crisis is different".

won't be a rapid phase out of fossil fuels, especially natural gas, any time soon, considering the estimated increase in electricity demand by 23-30% by 2030.[95]

According to Bordoff (2021), governments need to find new tools to control volatility, for instance, corrections to the power sector and structures, more efficient and expanded use of storage technologies, control of demand, and reforms of the framework for infrastructural development.[96] Those measures should serve to combine more efficiently the "old" energy system with the "new" one, given that " it's not just about the capacity of the amount of power we can get onto the network, it's about the flexibility and the ability to deliver that power at the right time".[97] In this sense, the need for a better harmonization would serve the scope to instil more certainty in energy markets, which in turn would reattract the necessary investments to advance the transition and secure still needed fossil markets.

Nevertheless, while providing more energy independence in terms of production, clean energy technologies and infrastructures could also bring along issues of energy security, given the geographical concentration of many critical minerals used to store energy or some states' market dominance in specific industries, such as China in relation to solar panels production. This is to say that international partnerships will be pivotal in the "green" world as much as they have been in the fossil fuels-dependent world, in order to avoid or manage potential energy security issues.[98] For this reason, due to the present situation and to the commitment to a greener and more electrified future, the EU will ultimately need to demonstrate how it can "walk the talk" by actually enhancing a common external energy policy to balance its traditional demand-based energy policies.

1.5 Critical Raw Materials and security of supply: balancing opportunities and threats

According to the IEA's 2021 Report on "The role of Critical Raw Materials in Clean Energy Transitions", the wider deployment of clean energy technologies in compliance with the goals set by the Paris Agreement will rise the global demand of Critical Raw Materials (from now on called CRMs) fourfold by 2040, with percentages varying from more than 40% for copper and 60-70% for nickel

[95] European Commission, (17.09.2020), "Impact assessment", [accompanying relative communication on "Stepping up Europe's 2030 climate ambition"], SWD(2020) 176 final, EUR-Lex, p.51, https://eur-lex.europa.eu/resource.html?uri=cellar:749e04bb-f8c5-11ea-991b-01aa75ed71a1.0001.02/DOC_2&format=PDF.
[96] J. Bordoff, (24.09.2021), "Why this energy crisis is different".
[97] D. R. Baker et al., (05.10.2021), "Global energy crisis is the first of many in the clean-power era", *Bloomberg*, https://www.bloomberg.com/news/articles/2021-10-05/global-energy-crisis-is-the-first-of-many-in-the-clean-power-era#:~:text=The%20next%20several%20decades%20could,are%20left%20vulnerable%20to%20shocks.
[98] F. Birol, (13.01.2022), "Europe and the world need to draw the right lessons from today's natural gas crisis", *International Energy Agency*.

and cobalt, to 90% for lithium.[99] In contrast to fossil fuels-based technologies, green ones make indeed greater use of raw materials. For instance, in an electric car, raw material components are sixfold compared to those needed for a conventional car.[100] The inherent strategic role of CRMs goes hand-in-hand with increasing worries about the risk of new dependencies, especially in the case of the European Union, in light of heightened international competition, market distortions, and a relatively disadvantageous geological configuration.

The European Commission defines CRMs as "those raw materials that are important economically and have a high supply risk. …[being] essential to the functioning and integrity of a wide range of industrial ecosystems".[101] CRMs are in fact pivotal, either directly or indirectly, for industrial sectors, in particular telecommunications, medical devices, automotive, green technologies and defence. As reported by the European Commission, the EU is dependent on imports for the majority of metals, with percentages going from 75% to 100%.[102]

The criticality of these materials can be explained considering the risks and variables to which CRMs are exposed: reliability and availability of the supply, geology, environmental and social impacts, and technical factors.

2020 critical raw materials (new as compared to 2017 in bold)		
Antimony	Hafnium	Phosphorus
Baryte	Heavy Rare Earth Elements	Scandium
Beryllium	Light Rare Earth Elements	Silicon metal
Bismuth	Indium	Tantalum
Borate	Magnesium	Tungsten
Cobalt	Natural graphite	Vanadium
Coking coal	Natural rubber	**Bauxite**
Fluorspar	Niobium	**Lithium**
Gallium	Platinum Group Metals	**Titanium**
Germanium	Phosphate rock	**Strontium**

Figure 1.5a: *List of CRMs published by the European Commission in September 2020 [Source: Directorate-General for Internal Market, Industry, Entrepreneurship and SMEs]*

More specifically, since 2011, the European Commission has used precise parameters to conduct triennial assessments on the criticality of a pre-defined range of CRMs, to detect changes in the world scenario and, thus, promote strategic responses (see Figure 1.5a).[103] Non-energy and non-agricultural raw materials are analysed according to their economic importance and their inherent supply risks. The first parameter is used to study a material's end-use applications and value added, whereas the second parameter measures the intensity of the risk of disruption, taking into account geological distribution, governance patterns and economic

[99] International Energy Agency, (May 2021), *The Role of Critical Minerals in Clean Energy Transitions*, International Energy Agency, p. 5-8, https://www.iea.org/reports/the-role-of-critical-minerals-in-clean-energy-transitions.
[100] Ivi, p. 28.
[101] European Commission, (03.09.2020), "Critical Raw Materials Resilience: Charting a Path towards greater Security and Sustainability", COM (2020) 474 final, DocsRoom, p. 1, https://ec.europa.eu/docsroom/documents/42849.
[102] Ivi, p. 5.
[103] Directorate-General Internal Market, Industry, Entrepreneurship and SMEs, "Critical raw materials", European Commission, https://single-market-economy.ec.europa.eu/sectors/raw-materials/areas-specific-interest/critical-raw-materials_en.

trends.[104] The publication of the list is aimed at orienting investment flows and industrial plans to secure CRMs supplies to the European Union, in the attempt to overcome internal shortages and limited presence in upstream and downstream processes.

In contrast to fossil fuels, CRMs are considerably more geographically concentrated in few exporter-countries (see Figure 1.5b). The case of cobalt is exemplary: 70% of world production takes

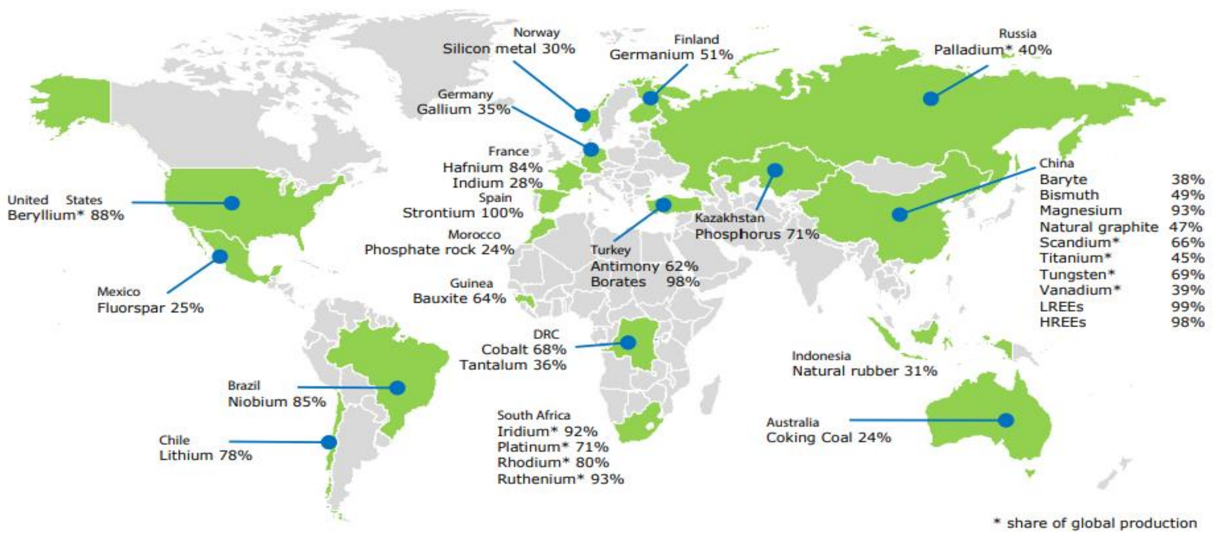

Figure 1.5b: *European Union's supplier countries for CRMs (2020)*
[Source: European Commission's Action Plan on Critical Raw Materials]

place in the Democratic Republic of Congo.[105] The geographical concentration can also be interpreted as the dominance of a country in the downstream production phases and in the fabrication of CRMs-intensive derivatives, as in the case of lithium-ion batteries. As a matter of fact, lithium has entered the list not because of its scarcity in nature – it is in fact expected to be in surplus in the short run – but because of the possible tightening of supply that its compounds might face in the near future.[106]

Still, owing to the fact that not every critical raw material is scarce in nature, few countries have actually promoted significant policies and actions aimed at reducing supply-related risks, and now find themselves straining to adequately respond to countries like China, that understood their criticality already in the 1970s. Adding to this, possible market crunches might also be caused by increasing international competition to gain competitive advantages in the market and to counterbalance Chinese monopoly in CRMs refining processes and in the production of critical compounds for clean energy technologies. Also, the IEA warns about the risks deriving from overextended project development

[104] Ibidem.
[105] International Energy Agency, (May 2021), *The Role of Critical Minerals in Clean Energy Transitions*, p. 32.
[106] Ivi, p. 11.

lead times, the erosion of minerals' quality, that could hamper materials' energy applications, and the exposure to climate risks, that could complicate the extraction process itself.[107]

Finally, concerns about the security of supply of CRMs cannot ignore accessibility. According to the IEA's Report, price volatility in CRMs markets is currently due to a lack of sufficient determination, courage, and ambition in driving forward stringent climate policies, which is influencing investors' in not taking decisive steps to fully support clean energy technologies.[108] This translates in more variable costs for the industries engaged in the production of these technologies and for end consumers buying them, preventing the transition from actually taking off and hindering the opportunity to scale up green solutions in the market. As concerns the impact of price volatility, green technologies reacts differently than fossil fuels markets to price spikes: increases in prices or tightening of supplies of minerals do not affect clean energy technologies in use, but only in production, with new buyers bearing the higher costs.

Given these vulnerabilities, the European Union and its Member States produced a wide range of policies and strategies representing the diverse, and sometimes conflicting, national interests, without being able to offer a coherent legal framework. Barteková and Kemp (2016) have studied the fragmentation of European responses to mineral security through the lens of policy styles, that is the interplay between "the government's approach to problem-solving and the relationship between government and other actors in the policy process".[109] The diverse nature of this interplay has produced a more liberal and pragmatic style in the UK, a more statist and activist style in France, and a strongly corporatist one in Germany and Sweden.

The authors partially justify the late and fragmented attempt of the European Union to answer to material security issues by considering the beginning of actual efforts to develop coordinated policies only at the end of the 1990s, after the foundation of the European Union. Even so, this topic had already been discussed in the framework of the European Community. From then on, the European Union has adopted a collaborative and multistakeholder approach to the definition of policy priorities and strategies in the field of critical minerals, bringing together European institutions, public-private partnerships, industrial representatives, NGOs, and academia.

In this context, one of the first achievements was the Raw Materials Initiative, launched in 2008, with the objective to mark a turning point in the consideration of mineral security issues in comparison

---

[107] Ivi, 12.
[108] Ivi, p. 8.
[109] E. Barteková and R. Kemp, (21.01.2016), "Critical Raw Material Strategies in Different World Regions", Maastricht University, p. 2, https://ideas.repec.org/p/unm/unumer/2016005.html.

to energy security.[110] In the related official communication, the European Commission explained the state of play, underlying the already high import reliance of the EU regarding "high-tech metals", crucial for the transition to a more sustainable production model. Also, it warned about the concentration of productive and refinery operations in often politically unstable, illiberal and/or economically fragile countries.[111] The main preoccupation, that the initiative tried to address, was the emergence of a disadvantageous market outlook for European industries, facing heightened competition in the access to mineral supplies. In order to avoid such a scenario, the Raw Materials Initiative was based on three main pillars, representing the then policy priorities in this field: securing fair and sustainable access to supplies of raw materials from global markets; enhancing the definition of a European legal framework to provide the basis for sustainable access to European mineral reserves (with particular attention to geological mapping and surveying initiatives); and promoting resource efficiency and recycling to reduce import reliance.[112] In said communication, the European Commission also highlighted the need to provide periodical criticality assessments on raw materials, to serve as the grounds for an integrated approach.[113] As a matter of fact, in 2011 the first CRMs list was published, comprising 14 materials.

In order to concretely achieve the objectives of the Raw Materials Initiative, the European Commission also launched an *ad hoc* European Innovation Partnership in 2012. Characterized by a pronounced multistakeholder and multilevel nature, European Innovation Partnerships aim at coordinating investments on pilot projects, forecasting, and intercepting any relevant change to be made in the legal framework and coordinating public procurement to scale-up innovative solutions faster.[114] The direct involvement of relevant stakeholders helps both implement concrete actions and gather the necessary R&I funding. The EIP was particularly thought to overcome the insufficient coordination between Member States and national research organisations, the lack of European verticalization in value chains, and the wrongly underrated importance of playing a more strategic role in the field of raw materials.

As part of the recommendations included in the communication of the EIP Raw Materials, the European Institute of Innovation and Technology launched the EIT RawMaterials Innovation

---

[110] European Commission, (04.11.2008), "The raw materials initiative – meeting our critical needs for our growth and jobs in Europe", COM(2008) 699 final, EUR-Lex, p. 1-14, https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52008DC0699.
[111] Ivi, p. 3.
[112] Ivi, p. 5-6.
[113] Ibidem.
[114] European Commission, "European Innovation Partnerships (EIPs)", Strategy on research and innovation, https://research-and-innovation.ec.europa.eu/strategy/past-research-and-innovation-policy-goals/open-innovation-resources/european-innovation-partnerships-eips_en#:~:text=Existing%20EIPs-,What%20are%20European%20Innovation%20Partnerships%20(EIPs)%3F,society%2C%20modernise%20sectors%20and%20markets.

Community in 2015.[115] To date, it is the largest consortium in this field, gathering more than 120 members. It is a legally independent entity engaged in education and entrepreneurship, funding innovative projects concerning the whole value chain of raw materials, with the aim of contributing to the achievement of a securer supply and of a more competitive role of the EU worldwide.

More recently, in 2020, the European Commission published the New Industrial Strategy for Europe highlighting two major trends to address, digitalization and decarbonisation.[116] Following the general ambitions to lead the transitions and to increase its global competitiveness, the Commission emphasised the pivotal role that European industries can and must play. As a matter of fact, the Strategy affirms the need for "a European industrial policy based on competition, open markets, world-leading research and technologies and a strong single market which brings down barriers and cuts red tape".[117] In particular, it states that European industries stand out in supplying high value-added products and services, notably concerning green technology patents, and are bound to the most stringent standards for the protection of the environment and the respect of social and labour rights.[118] In connection to this, the undergoing transitions in the industrial sector are already setting the conditions for the substitution of the inefficient traditional linear business model with a circular one, according to the major focus of the EU on resource efficiency and waste management. This ultimately translates into the need to make the most out of the opportunities coming from the localisation of once delocalized manufacturing processes back into the EU territory, with the objective to restore internal value chains.

In order to provide solutions to both accelerate the twin transitions and gain competitiveness, the European Commission intends to keep adopting a multilevel partnership approach, involving all relevant actors, therefore combining top-down plans and strategies with bottom-up initiatives. This general framework applies to all identified priorities, among which is industrial and strategic autonomy. In this respect, the communication reads as follows: "Europe's strategic autonomy is about reducing dependence on others for things we need the most: critical minerals and technologies, food, infrastructure, security and other strategic areas. They also provide Europe's industry with an opportunity to develop its own markets, products and services which boost competitiveness".[119] In relation to critical raw materials, the Commission acknowledges the possibility of new dependencies arising

[115] European Commission, (04.11.2008), "The raw materials initiative – meeting our critical needs for our growth and jobs in Europe", p. 5; EIT RawMaterials, "About EIT RawMaterials", https://eitrawmaterials.eu/about-us/.
[116] European Commission, (10.03.2020), "A New Industrial Strategy for Europe", COM (2020) 102 final, EUR-Lex, https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A52020DC0102.
[117] Ivi, p. 1.
[118] Ivi, p. 2.
[119] Ivi, p. 13.

from the shift from fossil markets to green ones and highlights the importance of supporting R&I in recycling and use of secondary raw materials, with the aim to decrease import reliance.

The renewed attention and importance given to CRMs was also reflected in the enclosed publication of an Action Plan on “Critical Raw Materials Resilience: Charting a Path towards greater Security and Sustainability”. This latter sheds the light on the main challenges that the EU is going to face in terms of security and sustainability of the supply of CRMs and on the actions needed. The Communication makes specific reference to the importance of collecting, systematizing, and sharing knowledge and information relevant for decision-making beyond the mere Raw Material Information System, a platform launched in 2015 and managed by the Joint Research Centre of the Commission, highlighting the need for a more collaborative and inclusive approach towards research institutions and bodies that can forecast future trends and needs.[120]

Altogether, the Plan takes into consideration four main fields of action, through which resilience and competitiveness can be improved: industrial policy, circular economy, extractive and refinery activities in the EU, and diversification of external sources.[121] To do so, the partnership approach mentioned in the Industrial Strategy is crucial: the necessary actions are to be discussed in collaboration with Member States, relevant stakeholders, and consolidated partnerships, such as the EIP on Raw Materials and the EIT RawMaterials.[122] In relation to the first field of action, the Commission announced the launch of a new industrial alliance on raw materials, the European Raw Materials Alliance (ERMA), with the aim to identify and assess existing obstacles and investment opportunities to boost European industrial ecosystems’ resilience.[123]

As regards circular economy, there is still room for improvement for recycling and use of secondary materials, which can be achieved through a more substantial support to R&I and to beneficial changes in business models. In the case of internal sourcing, the Commission has highlighted the lack of sufficient investments in upstreaming operations, the excessive red tape, and the common lack of public acceptance towards new mining projects.[124] To overcome these obstacles, the role of the Just Transition Mechanism, focused on alleviating the social impact of the transition and of the imposition of high environmental and social standards, is deemed central. Finally, as regards the diversification of external sources, the Commission has stressed the opportunities coming from a more efficient use of trade policy tools, like Free Trade Agreements, strategic partnerships, and external financial instruments to level the playing field and to enhance actual development policies in

[120] European Commission, (03.09.2020), “Critical Raw Materials Resilience: Charting a Path towards greater Security and Sustainability”, COM (2020) 474 final, DocsRoom, p. 4, https://ec.europa.eu/docsroom/documents/42849.
[121] Ivi, p.6.
[122] European Commission, (10.03.2020), “A New Industrial Strategy for Europe”, p. 3.
[123] Ivi, p. 7-8.
[124] Ivi, p. 11.

countries where national mineral resources are poorly governed and are not exploited according to environmental, social, and labour standards.[125]

In sum, after analysing the main characteristics of mineral security, it is possible to observe some similarities and differences between this latter and energy security, precisely with reference to their role and related approaches in the European Union. On the one side, fossil fuels reserves are less geographically concentrated than critical raw materials, which explains the generally lower import reliance rate for the former ones (27-46% in 2021) compared to the latter (75-100% in 2020).[126] On the contrary, as concerns the response to price volatility, fossil fuels tend to produce heavier consequences for end consumers, since everyone using them for electricity or mobility must bear the higher costs, while increases in prices of CRMs affect only new products or services, meaning only new consumers. On the other side, even if the security of supply of fossil fuels has been an EU priority over longer time than mineral security, both of them lack a harmonized policy framework at the European level, with Member States presenting conflicting national interests and energy needs. Therefore, in both cases EU strategies have been mainly driven by long-term demand-side policies, generally accompanied by fewer efforts to better handle supply-side policies, namely external relations. An aspect that has been relatively more pronounced in the case of fossil fuels rather than CRMs, and that will be further discussed in the next chapter. The late or inadequate responses given so far have created more pressure around the Union, which, in the case of CRMs, has been focusing mainly on resource efficiency, recycling and secondary use of materials, R&I investments, and assessment of EU mining potential, failing to adequately address near term needs and priorities. Last, but not least, fossil fuels value chains are situated closer to the EU than those of CRMs, and European energy companies are present in various upstream and downstream activities. The existing gap and risks of new dependences explain the priority for the EU to enter CRMs value chains more directly, if not localizing these latter back into the European territory, to contrast external competition and to impose its own standards.

Nowadays, the increasing strategic posture of the EU towards CRMs is dictated by the urgency to secure the access to the essential tools for the twin transitions and to gain ground in an ever-fiercer global competition. With the publication of the Action Plan in 2020, the Commission has tried to adopt a different approach to target urgent issues, in particular through the creation of the ERMA, that will first focus on increasing resilience in rare earths and magnets value chains, with the possibility to further expand its action to other CRMs in the future, depending on periodical priorities.

---

[125] Ivi, p. 15-17.

[126] European Commission, (03.09.2020), "Critical Raw Materials Resilience: Charting a Path towards greater Security and Sustainability", p. 5; European Commission, (20.04.2022), "In focus: Reducing the EU's dependence on imported fossil fuels", https://ec.europa.eu/info/news/focus-reducing-eus-dependence-imported-fossil-fuels-2022-apr-20_en.

Experts cast doubts on if these positive but still late responses will actually allow the EU to compete with China and other emerging actors.[127] Europe is characterized by a relatively limited mining industry and efforts to support recycling and secondary use will deliver their results only in the medium or even long term, while China currently benefits from a dominant position in the market, providing 98% of the EU's supply of rare earth elements and 62% of other CRMs.[128] At the same time, awareness over the geological configuration of Europe suggests that the old continent will inevitably continue to rely on imports of CRMs, a dependence that will increase in the near future, especially with the transition picking up speed – a trend that might also be true for bridging fuels, like natural gas, depending on the stringency of climate policies.

Thus, greater focus shall be made on the approaches and tools to deploy at the European level in order to build strategic partnerships with third countries to secure supplies and maintain competitiveness. EU's traditional reliance on resource imports means that it has the necessary tools to create said partnerships, but the effectiveness and success of these letter will be determined by its actual ability to compete with what other countries, like China, can offer, possibly enhancing innovative and impactful approaches to social, political, and economic development.

[127] F. Paron, (02.08.2018), "Europe's Dependence on Critical Raw Materials: Implications for the Competitiveness and Independence of Strategic Industries", *Istituto Affari Internazionali*, https://www.iai.it/en/pubblicazioni/europes-dependence-critical-raw-materials; F. Umbach, (10.01.2022), "Critical Raw Materials for the energy transition: Europe must start mining again", *Energy Post*, Critical Raw Materials for the energy transition: Europe must start mining again - Energy Post.

[128] Ibidem.

2. THE EUROPEAN ENERGY DIPLOMACY: a transition enabler or obstacle?

2.1 Energy diplomacy: the concept

Scholars agree on the general lack of solid theoretical fundamentals behind the conceptualization of energy diplomacy, both owing to the diverse interests and priorities to which it tries to answer and to the various forms it can assume. Yet, studies on energy diplomacy have been receiving increasing attention since the beginning of 2000s, when the market began experiencing a new contraction. As a result, at the international level, liberal and market-based approaches which had dominated in the 1990s were progressively substituted with more realist and politically strategic stances on energy issues, which have revived the debate on the role and the means of energy diplomacy.

Among the main scholars, Goldthau (2010) has defined energy diplomacy as "a strategic and instrumental use of foreign policy to secure access to energy supplies abroad and to promote (mostly bilateral, that is government to government) cooperation in the energy sector".[129] A definition that, according to the author, highlights the reinforced role of states as primary units in energy diplomacy, the predominance of national security goals over business ones in contract dealing and, therefore, the primacy of the political logic behind strategic considerations.

Similarly, one of the main Russian theorists of energy diplomacy, Stanislav Zhiznin (2010), has defined it an instrument of foreign policy, by particularly addressing its role for Russia when interacting with the world energy system. In an article published in 2010, he identified two major trends shaping contemporary energy affairs: the intensifying competition among large energy companies, and the greater expansion of international cooperation efforts on the regulation of the energy field.[130] According to the author, these factors have boosted the relevance of energy diplomacy, deployed in the attempt to curb disruptive competition and to provide energy security. Zhiznin (2010) affirms that, over time, the global architecture of energy security governance has expanded, creating new interplays and exchanges that were previously much more limited or even non-existent. For instance, the role of corporations has been harmonized with national governments orientations, which have reinforced their role in conducting energy diplomacy activities.

[129] A. Goldthau, (2010), "Energy Diplomacy in Trade and Investment of Oil and Gas", in Goldthau A. and Witte J. M. (ed.), *Global Energy Governance. The new rules of the game*, Washington, Brookings Press, p. 28; https://www.researchgate.net/publication/280609770_Energy_Diplomacy_in_Trade_and_Investment_of_Oil_and_Gas.

[130] S. Zhiznin, (2010), "Russian energy diplomacy and international energy security (geopolitics and economics)", *Baltic Region*, no.1, p. 7.

In addition to corporate and national governance layers, other centres of policymaking, research and monitoring have been consolidated, both at the regional (the EU, OSCE, NAFTA, …) and the international level (IEA, OPEC, IAEA, WTO, …). [131] On the one hand, this multi-layered structure, involving different actors and geographical reach, highlights the centrality of strategic factors and considerations when handling and deciding on energy issues, which means taking into account the influence of geographic and historical features of a country on its regional, continental, and global interactions, that could potentially provoke conflicts.[132] On the other hand, it also describes how the growing interactions between the diverse governance layers represent at least an attempt at containing international competition and possible frictions over energy issues, despite the predominance of sovereign states in addressing energy disputes. The current Russia's war of aggression in Ukraine, just to cite the latest case, demonstrates that this governance structure is not sufficient on its own to avoid disruptions in regional energy systems and markets, but, still, it can be useful to trace regional and international developments in the regulation of energy issues and the emerging priorities in the global energy scenario, for instance decarbonization and sustainable economic and social development.[133]

The commitment to seriously tackle climate change with ambitious goals and policies, which inherently needs an international collaborative approach to be efficiently achieved, often clashes with the conflicting nature of energy sources. Since these latter are scarce in nature, states' competition to secure access to them can be just partially contained by the international energy security architecture mentioned above. In moments of disruptions, the urgency to bargain over the distribution of these resources become fiercer, and the conflicting political aspects of energy prevail over and complicate the adoption of collaborative approaches. According to Česnakas (2010), this is more the case in states where the energy sector is closer to the central government, which is often not fully democratic, since in this context said government can arbitrarily decide to use national energy sources or the national need to secure access to energy instrumentally in its own foreign policy, to expand its power and influence.[134] On the contrary, more democratic countries often tend to enhance a greater distance between the energy sector and the central government, establishing a decentralized governance of energy policies. This translates in an inherent difficulty in using energy for foreign policy goals.

The approaches to energy diplomacy have been historically very diverse, depending on various factors, first and foremost on whether a state was either an energy importer or exporter. In the first case, such state would indeed act strategically to secure a stable access to key energy sources,

[131] Ivi, p. 12.
[132] Ivi, p. 8.
[133] J. Yu and Y. Dai, (2012), "Energy Politics and Security Concepts from Multidimensional Perspectives", *Journal of Middle Eastern and Islamic Studies* (in Asia), n. 6(4), p. 118.
[134] G. Česnakas, (2010), "Energy resources in foreign policy: a theoretical approach", *Baltic Journal of Law & Politics,* vol. 3, n. 1, p.48.

whereas, in the latter, it would aim at expanding and ensuring its own market shares. Since the beginning of the 20th century, the emergence of a more industrialized world has highlighted the increasingly central role of energy in modern economies. The end of the Second world war ultimately contributed to accelerating the pathway towards globalization, that changed the way in which countries treated threats to their own national security. As a matter of fact, the increasing economic and political costs of war, together with the greater opportunities of international cooperation and dialogue, have expanded the range of areas where diplomatic efforts could be concentrated. One of these was energy. A consideration on how energy diplomacy has been evolving cannot ignore one fundamental aspect on which it has built: the relations among national governments and private companies, meaning the way in which the former have dealt with energy issues that were more concretely managed by the latter. Overall, as far as the emergence of the tools and mechanisms of energy diplomacy - when it wasn't defined this way yet - are concerned, two main models stand out: the British and the American one.

At the beginning of 1900, the industrial revolution driven by internal combustion engines was setting the stage for the "energy era", a time where more rudimentary energy sources like kerosene began being substituted with oil.[135] This shift and the inherent advantages offered by the use of oil were first captured by carmakers and shipbuilders, but it didn't take long for military headquarters to grasp its enormous potential as well, especially with the First world war around the corner. As a matter of fact, Winston Churchill, First Lord of the Admiralty since 1911, became the fiercest supporter of the transition to oil in the British Navy, which he achieved in 1913, as a consequence of the approval by the British Parliament.[136] Yet, the absence of oil reserves in Great Britain's domains, as opposed to the abundance of coal in the national territory, turned the search for stable and exclusive energy supplies into a matter of national security.[137]

In this context, under the intense lobbying of Churchill, the British government decided to adopt an interventionist approach, meaning that it directly intervened to take control of strategic external oil reserves.[138] Proof of this is the acquisition of the Anglo-Persian Oil Company (APOC) in 1914, a previously private company that owned a 60-year-concession to explore and exploit natural gas and oil in Persia. At the time, the company was almost in bankruptcy, despite its potential, and at risk of foreign interference, therefore it was desperately seeking an end market. A situation that Churchill and APOC's general manager, Sir Charles Greenway, succeeded to use rhetorically to create domestic

[135] L. Maugeri, (2006), *L'era del petrolio. Mitologia, storia e futuro della più controversa risorsa del mondo*, Milano, Feltrinelli, p. 44.
[136] Ivi, p. 45.
[137]Ibidem.
[138] Ivi, p. 46.

consensus in the Parliament, also by hinting at the possible loss of competitiveness compared to US Standard Oil and the allegedly German sympathizer Royal Dutch-Shell, had the acquisition not taken place.[139] According to Petrini (2020), the Parliament's decision "marked the beginning of a century of entanglement between public powers and the private oil business".[140] A context in which the relations between oil companies and the British government defined themselves as asymmetric, not state-centred, given that despite the public acquisition, the government decided to enhance the maintenance of a corporate approach to the management of APOC, yet providing it with political protection from external interference.[141] A relation that didn't change up until the end of the 1970s and into the 1980s when the privatisation process culminated.

In the 1920s the British model had to face increasing US competition, given the preoccupations around the alleged exhaustion of US oil reserves at the time. The 1920s bonanza in the US was fuelling an upward trend in oil demand, when a Senate report affirmed that domestic oil reserves were being rapidly depleted.[142] Besides these localized occurrences, other major international circumstances caused a limited oil output in that period, which significantly raised prices. In this context, similarly to what had happened in Britain a decade before, President Coolidge, Secretary of State Evans Hughes and Secretary of Commerce Hoover lobbied to support US private oil companies' quest for concessions abroad, meaning penetrating in the colonial domains of European empires.[143] In this regard, at the beginning of the 1920s the US Presidency launched the "Open Door" doctrine, affirming the right of free access for any company to any country in the world. A decision that generated considerable frictions with Britain until 1928, when the "Big Oil" companies signed an agreement, according to which they all became equal shareholders in the Turkish Petroleum Co., previously controlled only by Britain, France and Germany.[144]

What distinguishes the American case from the British one is the approach. While the British government didn't hesitate in intervening directly to secure access to energy sources and become majority shareholder in previously private companies, the US government acted on the bases of public-private partnerships, where oil companies were "in the driver's seat" and the government established itself as a facilitator.[145] In this sense, the major outcome was consensus over an aggressive imperialist policy on oil to contrast British and European competitors. To do so, US oil companies themselves affirmed that a hypothetical direct intervention of the State into their business would have

[139] Ivi, p. 47; F. Petrini, (2020), ""Jumped on the boat of a territorialist organization": State and capital at the origins of oil imperialism", *Journal of Energy History*, no. 3, p. 4.
[140] Ibidem.
[141] L. Maugeri, (2006), *L'era del petrolio*, p. 48.
[142] F. Petrini, (2020), "Jumped on the boat of a territorialist organization", p. 5.
[143] L. Maugeri, (2006), *L'era del petrolio*, p. 48-49.
[144] Ivi, p. 53.
[145] F. Petrini, (2020), "Jumped on the boat of a territorialist organization", p. 5.

only obstructed them and convert their commercial aims into political ones.[146] Instead, they asked for political support, especially in negotiations with competitors, and defence of free market principles. From the very first occasion in which such public-private partnership started negotiations with Europeans for the Mesopotamian oil, the US government set the stage for the discussions to start, and maintained its support for US oil companies, without actually being a main interlocutor.[147] This approach won US oil companies a series of agreements in 1928., such as the Red Line Agreement, limiting international competition for Iraqi oil fields, and the As-Is Association Agreement to manage demand and supply imbalances. [148]

Following US governments maintained the role of facilitators, as several exemplary cases suggest. The predominant narrative on oil was based on the identification of national interest with oil companies' private interests, so whenever the operations of US oil companies abroad were questioned, the discourse on their adherence with national interest was used to dissipate any suspicions.[149] Post-war studies and investigations conducted in the United States helped reveal cases of non-transparent pricing mechanisms adopted by oil companies, proving the existence of a profound fracture between government and oil corporations in the way these latter had been pursuing their economic interests and shaping external relations, especially in the Middle East. [150]

This was evident when in the 1950s the Department of Justice announced the possibility to open a legal action against Big Oil for having created a world cartel since 1928.[151] Even if these accusations were legitimate, key Departments replied by remarking the traditional narrative, which ultimately resulted in the termination by President Truman of the investigation for national security issues.[152] In such a distorted system and in Britain as well, diplomatic relations often came to prioritize companies' quest for profit over other foreign policy issues, a trade-off that was not made transparently, owing to a context of asymmetric information.[153] Yet, the actual game-changer would have come only in 1973, when the oil shock revealed that oil companies would have no longer been able to secure supplies at reasonable prices. As a consequence, the US Senate advocated a review of the narrative on national interest and in Britain the government was demanded a more efficient and effective role in the oil industry and diplomacy.[154]

[146] Ivi, p. 6.
[147] Ivi, p. 7.
[148] L. Maugeri, (2006), *L'era del petrolio*, p. 53, 71.
[149] F. Petrini, (2020), "Jumped on the boat of a territorialist organization", p. 6.
[150] L. Maugeri, (2006), *L'era del petrolio*, p. 95-99.
[151] Ivi, p. 13.
[152] Ibidem.
[153] Ivi, p. 14.
[154] Ivi, p. 15.

As a result, governments, especially in importing countries, began to restore their foreign policy prerogatives both due to the effects of the oil crises and to the urgency to maintain high economic growth rates. The interest in maintaining and possibly expanding both growth levels and power progressively translated into actual diplomatic efforts devoted to "enhance access to energy resources and markets. […] by means of diplomatic dialogue, negotiation, lobbying, advocacy, and other peaceful methods".[155] In the attempt to be one of the means to pursue foreign policy goals, it "has developed its own programs, goals, instruments, tactics and action plans", both in importing and exporting countries, respectively focused either on securing access to supplies or to markets.[156]

An exemplary case was that of the Italian government and ENI, the National Hydrocarbons Entity, in the aftermath of the first oil crisis in 1973. In this period, the priority was to define innovative strategies and implement actions targeting energy security. Since Mattei's presidency of ENI in the 1950s, the national company had been developing a broad network of partnerships with Egypt (1955), the National Iranian Oil Company (1957) and the USSR (1960), among many others, in the attempt to enter the international oil system, still dominated by few large companies. The nature and the protagonists of the partnerships often triggered suspicions in US departments and oil companies, owing to the fact that the former did not always conform to Western alignments, as in the case of the USSR, and often offered better conditions in terms of profit distribution.[157]

The oil shock of 1973 contributed to exacerbating those underlying conflicts, for Western Europe, aware of its strong oil import reliance, decided to align with Arab countries. In this context, the Italian government based its own strategy on revitalized and innovative bilateral agreements, an approach that was obviously followed also by the then ENI President Raffaele Girotti, who managed to sign new agreements with Tunisia, Iraq, and Libya, apart from enhancing other initiatives in Iran, Kuwait, the UAE, and Saudi Arabia. The innovative aspect is to be found in the conditions of said agreements: the exchange did not merely include oil and profits, but a long-term collaboration for oil supplies which was accompanied by investments in the exporting countries to build productive infrastructures, develop energy sources and transport them optimizing the costs.[158]

Despite the quite recent interest to conceptualize energy diplomacy and the still vagueness of the term, the evolution of its tools, strategies and models can be traced back to the early 20th century. The

155 A. Bovan et al., (2020), "Negotiating Energy Diplomacy and its Relationship with Foreign Policy and National Security", *International Journal of Energy Economics and Policy*, 10(2), p. 1-6, https://www.econjournals.com/index.php/ijeep/article/view/8754.

156 Ibidem; C. Nakhle, (2018), "Russia's energy diplomacy in the Middle East, in N. Popescu and S. Secrieru (ed.) *RUSSIA'S RETURN IN THE MIDDLE EAST: BUILDING SANDCASTLES?*, Paris, European Union Institute for Security Studies (EUISS), p. 29.

157 L. Maugeri, (2006), *L'era del petrolio*, p. 110-114; S. Labbate, (2016), "Energia e Mediterraneo: le iniziative italiane nel secondo dopoguerra (1945-1979)", *Storia e problemi contemporanei*, n.73.

158 Ibidem.

description of the two main models that stood out at that time has served as a starting point from which the European approach to energy diplomacy can now be dealt with, albeit with some differences concerning the nature of the actor, an international organization, not a sovereign state, and, thus, its inherent exclusive or shared competences compared to Member States' exclusive competences. The next sections will attempt at identifying the state of play of energy diplomacy in the European Union, analysing its historical developments, effectiveness, and gaps. In the attempt to follow a comparative approach, further focus will be made on the new priorities brought about by the green transition and on the challenges and prospects characterizing raw materials diplomacy.

2.2 ALL QUIET ON THE EXTERNAL FRONT: THE FAILED PATH TOWARDS A COMMON EUROPEAN ENERGY DIPLOMACY

Although energy diplomacy has regained visibility in energy debates since the early 2000s and international energy relations have been reconsidering the strategic aspects of resources to the detriment of liberal market-based approaches, the European Union has generally kept endorsing a liberal paradigm, similar, to some extents, to the one embodied by the US, oriented to the liberalization of energy markets and the definition of principles and values to be exported outside its borders. According to Herranz-Surrallés (2015), when the EU was founded, the main priority was to tackle the lack of a sufficient regulatory framework for the creation of a common internal energy market, not the then already increasing import reliance rate.[159] Therefore, European institutions engaged in lifting barriers to free trade and enhanced fair competition, discouraging the formation of monopolies. As a result, the role of private companies, not that of sovereign governments was promoted and reinforced, although Member States haven't always followed suit, sometimes promoting mixed approaches, which tended to combine state intervention and private initiative. The Union's ultimate goal was to export its regulatory framework in third countries involved in energy relations with the former, thereby extending its common market and standards.

As reported in the first Green Paper published in 1995 by the European Commission, focus was made on the development of an internal EU energy market for gas and electricity and of an external action policy.[160] At that time, the Commission highlighted the urgency to deal with both the growing Union's import reliance rate and its inherent difficulty to influence international energy markets. Two priorities that would be maintained over time, for instance in 2006, when Gazprom interrupted gas flows towards Ukraine, and in 2010 in the "Energy 2020. A strategy for competitive, sustainable and

[159] A. Herranz-Surrallés, (2015) "An emerging EU energy diplomacy? Discursive shifts, enduring practices", *Journal of European Public Policy*, vol. 23, no. 9, p. 1386-1388.
[160] European Commission, (11.01.1995), "Green Paper. For a European Union Energy Policy", COM(94) 659 final, EUR-Lex, p. 15, 22, https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A51994DC0659&qid=1488204560202.

secure energy", with the objective to expand the external projection of the EU energy market, by integrating energy markets and regulatory frameworks, establishing privileged partnerships, promoting the global role of the EU in decarbonisation, and promoting legally binding standards.[161] Again, in 2015, the Energy Union Package intended to boost energy security by diversifying suppliers and routes, reinforcing collaboration between Member States and expanding the international role of the EU in global energy markets.[162]

Because of the peculiarities of EU energy policies and strategies, among which is the prioritization of economic considerations on energy security over its political dynamics, some scholars have questioned the existence of an actual EU energy diplomacy. As affirmed by Chaban and Knodt (2015), there are mainly three approaches to international energy relations: energy governance, energy markets and energy diplomacy.[163] According to Herranz-Surrallés (2015), in the 2000s the EU has undoubtedly embraced the energy governance approach, as demonstrated by its constant ambition to extend the Union's *acquis Communautaire*, including the Union's law, its political goals, substantive laws, etc.[164] As a matter of fact, energy governance generally gives priority over economic rather than strategic calculations, promoting competitiveness, safeguarding consumer sovereignty, and containing market failures through the establishment of functional regulatory frameworks.[165] The application of this approach rests on the involvement of multilateral institutions, in a multilevel and multistakeholder context, and on the expansion of liberal models in third countries.

Yet, the commitment to expand EU's liberal principles and values beyond its borders, with the aim to expand along energy value chains by promoting investments in extractive and refining operations in exporting countries hasn't been always welcomed by these latter, owing to various factors. The normative framework promoted by the EU hasn't been often in line with other countries' political and economic models, which show resistance to, if not rejection of, EU's efforts.[166] This is due to the fact that the energy governance approach is notably known for being a "one-way communication process", in which an actor (the EU) aims at "projecting and imposing internal values, principles and rules onto international interlocutors", through a variety of soft power tools, to promote not only

[161] European Commission, (10.11.2010), "Energy 2020. A strategy for competitive, sustainable and secure energy", COM(2010) 639 final, EUR-Lex, p. 17-19, https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex%3A52010DC0639.
[162] European Commission, (25.02.2015), "A Framework Strategy for a Resilient Energy Union with a Forward-Looking Climate Change Policy", COM(2015) 80 final, EUR-Lex, p. 4-7, https://eur-lex.europa.eu/resource.html?uri=cellar:1bd46c90-bdd4-11e4-bbe1-01aa75ed71a1.0001.03/DOC_1&format=PDF.
[163] N. Chaban and M. Knodt, (2015), "Energy diplomacy in the context of multistakeholder diplomacy: the EU and BICS", *Cooperation and Conflict*, vol. 50, no. 4, p. 459.
[164] A. Herranz-Surrallés, (2015), "An emerging EU energy diplomacy?", p. 1388.
[165] Ivi, p. 1389.
[166] A. Herranz-Surrallés, (2015), "European External Energy Policy: Governance, Diplomacy and Sustainability", in A.K. Aarstad et al. (ed.), *Sage Handbook of European Foreign Policy*, London, Sage, p. 6-8.

energy security and competitiveness, but also sustainability.[167] Therefore, the way in which the EU has handled energy governance has produced criticism: the preponderance of one-way communications styles over collaborative approaches has weakened the ability of the EU to interact with third countries, especially developing ones, which found other investors to be more attractive, such as in the case of China. According to its traditional Five Principles of Peaceful Coexistence, the PRC promotes mutual non-interference in each other's internal affairs, equality, and co-operation for mutual benefit, among others, weaving relations based on a more collaborative approach, even if they do not ultimately result in win-win solutions for both parties, due to the heavy penetration of Chinese investments in third countries' public debt and the negative financial and economic bond resulting from this.

Yet, energy governance hasn't been the only approach deployed by the EU in its international energy relations. Similarly, the European Union acts as a relevant actor in energy markets, even if its ability to influence them has been curbed by global developments, such as the tightening of markets since early 2000s. In particular, Chaban and Knodt (2015) underline the opportunities coming from EU's global economic stance, as the most integrated market, with particular reference to the projection of its economic and social market-related policies especially through trade partners.[168]

Together with energy governance and energy markets, the EU has been taking some steps forward also in terms of energy diplomacy. Even if its main focus on competitiveness and externalization of the *acquis Communautaire* have long marked European external energy relations and basically identified them with energy governance, the tightening of global energy markets, the increasing international competition and the latest market disruptions caused by the pandemic and heightened by the war in Ukraine have forced a change of course in energy debates and priorities at the European level. If energy security used to be seen as of mainly economic concern, nowadays, pragmatic calculations and strategies related to the former tend to dominate public debates, highlighting its ties with national security concerns. According to Herranz-Surrallés (2015), the main goals of energy diplomacy are indeed the promotion of national interest, by defending political sovereignty, adopting a strategic diversification, and building political alliances with foreign suppliers.[169]

One of the first steps taken in this direction was in 2017, when the European Commission reviewed existing legislation on its role in Intergovernmental Agreements (IGAs).[170] It began with two cases

[167] N. Chaban and M. Knodt, (2015), "Energy diplomacy in the context of multistakeholder diplomacy", p. 460.
[168] Ivi, p. 460.
[169] A. Herranz-Surrallés, (2015), "An emerging EU energy diplomacy?", p. 1389.
[170] P. Thaler and V. Pakalkaite, (30.06.2020), "How EU external energy policy has become "supranationalised" – and what this means for European integration", *London School of Economics and Political Science*, https://blogs.lse.ac.uk/europpblog/2020/06/30/how-eu-external-energy-policy-has-become-supranationalised-and-what-this-means-for-european-integration/

in 2010, when the Commission was asked to intervene in the negotiations between, on the one side, Polish gas supplier PGNiG and Gazprom, and, on the other side, Lithuania and Gazprom, to guarantee compliance with EU law. At that time, the intervention of the Commission became a significant precedent since the composition of the energy mix and the conclusion of its related partnerships had always been a prerogative of Member States. As a result, the Commission was agreed greater margin of manoeuvre through the Decision issued by the Parliament and the Council in 2017, recognizing its role to mandatorily assess IGAs draft versions to guarantee the respect of EU law and to avoid possible threats to the Union's energy security goals and internal market mechanisms. This Decision is considered a milestone, since the prerogative of Member States to establish energy partnerships has been partially constrained by the obligatory intervention of the Commission, which not only has been proved to empower EU countries in the process of negotiating IGAs with third parties, but also enhances greater harmonization of procedures and outcomes inside the EU internal energy market.[171]

Notoriously, one of the greatest shortcomings of EU external energy relations has typically been the lack of consensus among Member States to actually build a harmonized European energy diplomacy. According to Herranz-Surrallés (2015), the major obstacles to this have been the lack of a homogeneous policy style among Member States in relation to energy policies and the resistance of these latter to renounce to part of their foreign policy prerogatives in the energy field.[172] In 2015, when the author published her article on European external energy policy, she claimed that "energy security is still seen as prone to 'policy substitution', that is that Member States will continue opting for unilateral policies whenever the supranational approach does not meet their immediate interests".[173]

To complicate even more the context are the inherent characteristics of the energy governance approach, which, by enhancing a liberal model, has been involving a growing number of actors, of diverse nature, in the pursue of energy security goals and in the implementation of related policies. Notwithstanding the undiscussed role of Member States and other state actors in promoting state-centred diplomacies, Chaban and Knodt (2015) affirm that the EU has clearly enhanced and supported also a multistakeholder approach, involving not only its own institutions, but also NGOs, companies, lobbies, and other multilateral organizations, weaving a vast and tight network of interactions, occurring through diverse tools and paths.[174] Specifically, among the actors involved in this pattern, the authors mention the European institutions (with the European Commission playing the major role), the European External Action Service, EU Delegations, Member States (which obviously include

[171] Ibidem.
[172] A. Herranz-Surrallés, (2015), "European external energy policy", p. 10.
[173] Ivi, p.5.
[174] N Chaban and M. Knodt, (2015), "An emerging EU energy diplomacy?", p. 457-458.

national governments, parliaments, relevant ministries, and diplomatic missions), corporations, transnational companies, business chambers and associations.[175] Moreover, at the international level, these actors also negotiate and interact with others in a number of international fora, such as the Energy Charter Treaty, the IEA, the International Renewable Energy Agency (IRENA), the International Energy Forum (IEF), the G20, OPEC, the UN, and the World Bank.[176]

At the European level, the role of the Commission is the most prominent and has been frequently studied to highlight the changes and continuities behind EU external energy policies. On the one hand, Herranz-Surrallés (2015) points to the fact that since the early 2000s the Commission has been better defining its goals and strategies, struggling to expand its competences vis-à-vis Member States' reluctance, an ultimate example of which is the abovementioned Decision issued in 2017.[177] While the Commission managed to progressively intervene more concretely into its members' energy bilateral negotiations with third parties, it kept supporting a liberal and market-oriented approach to energy security even when the rest of the world turned more political on energy issues.

On the other hand, nevertheless, since the launch of the Energy Union Package in 2015 and even more so nowadays, the Commission has acquired a much more strategic posture on energy security, albeit dictated by the urgency to respond to frequent market disruptions, which could be interpreted as a general symptom of unpreparedness. Doing so, it could develop new tools to deploy in times of crisis, without renouncing to the traditional support to the liberal paradigm. According to Goldthau and Sitter (2014), the Commission has included in its toolbox diplomatic approaches, financial instruments, and exemptions to open market rules to be deployed in specific situations, for instance in the negotiations related to pipelines and in contrasting third parties' dominant positions in the market, as in the case of Gazprom.[178]

In the course of the Covid-19 pandemic and as a consequence of its repercussions in the world economy and in energy markets, energy issues have increasingly been interpreted in light of strategic considerations. The concept of energy security itself has come to be included in the major goal of "open strategic autonomy" introduced by the New Industrial Strategy for Europe in 2020, where this latter was defined as the need to reduce dependence on third countries for things that are crucial for European industrial ecosystems.[179] The push towards this goal has been further embodied by

[175] Ivi, p. 462.
[176] Ivi, p. 465-466.
[177] A. Herranz-Surrallés, (2015), "An emerging EU energy diplomacy?", p. 1394-1397.
[178] A. Goldthau and N. Sitter, (2014), "A liberal actor in a realist world", *Journal of European Public Policy*, Vol. 21, No. 10, p. 1468.
[179] European Commission, (10.03.2020), "A New Industrial Strategy for Europe", COM(2020) 102 final, EUR-Lex, p. 13, https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A52020DC0102.

REPowerEU, the European joint action plan launched vis-à-vis current energy market disruptions.[180] Simultaneously, the Commission and the High Representative of the Union for Foreign Affairs and Security Policy, Josep Borrell, published a communication on "EU external energy engagement in a changing world", highlighting the rediscovered centrality of energy diplomacy.[181] Although building on current energy issues and priorities, the communication specifically attempts at providing forward-looking guidelines to tackle both near- and long-term needs, affecting the security of supply of bridging fuels and the acceleration of the green transition, with the ultimate goal to shape and influence what will be the new global energy system.

The plan outlined by the High Representative envisions an updated and reinforced EU external energy policy built on the strengthening of its energy security, resilience, and open strategic autonomy, on the acceleration of the global green transition, on the support to Ukraine and other countries affected by the current war, on the establishment of long-lasting international partnerships and the promotion of EU clean energy industries.[182] In order to secure energy supplies, the EU intends to diversify its suppliers by increasing gas imports from exporting countries other than Russia via the newly established EU Energy Platform, with which Member States can decide, on a voluntary basis, to jointly purchase gas and hydrogen following a collaborative approach. This initiative embraces once again the traditional multistakeholder pattern, involving not only Member States, but also transmission system operators, associations, other relevant market operators and existing coordination fora.[183] In addition to this, the Commission has engaged in dialogues with the United States, Canada, Japan, Korea, Qatar, Norway, Algeria, Azerbaijan, and sub-Saharan African partners to increase current supplies of LNG or pipeline gas, and to explore additional potential for supplies. It has also been active in involving the European Investment Bank, the European Bank for Reconstruction and Development and the World Bank in facilitating investments for an improvement of efficiency in extractive and refinery activities.

Together with these measures oriented to meet the most urgent near- and medium-term needs of access to energy supplies, the Commission has promoted significant measures targeting the acceleration of the transition globally, which will be the case in point in the next section. Nevertheless, suffice it to say here that the plan represents an innovative pattern through which the EU has tried to

[180] European Commission, (8.03.2022), "REPowerEU: Joint European Action for more affordable, secure and sustainable energy", COM(2022) 108 final, EUR-Lex, p. 5-7, https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52022DC0108&from=EN.

[181] European Commission and High Representative of the Union for Foreign Affairs and Security Policy, (18.05.2022), "EU external energy engagement in a changing world", JOIN(2022) 23 final, EUR-Lex, p. 1-20, https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=JOIN%3A2022%3A23%3AFIN&qid=1653033264976.

[182] Ivi, p. 2.

[183] European Commission, "EU Energy Platform", Energy Security, https://energy.ec.europa.eu/topics/energy-security/eu-energy-platform_en.

look at traditional problems, albeit in an exceptional context. Does this mean that the EU is finally embarking on the right track towards an actual common energy diplomacy? Unfortunately, it's still too early to prove it. The exceptionality of the context and the approaching recession have also been highlighting conflicting strategies and behaviours adopted by Member States. If, on the one side, they have preferred coordination and collaboration at the European level to respond to the Russian war in Ukraine, on the other hand, the urgency to secure alternative supplies has produced competition among Member States, that may only voluntarily resort to concerted purchases through the EU Energy Platform.[184] For instance, Italy has been negotiating bilaterally an increase of supplies with Algeria, Egypt, and Qatar, but more Algerian supplies for Italy could mean less additional supplies for Spain, whose negotiations with the former have been in dreadlock for long.[185] At the same time, also Germany is autonomously negotiating a partnership with Qatar for LNG supplies. The persisting preference of Member States towards bilateral agreements is evident and shows the still insufficient cohesion in EU energy policies, which is weakening the European institutions' efforts.

Still, this plan attempts to respond to great challenges, by enhancing perhaps an unprecedented European commitment in delivering its energy objectives through external relations, and by building a pattern that should also be able to lay the foundations for a more balanced network of partnerships dedicated to concretely implement and bring forward the green transition. The coupling of energy security needs and climate objectives with other major foreign goals, such as sustainable economic and social development in third countries might be demanding too much from a still incomplete EU energy diplomacy. As Mišík (2022) affirms, if a Member State will keep preferring bilateral agreements, there will be no way this practice won't negatively impact on the others, since each of them has different energy security risks and needs to answer to.[186] A coordinated approach and a general empowerment of the European institutions on external energy relations are the fundamental means through which the Union can hope to lead and manage the transition. It must be recognized that the plan presented by Borrell rightly addresses the much needed refocus on external energy security and relations, to decarbonise and secure near-term fossil fuels supplies. The major interconnectivity of the EU internal market suggests that a coordinated approach would also be more desirable, for, with a potential acceleration of decarbonisation, the EU will still have to secure sufficient fossil fuels supplies for the transition.

[184] A. Varvelli, (21.04.2022), "Burn time: The case for a new European energy union", *European Council on Foreign Relations*, https://ecfr-eu.cdn.ampproject.org/c/s/ecfr.eu/article/burn-time-the-case-for-a-new-european-energy-union/?amp.
[185] Ibidem.
[186] M. Mišík, (2022), "The EU needs to improve its external energy security", *Energy Policy*, Vol. 165, p. 4.

In brief, the interplay between energy security and decarbonisation goals are shaping a new approach towards energy diplomacy, and the current strategy outlined by Borrell seems to be a testbed, possibly a positive one, for how to manage the intersections and interactions among them. The race towards the green transition does not erase the typical risks and threats of fossil fuels: many are the differences, but there are also similarities between the latter and the resources needed for clean energy technologies. The way in which the EU will manage to answer to current challenges will contribute to determining either a possible, and desirable, greater European integration or a new period of re-nationalization of external energy relations, that will depress the internal energy market and boost competition among Member States - opposite to the collaborative approach needed for the achievement of climate goals.

2.3 Time for new hopes? The Green Deal's energy diplomacy at a crossroads

The growing centrality of climate goals and ambitions has widened the scope of discussions held in multilateral fora and of diplomatic dialogues, further complicating the pattern of existing interactions among various areas of cooperation and variables. As a consequence, the traditional field of energy diplomacy, initially linked to foreign policy, economic growth, and national security strategies, has come to deal also with cooperation on development policies and programmes, greener investment policies, and know-how exchange. These increasing interplays have translated in an intrinsic difficulty in delivering the established goals in a context of intensifying competition among near-term needs to safeguard energy security and long-term goals of decarbonisation. Moreover, the pursuit of climate goals together with more conventional energy needs is contributing to the emergence of tensions among different approaches to their related diplomatic efforts, given that the former requires an extensive cooperative diplomatic environment in order to be more efficiently and rapidly achieved. Now, on the one side, the actual existence of such an environment is doubtful, owing to the diverse transition pathways in the world determined by different needs, interests, and goals. But obviously, on the other side, the alarming effects of climate change and environmental degradation have contributed to greater international commitments, as showed by the conclusion and adoption of the Paris Agreement, entered into force in November 2016. According to the latter, the signatory countries have to present and commit to National Determined Contributions, meaning explicit targets to be delivered by specific climate actions updated every 5 years, addressing both mitigation and adaptation measures.

Following the greater engagement promoted by the Paris Agreement, in 2019, President of the Commission Ursula von der Leyen launched the European Green Deal (from now on also abbreviated as EGD), a new growth strategy based on the search for a renewed prosperity and competitiveness in the old continent to tackle in the most effective way the challenges emerging from the green transition. The general goal, set in the very first page, is indeed to "[transform] the EU into a fair and prosperous society, with a modern, resource-efficient, and competitive economy, where there are no net emissions of GHGs in 2050 and where economic growth is decoupled from resource use".[187] With this objective in mind, the European Union aims at gaining a global leading role to influence other countries' transition pathways and promoting an acceleration of the actions needed to curb GHGs emissions and adopt sustainable and innovative solutions. The Deal focuses on a wide array of actions, among which there are: the design of transformative policies, the increase of climate goals, the need to ensure secure, sustainable, and affordable energy supplies, the mobilisation of industrial ecosystems to accelerate the adoption of circular business models, the pursuit of green finance and investment, the promotion of research and innovation, and, last but not least, the achievement of a globally leading position.[188] For the purposes of this thesis, these are the main priorities on which the analysis will be concentrated.

As a consequence of the reinforcement of international cooperation on climate action, the Green Deal was proposed not just as an internal strategy for the EU to transform its economy and welcome the transition, but also as an essential framework to be exported beyond EU's borders, perfectly embodying the definition of EU external environmental policy provided by Biedenkopf et al. (2018), as "[the] attempts to transfer the EU's environmental rules, regulations and objectives to third countries and international organisations".[189] Given the highly interdependent trading relations at the global level, the commitment to positively change one's economy cannot be efficiently and effectively satisfied without the others' seriously committing to their own climate goals. And because not every country can share the same climate goals and the same actions, which sometimes are also being put in the background in favour of more pressing economic or political goals, the EU hopes that while achieving a growingly leading position in determining the flow of the transition, it will be able to shape the financial system and related tools to indirectly instil those much needed changes in the trade system in favour of clean or low-carbon activities.

Specifically, the EGD wants to promote the traditional multistakeholder approach to extend the dialogue over possible transformative policies to all related stakeholders, with the aim to enhance the restoration of natural ecosystems, sustainability, and benefit human health. As a first step, the Commission proposed an exacerbation of climate ambitions for 2030, by increasing the previous target to

[187] European Commission, (11.12.2019), "The European Green Deal", COM(2019) 640 final, EUR-Lex, p. 2, https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52019DC0640&from=IT.
[188] Ivi, p. 4-22.
[189] K. Biedenkopf et al., (2018), "Conclusions", in C. Adelle et al. (ed), *European Union External Environmental Policy. Rules, Regulation and Governance Beyond Borders*, Cham, Palgrave MacMillan Cham, p. 337.

50-55% and anticipated the launch of a European Climate Law setting the goal of climate neutrality by 2050, which has entered into force in July 2021. The expansion of the climate *acquis Communautaire* has to be interpreted in light of the EU's pursuit of a leading role in setting the norms and standards to influence international climate negotiations and partnerships. The centrality of climate goals in international talks has grown ever since climate change has been seen as a "threat multiplier", and, therefore, as a national security concern, tending to leave in the background other equally important environmental issues.[190] As a result, foreign policy measures based on improving climate security have been directed both at safeguarding EU's common interests and at advancing cooperative efforts to build a common international pathway towards sustainability.

Yet, given the wider repercussions of climate change on economies and the EU's status of energy net importer, the Council of the EU affirmed that "EU and Member State foreign policy and external action will need to anticipate the geopolitical and security challenges", especially those deriving from climate change, by drawing on the role that EU energy diplomacy has played in delivering energy security needs and by recognizing the evolution of energy security itself.[191] In said communication, the Council also clearly stated that it will be among energy diplomacy's tasks to speed up the transition, by ensuring sustainable and secure supplies of energy, by promoting energy efficiency measures and the uptake of clean energy technologies, by developing a more interconnected energy system and discouraging new investments in conventional infrastructure projects in third countries, by increasing the resilience of supply chains and defending critical infrastructure against cyber-attacks.[192] As a result, EU energy diplomacy, if one can call it that way given the very recent steps taken in building it since 2015, has been charged of additional priorities, notwithstanding the fact that it should also keep delivering on its original ones, primarily energy security.

And yet, even if deriving from foreign policy, climate and/or environmental and energy diplomacy have always been different in scope, interlocutors, and approaches. While climate diplomacy has focused on promoting climate security, through the management of climate change-induced risks, energy diplomacy has always prioritized energy security, involving mostly polluting sources, despite the ambiguous conceptualization of the term operated by the Commission, which includes the sustainability of supplies. Also, climate diplomacy has been mostly directed to interact through a cooperative approach both with the most polluting countries and the countries suffering the most from

[190] R. Youngs, (2021), "The EU's indirect and defensive approach to climate security", in O. Lazard and R. Youngs (Ed.), *The EU and Climate Security: Toward Ecological Diplomacy*, Carnegie Europe and Open Society European Policy Institute, p. 5, https://carnegieeurope.eu/2021/07/12/eu-and-climate-security-toward-ecological-diplomacy-pub-84873; K. Biedenkopf et al., (2018), "Conclusions", p. 341.
[191] Council of the European Union, (25.01.2021), "Council conclusions on Climate and Energy Diplomacy – Delivering on the external dimension of the European Green Deal", 5263/21, p. 8, https://www.consilium.europa.eu/media/48057/st05263-en21.pdf.
[192] Ivi, p. 6-7.

climate change, in the attempt to manage its repercussions and enhance greater engagement in fighting them. Energy diplomacy, on the other side, has been mainly concentrated on the interactions between consuming and producing countries following a strategic bilateral approach headed to safeguard national security interests of both interlocutors, with a major focus on strategic aspects. These major differences suggest the difficulties with which a renewed energy diplomacy will have to cope.

The Council rightly affirmed that the concept of energy security has evolved, with an increasing attention on clean energy technologies development and critical raw materials supplies; still, as the current energy crisis clearly shows, the goal to secure affordable and reliable fossil fuel supplies has not faded away and binding it with broader climate concerns could be misleading, if not counterproductive, at least up until fossil sources will still make up the most of EU's energy mix, and Member States' energy policies will still be competing.[193] The context is complex due to the persistence of traditional fossil fuels partnerships with third countries, which will be, of course, affected by the new conceptualization of energy security and diplomacy. The consequences stemming from this will have to be tackled by an increasingly wide-ranging energy diplomacy, that will have to review its tools, strategies, and approaches to external relations, in the attempt to manage the obstacles and seize the opportunities deriving from the transition.

As concerns the approach towards external relations, the EGD points at the need to review the way in which the EU has built its partnerships or has been negotiating with third countries. In the previous section, it was already mentioned that one of EU's energy diplomacy's major weaknesses has been the "one-way" communication style or the attempt to impose its norms and standards through a "one-size-fits-all" approach that listened but a little to the peculiarities and diverse priorities of its counterparts while negotiating. As a matter of fact, the EGD advocates the adoption of tailor-made solutions, based on a cooperative and dialogic approach to diplomacy, that can more effectively and efficiently help other countries in their transition pathways. This new approach has not only to consider differences inherent to third countries' economies, transition potential and politics, but also differences in how the EU's green transition influences third countries.

The European energy diplomacy has traditionally focused on fossil fuels, therefore building long and consolidated partnerships first with neighbouring countries, especially Russia, the MENA region, Norway, and the Caspian basin, and then expanding them beyond its immediate neighbourhood, reaching Sub-Saharan Africa and the Gulf States, such as Qatar. A study conducted by Leonard et al. (2021) for the European Council on Foreign Relations has highlighted the various consequences stemming from the transition, in light of the consideration that oil and gas will be more substantially

[193] F. Petri, (November 2020), "Revisiting EU Climate and Energy Diplomacy: a starting point for Green Deal Diplomacy?", *European Policy Brief*, no. 65, p. 4.

phased out starting only from 2030, albeit in 2050 natural gas will still be contributing but a little to EU's energy mix.[194]

According to the authors, the transition will affect producing countries, global energy markets, European energy security and global trade. As regards global energy markets, the emphasis of the EGD on electrification and on a rapid transition to sustainable and smart mobility will cause a decrease in European demand for fossil fuels, causing a decrease in prices, the magnitude of which will in turn depend on third countries' pace towards decarbonisation. On the one hand, this will allow producers with lower production costs, such as Saudi Arabia, to gain market shares in the short-term, while other producers facing higher costs will be forced out of the market. Yet, on the other, traditional rentier states, basing their economy on energy export revenues, will see a decrease of these latter in the long-term, which may push them to take measures towards decarbonisation and a major transformation of their economy.

In order to manage those repercussions, along with the general impulse to electrification, EU's energy diplomacy should promote clean energy strategic alliances with traditional partners. In this regard, Oberthür et al. (2022) stresses the potential deriving from redefining such partnerships in favour of renewables and low-carbon development, capacity building, economic diversification, enhancement of higher education and research programmes and promotion of greener financial transitions.[195] In this way, the traditional purpose of these bilateral relations will be reoriented to serve the transition scope following a cross-sectoral approach, new impulse will be given to the uptake and scale-up of clean energy technologies, like solar, wind electricity and green hydrogen, in view of the enormous untapped potential lying in many fossil-fuel producing countries, especially those concentrated in the MENA region.

Despite the geographical proximity of the transition's implications in neighbouring countries, an energy diplomacy only focused on them would not be able to provide the EU with sufficient opportunities to gain a leading role globally and to seize all significant economic opportunities for its industries. As a result, according to Pastukhova et al. (2020), European policymakers and diplomats will have to identify further partnership opportunities with other countries, based on their potential for decarbonisation, on the economic prospects that they offer, on the possibility for the EU to contribute to its partner's political and social stability, and on the willingness of the potential partner to

[194] M. Leonard et al., (February 2021), "The Geopolitics of the European Green Deal", *European Council on Foreign Relations* p. 4-5, https://ecfr.eu/publication/the-geopolitics-of-the-european-green-deal/.
[195] S. Oberthür et al, (2022), "Conclusions. Challenges and opportunities for EU foreign policy and its analysis in an era of decarbonisation", in S. Oberthür et al. (ed), *European Foreign Policy in a Decarbonising World,* London, Routledge, p. 175.

adhere to EU's climate agenda and policies.[196] To do so, the authors have focused on the North Africa and Asia-Pacific regions, due to the major implications that the transition will have there and to the need to optimize as far as possible EU investments, still recognising the importance to keep the dialogue open with Africa and Latin America and the Caribbean too. For instance, they have identified India as a possible interesting partner to cooperate on normative issues, given its high level of GHGs emissions and energy demand, which could be managed with increasing investments in electricity. At the same time, closer to the EU's southern border, Morocco has been working on very ambitious climate goals, and presents great potential for the development of renewable energy, a sector in which the EU is trying to increase its presence amidst higher competition from Asia.

In sum, Pastukhova et al. (2020) affirms that EU energy diplomacy cannot be reduced to the mere projectisation of the EGD, nor it can keep promoting a static and ideological approach: "the high level of versatility regarding the political situations of the identified anchor partners, their different energy transition agendas, and their distinct approaches to climate change call for a more flexible and differentiated toolbox".[197] One example in this regard is the recent Strategic Partnership Agreement signed with the African Union in 2021. During the negotiations, European officials were engaged in trying not to provide further funding for traditional fossil fuels projects, but this produced criticism on how clean energy solutions could become prominent in a continent that falls short of economies of scale to efficiently uptake those innovations, produces just 2% of global GHGs emissions and is prominently committed to secure economic growth to its population. [198]

This example reveals another factor that needs to be considered when negotiating new or existing partnerships: development policies. Since the effects of climate change affect not only the environment, but also a country's society and economy, and the intensity of the goals set to counterbalance those effects depend on the interplay of various political, economic, military, and strategic interests, one of the ways through which the EU can try to influence third countries' climate agendas is development policies. In this regard, the EU has positioned itself as the first donor in the world, celebrating a long tradition of development assistance. One of the latest tools launched in 2021 is the Neighbourhood, Development and International Cooperation Instrument (NDICI), through which "the new long-term budget will bring a significant modernisation of the external dimension of the EU budget. It will increase the effectiveness and visibility of the EU's external policies, strengthen their

[196] M. Pastukhova et al., (June 2020), "Beyond the Green Deal: Upgrading the EU's Energy Diplomacy for a New Era", *Stiftung Wissenschaft und Politik*, No. 31, p. 4, https://www.swp-berlin.org/10.18449/2020C31/.
[197] Ivi, p. 6-7.
[198] B. Fox, (26.01.2021), "The Brief – EU energy diplomacy, a carrot that could become a stick", *Euractiv*, https://www.euractiv.com/section/energy/opinion/the-brief-eu-energy-diplomacy-a-carrot-that-could-become-a-stick/.

coordination with internal policies and give the EU the necessary flexibility to provide a faster response to new crises and challenges".[199]

With this new instrument, the EU has taken relevant steps towards greater flexibility and tailor-made approach to third countries. It provides an investment framework combining both public and private funds to enhance renewable energy and sustainable agriculture, among other objectives. The focus on climate goals has been made even more relevant in light of the fact that the need for actions supporting climate goals and biodiversity targets has been made transversal to all development projects, establishing that 30% of total funds will be deployed in favour of this cause. In this sense, NDICI has come to be the main instrument to promote the transition to clean energy in the world. Its application is pivotal in North Africa, especially after the revision of the partnership with Southern Neighbourhood in 2021, which envisioned a new economic and investment plan to be developed in the region, following diverse flagship investments and projects, among which there are specific initiatives to speed up the green transition especially in Egypt, Morocco, and Algeria.[200]

Whether these funds will be enough to counterbalance other global powers' rivalry is questionable. The EU is presently trying to offer alternative solutions and opportunities to the ones offered under the Chinese Belt and Road Initiative, which has reached a value of almost 4.000 billion dollars in 2020, and, among its main beneficiaries, can count Russia, Saudi Arabia, Malaysia and the United Kingdom.[201] More precisely, in order to directly respond to the challenge launched by the BRI in the infrastructure field, in 2021, the High Representative and the Commission have jointly announced the deployment of Global Gateway, a strategy that aims to provide a European framework for international infrastructure development, with the goal to support sustainable, smart, secure and reliable interconnection projects concerning energy systems and mobility. The projects developed under this framework will respect high quality standards, taking into consideration third countries' intrinsic characteristics and priorities, and offering interesting growth and investment perspectives, to help increase their competitiveness also for the private sector. Overall, Global Gateway aims to mobilise up to 300 billion euros of investments, but most of these funds are actually provided by the NDICI, which has a total budget of 76.46 billion euros. For this reason, according to Bennis, both instruments will have limited impact in comparison to the Chinese initiative.

[199] European Commission, "Factsheet – Global Europe: Neighbourhood, Development and International Cooperation Instrument ", Funding instruments, https://international-partnerships.ec.europa.eu/funding/funding-instruments/global-europe-neighbourhood-development-and-international-cooperation-instrument_en.
[200] A. Bennis, (4.04.2022), "North Africa's Energy Transition: A Key Asset in the War?", *Istituto per gli Studi di Politica Internazionale*, https://www.ispionline.it/it/pubblicazione/north-africas-energy-transition-key-asset-war-32916.
[201] A. Amighini, (30.09.2020), "Belt and Road: 2020, l'anno della svolta", *Istituto per gli Studi di Politica Internazionale*, https://www.ispionline.it/it/pubblicazione/belt-and-road-2020-lanno-della-svolta-27622.

Albeit the equation between energy, climate and development goals inevitably presents a wide array of complexities, the EU is determined to overcome them, or at least manage them, through the establishment of a more efficient green finance and investment system, based on an innovative governance approach. According to Bordoff and O'Sullivan (2022), the leading role of some countries in the transition process will be determined by three possible scenarios.[202] A country will gain a predominant position if it will be able to control supply chains for minerals and clean energy technologies, to cheaply produce clean technologies, to produce or export low-carbon fuels, or, finally, to set standards. This last scenario is the one towards which the EU is aiming, owing to its scarce presence in mineral value chains and possibilities to control related supply chains.

In this sense, NDICI and Global Gateway can be considered part of the wider investment framework that the EU has been trying to establish, given their underlying intent to externalise EU's climate and energy standards and norms. In particular, Global Gateway has been launched following an innovative approach, that is Team Europe. It involves a new governance pattern, which is characterised by a greater coordination between Member States and financial institutions to secure more efficient outcomes from funded projects.[203] The rationale behind this new approach lies in the need to harmonize the various national and European initiatives in the field of development cooperation, which, nevertheless, remain not fully integrated. The lack of harmonization would indeed cause uncertainty among receiving countries, which might feel that the European instruments are too binding or rigid in terms of targets and conditions.

The EU currently offers financial support also through the EU Global Technical Assistance Facility for Sustainable Energy, which operates to improve regulatory frameworks, enhance institutional capacities, and mobilise investments in sustainable energy, through cross-border cooperation projects and partnerships.[204] In addition, further investments also come from NDC Partnerships and Strategic Partnerships for the Implementation of the Paris Agreement (SPIPAs), aimed at helping developing countries and biggest emitters achieve their National Determined Contributions, and from the EU Projects of Common Interest (IPCEIs), particularly relevant to co-finance green energy interconnections with neighbouring countries, supported through the Connecting Europe Facility.[205]

In order to provide further support to the reorientation of investments in favour of sustainable activities, the Commission has been working on a Green Taxonomy, whose Regulation was officially

---

[202] J. Bordoff, M.L. O'Sullivan, (January/February 2022), "Green Upheaval. The New Geopolitics of Energy", *Foreign Affairs*, https://www.foreignaffairs.com/articles/world/2021-11-30/geopolitics-energy-green-upheaval.

[203] L. van Shaik et al., (15.12.2021), "Turning EU green diplomacy into reality", *Netherlands Institute of International Relations*, p. 5, https://www.clingendael.org/publication/turning-eu-green-energy-diplomacy-reality.

[204] European Commission, "The EU Global Technical Assistance Facility for Sustainable Energy (EU GTAF)", International Partnerships, https://international-partnerships.ec.europa.eu/policies/programming/projects/eu-global-technical-assistance-facility-sustainable-energy-eu-gtaf_en.

[205] L. van Shaik et al., (15.12.2021), "Turning EU green diplomacy into reality", p. 5-6.

published in June 2020, setting the fundamentals and the conditions to be respected so that an activity can be classified as environmentally sustainable. To do so, an activity has to contribute to the achievement of at least one of the environmental objectives established by the Regulation: climate change mitigation, climate change adaptation, sustainable use and protection of water and marine resources, circular economy, pollution prevention and control, protection and restoration of biodiversity and ecosystems.[206]

On the basis of this general parameters and further scientific assessment, the Commission adopted a Complementary Climate Delegated Act in March 2022, which included a list of the identified environmentally sustainable activities, with the main goal to provide market operators with more clarity and accurate information on the actual sustainability level of the activities they are financing.[207] The adoption of the taxonomy has produced significant criticism based on the inclusion of nuclear power and natural gas use, even if under specific conditions. According to *Bloomberg*, this decision has negatively impacted on the credibility of the EU to respect and enforce its own priorities. Even if gas and nuclear power are known to be bridging fuels, activists, investors, and bankers have criticised the unwillingness of EU policymakers to take a clear-cut decision in favour of the ambitious transition with which they have engaged.[208] A more decisive commitment towards the establishment of a fully green taxonomy would have sent stronger signals and support to the green finance system, which sees itself under the menace of increasing "green-washing" operations.

More specifically, the Taxonomy admits that gas projects substituting coal and respecting specific emissions parameters can be granted temporary green status. These projects should be formally authorised by 2030 and offer realistic possibilities of conversion into renewable or low-carbon gases in the following 5 years. This outcome was determined by the pressures exerted particularly by Germany for gas and France for nuclear power, in an obvious attempt to protect their own national interests. And yet, this outcome can also be held as exemplary of the tensions between the need to secure transition energy sources and the desire to favour green activities, which is causing great insecurity in investment markets, where the risk for so-called stranded assets is growing more tangible, almost amounting to 11 billion euros.[209]

[206] European Commission, "EU taxonomy for sustainable activities", Sustainable Finance, https://finance.ec.europa.eu/sustainable-finance/tools-and-standards/eu-taxonomy-sustainable-activities_en.

[207] Ibidem; D.H. Doyle, (12.05.2021), "A short guide to the EU's taxonomy regulation ", *S&P Global*, https://www.spglobal.com/esg/insights/a-short-guide-to-the-eu-s-taxonomy-regulation.

[208] J. Ainger et al., (06.06.2022), "Big Finance and Activists Slam 'Disappointing' EU Gas Vote", *Bloomberg*, https://www.bloomberg.com/news/articles/2022-07-06/eu-slammed-over-gas-vote-as-bankers-warn-of-new-greenwash-risks.

[209] D. Panzeri, (7.01.2022), "Tassonomia: il gas vince sulle rinnovabili e depotenzia la finanza sostenibile", *ECCO The Italian Climate Change Think Tank*, https://eccoclimate.org/tassonomia-il-gas-vince-sulle-rinnovabili-e-depotenzia-la-finanza-sostenibile/.

Following the goal to promote investments in sustainable energy projects, in June 2022 the Commission has also managed to negotiate a review of the Energy Charter Treaty (that will see signatories' formal approval in November 2022), a multilateral forum including fifty three members that has been effectively operating since 1998 to provide a legal framework for the promotion of energy security, through the establishment of competitive markets following the principles of sustainability and sovereignty of energy resources.[210] As one of the four main areas it works on is the protection of foreign investments and since the Treaty hadn't been updated since the 1990s, its recent review was essential to align it to European climate and environmental objectives, so that investments would be reoriented to favour sustainable projects more substantially (such as hydrogen, ammonia, CCS technologies, biomass, etc.), accelerating the phaseout of fossil fuels. Practically, the new provisions entail that, based on their climate goals, signatories can decide to accelerate towards decarbonization by interrupting existing fossil fuel investments after 10 years from the entry into force of the revision, and by excluding new investments on fossil sources right after the entry into force.[211]

Finally, despite the unsuccessful result of the negotiations on the taxonomy, this latter wasn't the only one to receive harsh criticism. Another still ideal measure that has managed to arise even the risk of third countries' retaliations is the establishment of a carbon border adjustment mechanism on imports from third countries, with the aim to reduce the impact of carbon-intense imported activities. The import of such activities could undermine European efforts to decarbonise the internal economy and go to the detriment of low-carbon or clean products produced internally, causing a loss of competitiveness. In the attempt to prevent this, a carbon border adjustment mechanism would provide more accurate information to the market by including the impact of carbon negative spillovers, deriving from production processes, into their related products' prices. While the inclusion of carbon leakages is desirable and long overdue, the imposition of a carbon border tax could be interpreted as a protectionist measure by third countries, especially developing ones. In this sense, the Green Deal could become a menace to them, because they would be disadvantaged in their trade relations with the EU. Another reason behind this proposal comes from the commitment of the EU to rebuild strategic value chains inside its territory, with particular reference to clean energy technologies, in order to boost European competitiveness and to seize upon the new occupational opportunities offered by the transition. To do so, it is clear that harsh climate measures in Europe not being accompanied by equally ambitious actions in third countries won't help the EU achieve its targets, but expose it to the

[210] Directorate-General for Trade, (24.01.2022), "Agreement in principle reached on Modernised Energy Charter Treaty", European Commission, https://policy.trade.ec.europa.eu/news/agreement-principle-reached-modernised-energy-charter-treaty-2022-06-24_en.

[211] M.T. Lin, (30.06.2022), "Energy Charter Treaty 'modernized' to reflect low-carbon transition needs after two years of talks", *IHS Markit*, https://cleanenergynews.ihsmarkit.com/research-analysis/energy-charter-treaty-modernized-to-reflect-lowcarbon-transiti.html.

risk of losing competitiveness, with carbon-intense industries finding it more profitable to delocalize in less stringent countries rather than stay in Europe.[212]

Still, apart from having been labelled by third countries as a form of protectionism, the application of a possible carbon border tax would have to deal with the difficulties in calculating the total amount of emissions produced along entire values chains to be then compensated with the tax.[213] A challenge that the EU could doubtfully overcome on its own simultaneously trying to avoid retaliations, and that could possibly be better tackled in a scenario where the carbon tax would be the result of coordinating and cooperating efforts between the EU and another global power, such as the United States. Such a possibility, taken into consideration by Leonard et al. (2021), would help mitigate the costs for the international system and help curb emissions, by creating a sort of "club" of pioneering countries, that are both economically strong and committed to emissions reductions, demonstrating the opportunities deriving from a carbon border tax, which then would encourage other countries to join.[214] Thus, it is evident that, even in a context of increasing competition to be frontrunners in the transition, cooperative and not competitive solutions are going to offer the maximum gains both in terms of the achievement of climate goals, promotion of new alliances and strategic partnerships based on shared norms and standards and relatively stable management of the transition process.

In brief, the European Green Deal is intended to shape EU's energy diplomacy, so that it progressively goes beyond traditional fossil fuel-based external relations and accelerate the transition towards clean energy and the achievement of decarbonisation. Despite the inherent difficulty in coupling energy diplomacy and security dynamics with climate diplomacy and security, the actual possibility for the EU to become leader in the transition process will depend on its ability to manage the tensions from these two different and yet strictly interlinked fields and hence to gain international credibility from this. Should it not be able to solve internal frictions and deliver a united image, the EU might encounter serious difficulties in leading the transition through an externalisation of its norms and standards.

Given the need to desirably proceed with a cooperative approach, the external dimension of the EGD will be concretised through the establishment of new partnerships and the renegotiation of existing ones; by means of an innovative approach to development policies; and a renewed, stronger, and greener financial system. These are the three main interlinked axes along which the EU intends to work to achieve its targets. It will have to manage the consequences of the transition on traditional external energy relations, by assessing their potential for clean energy development and possibly

[212] M. Leonard et al., (February 2021), "The Geopolitics of the European Green Deal", p. 12.
[213] Ivi, p. 13.
[214] Ivi, p. 27.

rebuild them on the opportunities stemming from this latter, thereby providing a chance to counter-balance disruptions deriving from a curb in fossil fuels demand and, at the same time, safeguarding a relative economic and political stability in partner countries.

Not only, the EU will have to identify new significant partnership opportunities, considering both climate change impacts, business prospects and the willingness of potential partners to commit to European norms and standards. In this regard, a special role will be played by development policies, through the NDICI, which will be directed to enhance the attractiveness of the EU amidst other rival powers as an interesting partner for developing countries and, simultaneously, to accelerate the transition while addressing economic and social issues. Overall, the NDICI, the European long-term budget and Global Gateway, among many others, will be the programmes responsible for delivering the internationalisation of the Green Deal. Through these, the EU intends to spread its own values and standards, as it has also been the case with the Taxonomy for Sustainable Activities and the proposal of a carbon border adjustment mechanism.

In doing so, traditional energy security toolkits won't have to be cast off but will contribute to a safe management of a transition process that respects technological neutrality and that enhances great flexibility to maintain energy availability levels stable. Dialogue with other global powers, such as the United States and China, will have to be kept open and possibly deepened, given the rising competitiveness in strategic industries and value chains, where the EU is still lacking sufficient presence, in order to avoid the cascade effects of the new security and economic threats brought about by the transition itself.

2.4 EU's RAW MATERIALS DIPLOMACY

The main features of the green deal diplomacy discussed so far can be applied also to the more specific case of raw materials diplomacy. The growing role of critical raw materials in the transition process explains the relevance of considering its impact in European external relations, and, more specifically, of designing an approach that takes into consideration both the major goal of strategic autonomy set in the New Industrial Strategy of 2020 and the necessity to mitigate possible new dependences and security issues better than it was traditionally done with energy security issues.

Following the general goal to accelerate decarbonisation, the European Green Deal introduces itself as "a new growth strategy that aims to transform the EU into a fair and prosperous society, with a modern, resource-efficient and competitive economy where there are no net emissions of greenhouse gases in 2050 and where economic growth is decoupled from resource use".[215] Yet, the transition to a system that phases out fossil fuels resources doesn't necessarily mean the exclusion of other resources use, such as in the case of critical raw materials, or even more emblematically, rare earths. Hence, as Lazard and Youngs (2021) have affirmed, it would be more appropriate to say that the decoupling of economic growth from fossil fuels will entail "a recoupling of economic growth and resource extraction", with its inherent ecological risks.[216] The demand for raw materials is expected to grow exponentially in the next decades; it is therefore fundamental that the European institutions conceive a strategy that allow them to prevent and contain possible disruptions and risks coming from such a structural change, with a major focus on how the establishment of external relations and the negotiation and renegotiation of international partnerships can contribute to it.

Currently, global powers have embarked on a race to pace the transition, in terms of market dominance and cleantech supply chains control. As already mentioned, according to Bordoff and O'Sullivan (2022), these are some of the fields that will determine present and future leaders of the transition, but in neither of them can the EU aim to prevail in the short-term: its scarce presence in raw materials value chains, its poorly financed mining industry and public resistance to new extractive projects are factors that majorly expose the old continent to bind its transition process to new risky dependences, especially in a global context increasingly dominated by strategic calculations. Contrarily to what the resolution of climate problems might suggest, the race towards the transition is showing that international efforts for cooperation are left to the more general agreement on climate goals, but, when it comes to be the frontrunners in industrial innovations and scale-up of new clean energy technologies, countries tend to be more protective and less inclined to cooperation. According to Bordoff and O'Sullivan (2022), even if the transition will require larger and longer supply chains for clean energy technologies given the relative geographic concentration of CRMs, it doesn't mean that it will further deepen the globalization process.

First, as a matter of fact, the impulse to electrification will impose a greater focus on local and regional production activities due to the difficulty in transporting electric power in long distances. Second, states' interest to dominate in specific industrial productions pivotal for renewable energy development has already demonstrated its potential to incentivise the adoption of protectionist measures or discourage the delocalisation of entire strategic industries or production processes abroad. This was the case of the PRC's National Plan for Mineral resources launched for the period 2008-2015, with which the Chinese government aimed to protect its own industrial growth. The plan

[215] European Commission, (11.12.2019), "The European Green Deal", COM(2019) 640 final, EUR-Lex, p. 2, https://eur-lex.europa.eu/legal-content/IT/TXT/?uri=CELEX:52019DC0640.
[216] O. Lazard, (2021), "The need for an EU ecological diplomacy", p. 21.

conceived a ban for foreign companies to enter mineral supply chains, if not in a joint venture with Chinese domestic companies; the subordination of both types of companies to export quotas; the ban to issue new mining licenses; and a further increase in the state's control over domestic extractive companies.[217] These measures were classified by the WTO as violating the international trade rules, and China was forced to review its strategies, albeit it still managed to adopt specific taxes and mechanisms to avoid excessive production and boost its own industrial growth in the production of high value added products. Third, the race for dominance will also be determined by the interest in imposing specific norms and standards to pace decarbonisation, which might result in retaliatory measures, as in the case of the Commission's proposal to apply a carbon border adjustment mechanism. Thus, will the EU inevitably lose the play due to its inherent weaknesses? Not necessarily. Much will depend on its ability to wisely manage CRMs alliances and strategic partnerships while deploying other security measures, such as minerals stockpiling, enhancing flexibility, diversifying supply routes (apart from suppliers), incentivise domestic efficiency, research on recycling and substitution.

One of the priorities set in the joint communication on "EU external energy engagement in a changing world", already described in section 2.2, focuses on the establishment of "long-lasting international partnerships and [the promotion of] EU clean energy industries across the globe".[218] While competing to gain a leading role, the EU aims to seize profitable opportunities for its cleantech industries, boosting their competitiveness, and for accelerating the transition to clean energy in its partner countries as well. With this in mind, new possible partnerships represent interesting business prospects. The communication highlights the favourable positioning of European cleantech industries in the development of wind turbines, photovoltaic, hydrogen and heat pumps, a value added that could be clearly fundamental in negotiating interesting trust-based partnerships especially with developing countries.[219] To do so, the need to ensure competitive, open and fair markets is deemed essential to pool sufficient investments and funds and to secure a stable growth of the cleantech sector both in Europe and in its partner countries. In exchange for their know-how, European industries would obtain access to critical raw materials for secondary products, filling in the gap of their scarce domestic mineral sourcing.

In this regard, the key actions outlined in the communication also include the reinforcement of cooperation on raw materials value chains, the strengthening of EU economic and trade policy tools to safeguard fair competition and free markets, the promotion of demand-side measures, like energy

[217] E. Barteková and R. Kemp, (January 2016), "Critical raw material strategies in different world regions", p. 9.
[218] European Commission and High Representative of the Union for Foreign Affairs and Security Policy, (18.05.2022), "EU external energy engagement in a changing world", JOIN (2022) 23 final, EUR-Lex, p. 2, https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=JOIN%3A2022%3A23%3AFIN.
[219] Ivi, p. 14.

efficiency, and an impulse towards the uptake of circular business models, and, finally, an extended collaboration and dialogue within multilateral fora.[220] The European Commission has been interacting both at the bilateral, regional and multilateral level with other countries, establishing relevant partnerships, even if often with countries which do not completely adhere to European ESG standards, as in the case of South Africa or China.

It is indeed commonly known that the production of CRMs in these and other countries produces high levels of CO_2 emissions together with other major ecological impacts. For these reasons, the EU has long insisted on the need to more extensively share production standards that promote social and ecological justice, with a major focus on waste management and circularity. Again, this explains the interconnection of raw materials diplomacy with development policies. Many of the areas rich in raw materials are also exposed to severe degradation of local ecosystems, such as in the case of the Congo Basin and Indonesia, apart from being breeding grounds for violence, conflicts, and human rights abuses.[221] Owing to the growing demand for raw materials in the next decades, there is the risk that mining countries in the Global South might pay the highest price for others' transitions, both in terms of conflicts, national governance and growth, and impacts on their ecosystems. The African Union is rightly trying to promote a localization of minerals' production processes in order to boost domestic industrial clusters and produce valuable capital.[222] This could in turn translate in export quotas or other limits to favour African growth to the detriment of European plans for the green transition.

Thus, a successful EU's strategy must envision a balanced equation between supply-side and demand-side measures to respectively implement a diversification of suppliers and to contain domestic consumption so as to limit the dependence of economic growth on resource use. In particular, it should develop specific parameters in order to identify possible partnerships. Those parameters should not only take into consideration the presence and magnitude of economic opportunities for European industries offered by a third country or its transition commitments, but also its political and economic fragility, its inherent risk of economic coercion and its exposure to climate change and environmental degradation.[223] These assessments respond to the need to limit considerable risks stemming from countries that are unstable and that could create major disruptions in the supply of specific raw materials. As concerns the risk of economic coercion, the EU should wisely negotiate partnership that are built on a mutual trust and that include an actual exchange of know-how or training on innovative solutions which can benefit its counterparts in terms of development. Should these partnerships

[220] Ivi, p. 14-15.
[221] O. Lazard, (2021), "The need for and EU ecological diplomacy", p. 22.
[222] V. Reisch, (1.06.2022), "The Race for Raw Materials", *Stiftung Wissenschaft und Politik*, no. 1, p. 5, https://www.swp-berlin.org/10.18449/2022JR01/.
[223] Ivi, p. 4.

respond mostly to European needs, then third countries, especially the ones characterized by authoritarian regimes and wide state interventionism, might decide to impose export quotas or sanctions against importing countries, in order to benefit their own industrial growth.

In this sense, the European Commission has engaged itself in a series of strategic partnerships and multilateral dialogues with third countries, regional and international organisations with the aim to build "sustainable and responsible strategic partnerships with resource-rich countries", in a way that "can help [its] partner countries' develop their mineral resources sustainably through supporting improved local governance and dissemination of responsible mining practices", following the adoption of the EU Regulation on Conflict Minerals and the launch of the European Partnership on Responsible Minerals.[224] These latter exemplify the growing attention given to responsible mining and the attempt of the EU to spread its own standards and principles for extractive activities. Despite the absence of a common raw materials diplomacy, over the last decade, the Commission has managed to sign significant political agreements with Latin American countries like Chile, Uruguay, Argentina, and Mexico, with Greenland, and has been developing policy coordination initiatives with the US, China, Japan, Canada, Australia, and the African Union.

The commitment to diversify suppliers of CRMs and define common policy goals has not help so far diminish EU's import reliance on China, which still accounts for 98% of European imports of rare earth elements.[225] Given the geographical concentration of CRMs, it is interesting to have a general overview over the major producing and processing countries, which can help understand the magnitude of Chinese market dominance. Figures 2.4a and b clearly show the strategy that the Chinese

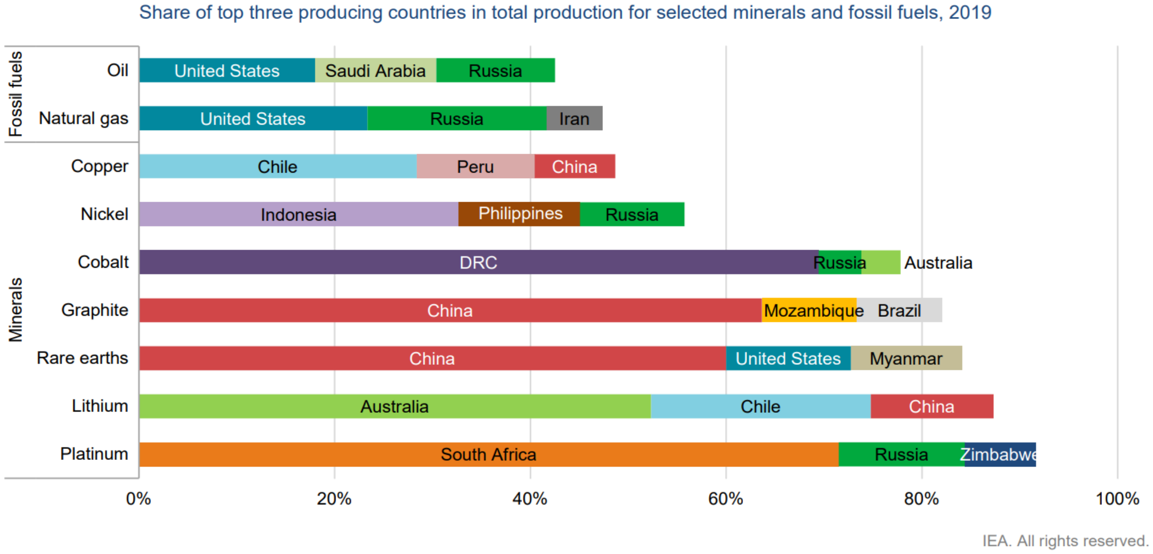

Figure 2.4a: *[Source: World Energy Outlook Special Report on The Role of Critical Minerals in Clean Energy Transitions, 2021, International Energy Agency]*

[224] European Commission, (03.09.2020), "Critical Raw Materials Resilience: Charting a Path towards greater Security and Sustainability", COM(2020) 474 final, EUR-Lex, p. 15-16, https://ec.europa.eu/docsroom/documents/42849.
[225] K. von Wieringen and M. Fernández Álvarez, (July 2022), "Securing the EU's supply of critical raw materials", *European Parliamentary Research Service*, p. 2, https://www.europarl.europa.eu/thinktank/en/document/EPRS_ATA(2022)733586.

government has been pursuing, that is aiming to dominate in the refinery of minerals for secondary uses critical for clean energy technologies. Contrarily to what it might seem from Figure 2.4a, the relative preponderance of other countries in the extraction of specific minerals, especially in Africa and Latin America, has been offset by an increased presence of Chinese capital and companies world-wide, such as in the case of Tianqi Lithium's, which acquired 23.8% of shares of the Chilean company SQM and 51% of the Australian Greenbushes, following the priorities set in the "Made in China 2025 initiative", launched in 2015, with the goal to identify the main industrial clusters to be granted public support.[226]

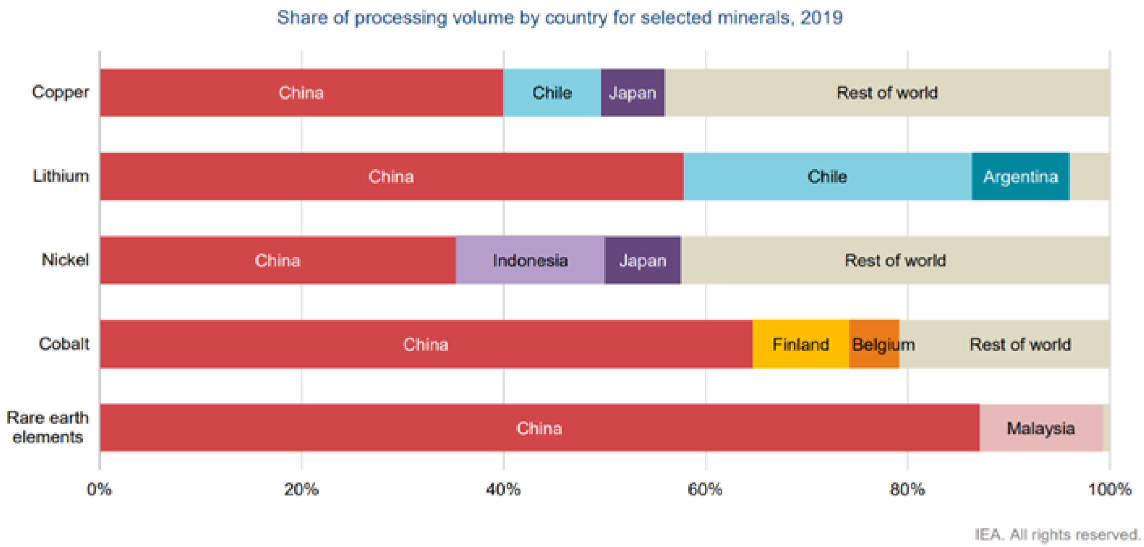

Figure 2.4b: *[Source: World Energy Outlook Special Report on The Role of Critical Minerals in Clean Energy Transitions, 2021, International Energy Agency]*

Now, due to its high dependence, the European Commission has maintained an open dialogue with China in this field, establishing a Metals Working Group in 2003 in collaboration with the Chinese Ministry of Industry and Information Technology, and, later on in 2010, a Working Group on Raw Materials. The goals of these initiatives include an increase of collaboration on tackling raw materials issues, the exchange of information and the promotion of fair and competitive markets. Yet, with China playing a pivotal role in the processing of raw materials and in controlling their related supply chains, apart from consuming large amounts of materials to feed its economy, bilateral negotiations with the EU in the form of High-Level Environment and Climate Dialogues, have attempted to make further focus on decarbonization, as a necessary step for China to avoid risks stemming from its own dominant position. In doing so, the EU aims to influence Chinese climate agenda, which, for the time being, envisions the achievement of climate neutrality not earlier than by 2060.

Thus, despite the importance of China, the EU needs to look beyond it if it actually aims at gaining a leading role in setting norms and standards worldwide for raw materials production and limit carbon

[226] International Energy Agency, (May 2021), *The Role of Critical Minerals in Clean Energy Transitions*, p. 166.

leakages deriving from mineral value chains. For this reason, another essential piece of the whole puzzle is related to the improvement of transatlantic relations, which haven't been recently following the same directions and were poorly coordinated. Since the implementation of China's National Plan for Mineral resources for 2008-2015, and the related imposition of export quotas, apart from an embargo of rare earths exports to Japan, the EU and the US haven't been able to properly respond to China's instrumental use of raw materials, allowing prices to rise exponentially. Undoubtfully, they both are engaged in periodically reviewing criticality assessments and industrial dependence to reduce risk exposure and develop greater resilience, examples of which are the launch of the European Raw Materials Alliance in 2020 and the creation of the US Strategic Materials Assessment and Risk Topography.[227] Also, they are increasingly investing in and supporting R&I in recycling of critical raw materials and domestic geological mapping to detect possible strategic reserves. Nevertheless, when it comes to proper diversification of supplies and timely and united responses to Chinese market dominance, both parties fall short of cohesion, and ambition.

With the return of Democrats at the presidency and with the rehabilitation of previously undertaken international climate commitments, transatlantic cooperation might hopefully (re)gain momentum, in the shared attempt to adopt a proactive approach to raw materials security issues. According to Ruiz Guix (2021), a renewed strategy for EU-US cooperation should build on a common goal to reduce the respective import reliance rates, draft common investment priorities, mining standards, de-risking mechanisms to pool private investments and develop joint projects.[228] Moreover, they should commit to a shared framework to increase their control over supply chains, so as to minimize the risks deriving from potential unilateral disruptions caused by China.[229]

To these fundamental steps, Reisch (2022) adds the need for a joint research and development plan for recycling and minerals mapping, besides the development of joint strategic stockpiling.[230] There are already two important fora that can provide sufficient space for dialogue and cooperation on these issues, such as the trilateral initiative with Japan and the US and the Trade and Technology Council. The first one has been active since 2011, following annual updates, with the purpose to face rising raw materials prices, exchange relevant information and discuss joint research and development initiatives. The second, created in 2021, comprises a specific Working Group on "Secure Supply

---

[227] P. Ruiz Guix, (17.12.2021), "Critical mass: Raw materials, economic coercion, and transatlantic cooperation", *European Council on Foreign Relations*, https://ecfr.eu/article/critical-mass-raw-materials-economic-coercion-and-transatlantic-cooperation/.
[228] Ibidem.
[229] Ibidem.
[230] V. Reisch, (2022), "The Race for Raw Materials", p. 4.

Chains", and focuses on increasing bilateral cooperation on global trade and technology issues, building on the shared values of democracy, freedom, and human rights.[231]

In brief, EU and US bilateral relations might be able to find new breeding ground for cooperation, if they succeed in balancing their search for greater competitiveness with the need and advantages deriving from concerted responses to wide-raging mineral security issues. The tensions with Russia have got them closer, even if their environmental policies remain different in ambitions and priorities, also due to the extreme polarization that has been fuelled in the US on climate issues. Yet, the EU would profit from a more cooperative approach to target mineral security, given that otherwise the US might come to embody another global rival, increasing the potential magnitude of risks in supply chains, undermining the success of a possible implementation of a carbon border adjustment mechanism, and causing grater fragmentation in confronting Chinese strategies. An example of cooperation efforts from which transatlantic relations could also draw is the Partnership for Global Infrastructure and Investment, launched by G7 countries in response to the PRC's Belt and Road Initiative, with the aim to pool private and public funding to increase low- and middle-income countries' accessibility to energy, health care and telecommunications, following shared environmental and social values.[232]

[231] European Commission, "Digital in the EU-US Trade and Technology Council", Policies, https://digital-strategy.ec.europa.eu/en/policies/trade-and-technology-council.
[232] Council of the European Union, (26.06.2022), "Statement by President Michel at the G7 summit side event on Partnership for global infrastructure and investment", https://www.consilium.europa.eu/it/press/press-releases/2022/06/26/remarks-by-president-g7-summit-side-event-on-partnership-for-global-infrastructure-and-investment/.

3. AN ELECTRIFIED TRANSITION TO CLEAN MOBILITY

3.1 THE ELECTRIFICATION HYPE: TOWARDS THE GOLDEN AGE OF EVS?

As anticipated in the introduction, the initial explanation of the concepts of energy security and diplomacy is instrumental to bring forward the thematic focus of this thesis, that is the transition to clean mobility in the European Union. The analysis of the features and risks pertaining to the sphere of these interpretive categories has served to highlight the gaps and the evolution of European energy policies, with particular regard to their increasing interplay with the European climate agenda and the changing political environment at the international level. For many reasons that will be soon explored, the role of transport in this field has always been crucial, so that taking it into consideration when analysing the impact of today's transitions is fundamental to identify some of the major challenges and obstacles that the EU will have to tackle in order not to yield to new dependencies, unfair international competition, market distortions caused by monopolies and major exposure to risks of supply chains' disruptions.

As already pointed out in CRMs related sections, energy security concerns are far from fading away from energy policy agendas: the energy crisis erupted in 2021 and later on the war of aggression in Ukraine have once again reminded policymakers that the need to ensure affordable and reliable supplies, and, perhaps even more importantly, to commit to the improvement of the resilience of energy systems are priorities that should be considered as such not only when alarm bells start to ring. They should be at the heart of policymaking, in the attempt to make our societies safer and our economies stronger and to improve the timeliness of response to emerging crises. Similarly, the considerable attention given to the formation and consolidation of international partnerships and alliances in the latest EU's strategic action plans shows that the role of energy diplomacy will perhaps grow along the process of transition, given the need to collaborate for research and innovation purposes and to find new ways to reach high levels of energy security, so that the transitions will occur as smooth as possible.

Therefore, the focus on clean mobility and lithium that follows will build on the theoretical features of the evolving energy security and diplomacy as described in Chapter 1 and 2 and will attempt to measure the impact of EU's green transition in this field, looking at emerging risks and opportunities to compete in the global race for the transition. For reasons of coherence and conciseness of this thesis, the general overview on clean mobility will merely consider light passenger electric vehicles, since a broader discussion including also medium- and heavy-duty EVs would have to include insights on other groundbreaking innovations, such as the use of green hydrogen and other alternative fuels such as ammonia, which are said to have more potential than lithium-ion batteries to decarbonise them.

Clean mobility is set to be a key testbed for the green transition. One reason for this is the unfortunately still high reliance on internal combustion engines, with consequent GHGs emissions. According to a briefing published by the European Parliamentary Research Service in 2016, transport accounted for 25% of EU's total emissions, with road transport emitting the most, around 80%.[233] Due to the outburst of the pandemic in 2020, there was concern that the prioritization of economic recovery amidst the losses caused by companies' lockdowns and shutdowns and supply chains disruptions would have once again hampered a clear-cut turn towards clean energy and climate goals, as it was the case after the financial crisis in 2008.

Yet, according to the data presented by the IEA, which are confirmed also by other observatories, such as S&P Global, despite the geographically variable recovery of the automotive sector worldwide in the post-pandemic period, there was an unprecedented spike in the uptake of EVs, which suggests a generally more mature commitment to decarbonisation goals in this sector and an increased competition to be frontrunners for their broader deployment.[234] It has been calculated that the units of EVs sold in 2021 were twofold compared to 2020, reaching the record number of 6.6 million.[235] The IEA explained this upward trend as the result of an increased policy support towards the uptake of EVs in the form of subsidies and more stringent climate goals, and of the more ambitious electrification plans defined by carmakers.

China is leading the global rise in EVs (+150% compared to 2020) thanks to a substantial subsidization of EVs purchases to expand its internal market, now characterised by a certain level of maturity given the scale back of incentives in the last two years, which did not prevent a further increase in sales.[236] The European Union similarly presented a significant, yet diversely geographically distributed, expansion in EVs sales, which grew by 66% in 2021 in comparison with the previous year.[237]

[233] M. Niestadt and A. Bjørnåvold, (April 2019), "Electric road vehicles in the European Union: Trends, impacts and policies", *European Parliamentary Research Service*, p. 5, https://www.europarl.europa.eu/thinktank/en/document/EPRS_BRI(2019)637895.

[234] G. Hering, (20.09.2021), "EV impact: electric vehicle surge resonates across global economy", *S&P Global*, https://www.spglobal.com/marketintelligence/en/news-insights/latest-news-headlines/ev-impact-electric-vehicle-surge-resonates-across-global-economy-66518519.

[235] International Energy Agency, (May 2022), *Global EV Outlook 2022. Securing supplies for an electric future*, IEA Publications, p.4, https://www.iea.org/reports/global-ev-outlook-2022.

[236] Ibidem; H. Cui and D. Hall, (29.06.2022), "Annual update on the global transition to electric vehicles: 2021", *The International Council on Clean Transportation*, https://theicct.org/publication/global-ev-update-2021-jun22/#:~:text=In%202021%2C%202.3%20million%20EVs,compared%20to%2042%25%20in%202020.

[237] Ibidem.

17 out of 100 cars sold in 2021 in Europe were electric, with Norway registering the highest percentage of units sold (86%), making it a global flagship for the effective deployment of EVs in its society.[238] It is currently followed by Iceland and Sweden, with sales respectively amounting to 72% and 43%. Numbers that fall sharply if looking at the very bottom of the ranking, which sees Italy and Spain as latecomers with 9% and 8% of EVs sold in 2021. Still, in general Europe can be said to have had the highest compound annual growth rate (+61%) worldwide in the period stretching from 2016 to the present.[239]

Hence, despite the pandemic, these data showed the considerable recovery potential of EVs in the automotive sector and, more importantly, are signals of vibrant and untapped opportunities of growth for the European automotive industry in an increasing electrified future. This potential is fed by the more ambitious goals of the EU in its fight against climate change and has been entirely grasped by industrial protagonists and analysts worldwide. S&P Global has estimated that EVs sold units will represent 20% of Chinese automotive market by 2025, 37% in the European one and 10% in the US.[240] As ambitions to lead the change grow, industrial actors and policymakers have come to cooperate more substantially to tackle the barriers and challenges for a greater uptake of EVs, promoting the deployment of charging infrastructure, joint research and innovation projects with particular reference to metals recycling and substitution, and increasing industries' accountability along clean energy technologies' value chains to address ethical and environmental issues.

The positive developments experienced by EVs global market, and their entire value chain, have been recognized by financial operators as well. According to the IEA, EV and battery indices have exceeded most relevant carmakers' capitalization rate by 60% at the end of 2021.[241] Major "green" commitments vis-à-vis the impact of the pandemic in the economy resulted in a record growth for EVs (+70%) and battery quotations (+40%), through which investors actually highlighted their increasing perceived relevance of battery supply chains for strategic planning in the automotive sector.[242] The high capitalization of these indices can be interpreted as the trust given by investors to the potential of the companies active in EVs value chains to create value, to rapidly expand in the market and generate high returns on investments. Investors' attitude has moved in line with a general increasing attention to sustainability in finance, that has in turn been promoted by policymakers' initiatives to support the transfer of more realistic and positive signals in relation to the actual activities performed by market operators. An example of this has been the European Taxonomy for sustainable

[238] International Energy Agency, (May 2022), *Global EV Outlook 2022*, p. 17.
[239] Ibidem.
[240] G. Hering, (20.09.2021), "EV Impact: Electric vehicle surge resonates across global economy".
[241] International Energy Agency, (May 2022), *Global EV Outlook 2022*, p. 42-43.
[242] Ibidem.

activities approved by the European Commission in March 2022, which combines the need to categorize the diverse economic activities based on the principle of "do[ing] no significant harm" to the environment, among others, and on the possible obligation of companies to report the share of sustainable activities performed.[243]

A higher attention to the contribution that the mobility sector can make to alleviate climate issues has helped bring forward other long overdue legislative initiatives in the European Union. The adoption of the European Climate Law and the approval of the Fit-for-55 package are just two exemplary cases, with the former setting the goal of climate neutrality by 2050, and the latter establishing the legal framework to support a curb of 55% of GHGs emissions by 2030.[244] The Commission has also invited to review the Alternative Fuels Infrastructure Directive, converting it into a Regulation, so that there is no need for Member States' text adaptation, and has proposed a revision of the Renewable Energy Directive II, envisioning a further decrease of GHG intensity of transport fuels to -13% by 2030.[245] These harsher signals against conventional fuels and cars have finally been translated into the Commission's proposal to forbid the sale of internal combustion engines by 2035, which was followed by a first Parliament's approval in June 2022.[246] The general goal is to accelerate the uptake of EVs by setting a tighter roadmap, so that market operators will be more incentivised to invest on sustainable solutions.

In line with these institutional initiatives, European carmakers have all committed to higher electrification goals, with Volkswagen pledging to sell 70% of EVs by 2030, and Stellantis aiming at the target of 100% EVs by the same year, although the automotive sector has casted some doubts on the real benefits of the EU's strategy to insist only on electric cars to the detriment of other low-emission solutions, also highlighting the problem of a still insufficient charging infrastructure.[247] Indeed, as stated in IEA's EVs Outlook (2022), no one among the EU's Member States characterised by the highest EVs uptake is in line with EU's provisions on charging infrastructure, a limitation that actually influences European consumers when purchasing a new car. An important perspective to take into consideration when analysing the steps taken by the EU vis-à-vis the dominant position of China.

The PRC is in fact a leading market in the uptake of EVs, having adopted more substantial policies long ago and having gained market domination in key clean energy technologies value chains for EVs, such as lithium-ion batteries, for which it provides 75% of global supply.[248] Two of the major

---

[243] Ivi, p. 70.
[244] Ivi, p. 56, 64.
[245] Ivi, p. 84.
[246] Ivi p. 64; K. Abnett, (8.06.2022), "EU lawmakers back ban on new fossil-fuel cars from 2035", *Reuters*, https://www.reuters.com/business/autos-transportation/eu-lawmakers-support-effective-ban-new-fossil-fuel-cars-2035-2022-06-08/.
[247] Ibidem; International Energy Agency, (May 2022), *Global EV Outlook 2022*, p. 108.
[248] Ivi, p. 6.

current policy priorities of China for the near future are the further development of charging infrastructure, to meet the target of 20 million units of EVs sold by 2025, and the optimization of its battery industry.[249] On the contrary, the United States appears to have lagged behind, even if they were among the first to bet on EVs potential in the 2000s yet overestimating their uptake potential back then compared to conventional vehicles.[250] EVs sales in the US increased to 4.5% in 2021 in comparison with the previous year, and it is expected that they will account for 10% of the automotive market by 2025.[251] The approval of the Infrastructure Investment and Jobs Act by the Biden's administration has granted 7.5 billion USD to meet the deployment of 500,000 EVs chargers in the whole country, along the target of 50% EV sales by 2030. It is evident that the three major global players in the EVs market along with other emerging actors are pushing towards more ambitious industrial goals to boost the transition in the mobility sector, keeping the momentum gathered during the pandemic.

The strategies implemented are as diverse as the priorities that drive them, nevertheless the IEA (2022) has identified some key factors to actually promote a further uptake of EVs in a strategic way.[252] In this regard, countries should first and foremost keep incentivising EVs sales and the development of better and more integrated charging and power infrastructures to create those much-needed conditions to positively influence and ease consumers' choices in favour of electric vehicles. Also, there should be a major commitment to help increase EVs uptake in developing and emerging economies, where the scalability of innovative solutions and the presence of adequate infrastructures often represent insurmountable obstacles. Finally, further attention should be given to ensuring secure, resilient and sustainable EV supply chains by reorienting public and private investment flows, improving public licensing and procurement, supporting research and innovation, containing energy consumption and reinforcing accountability and transparency along EVs value chains.

As a matter of fact, value chains are a key factor that will determine the EU's possibility to compete or, in the best case, to collaborate with China and the US to bring forward its transition to green mobility. The EU has yet started from a disadvantaged position, either for its industrial structure or for its late policy responses. In 2019, in a publication for *Bruegel*, Veugelers and Tagliapietra affirmed that it was not too late for Europe to earn first place if proper impulse would be given to investments in R&I projects, patenting, and mining as Professor Umbach would add.[253] There is no

[249] Ivi, p. 55.
[250] D. Yergin, (31.08.2021), "The Major Problems Blocking America's Electric Car Future", *Politico*, https://www.politico.com/news/magazine/2021/08/31/biden-electric-vehicles-problems-yergin-507599.
[251] International Energy Agency, (May 2022), *Global EV Outlook 2022*, p. 55; G. Hering, (20.09.2021), "EV impact: electric vehicle surge resonates across global economy".
[252] International Energy Agency, (May 2022), *Global EV Outlook 2022*, p. 8-9.
[253] R. Veugelers, S. Tagliapietra, (9.01.2019), "How Europe could yet take the lead in the global electric-vehicle development race", *Bruegel*, https://www.bruegel.org/blog-post/how-europe-could-yet-take-lead-global-electric-vehicle-development-race; F. Umbach, (30.03.2021), "Critical raw materials: Assessing EU vulnerabilities", *Geopolitical Intelligence Services*, https://www.gisreportsonline.com/r/critical-raw-materials/.

doubt that innovation is and will be even more pivotal to gain competitiveness in a constantly evolving market such as that of EVs – and indeed the EU has taken purposeful steps in this direction, as it will be demonstrated in section 3.3. Yet, given that the thematic focus of this thesis on the role of lithium for the European transition to clean mobility will be particularly deepened in chapter 4, it is essential to understand the criticality of EVs supply and value chains for the EU, to grasp the gaps and the opportunities deriving from them.

3.2 From CRMs to battery cells: when supply and value chains become critical

When addressing the role of the European Union in EVs supply and value chains the first aspect that stands out is the already mentioned geographical concentration of most production phases, which naturally creates the condition for market distortions if coupled with the ambition of nation states to gain as much competitive advantage as possible over their rivals. Supply chains are defined by Cambridge Dictionary as "the system of people and thing that are involved in getting a product from the place where it is made to the person who buys it"; a definition that inevitably sheds light on the interplays between the actors participating in the articulated phases that go from production to distribution, with the related logistical considerations.[254] Supply chains criticality has much to do with risk prevention and management, especially for countries that do not benefit from a relevant control of the latter, being exposed to the possible perilous unilateral decisions of the nation states dominating the scene, as it has been proved by the evolution of foreign energy relations among the EU and Russia owing to Putin's war of aggression in Ukraine. Thus, these countries need to assess the various components of risk, meaning (unintentional) hazards and (intentional) threads, vulnerabilities, consequences and resilience. In this regard, risk analysis help policymakers identify weaknesses and threats, set priorities, inform preventive, protective, and mitigation measures to counter the probability of the actual emergence of an identified risk or to alleviate its impact once it has already emerged.

The long commitment of the EU to influence European consumers' behaviour in order to promote and consolidate more energy-efficient solutions in their daily routine can be interpreted as a preventive measure (currently a mitigation measure, due to the exceptional context) that aims to decrease the exposure to externally controlled supply chains by acting on the demand side. This strategy has dominated energy security action plans since the early 2000s, together with the impulse to build a more integrated and interconnected common energy market; an ambition that, for example, has been embodied by the liberalization of the electricity market in Europe and the further development and use of reverse power flow in critical areas under the Energy Community. Yet, at least in the European

[254] Cambridge Dictionary, "Supply chain", [online], https://dictionary.cambridge.org/dictionary/english/supply-chain.

case, and before the war in Ukraine hit unsettling geopolitical balances, natural gas supplies occurred in a regional environment, with Russia, Algeria and Norway being the largest suppliers for Europe. Electricity distribution itself still occurs along short or medium distances, given the unsolved technical obstacles to perform longer distances. Despite the development of renewable energy sources suggest a more localized energy production, as in the case of solar and wind power, which will contribute to the decarbonization of electricity production, the impulse to electrification itself to fuel the

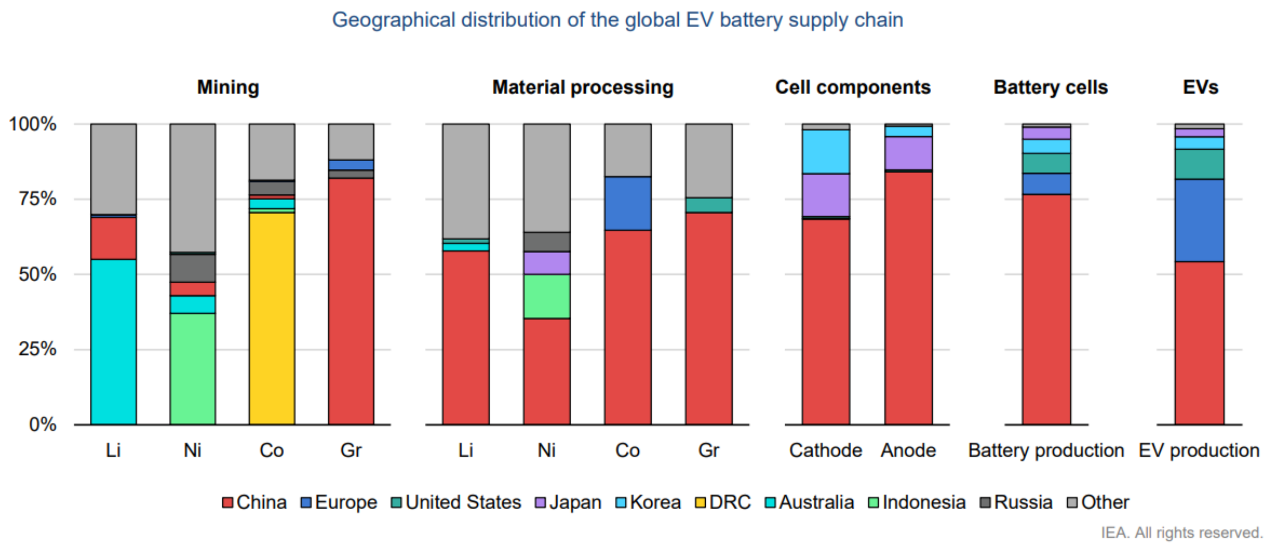

Figure 3.2a*: China's dominance in EVs supply chain [Source: Global EV Outlook 2022, International Energy Agency]*

green and digital transition, especially in the mobility sector, is increasing the criticality of clean energy technologies' supply chains, which are highly dependent on the extraction of raw materials. This aspect has been highlighted by financial transaction themselves: in 2021 the battery index registered a higher growth than EVs indices, signalling the concern for carmakers and other related investors to ensure secure and reliable supply chains for EV batteries.[255] This concern is explained by the excessive concentration of major production processes in one country, China (see Figure 3.2a).

Batteries' supply chain refers to the following complementary processes: extraction of raw materials, refining and processing of the materials mined, production of cell components, production of battery cells or packs, production of EVs and integration of the battery pack in their engine, and, finally, possible recycling or re-use of battery's mineral components.[256] China is currently dominant in each one of these production phases, meeting 75% of global lithium-ion batteries demand, and hosting 70% and 85% of global cathode and anode production respectively, that are fundamental parts of the battery itself determining its performance.[257] Also, China has driven the rise in EVs sales in

[255] International Energy Agency, (May 2022), *Global EV Outlook 2022*, p. 42.
[256] Ivi, p. 146.
[257] Ivi, p. 6-7.

2021, consequently impacting batteries demand, which has grown by 140% there, compared to a 70% rise in Europe in the same year.[258]

Besides being the frontrunner in the refinement of lithium, China plays a significant role in the processing of nickel and cobalt through Jinchuan Group. It is dominant in graphite mining, meeting 80% of global demand, and is a key supplier of manganese, even though these minerals are more broadly distributed around the world and, therefore, do not present a considerable concentration issue on the mining side.[259] Nevertheless, as concerns refining, China is home to the major global suppliers of key processed minerals, especially lithium carbonate and hydroxide, and is responsible for 90% of global production of high-purity manganese sulphate.

As for the production of batteries' cathodes and anodes, Chinese companies have got the lion's share, playing a crucial role in a highly concentrated market. In the case of cathodes, China is represented by three major companies, Tianjin B&M Science and Technology, Shenzhen Dynanonic and Nigbo Shanshan, whereas as regards anode production, key actors also include BTR New Energy Materials and Shanghai Putailai New Energy Technology, among others, covering more than 60% of global demand.[260] The production of battery cells and packs is also significantly concentrated, given that they require energy- and capital-intensive industrial processes. 65% of global demand is met by three suppliers only, the first of which is Chinese CATL, followed by Korean LG Energy Solution and Japanese Panasonic.[261] In this regard, the IEA (2022) has specified that Europe and North America are also moving -belatedly- towards a higher presence in battery production activities, despite lagging on scalability issues concerning their solutions.

Finally, also EV production and subsequent re-use or recycling activities are equally concentrated. Few carmakers are responsible for the production of electric vehicles, with Tesla, Volkswagen Group and Chinese BYD producing over 30% of EVs worldwide.[262] Despite researchers still have to untap the full potential of recycling and re-use of materials, China hosts 50% of global recycling capacity, and intends to increase it in the years ahead: a decision that, according to the IEA (2022), will grant China the maintenance of its dominant position, albeit new players involved in the supply chain are entering the business, based on the policy prioritization of a more responsible waste management.

As it can be noticed in Figure 3.2a, the only significant presence of Europe along the EV battery's supply chain is in cobalt processing, which accounts for 20% of global supply and is mainly concentrated in Finland, and EVs production, covering more than 20% of global demand.[263] Undoubtedly,

[258] Ivi, p. 138.
[259] Ivi, p. 149.
[260] Ivi, p. 150.
[261] Ivi, p. 151.
[262] Ivi, p. 152.
[263] Ibidem.

EV battery supply chains are concentrated in the Asia-Pacific region and given the political and economic ambitions of states like China, Japan or South Korea, their dominance is going to last. Still, a conjuncture determined by the inflationary post-pandemic recovery, commodity price spikes, global supply chains disruption, chip shortages and the war in Ukraine, has caused a disjuncture between raw materials demand and supply, inflating prices. Despite not being scarce in nature, lithium's value has risen sevenfold, while cobalt price is twice as much as in 2020.[264] Nickel, one of the essential chemical elements used to manufacture the best performing cathode chemistry by now, is in the eye of the storm, given that its global largest producer is Russia. The high purity level of nickel required to build batteries makes it difficult to diversify its sourcing, without further complicating its processing stages, not to mention the fact that owing to a higher quantitative presence of nickel than other metals in a battery, its price has the greatest influence on the battery price itself.[265]

For this reason, some markets, like the Chinese one, have moved towards other cathode chemistries, that require less nickel and offer a comparable performance, such as lithium-iron phosphate (LFP). This solution does not eliminate the need to increase extractive activities to meet the constantly expanding global demand and the more ambitious climate goals. As reported by the IEA (2022), mining has grown by 50% in 2021 compared to 2020, after years of underinvestment due to low commodity prices, which has undermined early opportunities to increase the geographic distribution of upstream activities.[266] So, the current investment trend should be supported in a forward-looking perspective and possibly more broadly extended to the other batteries' production stages as well, so as to amplify the range of actors involved in EV battery supply chains and decrease the exposure to disruption risks.

The IEA (2022) reasonably highlights the different lead times required to actually activate each production phase (see Figure 3.2b), which should underline the importance of strategically planning said activities to boost countries' competitiveness and resilience. There is indeed considerable space for diversification in the mining sector: Australia could increase its nickel and cobalt production threefold and fourfold respectively, for example. Europe could equally gain significant leverage in graphite extraction, where China's dominance is currently unrivalled. Likewise, downstream activities are set to evolve in favour of a higher diversification towards the end of 2030, thanks to more ambitious industrial plans issued by the European Union and the US. These latter could come to account for 25% of global battery production capacity.[267]

[264] Ivi, p. 142.
[265] Ivi, p. 145.
[266] Ivi, p. 143.
[267] Ivi, p. 157.

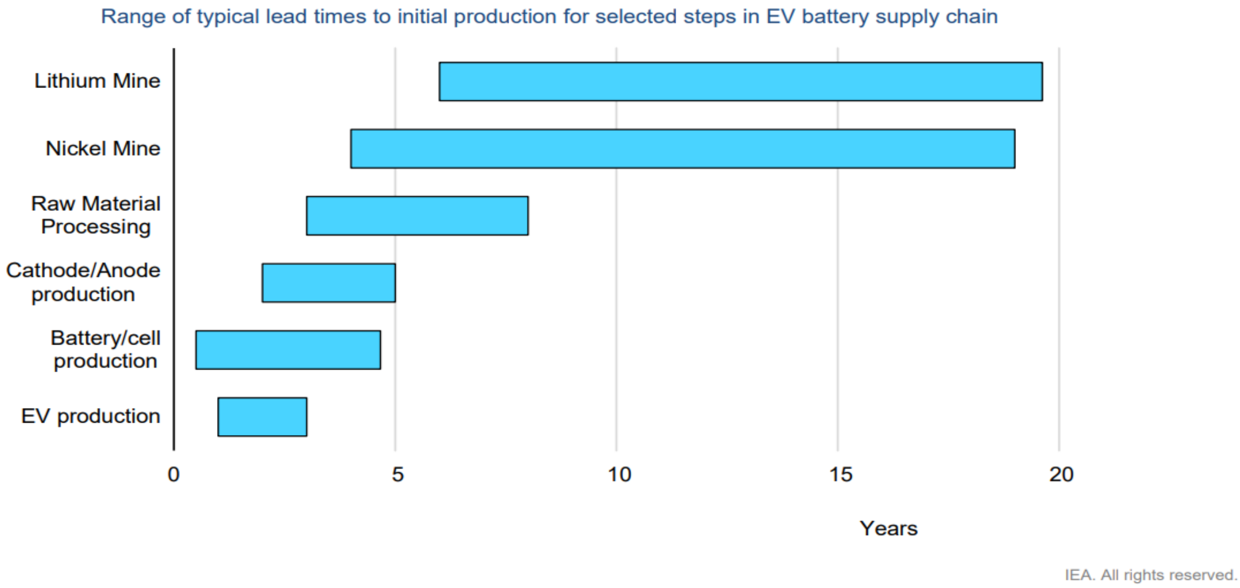

Figure 3.2b: *Examples of lead times in EV battery supply chain. [Source: Global EV Outlook 2022, International Energy Agency]*

The importance of refocusing financial markets and investors on these activities stems also from the centrality and criticality of battery value chains. The Cambridge Dictionary defines "value chain" as "the series of companies involved in the different stages of producing a product or service that is sold to consumers, with each stage adding to its value", underlying the activity of creating and adding value to a product, therefore benefitting from it in terms of industrial growth and competitiveness.[268] Why talking about critical value chains when it is evident that the criticality of supply chains responds to more urgent and tangible security dynamics (either real or perceived as such)? The role of value chains is pivotal due to nation states' increased awareness about the need to avoid excessive dependence on a few suppliers, which is in turn highlighting the advantages of a (re)localization of key industrial processes within their borders. The green transition is thought to open up new job opportunities that could give breath to long stalling economies, especially the advanced ones. Also, given that EV battery supply chains are not green in themselves, especially in the processing and refining stages for which industries perform energy-intensive activities that do not always come with a preponderant use of renewable energy sources, a localization of these activities in areas of the world where there are higher ESG (Environment, Social and Governance) standards would help offer greater guarantees on the quality of the product and of its supply chain.

These factors have been grasped by European institutions in their various strategic declinations. In 2016, the European Commission proposed a European Strategy for low-emission mobility, identifying some priorities for the years to follow: improving the efficiency of the mobility sector, accelerating the deployment of alternative fuels with low GHGs emissions, and moving towards zero-

[268] Cambridge Dictionary, "Value chain", [online], https://dictionary.cambridge.org/dictionary/english/value-chain.

emission vehicles.[269] Having to deal with a mobility sector still highly dependent on oil (94%), the Commission thought of this strategy as a common starting point for national, regional and local authorities to envision their own plans, following an inclusive and multi-stakeholder approach representative of the fact that mobility is an area of shared competences among Member States and European institutions.[270] In its attempt to make the best out the advantages deriving from the transition, said strategy intended to provide more certainty to investors, energy suppliers and businesses by prioritizing research and innovation in alternative mobility solutions. It highlighted the centrality of re-skilling and up-skilling initiatives for the workforce to skilfully lead the transition and minimize a possible occupational issue, determined by the mismatch between conventional skills and new ones. More concretely, it marked the need to increase the interactions between energy systems and mobility, and to improve the measurement mechanisms for vehicle emissions to promote greener solutions and lay the foundations for a zero-emission vehicles market.

Following the launch of this strategy, in 2017 the European Parliament invited the Commission to adopt an action plan that would urge Member States to apply fiscal incentives for zero- and low-emission vehicles.[271] In the same year, the Commission adopted "Europe on the Move", a legislative framework focused on promoting European competitiveness in clean mobility. After one year, this framework was further integrated with Annex 2, a Strategic Action Plan on Batteries, aiming to lay the foundations for Europe to win a leading role in the battery industry, so as to benefit from new occupational opportunities and industrial growth, and to improve accountability and transparency in mining operations that take place in third countries.[272] The primary fields of action enlisted in the first page of the communication share a common goal: embracing the whole battery value chain with a major focus on sustainability and circularity standards. The development and treatment of batteries have been intrinsically tied to circular economy legislative packages (of which the latest Circular Economy Action Plan for a cleaner and more competitive Europe is an example) and waste management provisions, which insist on the opportunities deriving from a major industrial focus on recycling and re-use of battery components and electric vehicles themselves, by directly addressing design issues and obsolete business models.[273]

[269] European Commission, (20.07.2016), "A European Strategy for low-emission mobility", https://ec.europa.eu/commission/presscorner/detail/et/MEMO_16_2497.
[270] M. Niestadt and A. Bjørnåvold, (April 2019), "Electric road vehicles in the European Union", p. 7.
[271] Ibidem.
[272] European Commission, (17.05.2018), "ANNEX 2 – Strategic Action Plan on Batteries" to "EUROPE ON THE MOVE. Sustainable Mobility for Europe: safe, connected and clean", COM(2018) 293 final Annex 2, EUR-Lex, https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A52018DC0293&qid=1665146521178.
[273] Directorate General for Internal Market, Industry, Entrepreneurship and SMEs, (2018), *Report on Critical Raw Materials and the Circular Economy*, Publications Office, p. 10, 13, https://data.europa.eu/doi/10.2873/167813; European Commission, (11.03.2020), "A new Circular Economy Action Plan. For a cleaner and more competitive Europe",

This is the framework on which the European Commission intends to build EU's global leading role in battery production and use. To do so, the main pillars underpinning the strategy refer to securing access to raw materials both in third countries and within European borders, and to secondary raw materials through recycling; adopting a cross-border and multistakeholder approach to increase the European role along the entire battery value chain; increasing support to R&I projects, essential to discover and scale-up groundbreaking innovative solutions and deploy them in the market; developing the required skills to prepare and attract workforce; increasing the use of renewable energy sources in battery manufacturing processes; and promote policy-level synergies.[274]

The Strategic Action Plan on Batteries once again gave importance to EU's role as standard setter: the Commission proposed further analyses on the possibility to standardize the determinants for a green production of batteries, including a standardised EU life cycle assessment scheme for batteries, to trace their emissions.[275] It also proposed the identification of design and use requirements to be applied to all batteries entering the European market. These last provisions have been further developed into the proposed revision of the EU Battery Regulation in 2022, in accordance with the actions defined by the roadmap of the European Green Deal.[276] The revision intends to promote the creation of a EU Battery Passport by 2026, a tool demanding all operators along battery value chains to disclose information on the characteristics of the battery and its performance and durability, apart from requiring them to fulfil specific due diligence obligations.[277] On these grounds, the battery passport is set to increase sustainability standards along battery production stages, boost competition in improving batteries' performance and durability, increase public awareness on the product and provide a flexible tool that can be easily adapted to constant technological progress.

Besides promoting an update of the Battery Regulation, the European Green Deal included among its priorities the mobilisation of industry for clean and circular economy, which is thought of both as an enabler and a financing tool for the transition. In this regard, the Commission highlighted the criticality of access to sustainable raw materials and diversification of suppliers, as "pre-requisites to make this transition happen".[278] As concerns the further development of key and groundbreaking technologies, it affirmed that European industrial players need to stand out through their innovations and their market penetration by 2030 to secure a competitive stance to the whole continent, in the

COM(2020) 98 final, EUR-Lex, https://eur-lex.europa.eu/legal-content/EN/TXT/?qid=1583933814386&uri=COM:2020:98:FIN.

[274] European Commission, (17.05.2018), "ANNEX 2 – Strategic Action Plan on Batteries", p. 2.

[275] Ivi, p. 8.

[276] European Commission, (11.12.2019), "Annex to The European Green Deal", COM(2019) 640 final ANNEX, EUR-Lex, p. 3, https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=COM%3A2019%3A640%3AFIN.

[277] C. Stretton, (11.07.2022), "EU battery passport regulation requirements", *Circularise*, https://www.circularise.com/blog/battery-passports-and-the-battery-regulation-amendment-requirements#top.

[278] European Commission, (11.12.2019), "The European Green Deal", COM (2019) 640 final, EUR-Lex, p. 8-9, https://eur-lex.europa.eu/legal-content/IT/TXT/?uri=CELEX:52019DC0640.

attempt to seize the economic and occupational opportunities stemming from the transition. The main fields in which the Commission intended to boost European industrial growth, and still do so, are clean hydrogen, fuel cells, energy storage, carbon capture and storage. To do so, the Green Deal emphasised the need to strengthen strategic partnerships that would win the EU greater presence along key value chains, such as in the case of the European Battery Alliance and other initiatives, like the Important Projects of Common European Interest, that will be discussed in the next section.

The emphasis on critical industrial sectors and value chains and the need to open up further space for them in the European market has been further highlighted in the New Industrial Strategy for Europe in 2020 and in the subsequent Comprehensive Strategy for Sustainable and Smart Mobility, where focus has been made on supporting innovative, energy- and cost-effective industrial processes.[279] In this sense, clean mobility industries are set to have great potential to increase European competitiveness and give a major impulse to energy systems integration and connectivity. A potential that needs to rely on greater support to research and innovation, on appropriate fiscal incentives and infrastructure, on efficient public procurement, and on standardization initiatives, to be fully revealed.

In line with these communications, the latest CRMs Resilience strategy launched in 2020 has shed light on the existing gaps regarding CRMs value chains, affirming that filling them is a matter of resilience, that is of preparedness of our economies and societies to properly and timely respond and react to possible disruptions.[280] To solve this, it has underlined the role of ERMA (European Raw Materials Alliance) in addressing most urgent priorities, with particular regard to rare earths and magnets value chains, and the role of the European partnerships EIT Raw Materials and EIP on Raw Materials in supporting and advising the Commission. Finally, as one last example showing the Commission’s engagement in prioritizing greater European penetration in CRMs value chains, the joint communication “The EU external energy engagement in a changing world”, following REPowerEU launch in March 2022, has once again highlighted the centrality of strategic value chain partnerships, based on sustainability standards and targeting resilience, that the Commission has already signed with Canada and Ukraine, together with the ambition to broaden relations and collaboration with African countries, the LAC region, Australia and Western Balkans as well.[281]

---

[279] European Commission, (10.03.2020), “A new Industrial Strategy for Europe”, COM (2020) 102 final, EUR-Lex, p. 8, https://eur-lex.europa.eu/legal-content/EN/TXT/?qid=1593086905382&uri=CELEX:52020DC0102; European Commission, (09.12.2020), “Sustainable and Smart mobility Strategy – putting European transport on track for the future”, COM(2020) 789 final, EUR-Lex, https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A52020DC0789.

[280] European Commission, (3.09.2020), “Critical Raw Materials Resilience: Charting a Path towards greater Security and Sustainability”, COM (2020) 474 final, EUR-Lex, p. 6-8, https://ec.europa.eu/docsroom/documents/42849.

[281] European Commission, (18.05.2022), “EU external energy engagement in a changing world”, JOIN (2022) 23 final, EUR-Lex, p. 16, https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=JOIN%3A2022%3A23%3AFIN&qid=1653033264976.

In brief, critical supply and value chains for sustainable mobility can be interpreted as two sides of a same coin, that have come to be increasingly prioritized in European strategies, vis-à-vis a more serious approach towards climate goals. The transversality of transition goals in any policy or action plan has increased the interactions and interlinks between diverse policy areas, that go from industrial strategy, foreign policy to research and innovation, by means of an inclusive approach to decision-making involving both public and private actors. The fierce global competition characterising clean mobility's supply chains is set to place a burden on latecomers, that would find themselves subordinated to externally controlled industrial production processes, higher exposure to disruption risks and, possibly, a reduced capacity to guarantee resilience. The reasons for Europe to aim at leading the global transition are multiple. Its ambitions to become the main standard setter and gain competitive advantage on other rivals, first and foremost China, share one fundamental element: the emphasis on and support to research and innovation. To win the race for the transition, European industries have to innovate, and to innovate, European institutions have to guarantee an adequate legal, economic and social framework that fully embrace the potential of innovation, involving related players and deploying innovative policy instruments.

3.3 RESEARCH AND INNOVATION: THE CATALYSTS FOR COMPETITIVENESS

Since 2017, the European Commission seems to have fully committed to supporting R&I projects to enlarge and localize European battery value chains through the creation of innovative co-financed public-private partnerships with a major focus on industrial players. The common goals reflect the needs to balance battery and mineral supply and demand, developing more cost-effective and energy-efficient solutions, and properly diversifying critical mineral suppliers.[282]

The launch of the Strategic Action Plan on Batteries in 2018, as Annex 2 to Europe on the Move package, has built on the priorities and ambitions of the European Battery Alliance ("EBA"), created in the previous year. Launched in 2017, EBA pursues the goal to "[create] a competitive and sustainable battery cell manufacturing value chain in Europe", in order to provide European citizens' with a safer, cleaner and more sustainable mobility sector.[283] To do so, it has adopted an integrated approach that combines cooperation and inclusion among the various key industrial players along the battery value chain, to set common priorities and to achieve the expected results, with European financial strength and the development of groundbreaking skills.[284] At present, the Alliance can count on more

[282] International Energy Agency, (May 2022), *Global EV Outlook 2022*, p. 190.
[283] EIT InnoEnergy, "About EBA250", https://www.eba250.com/about-eba250/.
[284] Ibidem; Enerdata et al., (01.06.2021), "The European Battery Alliance", p. 5, https://www.enerdata.net/publications/executive-briefing/global-battery-market-outlook.html.

than 750 stakeholders, attracted by the increasing market growth expectations on batteries in the forthcoming years. According to *Bruegel*, the automotive sector accounted for 4% of EU GDP as of 2019 and characterises as one of the main catalysts for research and development funds.[285] So far, EBA has already managed to attract considerable investments benefitting European battery value chain and creating realistic perspectives for Europe to become the second global player for battery cell production by 2030; a market that, according to official estimates, should account for 250 billion euros yearly by 2025.[286]

More concretely, EBA's stakeholders have identified 18 priority areas where to intervene, among which there is the need to secure availability and affordability of sustainably sourced raw materials; transform Europe in the global leader in sustainable battery technology by enhancing the creation of a cross-value battery industrial ecosystem; support battery demand uptake in Europe by increasing European competitiveness, concentrating investments in initial R&I stages through IPCEIs or fiscal incentives and decreasing lead times to commercialization of innovative solutions.[287] In addition, specific emphasis was made on supporting new markets for batteries and on expanding Europe's R&I capacity and workforce's re-skilling and upskilling initiatives. To do so, EBA is focusing both on constant incremental and disruptive innovations, such as in the case of solid-state Li-ion batteries, and on deeper cooperation among universities and industries to amplify their efforts to innovate along each stage of the value chain.

In this framework, a fundamental instrument to provide the funding needed to achieve these goals are IPCEIs (Important Projects of Common European Interest). These projects are activated following European Commission's assessments and formal communication in cases of market failures, that is when private actors are not willing or capable to pool sufficient financial resources to fund the development of innovations of particular interest for the European Union, which often entail high technological risks due to low Technology Readiness Levels (meaning that the technology in question is still in its initial ideational or development stages and presents a considerable risk of failure).[288] In doing so, the Commission proposes itself as the primary facilitator and enabler of these innovations, in the attempt to secure the competitive advantages deriving from them after their potential commercialization, always in compliance with European competition law. Projects labelled as such entail co-financing procedures involving both public and private funds.

[285] R. Veugelers, S. Tagliapietra, (9.01.2019), "How Europe could yet take the lead in the global electric-vehicle development race".
[286] I. von Dalwigk, (6.09.2022), "A domestic raw material supply chain is essential for Europe's battery ambition", EIT InnoEnergy, https://www.eba250.com/a-domestic-raw-material-supply-chain-is-essential-for-europes-battery-ambition/; Enerdata et al., (01.06.2021), "The European Battery Alliance", p. 1; "About EBA250", EIT InnoEnergy.
[287] EIT InnoEnergy, "Priority Actions", https://www.eba250.com/actions-projects/priority-actions/.
[288] European Commission, (25.11.2021), "State aid: Commission adopts revised State aid rules on Important Projects of Common European Interest", https://ec.europa.eu/commission/presscorner/detail/en/IP_21_6245.

On these bases, in 2019 and 2021 the Commission approved the IPCEI on Batteries and the IPCEI European Battery Innovation respectively, in the framework of EBA. The former was jointly proposed by seven Member States, Belgium, Finland, France, Germany, Italy, Poland and Sweden, targeting R&I in the field of batteries.[289] Overall, it involved 17 participants, mainly industries and SMEs, which were granted a total (public) budget of 3.2 billion euros, vis-à-vis the expectation to pool other 5 billion euros from private funding. This IPCEI is focused on four main areas: sustainability of raw material sourcing, improvements in performance and safety of battery cells and modules, battery systems, battery recycling, repurposing and refining.[290] It aims to address the entire battery value chain, in the attempt to overcome significant financial and technological risks, while allowing for a positive spill-over effect in the way competitive advantages and profits will be distributed in Europe once innovations will enter the market.

Following the considerable impulse given to R&I by this joint project, in 2021 the Commission decided to approve the IPCEI European Battery Innovation, targeting the same field of action of the previous one, yet with a stronger participation from Member States and higher private funds pooling.[291] As a matter of fact, this second IPCEI on battery value chains was joint by other Member States in addition to the Members of the IPCEI on Batteries, such as Austria, Croatia, Greece, Slovakia, and Spain. The total budget of public funds amounts to 2.9 billion euros, but it has been estimated that the project could pool up to 9 billion euros through private investments. As a complementary project to the one of 2019, "[i]t is expected to contribute to the development of a whole set of new technological breakthroughs, including different cell chemistries and novel production processes, and other innovations in the battery value chain", therefore aiming at going beyond current innovations and producing positive competitive advantages for Europe as a whole.[292] The project directly involves 42 diverse actors and should show results by 2028.

R&I initiatives and projects are not merely financed with IPCEIs, but also through the European Multiannual Financial Framework, or long-term budget. As for the period 2021-2027, the European Union is consistently financing R&I projects through Horizon Europe, EU's flagship funding programme for this field, whose budget amounts to 95.9 billion euros, 925 million of which will be directed to battery-related projects.[293] In June 2021, the Commission approved the creation of a co-

[289] European Commission, (9.12.2019), "State aid: Commission approves €3.2 billion public support by seven Member States for a pan-European research and innovation project in all segments of the battery value chain", https://ec.europa.eu/commission/presscorner/detail/en/ip_19_6705.
[290] Ibidem.
[291] European Commission, (26.01.2021), "State aid: Commission approves €2.9 billion public support by twelve Member States for a second pan-European research and innovation project along the entire battery value chain", https://ec.europa.eu/commission/presscorner/detail/en/IP_21_226.
[292] Ibidem.
[293] Batt4EU, "Horizon Europe Calls", https://bepassociation.eu/funding-opportunities/horizon-europe/.

programmed partnership under Horizon Europe, Batt4EU, whose goal is projected on the long-term, addressing the need to turn Europe into the global innovation hotspot by 2030, with major emphasis on competition, sustainability, circularity and carbon-neutrality. To do so, it will focus on most pressing R&I priorities, that will be possibly delivered through the 18 calls for proposals that will be published until 2027. The priorities on which Batt4EU draws are set by the ETIP Batteries Europe, a European Technology and Innovation Platform launched in 2019 in the framework of the European Battery Alliance to help members identify common needs along the whole battery value chain and irrespective of specific Technology Readiness Levels.[294] Therefore, Batt4EU intends to achieve specific operational objectives, including the increase of battery energy and power density, improvements to battery cycle lifetime and decrease in battery costs.[295]

Following these initiatives and programmes launched by the Commission, the European Battery Alliance has contributed to the establishment of 15 Lithium-ion battery plant projects, which have given birth to innovative European mega-factory projects, such as the Automotive Cells Company, that sees a strong intergovernmental coordination, and Northvolt, a Swedish start-up benefitting from significant private funding and from the support of key industrial players like Volkswagen.[296] In this regard, Northvolt has been qualified as the first European Tier 1 supplier of batteries to the automotive market in 2022, after only 5 years of activity, meaning it is now considered a direct supplier of automotive industries in addition to other eight foreign companies, mainly headquartered in Asia.[297] While not excluding external suppliers, it is one first step to build a European Battery value chain and decrease import reliance. In Spain, another partnership has been taking steps forward: Basquevolt, an initiative aimed at developing groundbreaking solid-state batteries from 2027.[298] Included among the priority fields of action according to the Critical Raw Materials Resilience Strategic plan of 2020, development of solid-state batteries is one of the new horizons of battery innovation, which will help go beyond liquid electrolyte Lithium-ion batteries, increasing battery performance, safety and durability.[299]

[294] Batt4EU, "The ETIP Batteries Europe", https://bepassociation.eu/synergies-and-collaborations/the-etip-batteries-europe/.
[295] Batt4EU, "The BATT4EU Partnership", https://bepassociation.eu/about/batt4eu-partnership/.
[296] Enerdata et al., (01.06.2021), "The European Battery Alliance", p. 6.
[297] EIT InnoEnergy, (21.06.2022), "First homegrown European battery company to qualify as Tier One supplier", https://www.eba250.com/first-homegrown-european-battery-company-to-qualify-as-tier-one-supplier/.
[298] EIT InnoEnergy, (10.06.2022), "BASQUEVOLT, the Basque initiative for production of solid-state batteries, is launched with the aim of producing 10GWh by 2027", https://www.eba250.com/basquevolt-the-basque-initiative-for-production-of-solid-state-batteries-is-launched-with-the-aim-of-producing-10gwh-by-2027/.
[299] Erickson Camille, (21.09.2021), "EV impact: Battery disruptors are jolting metal supply chains", *S&P Global*, https://www.spglobal.com/marketintelligence/en/news-insights/latest-news-headlines/ev-impact-battery-disruptors-are-jolting-metal-supply-chains-66518783.

While industrial partnerships grow, the Commission has also envisioned an *ad hoc* initiative to support disruptive and cutting-edge innovations. Battery 2030+ embodies the large-scale and long-term initiative specifically questioning the consolidated patterns of industrial design and development of batteries, that should provide a toolbox to grant Europe the appropriate ecosystem to forerun foreign competitors.[300] Besides the promotion of European partnerships to boost the continent's competitiveness, the Commission has welcomed the launch of joint initiatives with other countries as well, such as in the case of the partnership between EBA and the US Li-Bridge Alliance in March 2022, reflecting common priorities and goals.[301]

The developments concerning public and private support to battery value chains at the European level suggest the need for the EU to regain positions in patenting. According to Enerdata et al. (2021), Japan and South Korea accounts for more than 65% of world's patents concerning lithium-ion technologies issued from 2014 to 2018, a delay that has also been reported by *Bruegel* (2019), with a subsequent emphasis on the need to focus on early-phase technologies, like solid-state chemistries, sodium-sulphur or flow batteries, and their entire value chain.[302] The unprecedented opportunities offered by battery and automotive markets nowadays represent a significant incentive for Europe to create an industrial ecosystem with solid pillars to serve European battery demand uptake. If this ambition is unlikely to be met in the near-term, due to unrivalled Asian competition, it should be fulfilled in the medium- to long- term to enhance the resilience of European green transition. Contrarily to what it is often perceived, European labour conditions, that is higher wages compared to the ones offered in the Asia-Pacific, are not to become a major obstacle to the development of European battery value chains: according to IFRI, labour will only represent 10% of battery final manufacturing cost, which won't prevent Europe to compete with its Asian rivals.[303] Yet, Europe also lacks high-skilled workforce, which is, on the other hand, abundant in Asia, due to long specialization in high value-added industrial manufacturing processes and proximity to materials sourcing sites.

These aspects have been prioritised by major European strategic plans and initiatives on battery value chains, highlighting the relevance of cooperation and strategic partnerships with third countries, investments and re-skilling and upskilling activities. To be competitive, clean energy technologies won't only have to comply with primary and secondary raw materials availability parameters, but

[300] Battery 2030+, "About us", https://battery2030.eu/battery2030/about-us/.
[301] Directorate-General Internal Market, Industry, Entrepreneurship and SMEs, (14.03.2022), "European Commission and U.S. Department of Energy support collaboration between the European Battery Alliance and U.S. Li-Bridge Alliance to strengthen supply chain", https://single-market-economy.ec.europa.eu/news/european-commission-and-us-department-energy-support-collaboration-between-european-battery-alliance-2022-03-14_en.
[302] Enerdata et al., (01.06.2021), "The European Battery Alliance", p. 2; R. Veugelers, S. Tagliapietra, (9.01.2019), "How Europe could yet take the lead in the global electric-vehicle development race".
[303] C. Mathieu, (20.02.2018), "The EU Battery Alliance. Can Europe Avoid Technological Dependence?", *Institut français des relations internationales*, p. 4, https://www.ifri.org/sites/default/files/atoms/files/mathieu_eu_battery_alliance_2018.pdf.

also with affordability. The development of disruptive technologies ahead of Asian rivals won't be sufficient if costs will remain prohibitive. Therefore, while supporting R&I projects, it is essential to aim at the scalability of the technologies obtained.[304]

And still, what happens when the focus on battery value chain is shifted from industrial processes to mineral sourcing? Can the EU aspire to serve its clean energy technologies demand uptake without giving new breadth to its mining industry? Without forgetting the tangible and welcomed advances described so far, the next chapter will try to deal with these issues with reference to a particular critical raw material currently thought as irreplaceable in battery chemistries: lithium. The ambition of the EU to gain competitive advantages in global battery value chains cannot avoid a serious discussion on the repurposing of the European extractive potential to support the resilience of the battery eco-system and of the transition.

[304] K. Ruby, (25.05.2021), "Winning the Electric Decade: 'Electrification Strategy' at the heart of 'Fit for 55' package", *Euractiv*, https://www.euractiv.com/section/energy-environment/opinion/winning-the-electric-decade-electrification-strategy-at-the-heart-of-the-fit-for-55-package/.

4. THE STRATEGIC ROLE OF LITHIUM FOR THE EUROPEAN TRANSITION

4.1 THE GLOBAL LITHIUM MARKET AND THE EU'S POSITIONING

While lithium has been traditionally relevant for uses in the production of ceramic glasses, lubricants, greases and pharmaceuticals, among others, its criticality is nowadays mainly connected with its role as one of the essential components of EV batteries. Said mineral appears to have an unparalleled combination of lightness, energy density, rechargeability, electrochemical features, longevity and low maintenance rate, which explain its irreplaceability, as for the time being.[305] Whether or not it will be the "new oil" of this century, it is undoubtful that lithium will lead the transition at least in the next decade, given that possible alternatives currently present a low technology readiness level, meaning that they have a long way to go before they can be commercialized at a competitive price. Lithium-ion batteries are pivotal for everyday smartphones, portable computers and other electronic devices, besides representing a new frontier for stabilising inherently intermittent renewable energy production through groundbreaking energy storage systems.

Despite what its current high price might suggest, on the supply side, lithium is abundant in nature and presents a relatively diversified geographical distribution, with resources amounting to 89 million tonnes, according to the United States Geological Survey (USGS).[306] The country with the largest lithium resources is Bolivia (22 million tonnes), which nevertheless is among the scarcest producers of lithium, due to various reasons that stretch from the absence of a legal framework for extraction to technical aspects of its lithium fields.[307] Yet, Bolivia itself is part of the so-called "lithium triangle" together with Chile and Argentina (accounting for 60% of world lithium reserves), that currently rank second and fourth for lithium production on a global scale. Other lithium resources have been registered in Canada, Mexico, Serbia, Russia, Mali, Austria and Portugal, for example. Notwithstanding the wide geographical distribution, few are the key players that stand out for production capacity in the market, making it strongly concentrated. As registered by the USGS, the largest lithium producers

---

305 N. King and N. Muller, (22.07.2021), "How long until lithium supply is depleted?", *Deutsche Welle*, https://www.dw.com/en/is-e-mobility-going-to-crash-over-lithium-shortages/a-58214328.
306 National Minerals Information Center, (2022), "Mineral Commodity Summaries – Lithium", *United States Geological Survey*, p. 2, https://www.usgs.gov/centers/national-minerals-information-center/lithium-statistics-and-information.
307 M. Rochabrun, (23.05.2022), "Legendary lithium riches from Bolivia's salt flats may still just be a mirage", *Reuters*, https://www.reuters.com/markets/commodities/legendary-lithium-riches-bolivias-salt-flats-may-still-just-be-mirage-2022-05-23/.

are Australia (39,700 tonnes), Chile (21,500 tonnes), China (13,300 tonnes), Argentina (5,900 tonnes), with the United States ranking seventh due to a total production amounting to 900 tonnes in 2020.[308]

The extraction of lithium occurs generally by means of two different processes: either brine evaporation or hard rock mining, depending on where the mineral is contained, that is in either salt brines or peculiar rocks called pegmatites. From the 1980s to 2018, brine evaporation was the dominant extractive process, with hard rock mining taking the lead just recently. The lithium extracted comes in the form of lithium carbonate, which can be further processed to obtain lithium hydroxide. The former is generally characterised by a lower grade of lithium content, whereas the latter tends to be purer. The subsequent refinement will further determine whether the lithium processed is technical grade (99.3% purity) to be used in the production of glass and ceramics, or battery grade (> 99.5% purity), meaning it can be used in battery manufacturing, even if in this case it is preferable to directly use lithium hydroxide or to convert lithium carbonate in hydroxide to guarantee the final product's performance.[309]

In the case of hard rock drilling, upstream operations involve open-pit mining that allows to extract lithium. This latter will then undergo refining and enrichment processes to increase its purity, which include a number of chemical processes to grind, percolate, filter and dry it, up until lithium carbonate is obtained. Overall, this type of extraction entails three to five years for mines to be operative compared to the seven years required to begin production in brines.[310] Such shorter lead times have particularly favoured Australia, currently the largest producer in the world. Either way, even if hard rock mining offers interesting potential to promptly serve a steadily increasing global demand for lithium, brine evaporation is still a common practice in the Americas and in China. The brines situated in South America are currently the most profitable, given the higher grade of lithium contained in them, which, on the contrary, is significantly lower in the US and China.[311] To extract lithium, underground brines are pumped and transferred into interconnected open-cast basins, where different evaporation steps take place until lithium deposits. Afterwards, the mineral is brought to specific chemical plants where it is further processed into lithium carbonate and, possibly, converted into battery grade. Brine

[308] National Minerals Information Center, (2022), "Mineral Commodity Summaries – Lithium", *United States Geological Survey*, p. 2; J. Mitchell, (23.08.2021), "Soaring demand, rising prices … what now for the lithium market?", *Investment Monitor*, https://www.investmentmonitor.ai/sectors/extractive-industries/lithium-price-demand-environment-supply; G. Bhutada, (09.02.2022), "Charted: Lithium Production by Country (1995-2020)", *Visual Capitalist*, https://www.visualcapitalist.com/sp/charted-lithium-production-by-country-1995-2020/#:~:text=By%20contrast%2C%20the%20U.S.%20produced,lithium%20reserves%20at%20750%2C000%20tonnes.
[309] M. Drobe, (July 2020), "Lithium - Sustainability Information", *Bundesanstalt für Geowissenschaften und Rohstoffe*, p.5, https://www.bgr.bund.de/EN/Gemeinsames/Produkte/Downloads/Informationen_Nachhaltigkeit/lithium_en.html.
[310] E. Latham and B. Kilbey, (24.10.2019), "Lithium supply is set to triple by 2025. Will it be enough?", *S&P Global*, https://www.spglobal.com/en/research-insights/articles/lithium-supply-is-set-to-triple-by-2025-will-it-be-enough.
[311] M. Drobe, (2020), "Lithium. Sustainability Information", p. 5-6.

evaporation projects are concentrated only in arid ecosystems and can take up to two years to obtain the expected lithium concentration, besides requiring tremendous amounts of water (in the order of ca. two million litres of water per lithium tonne).[312]

These technical features are pivotal to understand the criticality of the supply side of a market that appears to be considerably concentrated in the hands of a few key players. As a matter of fact, one to five key corporations are responsible for most of global lithium supply, denoting an oligopolistic market structure, inherently little competitive, which has been said to possibly implicate collusion.[313] The upstream sector, mainly focused on exploration, perforation and extraction activities, is dominated by Albemarle Corporation, Sociedad Química y Minera (SQM) SA, Tianqi Lithium, Livent Corporation, Orocobre Ltd., Ganfeng Lithium Co., Lithium Americas Corp. and Pilbara Minerals. SQM and Albemarle together already produce more than 25% of lithium globally.[314] In the last two years, many of these companies have engaged in expansion plans thanks to the favourable upward trend in the market. Towards the end of 2021, Albemarle signed strategic investment agreements in China to build a new lithium conversion facility, while it also opened a new Innovation Center in North Carolina, to enhance innovation in battery cell manufacturing, a field where Chinese dominance is currently unrivalled.[315]

In 2021, the Asia Pacific was the global leader in the lithium market and is expected to maintain this role throughout this decade, given the concentration of key manufacturing industries for EV batteries and the significant political commitment to keep public investments high in this field, which have made China the greatest consumer of EVs worldwide.[316] Last year, this region totalled the highest revenue share, being led by increased upstream operations, particularly in Australia.[317] Latin America came second, while Europe's positioning grew in importance, thanks to the development of a more strategic view on CRMs and consequent political initiatives, focused on internal sourcing as well. Finally, despite ranking among the top lithium consumers worldwide, lithium production in the

[312] Emergen Research, (September 2022), "Lithium Mining Market. Market Synopsis", https://www.emergen-research.com/industry-report/lithium-mining-market.
[313] A. Ebensperger et al., (September 2005), "The lithium industry: Its recent evolution and future prospects", *Resources Policy*, vol. 30, no. 3, p. 224.
[314] Emergen Research, (2022), "Lithium Mining Market. Market Synopsis".
[315] Albemarle, [date not available], "Albemarle breaks ground to mark the start of construction of new lithium conversion facility", https://www.albemarle.com/blog/albemarle-breaks-ground-in-china-to-support-the-expansion-of-lithium-conversion-capacity; Albemarle, (30.06.2021), "Albemarle establishes battery materials Innovation Center in North Carolina", https://www.albemarle.com/news/albemarle-establishes-battery-materials-innovation-center-in-north-carolina#:~:text=CHARLOTTE%2C%20N.C.%20%2C%20June%2030%2C,Mountain%2C%20North%20Carolina%20%2C%20site.
[316] Mordor Intelligence, (2022), "Lithium market – growth, trends, covid-19 impact, and forecasts (2022-2027)", https://www.mordorintelligence.com/industry-reports/lithium-market; Grand View Research, (2022), "Lithium market size, share & trends analysis report", https://www.grandviewresearch.com/industry-analysis/lithium-market.
[317] Emergen Research, (2022), "Lithium Mining Market. Market Synopsis".

United States met only 1% of global demand, having just one active brine operation in Nevada.[318] Yet, as in the case of Europe, in 2018 the US administration labelled lithium as a critical mineral too, heightening its national strategic importance.

As concerns lithium demand, it should be considered as "a reflection of demand for the final goods that contain it as an input".[319] The lithium market can be segmented by application, i.e., batteries, ceramics, pharmaceuticals, grease, etc. As observed by the IEA, the battery segment has outweighed more traditional application segments (see figure 4.1a), in response to the increasing demand for lithium-ion batteries, the sale of which has been unparalleled in China last year.[320] In order to meet the international climate goals set in the Paris Agreement, the use of minerals for cleantech should be increased fourfold by 2040, leading to a demand growth for lithium by more than 40 times by 2040.[321] In the European case, EU's current mobility electrification plans would require 18 times more lithium by 2030 and up to 60 times more for climate neutrality by 2050.[322] A growth that would run parallel to a rise in electric vehicles sales in the order of 40% globally by 2030 and of 55% in Europe (considering only light-duty battery EVs).[323] Even if EV sales have actually doubled to 6.6 million units compared to 2020 on a global scale, mainly as a consequence of general government support, maintaining such growth levels represents a challenge for diverse reasons.

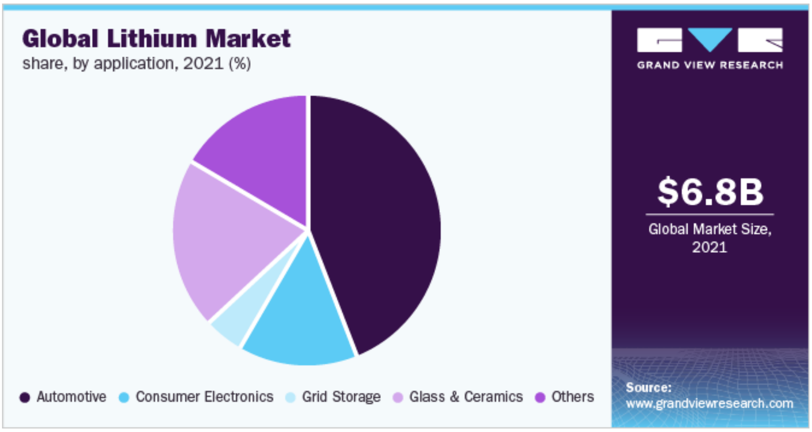

Figure 4.1a*: Lithium market segmentation by end-user industry [Source: Grand View Research]*

Among the variables influencing the level of demand, there are income changes, lithium price itself, the price of its substitutes and complements, technological change, consumer preferences and government activities.[324] Among these, consumers' accessibility, technological progress and government policies are the most important, given the current absence of competitive substitutes. As concerns technological change, competition to find scalable alternatives is heightened, but forecasts agree

[318] Grand View Research, (2022), "Lithium market size, share & trends analysis report".
[319] A. Ebensperger et al., (2005), "The lithium industry: Its recent evolution and future prospects", p. 219.
[320] International Energy Agency, (2022), *Global EV Outlook 2022*, p. 4, 42.
[321] International Energy Agency, (2021), *The Role of Critical Minerals in Clean Energy Transitions*, p. 8.
[322] N. King and N. Muller, (2021) "How long until lithium supply is depleted?".
[323] International Energy Agency, (2021), *The Role of Critical Minerals in Clean Energy Transitions*, p. 85; International Energy Agency, (2022), *Electric vehicle share of vehicle sales by mode and scenario in Europe, 2030*, International Energy Agency, Paris https://www.iea.org/data-and-statistics/charts/electric-vehicle-share-of-vehicle-sales-by-mode-and-scenario-in-europe-2030.
[324] A. Ebensperger et al., (2005), "The lithium industry: Its recent evolution and future prospects", p. 220.

on the fact that lithium-ion batteries will dominate this decade, for substitutes are only at early research and testing stages. As for government support, the prioritization of health policies during the pandemic has not largely impacted on the transition path, yet the subsequent energy crisis has caused turmoil especially in Europe, opening up debates even on the need to reopen carbon plants to mitigate gas supply shortages. The less serious governments take their transition goals, the less they will contribute to support stable investment plans in favour of the development of clean energy technology and to stabilise their prices. Hence, there should be preferably a better coordinated global approach to the transition and a more credible national engagement in delivering the goals set, together with higher ESG standards.[325] On a positive note, lithium, together with other raw materials, is now approached more strategically by governments, which is in part guaranteeing increased attention on it and giving birth to increased policy initiatives and strategies to secure production and to reassess domestic sourcing. For instance, early in 2021 the US Bureau of Land Management gave permission to Lithium Americas to start activities in the Thacker Pass Mine, Nevada, in 2023, where up until now there has been just one operative mine, the Silver Peak.[326]

Decisions around new mining expansion plans and the opening of new pits are yet majorly a result of high prices, that are contributing to shaping the structure of the lithium market, after a period of oversupply and delay of further investment plans due to a downward trend in pricing. 2021 saw a steady rise in commodity prices. According to *S&P Global*, the price of the lithium carbonate imported in China grew by 485.8% in December 2021 compared to the same period of the previous year.[327] In general, lithium concentrate cash costs, meaning its total direct costs of production, increased by 17.4%, going from $2,155/t Lithium Carbonate Equivalent ("LCE", i.e., the most common lithium compound traded in the industry, that serves as benchmark for pricing) in 2020 to $2,529/t LCE in 2021. Similarly, the cost of lithium compounds rose from $4,684/t LCE traded in 2020 to $5,048/t LCE

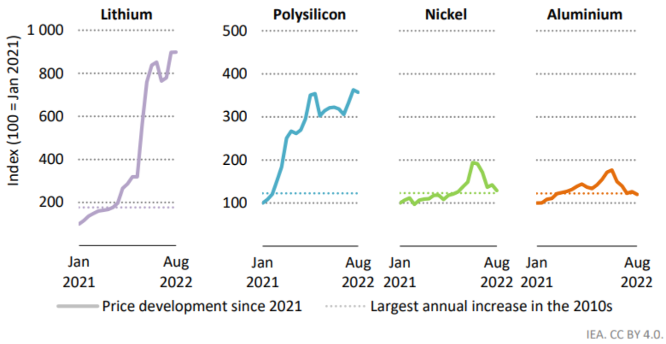

***Figure 4.1b**: Examples of metals' price trend between 2021-2022 [Source: World Energy Outlook 2022, International Energy Agency].*

[325] L. Boer et al., (05.11.2021), "Metals may become the new oil in net-zero emissions scenario", *VOXEU Centre for Economic Policy Research*, https://cepr.org/voxeu/columns/metals-may-become-new-oil-net-zero-emissions-scenario.
[326] Grand View Research, (2022), "Lithium market size, share & trends analysis report".
[327] S. Yao, (12.07.2022), "Lithium costs up in 2021, continuing to surge in 2022", *S&P Global*, https://www.spglobal.com/marketintelligence/en/news-insights/research/lithium-costs-up-in-2021-continuing-to-surge-in-2022#:~:text=Total%20cash%20costs%20of%20lithium%20chemicals%20%E2%80%94%20lithium%20carbonate%20and%20lithium,%245%2C048%2Ft%20LCE%20in%202021.

in 2021. Such upward trend has been maintained throughout 2022, considering that just from January to April prices have kept doubling (see Figure 4.1b).[328]

Behind these eye-watering price spikes, there are diverse reasons, such as a steadily rising demand, global supply chains disruptions, higher royalties, and higher raw material prices.[329] The combination of rising commodity prices and bottlenecks in global supply chains have inflated freight costs, the third cost item in terms of increase. In particular, the skyrocketing commodity prices, that come first, are having a great influence on brine evaporation projects, which make more use of chemical reagents than lithium mineral extraction operations, weighing on mining costs. Against this backdrop, mining corporations have been observing a significant surge of royalties, the tax they are required to pay to producing countries in proportion to their revenues.[330]

As concerns demand growth, the more strategic approach to critical raw materials and the subsequent stronger government support through *ad hoc* policies, initiatives and subsidies have produced a higher demand for clean energy technologies, which have been slightly influenced by the current energy crunch and are key for the green transition and to achieve climate goals. In this context, automotive industries are facing a greater demand of EVs from consumers. A demand that they will be able to serve only if they reconsider their position in the EV battery value chain, which means absorbing more specialized workforce to enter key production processes, as in the case of battery cells and packs.[331] If won, the challenge of vertical integration for these industries would mean a stronger control over EVs supply chains, higher competitive advantages and a better management of market power, which could be applied in the form of strategic alliances and joint ventures along the supply chain to ensure diversification and reliability of lithium supplies.[332]

Yet, even if the verticalization of such key industries is becoming pivotal to have actual chances to compete globally, it could also result in a double-edged sword. As a matter of fact, the centralization of market power in almost fully integrated consortia could potentially translate in not such a different reality that the current one, where the lithium market notably has an oligopolistic structure. Also, it could entail higher management and merger costs for those corporations.[333] The traditional concentration of the market has prevented the diffusion of transparent pricing mechanisms among the various operators. According to *McKinsey & Company*, lithium has traditionally been regarded as a

[328] International Energy Agency, (October 2022), *World Energy Outlook 2022*, IEA Publications, p.113, https://www.iea.org/reports/world-energy-outlook-2022.
[329] Ibidem; S. Yao, (2021), "Lithium costs up in 2021, continuing to surge in 2022".
[330] Ibidem.
[331] L. Goldie-Scot, (05.03.2019), "A Behind the Scenes Take on Lithium-ion Battery Prices", *BloombergNEF*, https://about.bnef.com/blog/behind-scenes-take-lithium-ion-battery-prices/.
[332] A. Ebensperger et al., (2005), "The lithium industry: its recent evolution and future prospects", p. 225; J. Mitchell, (2021), "Soaring demand, rising prices … what now for the lithium market?".
[333] A. Ebensperger et al., (2005), "The lithium industry: its recent evolution and future prospects", p. 225.

minor metal; it has been rediscovered by means of its potential for energy storage.[334] Therefore, prices are still predominantly set through direct negotiations between producers and consumers, while spot price determination remains marginal, being much more exposed to speculation. The negotiated contracts can have a duration from three months to years, but the commercial conditions contained in them are frequently kept confidential. According to *McKinsey & Company*, the criticality that lithium is acquiring globally is dragging more financial operators into lithium-related transactions, which on the longer term will help provide investors with more transparent and liquid contracts, besides, hopefully, laying the foundations for stable market to keep the green transition as smooth as possible.[335]

The rise of lithium prices, like for any other critical commodity in history, has arisen worries on possible supply shortages. Obviously, this is not the case for lithium. As a result of high prices and renewed political attention, those expansion plans that had been postponed between 2019 and 2020 have been reconsidered recently, leading to the opening of new mines or the expansion of existing ones. For instance, Australia and Chile are set to expand production at Greenbushes mine and at the Salar de Atacama respectively, in the order of over 2.5 times in the medium term, meaning more than 70% of current global production.[336] Other six production projects concentrated in the area of the lithium triangle, in South America, will be implemented by 2025.[337] The activation of new projects and the entrance of new players will help the market find a new balance, that should lead to a price reduction by 2023, as affirmed by S&P Global.[338] Overall, most market analyses publicly available agree on a liberal approach by recalling the saying "the cure for high prices is… high prices", implying that the investments made in such a context will expand supply, that in turn will automatically bring down the price.[339] Even so, not all that glitters is gold: the IEA warned that despite the rise of investments is a positive signal, these still do not reach the necessary levels required by current climate goals.[340]

In this context, the European Union is emerging as relevant player, given its aspiration to lead the transition globally and, thus, to its interest in gaining competitiveness in the cleantech sector. In its revision of the List of Critical Raw Materials in 2020, the European Commission included lithium, based on the analysis of its inherent supply risk and economic importance. This latter appeared to be predominant compared to the former in the criticality assessment, but the factor determining the change of classification was the increased supply risk in the production and refining processes, which

[334] M. Azevedo et al., (22.06.2018), "Lithium and cobalt – a tale of two commodities", *McKinsey & Company*, p. 10, https://www.mckinsey.com/industries/metals-and-mining/our-insights/lithium-and-cobalt-a-tale-of-two-commodities.
[335] Ibidem.
[336] International Energy Agency, (2021), *The Role of Critical Raw Materials in Clean Energy Transitions*, p. 140.
[337] Ibidem.
[338] S. Yao, (2021), "Lithium costs up in 2021, continuing to surge in 2022".
[339] M. Azevedo et al., (2018), "Lithium and cobalt – a tale of two commodities", p. 10.
[340] International Energy Agency, (2022), *World Energy Outlook 2022*, p. 114.

was not observed in previous assessments.[341] The European Union presents an import reliance of 87% for lithium concentrates, and of 100% for refined lithium compounds. In this regard, Chile supplies Europe 78% of lithium compounds, whereas Australia is Europe's top supplier for lithium concentrates. Internal sourcing is currently almost negligible, providing only 110t LCE of lithium concentrates per year vis-à-vis an overall domestic consumption of 3,208t LCE per year, according to the average data from 2012 to 2016. The diversification of suppliers is slightly more prominent in the case of lithium compounds than of concentrates (see Figure 4.1c).

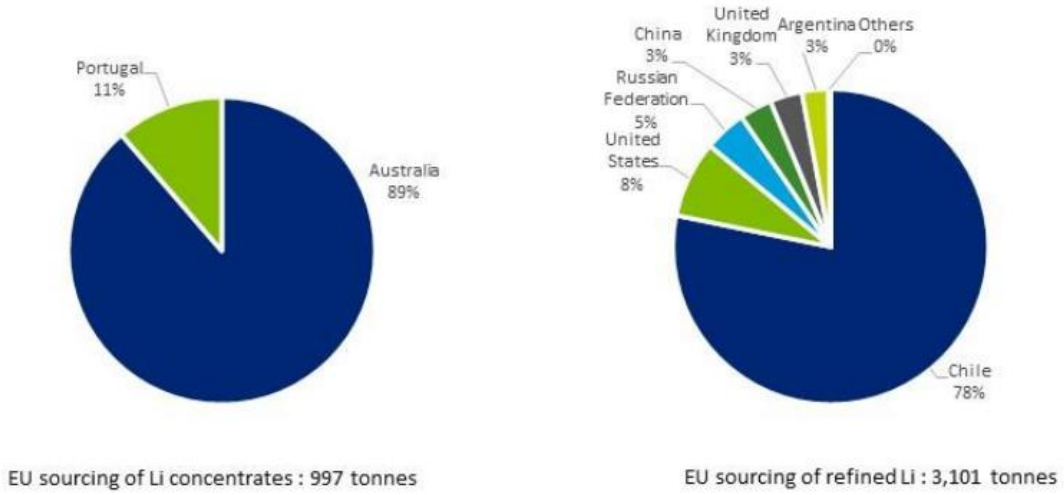

Figure 4.1c: *EU's lithium suppliers as for lithium concentrates and compounds.*
[Source: European Commission, 2020].

When considering market segmentation by application, EU's lithium imports are mainly directed to the glass and ceramics industry, which accounts for 66% of the total lithium demand, followed by lubricating greases (9%), cement production (9%) and others, among which are batteries and products containing them (only 1%).[342] This outlook shows an opposite trend with respect to the rest of the world, where the primary application of lithium is batteries. This also explains the prevalence of imports of lithium carbonate (83%) rather than lithium hydroxide (17%).[343]

[341] Directorate-General for Internal Market, Industry, Entrepreneurship and SMEs, (2020), "Study on the EU's list of critical raw materials (2020): final report", Publications Office, p. 33, https://data.europa.eu/doi/10.2873/11619.
[342] Ivi, p. 76-77.
[343] Directorate-General GROW, Joint Research Centre, (September 2020), "Study on the EU's list of Critical Raw Materials (2020), Factsheets on Critical Raw Materials", p. 294, https://single-market-economy.ec.europa.eu/sectors/raw-materials/areas-specific-interest/critical-raw-materials_en.

While not presenting relevant refining lithium plants, the EU does host an internationally relevant trading hub for lithium, that is Belgium, and interesting opportunities of domestic lithium sourcing, even if the majority of it is currently untapped (see Figure 4.1d).[344] The critical mineral is in fact to be found in diverse hard rock deposits throughout south-west and central Europe, such as in Portugal, Spain, Czechia, Finland, Germany, Austria and Serbia. The Czech Republic was deemed to possess the largest deposit of lithium resources in Europe, amounting to almost 700 million tonnes, up until the discovery of resources in the order of 2,484 million tonnes in the Upper Rhine Valley in Germany was made in 2019.[345] Another relevant deposit containing about 136 million tonnes has been found in Serbia in the early 2000s. At present, Portugal is considered the most significant European player in terms of lithium mining: it is the second supplier for Europe of lithium concentrates, after Australia, which is key for the European ceramics industry. Yet, the real innovation is under study in the newly discovered deposits in the Rhine Valley in Germany, where a German-Australian joint venture, Vulcan Energy Resources, is testing new extraction methods, particularly direct lithium extraction and geothermal mining, that are deemed to have a lower environmental impact than more traditional methods and present a considerably inferior waste of water.[346]

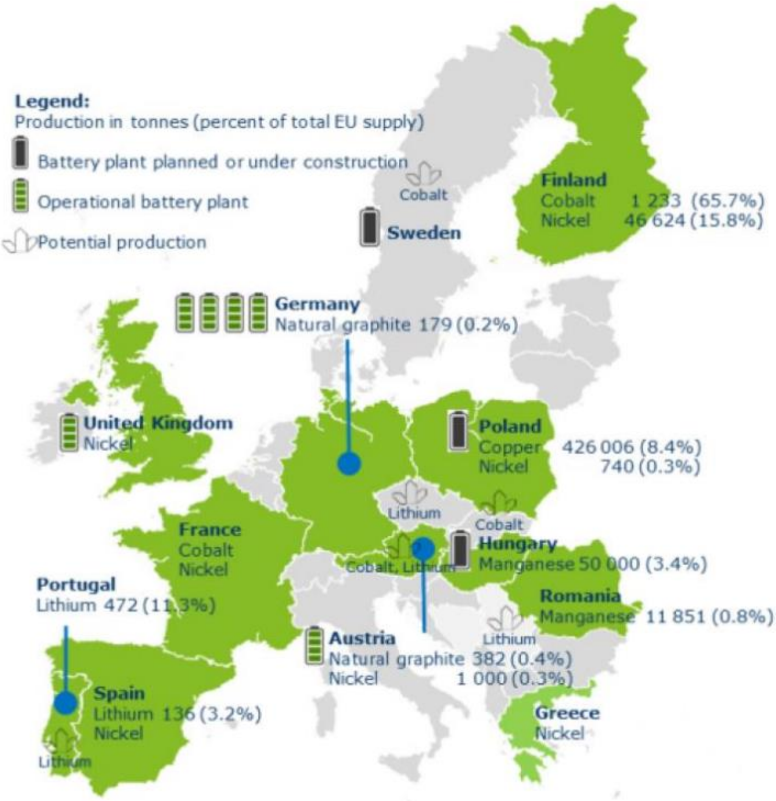

***Figure 4.1d**: Europe's actual and potential mineral sourcing [Source: Critical Raw Materials Factsheets, European Commission].*

In conclusion, renewed interest from governments and investors is gradually reshaping the global lithium market, first and foremost by bringing more capacity online. Resources and reserves are constantly reviewed in light of updated geological surveys and mapping, suggesting that there is no

[344] Ivi, p. 290.
[345] Ivi, p. 310.
[346] N. King and N. Muller, (2021), “How long until lithium supply is depleted?”; J. Mitchell, (2021), “Soaring demand, rising prices… what now for the lithium market?”.

shortage risk on the horizon. The race to become "strategically autonomous" is requiring the public opinion to assume a new perspective on mining, as an essential activity to fuel the energy transition. Yet, even if the opening of new mines appears to be inevitable in an economy that is going from fossil fuel reliance to mineral dependence, many are the environmental and social setbacks to consider. Should becoming green mean resigning to ecologically unfriendly mining practices? What is actually at stake?

4.2 SOCIAL AND ENVIRONMENTAL NEGATIVE EXTERNALITIES: AN UNJUST TRANSITION

The expansion of mining operations worldwide is causing diffused outcry, especially related to the multiple risks they could bring along. As a matter of fact, chemical leaks, land and biodiversity destruction are just some of the many issues, which inhabitants living nearby quarries have to deal with regularly. In other words, extracting minerals from the ground produces costs that are not always included in the price of the final product and that not only affect producers and consumers, but a much wider public. These costs are known as negative externalities, for they affect in a negative way third parties that do not make part of the initial contract between producers and consumers of a certain product.[347] The context in which they arise is one of market failure, because the price offered does not include the costs deriving from such a damaging production process, hence it doesn't convey realistic information on the product itself. It represents a Pareto-inefficient allocation of the resources, meaning that it harms one or more actors. In this case, the market cannot operate efficiently on its own, but there needs to be adequate corrective actions to restore balance.

According to literature, market failures in terms of negative externalities occur due to the absence or insufficiency of third parties' rights, besides producers' property rights, that can make these latter accountable for the harmful impacts of their production processes.[348] For instance, lithium extraction from brines can lead to chemical leaks into the surface if the PVC barriers covering evaporating ponds deteriorate, consequently affecting groundwater wells.[349] Suppose that the producer operating in such

[347] The CORE team, (2017), "Markets, efficiency, and public policy", Unit 12, in the CORE team (ed), *The Economy*, online, https://www.core-econ.org/the-economy/book/text/12.html#121-market-failure-external-effects-of-pollution.
[348] Ibidem.
[349] D. Buyung Agusdinata et al., (2018), "Socio-environmental impacts of lithium mineral extraction: towards a research agenda", *Environ. Res. Lett.*, n. 13, p.9.

lithium brine has kept the same levels of production (see point A, Figure 4.2a), without substituting the barriers, along the line of its marginal private cost, that is "the cost for the producer to produce an additional unit of a good", without internalising external costs.[350] It is assumed that the producer is operating as a price-taker in a competitive market where the demand/supply balance is to be found in point A. By doing so, it damages the quality of underground water, which is regularly used by farmers and local communities nearby. These latter are forced to reduce if not interrupt their production, because the water they used to irrigate their fields is now compromised. They are therefore bearing the marginal external cost for the contaminated water, which is not internalized in the price of lithium by the producer. The sum of the marginal private cost and the marginal external cost describes the marginal social cost, which in its intersection with the price (or demand) line defines a different market balance (p= 400€; q=38,000t in the graph), where resources are allocated efficiently. In this point, the producer would reduce production with a consequent loss of profit, but at the same time the marginal external cost would be internalized in the new price, benefitting farmers. Yet, without a severe legislation establishing a right for farmers to have access to clean water equal to the property right of producers to operate on the land they have been given concession for, what is perceived by the famers as their own right would not be enforceable or usable in a court of law.

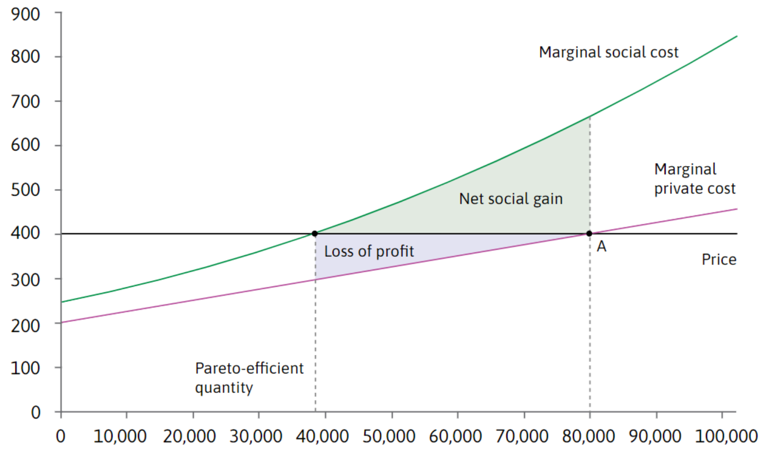

Figure 4.2a*: Negative externalities model, where costs (in euros) are displayed on the x-axis and quantities (in tonnes) on the ordinates. [Source. The Economy, the CORE Team.]*

As a matter of fact, in Chile, brines are ruled under the Chilean Mining Code of 1983 (Law 18248), according to which they are considered as minerals, not water. Article 1 of said Code establishes that the Chilean State exerts the absolute, exclusive, inalienable, and imprescriptible property right over all mines, including salt brines; yet, recognising to third parties the faculty to search and dig for mineral substances under specific concessions and only in the case of concessible mineral substances.[351] Interestingly, lithium does not pertain to this category. Article 7 affirms that concessions around the exploration and exploitation of lithium in the national territory would be no more issued

[350] The CORE team, (2017), "Markets, efficiency, and public policy", Unit 12, in the CORE team (ed.), *The Economy*, online, https://www.core-econ.org/the-economy/book/text/12.html#122-external-effects-and-bargaining.
[351] Ministerio de Minería, *Ley 18248 Código de Minería*, (14.10.1983), Chile, Biblioteca del Congreso Nacional de Chile [online], https://www.bcn.cl/leychile/navegar?idNorma=29668&idParte=.

to third parties from that moment on, with the exception of already existing concessions.[352] Prior to this, in 1979, Decree Law 2886 defined lithium as a strategic mineral for national security, meaning a state reserved mineral, with reference to its possible use in the nuclear fusion process; a decision that laid the foundations for the Mining Code review of 1983.[353] This explains the existence of only two main companies operating in the lithium industry in Chile, namely Sociedad Química y Minera (SQM) and Rockwood Holding, recently acquired by US-based Albemarle. SQM was originally funded as a public-private company, but the military regime under Augusto Pinochet privatized it in the 1980s, with its family still owning significant shares in it.[354] They were both granted concessions before lithium was declared a state reserved mineral, but while property rights are leased to SQM by the appointed national authority (CORFO), they have been fully transferred in the case of Rockwood Holdings, profiling a quite controversial situation.[355]

As an example, SQM has been repeatedly accused of corruption, environmental damages, underpaying royalties, money laundering and illegal lobbying activities, that also involved the former Minister of the Economy Pablo Longueira, who was charged with bribery, for accepting to influence the outcome of a legislative review on mining royalties in exchange for money from SQM.[356] Despite these inherent conflicts of interest, a hypothetical review of the current legal framework establishing brines as water instead of minerals would define different power relations between the Chilean state and the mining companies, since it would transfer more power to indigenous and local communities living nearby lithium brines and to environmental regulations.[357] This would ultimately allow for a more serious approach to negative externalities deriving from lithium extraction and the consequent environmental degradation.

The legal framework defining water rights in Chile has been equally created during Pinochet's military regime. Chile was one of the global forerunners in the privatization of the market for water, in light of the profound neoliberal economic orientation of that period.[358] Thus, public authorities

[352] Ibidem.
[353] Ministerio de Minería, *Decreto Ley 2886*, (14.11.1979), Chile, Biblioteca del Congreso Nacional de Chile [online], https://www.bcn.cl/leychile/navegar?idNorma=7029&idVersion=1979-11-14.
[354] S. Boddenberg, (05.11.2018), "Chile's lithium – blessing or curse?", *Deutsche Welle*, https://www.dw.com/en/chiles-lithium-blessing-or-curse/a-43721539.
[355] R. Perotti and M. Coviello, (September 2015), "Governance of strategic minerals in Latin America: the case of lithium", *Community of Latin American and Caribbean States*, p. 39, https://www.cepal.org/en/publications/38961-governance-strategic-minerals-latin-america-case-lithium.
[356] S. Boddenberg, (2018), "Chile's lithium – blessing or curse?"; G. Pizarro and P. Ramírez, (04.05.2018), "El entierro del caso SQM IV: la formalización de Longueira, el "perdonazo" del SII y la renuncia de los fiscales", *Centro de Investigación Periodística*, https://www.ciperchile.cl/2018/05/04/el-entierro-del-caso-sqm-iv-la-formalizacion-de-longueira-el-perdonazo-del-sii-y-la-renuncia-de-los-fiscales/.
[357] A. Valentino, (28.07.2021), "How Chile's lithium mining industry is cleaning up its act", *NS Energy*, https://www.nsenergybusiness.com/features/chiles-lithium-mining-industry/.
[358] S. Babidge, (2015) "Contested value and an ethics of resources: Water, mining and indigenous people in the Atacama Desert, Chile", *The Australian Journal of Anthropology*, vol. 27, no. 1, p.88.

grant water rights as "rights to extract or use water from particular sources in volumes measured at litres per second".[359] This has provoked numerous cases where water was depleted or polluted by the industrial actors who were granted property rights over this resource, especially in the northern, desert lands of the country. Over the last thirty years, the Chilean government applied some corrective actions, reinforcing its environmental legislation with reference to indigenous practices. However, the recognition of their own rights has been often limited to their daily water consumption for basic needs and agriculture, failing to extend these rights throughout the whole territory claimed as traditional lands by these communities.[360] According to Babidge (2015), the conflict between the water code and environmental legislation is a major problem that, on the one side, obstruct a full and consistent recognition of indigenous communities' rights, and, on the other, allows for persistent water resources consumption and exhaustion by those actors that were granted property rights on water before environmental laws came into force.[361]

The lack of enforceable rights is only one part of the equation. Another key factor behind negative externalities is also the lack of quality information or access to it. One the one side, it appears to derive from the inherent difficulty of measuring the impact of large polluting industries given incomplete or absent *ex-ante* baseline studies. On the other, there is often a lack of expertise among the affected third parties that prevents them from fully interpret and comprehend the data disclosed by the industries. For example, in Chile contracts among mining companies and local communities include provisions on the creation of a community monitoring system, which should ease the access to information related to the use of resources and the company's compliance with environmental norms.[362] Yet, there is a lack of continuous and objective dialogue between companies and communities, since these latter are left alone to interpret the overwhelming amount of technical data disclosed by the companies, or to find an expert to do that.

Similarly, in Argentina the federal government has charged provincial executive bodies with the enforcement of the ILO Indigenous and Tribal Peoples Convention 169 of 1989. Besides being one of its kind internationally, Article 6 of the Convention establishes the right for indigenous and tribal peoples to be "(a) [consulted], whenever consideration is being given to legislative or administrative measures which may affect them directly; (b) [given the means] by which [they] can freely participate […] at all levels of decision-making".[363] In particular, according to Article 7, "they shall participate in the formulation, implementation and evaluation of plans and programmes for national and regional

[359] Ibidem.
[360] Ivi, p. 89, 91.
[361] Ibidem.
[362] D. Buyung Agusdinata et al., (2018), "Socio-environmental impacts of lithium mineral extraction", p. 11.
[363] International Labour Organisation, *C169 – Indigenous and Tribal Peoples Convention*, (1989), art.6 (a;b), https://www.ilo.org/dyn/normlex/en/f?p=NORMLEXPUB:12100:0::NO::P12100_INSTRUMENT_ID:312314.

development which may affect them directly".[364] In this regard, "Governments shall take measures, in co-operation with the peoples concerned, to protect and preserve the environment of the territories they inhabit". In the specific case of mineral and natural resources exploitation, Article 15 states that "governments shall establish or maintain procedures through which they shall consult these peoples, with a view to ascertaining whether and to what degree their interests would be prejudiced, before undertaking or permitting any programmes for the exploration or exploitation of such resources pertaining to their lands".[365] Despite being successful in Jujuy and Salta, two provinces and lithium mining sites in north-west Argentina, Quijano (2020) reported that these provisions have not been included in domestic legislation, meaning that their enforcement is highly fragile and subject to the changes in the political scenario.[366] As a matter of fact, the author affirms that in still many cases indigenous peoples have neither been adequately involved in the decision-making process nor sufficiently informed on the negative impacts of lithium extraction on their resources, especially water.

In brief, there is a situation of asymmetric information that is imputable to various actors, from producing countries, industries and consuming countries to researchers. As concerns lithium mining, many are the research areas that have been investigated in the last twenty years, yet with a preponderance of focus on technical and economic issues, GHGs emissions and energy efficiency.[367] Only after a more substantial policy impulse in the 2010s have new topics emerged, such as toxicity, sustainability and environmental-friendly technology.[368] Buyung Agusdinata et al. (2018), have observed the prevalence of four main thematic fields pertaining to the research cluster "Socio-Environmental Impacts of Lithium Extraction and Use", namely "Environmental Concerns", "Battery Chemistry and Materials", "Socio-economic Concerns" and "Battery Performance and Design", where socio-economic concerns presented the scarcest results in terms of publications.[369] Since 2017, this thematic area was in fact absorbed by the broader one on Environmental concerns, failing to develop relevant literature in terms of the impacts of lithium extraction for vulnerable communities, as in the case of indigenous people in South America or Australia.[370] It can be argued that these shifts have also been produced by the expansion of EVs and the progress in raw materials production techniques, which have led to a greater interest in the opportunities offered by lithium and other CRMs for

[364] Ivi, art. 7.1; 7.4.
[365] Ivi, art. 15.2.
[366] G. Quijano, (July 2020), "Lithium Might Hold the Key to our Clean Energy Future, but Will this Star Metal Fully Deliver on its Green Potential?", *Business and Human Rights Journal*, vol. 5, no. 2, p. 279-280.
[367] D. Buyung Agusdinata et al., (2018), "Socio-environmental impacts of lithium mineral extraction", p. 2.
[368] Ivi, p.6.
[369] Ivi, p. 6-7.
[370] Ivi, p. 10.

improving the energy system and by the application of a more circular business model, i.e. through recycling.[371]

More importantly, Buyung Agusdinata et al. (2018) found that the lack of relevant research is more pronounced in producing countries than in consuming ones. 54% of total research publications come from lithium-ion batteries consumers, such as Europe, Korea and Japan; 44% comes from the United States and China, which are both producers and consumers; while the remaining 2% comes from producing countries only.[372] Even if more prolific, only 4% and 1% of research published in the US and China respectively focuses on environmental and social impacts of lithium extraction. This means that the research flow and focuses are mainly determined and oriented by consuming countries, which for their more stringent policies on climate change and an increasing attention to circular economy are currently pushing for more research on recycling and technological advances in extractive methods and in chemistries composition. According to the authors, this is also happening because of the fewer resources and capacities that producing countries have to enter the discourse and establish their own research themes or thematic areas.[373] In addition, lithium mining operations frequently occur in remote areas presenting a very low population density, where little villages haven't the same power of more densely populated areas to make their voices heard, or to attract relevant researchers on the negative impacts they are facing.[374] Nevertheless, in a moment of great changes, where advanced economies are paving the way for more electrified energy systems through greener policies and strategies, it should be highlighted how relevant it is to study more deeply how the race for electrification is impacting outer ecosystems and societies, also in order to provide a better-informed framework on how to contain negative effects and set the priorities to build fairer trade relations.

In light of all these considerations, the parties involved together with governments can implement diverse solutions to internalize negative externalities, depending of course on the situation and information available. As concerns the case of lithium that was described so far, the lack of access to quality and scientific information on the long-term impacts of lithium mining and the lack of expertise and sufficient funds to negotiate different production levels with the polluting company represent significant obstacles to the application of private bargaining, also known as Coasean bargaining. In this case, following the previous example of the polluting lithium company and the neighbouring farmers, the farmers would have to negotiate with the company a reduction of its lithium production in exchange of a monetary compensation for the company's corresponding loss of profit. Yet, without

[371] Ivi, p. 9.
[372] Ivi, p. 5.
[373] Ivi, p. 10.
[374] S. Evans, (27.01.2021), "Lithium's water problem", *Mining Technology*, https://www.mining-technology.com/features/lithiums-water-problem/.

corroborated information and without proper funds, it would be quite difficult for the farmers to possibly open a negotiating table. Another possible solution entails the imposition of a quantity cap on the mining company, that would be forced to produce less without being compensated for its profit loss. A solution that could be arguably more difficult to apply in certain areas of the world, such as South America, where mining industries exert a significant leverage on local and national governments through their lobbying activities, besides the fact that governments benefit from royalties on mining activities and are therefore entrapped in a conflict of interest. A measure that would present similar setbacks is taxation. This would mean impose on mining companies a specific tax, so that they pay for the whole marginal social cost. Yet, in this way, companies would not only have to reduce their output, but also pay a tax to the government; a solution that would be more easily applicable by a strong government in a country whose economy is not significantly reliant on the exploitation of natural resources or where environmental protection is deemed at least as important as the opportunities of local, regional and national development through mining.

Last but not least, the more practicable even if, arguably, not the perfect solution appears to be the enforcement of compensation. In this case, companies would be forced to compensate the farmers paying them a sum equal to the social cost. Companies would still have to reduce their production, but at least the role of the government would be inexistent. The amount of the compensation would be preferably included in the initial budget for the project based on relevant calculations on the negative effects of mining.[375] Nevertheless, given the complexity of the problem, the application of just one solution cannot be deemed sufficient to build a solid framework of protection from negative externalities of all people affected. There are many more corrective actions to be considered. In order to provide accurate information on socio-environmental impacts of mining and to lay the groundwork for future comparative analysis, preliminary objective environmental impact studies should be more significantly financed, also from central governments, and made public, with a particular attention to accessibility issues, especially when it comes to the translation of research papers into local languages.[376] Furthermore, as enhanced by ILO Convention 169 and reported by Quijano (2020), there should be a greater involvement of all stakeholders in the decision-making process in order to promote more transparency and inclusion in what concerns decisions on local ecosystems.

Similarly, companies should be held more accountable of their business decisions through appropriate due diligence duties, that is through periodical reports on their activities and impact, as a way

[375] A. Becker, (2021) "La transición energética y la guerra por los recursos del Sur global", *Nueva Sociedad*, https://nuso.org/articulo/transicion-energetica-recursos-sur-global-litio/.
[376] Ibidem.

to monitor their performance and to communicate in what ways they are improving.[377] This would perhaps help to slowly rebuild credibility and transparency in the relations with locals. On the legislative side, Environment, Sustainability and Governance (ESG) standards together with relevant international agreements and conventions should be strictly enforced particularly by producing countries' governments and, if possible, included both in bilateral and multilateral trade agreements.[378] Finally, more research should be devoted to the recycling potential of lithium and to the necessary structural socio-economic transformation based on circular economy, with reference to the mining industry as well.

To conclude, the negative effects deriving from mining are complex, for they affect not only the environment, but also local communities exposed to them. At present, the lack of sufficient information on the long-term impact of lithium extraction is maybe the main obstacle to define a clear compensation mechanism for affected people, but a greater support to research in this direction is just one of the actions that can help bring more transparency and awareness on the issue. Lithium extraction can cause very diverse environmental impacts based mainly on the extraction methods used, which deserve further consideration in view of an announced "resurgence" of the mining industry in Europe. While a discussion on such negative externalities is relevant to understand the side effects of a transition that claims to be green but that hides significant controversies, the further chapter will also examine the technological advances in mining that are setting in and that will inherently have a more limited socio-environmental footprint.

4.3 CASE-STUDY 1: COMPARING THE IMPACTS OF LITHIUM EXTRACTION, WHAT LIES AHEAD?

The intensification of such a congenitally mineral-dependent green transition in the Global North has been causing environmental impacts in producing countries, which are mainly located in the Global South, with the exception of the United States and Australia. As already mentioned, the effects on the environment have in turn taken a toll on local communities, highlighting the disruptive socio-economic potential of mining in certain regions of the world. The lack of accountable and transparent governance tools in some producing countries, in an overall context of asymmetric information, makes it difficult to exactly measure the environmental damage caused by mining operations and establish fair and efficient compensation mechanisms for the affected communities. Focus will be made here on the negative environmental externalities of the first production stage, that is extraction.

[377] R. Bolton, (11.08.2021), "Lithium mining is booming – here's how to manage its impact", *GreeBiz*, https://www.greenbiz.com/article/lithium-mining-booming-heres-how-manage-its-impact.
[378] A. Becker, (2021), "La transición energética y la guerra por los recursos del Sur global"; S. Evans, (2021), "Lithium's water problem".

Nevertheless, it should be taken into account that, as highlighted in chapter three, the EV battery supply chain is a long one and also include several chemical and energy-intensive refinement processes, which might contribute to the overall environmental footprint of the industry, should they continue to use fossil fuels rather than renewable energy sources. Thus, a complete analysis should consider the impact of the whole supply chain. Yet, for reasons of conciseness and coherence with the purposes of this thesis, light will be mostly thrown on lithium extraction.

In the last decade, lithium mining has occurred through two main extractive methods, namely brine evaporation and hard rock mining. Even if these latter present differences in their environmental impact, they both might cause the release of mineral and/or chemical residues in the air, be exposed to climate change effects, cause possible chronic or catastrophic accidents, imply an extensive or intensive use of land and deforestation, consume water and have an impact on human health.[379] Thanks to a global rising, yet hesitant, awareness on how the race for electrification is impacting specific ecosystems, recent accidents in lithium mines are gaining more, even if not sufficiently widespread, media coverage than in the past. Key actors in the automotive sector, like Volkswagen, have engaged in research pathways to discover the actual impact of the transition to green mobility in those places where critical raw materials are extracted.[380] Whether this is one of many cases of "greenwashing" remains to be seen, but it ultimately highlights the need to get all stakeholders involved and made accountable for their decisions, especially in terms of investment in R&I. This engagement seems not to be shared among major mining corporations, such as SQM and Albemarle. This latter, for instance, often carries out projects of local development, through the construction of schools, employs local inhabitants in mines, offering them above-average wages, medical insurance or other perks, that in any case do not internalize the actual effects mining has on local flora, fauna and water wells.[381]

Again, it is crucial to conduct independent research and analyses on the impact of lithium mining in fragile ecosystems and in local communities that can complement the otherwise biased data disclosed by mining corporations and help define a more exhaustive and standardised framework for the environmental assessment of diverse lithium mining methods. Bringing diverse perspectives onto the table means empowering those stakeholders that have remained unheard and, possibly, pushing mining corporations to abandon their business as usual and become forerunners in more sustainable mining practices.

[379] B. K. Sovacool et al., (2021), "The hidden costs of energy and mobility: A global meta-analysis and research synthesis of electricity and transport externalities", *Energy Research & Social Science*, vol. 72, p.4.
[380] C. Palmer, (16.03.2021), "Can Chile avoid resource curse from lithium?", *Reuters*, https://www.reutersevents.com/sustainability/can-chile-avoid-resource-curse-lithium.
[381] Ibidem; B. Heubl, (21.08.2019), "Lithium firms depleting vital water supplies in Chile, analysis suggests", *Engineering & Technology*, https://eandt.theiet.org/content/articles/2019/08/lithium-firms-are-depleting-vital-water-supplies-in-chile-according-to-et-analysis/.

Protests against new mining operations or accidents occurred in lithium mines have been increasingly brought to the attention of the public, highlighting the presence of a more disenchanted perspective on the green transition. For example, in 2016, for the third time in less than a decade, chemical residues leaked from Ganzizhou Rongda lithium mine in China, thus contaminating the waters of the nearby Liqui river and provoking the death of hundreds of fish, besides other animal species that had drunk from the river.[382] As a consequence of these accidents, local inhabitants decided to gather the dead fish a throw it onto the streets in sign of protest. The impact of lithium mining on fauna has been corroborated thorough other studies, one of which was conducted in Nevada, showing the possible magnitude of related environmental degradation. It was found that lithium brines evaporation and subsequent early refinement processes affect fish in a radius of 150 miles downstream from the operating lithium mine.[383] In this regard, a rancher in Nevada sued the authorities responsible for approving a lithium mine disregarding relevant environmental legislation.[384]

One of the most traditional lithium mining methods is brine evaporation. This method is currently applied in the lithium triangle in South America, in Nevada and in some mines in China. It consists in pumping underground mineral-rich groundwater into evaporating ponds, where lithium carbonate is progressively isolated from other minerals, such as magnesium and boron, also through the use of chemicals. This method entails an extensive use of land for creating an interconnected system of ponds.[385] To be applied in an efficient way, brine evaporation is performed in lithium deposits that are found in extremely arid regions, with low precipitations, an example of which is the Salar de Atacama in Chile. This latter is renowned to offer the best performance in terms of production compared to other mines in the same region, given that even a slight change in exposure to precipitations or altitude of the deposit determine very diverse lithium concentrations. As a matter of fact, in comparison, Bolivia's lithium deposits in the Salar de Uyuni would present longer lead times, because of recurring rainfalls, and a worse environmental impact due to the higher presence of magnesium, a mineral very similar to lithium, which is isolated through lime.[386] This is to say that despite being quite abundantly distributed on the Earth surface, not every lithium deposit can be considered automatically cost-efficient and "sustainable".

Besides requiring a considerable use of land, brine evaporation produces toxic residues, which are contained in water storage ponds and transported products. These can have biophysical consequences,

---

[382] A. Katwala, (05.08.2019), "The spiralling environmental cost of our lithium battery addiction", *Wired*, https://www.wired.co.uk/article/lithium-batteries-environment-impact.
[383] Ibidem.
[384] C. Palmer, (2021), "Can Chile avoid resource curse from lithium?".
[385] M. Drobe, (2020), „Lithium - Sustainability Information", p. 8.
[386] A. Baxter, (29.08.2020), "Bolivian Indigenous People Lose Out On Lithium", *Human Rights Pulse*, https://www.humanrightspulse.com/mastercontentblog/bolivian-indigenous-people-lose-out-on-lithium#:~:text=The%20Bolivian%20government%20has%20been,inhabited%20by%20Indigenous%20Aymara%20people.

both for human health and the affected flora and fauna in case of leakage.[387] In this situation, climate change effects, such as floodings might contaminate the soil or groundwater with said toxic residues, causing serious environmental damages, considering that brines are located in desert places with extremely fragile ecosystems.[388]

Yet, the harshest environmental impact of this method lies in its tremendous water consumption rate. Even if regarded as mineral in Chile's mining legislation, brines are 70% water and 30% salt.[389] After a brine is pumped to the surface into the evaporative ponds, it takes up to 18 months to extract lithium from it. Meanwhile, 97% of the water originally contained in the brine slowly evaporates under the effect of the sun, with no possibility to recover it.[390] According to *Engineering & Technology*, the lack of water recovery and the disproportionate production levels are producing hydrogeological imbalances. Presupposed that a ton of lithium extracted requires around 2 273 045 litres of water, it has been estimated that the brine output is currently over 2,000 litres per second above the recharge capacity, meaning that saltwater reserves are being progressively depleted.[391] As a matter of fact, Chilean authorities have reported an increase by 21% of brine water extracted from 2000 to 2015, causing the depletion of local groundwater levels by 1 metre per year.[392]

In this regard, the major problem to be tackled is the general absence of preliminary baseline studies on the original level of groundwater wells, which precludes the possibility to conduct comparative analyses and describe in detail water levels variation as a result of lithium extraction.[393] Such studies would allow to define more precisely its impact in the long run, something that remains quite abstract to date. The measurement of water levels variation acquires even more relevance in consideration of the indirect effects that brine extraction has on freshwater wells and, hence, on local communities. Despite without sufficient scientific corroboration, there are good reasons to believe that a prolonged extraction of brine water from a deposit and/or increasing temperatures contribute to an irrecoverable depletion of saltwater, which would cause freshwater contained in other nearby wells to penetrate the brine deposit in exhaustion, mixing with saltwater and making it unusable for farmers and local

387 R. B. Kaunda, (2020), "Potential environmental impacts of lithium mining", *Journal of Energy & Natural Resources Law*, vol. 38, p. 241-242.
388 E. Giglio, (2021), "Extractivism and its socio-environmental impact in South America. Overview of the 'lithium triangle'", *América Crítica*, vol. 5, no. 1, p. 50.
389 B. Heubl, (2019), "Lithium firms depleting vital water supplies in Chile, analysis suggests", Engineering & Technology.
390 M. Drobe, (2020), "Lithium - Sustainability Information", p. 9.
391 E. Gonzalez, (17.02.2021), "Explainer: Latin America's Lithium Triangle", *Americas Society / Council of the Americas*, https://www.as-coa.org/articles/explainer-latin-americas-lithium-triangle; B. Heubl, (2019), "Lithium firms depleting vital water supplies in Chile, analysis suggests", *Engineering & Technology*.
392 R. B. Kaunda, (2020), "Potential environmental impacts of lithium mining", p. 243.
393 G. Quijano, (2020), "Lithium Might Hold the Key to our Clean Energy Future, but Will this Star Metal Fully Deliver on its Green Potential?", p. 279.

inhabitants.[394] According to Giglio (2021), this excessive water consumption has direct impact on communities living both in the highlands and downstream of the mining site, which see themselves frequently forced to migrate from their native villages because their access to freshwater is not adequately protected and ensured.[395]

On the other side, a second method involves hard rock mining. In this case, lithium isn't contained in underground brines, but in pegmatites, that is hard rock deposits where extraction occurs through drilling. Hard rocks are then grinded and directly processed in order to purify the mineral and concentrate it. To do so, there are several chemical processes to be implemented, that could potentially affect the surrounding environment. As a matter of fact, this mining practice tends to produce higher GHGs emissions than brine evaporation, as a result of the prevalent use of non-renewable energy sources to fuel the multiple refinement processes.[396] This method is currently prevalent in Australia, the largest producer worldwide, and it could also be predominant in Europe, given the nature of lithium deposits in Portugal and Central Europe.

As concerns its impact on the soil, hard rock mining is characterised by a more intensive rather than extensive land use. Contrarily to lithium brines, lithium hard rock deposits can be found both in arid and humid geographical areas, as happens in Australia, where major deposits are located in the North-West and in the South-West of the country.[397] Therefore, the territorial dimension of approved mines in the woodlands tend to be more limited, while there are less constraints in more desert regions. On average, a lithium mineral deposit can produce 3 to 10 tons of mineral waste per ton of lithium ore, which is often piled up.[398] Yet, the drilling process causes the production of toxic dust that, if not kept under controlled or minimized, can pollute the air and have repercussions of the health of workers and local communities, besides affecting the soil and the local flora and fauna.[399]

Furthermore, the impact on water seems to be marginal compared to brine evaporation. This precious resource is used to grind pegmatites ore to be than processed, and to increase the mineral concentration. There have been considerable developments to enhance a greater water recovery rate. Even so, Australia does not appear to present similar conflicts over water resources as in the lithium triangle in South America, which is in part due to the different location of lithium deposits and to the scarcity of agricultural activities in most desert areas, but also to the more stringent environmental legislation, which describes a more solid and efficient local governance system.[400] Unlike Chile, and

[394] M. Drobe, (2020), "Lithium - Sustainability Information", p. 9.
[395] E. Giglio, (2021), "Extractivism and its socio-environmental impact in South America", p. 51.
[396] M. Drobe, (2020), "Lithium - Sustainability Information", p. 10-11.
[397] Ivi, p. 8.
[398] Ibidem.
[399] R. B. Kaunda, (2020), "Potential environmental impacts of lithium mining", p. 241.
[400] M. Drobe, (2020), "Lithium - Sustainability Information", p. 8-9.

more similarly to Argentina, mineral rights are owned by the Australian States and Territories "on behalf of the people", not the central government, so each territory has its related legislation on, for instance, concessions and royalties.[401] Australia hasn't classified lithium as a state reserved mineral, so that it is treated as all other minerals extracted in the country. Through income taxation, the central government invests in local development projects and, thus, returns part of the profit generated by the exploitation of national resources to the communities. In addition, it is the main promoter of regional partnership programs, aimed at developing more transparent and inclusive relations between mining companies and aboriginal communities.[402]

Improvements to governance systems where these are inefficient and a major impulse to scientific research to finally measure the impact of lithium mining and lay the foundations for a stronger implementation of environmental legislation are crucial, but not sufficient to tackle the socio-economic and socio-environmental problems of mining, which will continue to take place in the future bringing along its inherent environmental risks and social impacts. Although it is necessary to fill in the gaps to provide a more transparent and inclusive framework, major changes in mining practices need to take place. Research and Innovation play an unparalleled role, for they have the potential to contribute to discovering and developing alternative mining methods aimed at eliminating, or at least minimizing as much as possible, the environmental negative externalities before they even start emerging. This means, first and foremost, enhance circularity in the treatment of the water used or of the residues produced, limit land use and increase mining companies' flexibility in adopting best practices.

One possible alternative mining method that has recently gained momentum is Direct Lithium Extraction (DLE), a technology that would be applicable to lithium brine deposits and allow for a much more positive environmental impact. This solution drastically decreases land use since evaporation ponds are no more needed. Lithium is extracted from the brine by means of absorbing substances, which almost directly isolate it from other minerals. This stringent selection ensures the high quality of the final product, maintaining prices on a reasonable level. It also allows for a better management of waste material, which is no more piled up on the soil and exposed to the elements with the risk to cause major environmental damages. More importantly, DLE is designed to recycle over 98% of the water used during the refinement of the mineral, which otherwise would be lost in the case of traditional brine evaporation techniques.[403]

Another innovation that, if viable, would perfectly embody the idea of circularity, is geothermal extraction. It is currently being tested in the Upper Rhine Valley lithium mine in Germany by joint

[401] R. Perotti e M. F. Coviello, (2015), "Governance of strategic minerals in Latin America", p. 28-29.
[402] Ibidem.
[403] International Battery Metals, (24.06.2021), "All you need to know about the Direct Lithium Extraction process", https://www.ibatterymetals.com/insights/all-you-need-to-know-about-the-direct-lithium-extraction-process.

venture Vulcan Energy Resources and in Salton Sea, California.[404] This method has been studied to exploit underground steam in order to pump lithium-rich brine to the surface and to further produce geothermal energy. Once lithium is isolated, the remaining brine is reintroduced in the underground, limiting the risk of subsidence. While the impact of drilling remains, resources extracted from it would be exploited efficiently and in diversified ways. The production of residues and the use of chemical substances is completely minimized, if not eliminated. Vulcan Energy Resources is still currently conducting feasibility studies and plans beginning production before 2025. It has already signed agreements with major automakers, like Volkswagen Group, Stellantis and Renault Group and with a key cathode and battery producer, Korean LG Energy Solution.[405]

These are just few of the various technologies that are currently under study. Of course, the key word for making a mineral-addicted transition more sustainable is recycling, but this still appears to have a long way to go in the case of lithium. The EV market is currently still limited at a global level, which makes battery recycling not commercially viable, also for the present scarcity of disused batteries to restore. This context is set to change in a decade, but in the meantime it is crucial that more investments are directed in research and innovation to expand the deployment of more sustainable practices in mining, which have the potential to alleviate its socio-environmental footprint in the regions that have been affected the most.[406]

Some authors warn that the transition to green mobility has not actually been designed to move on from business as usual, meaning it is failing to abandon the traditional "automobile-centric society" for a less impactful lifestyle encouraging the use of public transportation and car sharing, among others.[407] This is a problem that needs to be tackled with both a bottom-up and a top-down approach. On the one hand, there is a need to raise awareness among consumers on the socio-environmental impact of CRMs mining, so that they are more empowered in their choices when buying a new electric car, because even its dimensions determine different mineral quantities, thus different footprints. On the other, demand control initiatives and actions need to receive greater attention from policymakers,

---

[404] C. A. Williams, (18.04.2022), "Greener lithium mining: Lithium is crucial for greening transportation and energy networks. Let's make mining greener, too.", *Canadian Mining Journal*, https://www.canadianminingjournal.com/featured-article/greener-lithium-mining-lithium-is-crucial-for-greening-transportation-and-energy-networks-lets-make-mining-it-greener-too/.
[405] Ibidem.
[406] C. Cabot, (19.10.2022), "Europe joins the 'white gold' rush for lithium and faces an energy transition challenge", *France24*, https://www.france24.com/en/europe/20221019-europe-joins-the-white-gold-rush-for-lithium-and-faces-an-energy-transition-challenge.
[407] F. Hewett, (19.01.2022), "The dark side of green tech", *WBUR*, https://www.wbur.org/cognoscenti/2022/01/19/lithium-batteries-frederick-hewett; J. J. A. Blair, (2021), "Extractivismo del Litio y el Problema de la Escala: Acción Climática Global y Justicia Ambiental Local", in R. Morales Balcázar (ed.), *Salares Andinos. Ecología de Saberes por la Protección de Nuestros Salares y Humedales*, Observatorio Plurinacional de Salares Andinos, p. 88-89, https://cl.boell.org/es/2020/12/18/salares-andinos-ecologia-de-saberes-por-la-proteccion-de-nuestros-salares-y-humedales.

that, in contrast, are currently more focus on ensuring access to supply and on developing production capacity to compete on a global scale, thus occupying a strategic position along the supply chain.

4.4 Civil Society's role and response in Europe

Following the publication of the New Industrial Strategy for Europe in March 2020, prioritizing the goal of open strategic autonomy, later that year the European Commission launched an Action Plan on Critical Raw Materials Resilience, highlighting the need to further "strengthen the sustainable and responsible domestic sourcing and processing of raw materials in the European Union".[408] The key role played by critical raw materials for the electrification of the mobility sector has been interpreted as both a risk and an opportunity for Europe. If, on the one side, the old continent might face the risk to be entrapped in a new dependence from external suppliers, similarly to what has happened so far with fossil fuels, on the other, it does have more potential to exploit domestic resources to alleviate pressures in terms of mineral security than it had in the case of natural gas or oil. Among the minerals to be found in Europe, there are some key elements for batteries manufacturing, such as lithium, nickel, cobalt, graphite and manganese.[409] Therefore, policymakers have defined domestic sourcing as having a strategic relevance in a context of fierce global competition. In this regard, they have set a number of priority actions that include the identification of mining and processing projects with related financing opportunities for CRMs, to be fully active by 2025; the development of relevant expertise and skills regarding the whole CRMs supply chain; tracing European resources; and the development of funded projects in R&I to support the exploitation and processing of raw materials, while minimizing their environmental footprint.[410]

Yet, according to the Commission's Action Plan, such projects often have to face numerous obstacles to actually be implemented. A first issue has to do with bureaucracy, for long public procurement and concession procedures frequently protract already lengthy lead times, causing dreadlock and lack of trust in industrial players and investors that find other contexts more attractive, such as Australia or South America. A second one is linked to insufficiency of specific funding opportunities and support for mining exploration. At present, the mining companies competing in Europe are above all small and medium businesses or joint ventures between large international corporations and local companies. Yet, these latter often encounter difficulties in accessing credit and other financial

---

[408] European Commission, (3.09.2020), "Critical Raw Materials Resilience: Charting a Path towards greater Security and Sustainability", COM (2020) 474 final, DocsRoom, p.6, https://ec.europa.eu/docsroom/documents/42849.
[409] Ivi, p. 12.
[410] Ivi, p. 14.

support, given the lack of long-term contracts based on fixed prices.[411] This occurs also for the general perceptions around mining activities in Europe, which explains the third and last obstacle: lack of public consensus, which is often embraced by policymakers to avoid clashing with the public opinion, especially close to elections.[412]

As mentioned in section 4.1, there are currently many lithium mining projects under discussion in Europe and feasibility studies are being conducted by mining companies to possibly begin exploitation in the near future. Portugal, Germany, France, Finland, Czechia and Austria have been emerging as interesting sites where to channel investments and innovative pilot projects to study and test alternative mining methods. In Portugal, British-based Savannah Resources is waiting for approval from national authorities to start operations. Authorizations have been delayed due to protests from locals near the Barroso mine, a hard rock lithium mine situated in the north of the country.[413] Vulcan Energy Resources is planning to begin production in the German Upper Rhine Valley by 2025, after completion of all final feasibility studies. Despite leading a groundbreaking project as in the way it intends to exploit geothermal energy to both extract lithium and produce electricity, Vulcan Energy was forced to temporarily interrupt its operations in Germany due to local opposition to the seismic survey the company had announced.[414] In Finland, relations among local stakeholders and mining companies appear to be less tense, which is helping bring along permitting procedures without significant delays. Here, most electricity is produced from renewables, meaning that the impact of refinement stages would be considerably reduced.[415]

Even if not part of the European Union, Serbia embodies the most exemplary case of how far protests have come to oppose mining projects. In the early 2000s, Australian mining corporation Rio Tinto discovered a jadarite mine in western Serbia. Initial exploration plans by Rio Tinto announced operations would have covered an area of 20 hectares, while allegedly, after a few years the company would have extended the area to 80 hectares and above.[416] The Serbian government simultaneously conducted studies on the environmental impact of the mine, affirming that the area exposed to the

---

411 S. O'Farrell, (27.04.2022), "Can Europe mine lithium?", *fDi Intelligence*, https://www.fdiintelligence.com/content/feature/can-europe-mine-lithium-80851.

412 P. Crowson, (1996), "The European mining industry. What future?", *Resources Policy*, vol. 22, no. 1 / 2, p. 105.

413 C. Rustici, (03.11.2022), "Lithium: What Are the Main Mining Projects in Europe?", *DirectIndustry*, *https://emag.directindustry.com/2022/11/03/lithium-what-are-the-main-mining-projects-in-europe/#:~:text=European%20Lithium%20is%20developing%20the,of%20approximately%20200%2C000%20electric%20vehicles*.

414 M. Roddan, (21.11.2021), "Vulcan 'pauses' Rhine application amid public opposition", *Financial Review*, https://www.afr.com/companies/energy/vulcan-pauses-rhine-application-amid-public-opposition-20211121-p59aoa.

415 Ibidem.

416 M. Meaker, (02.04.2022), "Europe's Biggest Lithium Mine Is Caught in a Political Maelstrom", *Wired*, https://www.wired.com/story/serbia-europe-lithium-mining-electric-cars/; D. Boffey, (19.11.2021), "Rio Tinto's past casts a shadow over Serbia's hopes of a lithium revolution", *The Guardian*, https://www.theguardian.com/global-development/2021/nov/19/rio-tintos-past-casts-a-shadow-over-serbias-hopes-of-a-lithium-revolution.

risk of subsidence amounted to 850 hectares.[417] In addition, as reported by *The Guardian*, in 2014 a flooding in the area interested by the mine caused toxic waste leakages, worsening the reputation of Rio Tinto.[418] More recently, at the end of 2021, local communities fiercely protested against the mining project, obtaining the revocation of exploration concessions by the Serbian government, just three months before legislative elections took place.[419]

As demonstrated by these cases, opposition to extractive projects is intense and is not set to alleviate because of its relevance for the green transition. This represents a crucial hurdle for European policymakers and for the future of the European transition, as far as mineral security and competitiveness are concerned. Except for Finland, other sites interested from mining exploration present local mistrust and complete rejection towards mining companies. In some cases, this is due to the poor reputation of these latter, that often bring along a past of disregard towards the environment, and/or to a rough or inexistent national legislation on mining, as in the case of Serbia.[420]

According to Crowson (1996), negative perceptions around mining in Europe are well-established and, during history, they have often been identified with the coal industry and its impact on the environment and the society.[421] Contrarily to what happens in Australia or in the desert *salares* in South America, mines in Europe have been located nearby residential areas, which has amplified their impact. Even so, it is generally ignored that mines in outer and remote places often produces environmental degradation, which fails to be perceived as an actual problem among consumers of the raw materials extracted there, such as Europeans. This perspective is, also, a result of the long colonial race that aimed at ensuring access and control over external mineral resources, relocating many mining operations in the colonies rather than keeping them in the homeland. Thus, as affirmed by Crowson (1996), Europeans have commonly thought of Europe's mining resources as depleted and no more cost-efficient in comparison with external sourcing.[422]

Despite mining operations have been progressively moved outside European borders, Europe has kept cultivating its knowledge and industrial expertise in the sector, which explains the potential of Europe to make a difference in tackling the challenges that the industry is facing nowadays. In its long path towards the definition of a stringent environmental protection legal framework, the EU has progressively developed one of the most solid legislations, when it comes to the impact of industrial activities on the environment and biodiversity. If, on the one hand, this has discouraged investments in the European mining industry, on the other, it represents a major opportunity in comparison to

[417] Ibidem.
[418] Ibidem.
[419] S. O'Farrell, (27.04.2022), "Can Europe mine lithium?".
[420] M. Meaker, (02.04.2022), "Europe's Biggest Lithium Mine Is Caught in a Political Maelstrom".
[421] P. Crowson, (1996), "The European mining industry. What future?", p. 99.
[422] Ibidem.

other producing countries with lower governance standards, suffice it to consider, for instance, the latest provisional deal obtained by the Council and the European Parliament to establish sustainability standards for batteries and waste batteries.[423] This means that, potentially, the European Union has a chance to reshape mining practices, in a way that respects its high ESG standards and to set a good example worldwide. As reported by Umbach (2021), European mining industries have succeeded in decreasing their carbon footprint by over 60% compared to their Chinese rivals.[424] The observation of higher standards could be applied not only in the case of domestic sourcing, but also with external suppliers, so that they are gradually made more accountable for their decisions and production methods. As stated by Tiday (2022), reinforcing domestic sourcing would allow for a greater control over related industrial activities, which is much more difficult outside European borders, besides enhancing economic growth and employment.[425]

The European Commission understands the urgency to change perceptions and debunk false myths on mining if it wants to be a global leader in the green transition and achieve its goals. In 2023, a new Action Plan on CRMs should be published, with a stronger emphasis on domestic mining as a way to diversify current supplies.[426] According to *Politico*, the Commission's strategy will involve the prioritization of specific mining projects in the EU with related bureaucratic simplifications.[427] This hypothesis would of course see opposition from local communities that would be affected by the new mines. Still, opposition is not only coming from citizens, but also from European bodies. The European Chemical Agency's Risk Assessment Committee corroborated the toxicity of lithium carbonate, hydroxide and chloride with reference to a proposal issued by French authorities to classify such lithium compounds as toxic at the European level.[428] Such proposal presents high risks for the lithium industry since it would create uncertainty for investors and other relevant players that would encounter difficulties to plan their activities.

As it clearly emerges, the green transition, the one that should free Europe from energy security issues with traditional oil and gas producers and that should help it achieve its climate goals, hides

---

[423] Council of the European Union, (09.12.2022), "Council and Parliament strike provisional deal to create a sustainable life cycle for batteries", https://www.consilium.europa.eu/en/press/press-releases/2022/12/09/council-and-parliament-strike-provisional-deal-to-create-a-sustainable-life-cycle-for-batteries/.

[424] F. Umbach, (30.03.2021), "CRMs: assessing EU vulnerabilities".

[425] A. Tiday, (14.04.2022), "Lithium could help end the EU's oil addiction. But does Europe have enough of it?", *Euronews*, https://www.euronews.com/my-europe/2022/04/14/lithium-could-help-end-the-eu-s-oil-addiction-but-does-europe-have-enough-of-it.

[426] L. Cater and A. Zimmermann, (20.10.2022), "The EU wants to mine its way out of reliance on China for raw materials. It'll have to convince locals", *Politico*, https://www.politico.eu/article/the-eu-wants-to-mine-its-way-out-of-reliance-on-china-for-raw-materials-itll-have-to-convince-the-locals/.

[427] Ibidem.

[428] L. Cater and A. Zimmermann, (14.07.2022), "Toxic or magic? Batteries industry freaks out over EU proposal to classify lithium as a toxin", *Politico*, https://www.politico.eu/article/eu-commission-toxic-or-magic-batteries-industry-freaks-out-over-proposal-to-classify-lithium-as-a-toxin/.

various controversies that need to be tackled. Yet, problems do not only derive from still scarce domestic mining, but also from the lack of competitiveness along other production stages, such as refinement and battery cells and packs manufacturing. Supposed that citizens' perceptions change over time, reinforcement of domestic mining is central but not enough to be competitive on a global scale and to help decarbonise subsequent production stages, that still make use of non-renewable energy sources. In this regard, what are the actual prospects for the EU? What necessary steps does it have to take? These questions will be answered in a comparative way, by analysing the strategies that the Unites States, as both allies and competitors, have been recently implementing.

4.5 CASE-STUDY 2: THE US LITHIUM INDUSTRY

Automotive is a driving industry in the United States, offering employment to around 10 million people and generating $1.1 trillion yearly.[429] Its transition to clean energy technologies, which has given a major impulse to the production of alternative vehicles, like EVs and Plug-in hybrid electric vehicles, have been continuously boosting employment in the sector and are set to keep doing so, considering the fast expected growth in consumption. With the comeback of Democrats in the White House in 2020 and the renewed commitment to follow the international climate agenda, managing a possibly smooth transition in the US automotive sector has acquired even more relevance, owing not only to its impact on employment, but also to the carbon footprint of the sector on the national territory, more than one quarter of total US emissions.[430] The United States currently possess 8% of global battery cell production capacity, which they are planning to significantly increase by 2025.[431] Nevertheless, consumption is expected to grow at a faster rate than supply, which puts the US in the risky position of not having sufficient and timely domestic production capacity to meet most of their demand by 2025. If capacity expansion announcement will move forward as planned, Europe is set to reach a higher manufacturing capacity level (13%) than the US (8%) by 2025, compared to the rest of the world.[432] Similarly, battery manufacturing projections suggest that the US will be able to serve less than a half of its demand by 2028.[433]

Yet, in the last two years, the federal government has been taking significant steps forward to set specific priorities and change the US legal framework for the transition to clean mobility in a more strategic way. At present, the most transversal and important document is the National Blueprint for

[429] Federal Consortium for Advanced Batteries (FCAB), June 2021, "Executive Summary. National Blueprint for Lithium Batteries 2021-2030", p. 10, https://www.energy.gov/eere/vehicles/articles/national-blueprint-lithium-batteries.
[430] Ibidem.
[431] Ivi, p. 12.
[432] Ivi, p. 13.
[433] Ivi, p. 15.

Lithium Batteries, published in 2021 by the Federal Consortium for Advanced Batteries (FCAB), an entity that connects various federal agencies engaged in the areas of industrial development and lithium batteries, and led jointly by the Departments of Energy, Defense, Commerce, and State.[434] The main goal to which it has intended to respond is creating a framework for Lithium-ion batteries and related supply chains to orient investments in a way that they contribute to building an enduring domestic Li-ion battery value chain by 2030, able to reduce US dependence on unreliable foreign suppliers, namely China, boost industrial competitiveness and support climate goals.

The Blueprint has been structured around five main goals to both address the related short-term and long-term priorities. It intends to ensure access to raw and refined materials and support research in alternative solutions; boost US materials-processing capacity consistently with expected consumption growth; enhance greater domestic battery manufacturing capacity; encourage reuse and recycling of battery materials; and further foster US battery leadership through investments in R&D and STEM education.[435] In light of the diverse perspectives that such documents addresses and of the nature itself of the FCAB, it is clear that the Blueprint responds to a multistakeholder approach, or at least, intends to promote its application to achieve the goals by involving and engaging diverse actors, from public bodies to key industrial players, from academics and research laboratories to international partners and allies. An approach that is shared by the EU, and that was embodied, for instance, by the Commission's communication on Critical Raw Materials Resilience and by the European Battery Alliance. In the US, such approach underlies the launch of the Li-Bridge Alliance, a consortium gathering both public and private actors to achieve the goals set in the Blueprint.[436] It aims to fill the gap between domestic battery supply and expected demand growth, in an inclusive approach, thus involving diverse stakeholders to balance their visions, priorities and needs.

Following the Blueprint's goals, the main actions that will need to be implemented include stimulating sustainable domestic mining projects, while diversifying external suppliers and expanding current mining and processing capacities in operative pits and facilities.[437] Furthermore, strong support is expected to come from policymakers, through the launch of competitive and strategic measures devoted to streamlining the expansion of domestic battery production, with a particular attention to environmental sustainability, therefore to battery design innovation for second use and recycling

[434] U.S. Department of Energy, Office of Energy Efficiency & Renewable Energy, "Federal Consortium for Advanced Batteries", https://www.energy.gov/eere/vehicles/federal-consortium-advanced-batteries-fcab#:~:text=The%20Federal%20Consortium%20for%20Advanced,and%20secure%20domestic%20industrial%20base.

[435] Federal Consortium for Advanced Batteries, (2021), "Executive Summary. National Blueprint for Lithium Batteries 2021-2030", p. 6-7.

[436] D. Abrams Kaplan, (01.11.2022), "How the US plans to transform its lithium supply chain", *Utility Dive*, https://www.utilitydive.com/news/us-strengthening-lithium-supply-processing-ev-batteries/635338/.

[437] Federal Consortium for Advanced Batteries, (2021), "Executive Summary. National Blueprint for Lithium Batteries 2021-2030", p.7.

purposes. In this regard, the FCAB set the goal to boost consumer electronics recycling up to 90% and to halve EV battery pack production costs by 2030.[438] Finally, efforts should be made to innovate public-private partnerships in the field so as to multiply private investments and engagement, besides developing and scaling up the commercialization of innovative batteries.[439] To do so, important steps forward need to be taken to improve intellectual property rights protection and to harmonise and standardise provisions for battery technologies and design to favour technology transfer among diverse sectors.[440]

Overall, these objectives are mutually shared by the United States and the EU, given their current standing in global battery supply chains in comparison to China, which makes them both competitors and allies. As a matter of fact, transatlantic relations have recently attempted to better coordinate efforts to increase the resilience of battery supply chains. Proof of this is the partnership between the Li-Bridge Alliance the European Battery Alliance, that intends to promote more solid Lithium-ion battery supply chains and coordination on R&I to develop alternative batteries to Li-ion.[441] This collaboration is based on several common priorities, such as the push towards the green transition, the urgency to get a better positioning along battery value chains and the commitment to fight climate change. Thus, the partnership is aimed at developing a sustainable battery industry, through joint efforts in R&I, international standardisation to favour ethical mining practices, recycling and reuse capacity, and prioritization of environmental justice.

While cooperation with Europe intends to respond to issues of resilience, sustainability and innovation in battery supply chains, US relations with major producing and processing countries should be also reviewed in light of these priorities. According to the *Center for Strategic and International Studies*, the opportunities deriving from a major collaboration between the United States and the Lithium Triangle, especially Chile and Argentina, are significant.[442] In particular, the US could promote more continental coordination on lithium, with special attention to ethical and environmentally friendly mining practices, such as DLE, which would contribute to making the industry more sustainable, while also promoting local and regional development. As regards battery electrodes and cells

[438] Ivi, p. 20-21.
[439] Ivi, p.7.
[440] Ivi, p. 22.
[441] U.S. Department of Energy, (15.03.2022), "DOE and European Commission Support Collaboration Between the U.S. Li-Bridge Alliance and European Battery Alliance to Strengthen Supply Chain for Battery Technologies", https://www.energy.gov/articles/doe-and-european-commission-support-collaboration-between-us-li-bridge-alliance-and.
[442] R. C. Berg, A. T. Sady-Kennedy, (17.08.2021), "South America's Lithium Triangle: Opportunities for the Biden Administration", *Centre for Strategic and International Studies*, https://www.csis.org/analysis/south-americas-lithium-triangle-opportunities-biden-administration#:~:text=Policy%20Recommendations%20for%20the%20Biden%20Administration&text=Internationally%2C%20strong%20public%2Dprivate%20partnerships,global%20scale%20reduce%20carbon%20emissions.

production, other relevant US allies are South Korea and Japan, which are set to continue being net exporter of these products in the near future, given their low domestic EVs demand growth.[443]

And yet, the competition with China hasn't been the sole driver of the adoption of a more strategic approach towards battery materials and supply chains by the US. The Russian war in Ukraine worsened the already existing impact of the post-pandemic economic recovery on energy prices, which pushed national governments to secure sufficient supplies and reserves and to accelerate the green transition. In this regard, in March 2022, the Biden administration authorised the Defense Production Act, a presidential strategic tool to accelerate and reinforce domestic materials supply and services to promote national defence.[444] In this case, the goal was to secure domestic CRMs production, especially of lithium, nickel - whose global dominant supplier is Russia -, cobalt, graphite and manganese, and to support US clean energy economy.

In conjunction with the authorisation of the Defense Production Act and following the signing of the Infrastructure Investment and Jobs Act (or Bipartisan Infrastructure Law) in November 2021, the Department of Energy announced the opening of applications for grants amounting to a total of almost $3 billion, contained in said Act.[445] In October, the administration affirmed that the funding had been agreed to projects submitted by 20 manufacturing and processing companies throughout the country, with the aim to boost energy efficiency and electrification.[446] Overall, the Bipartisan Infrastructure Law is said to contribute with $7 billion investments to ensure domestic producers access to critical materials.

Furthermore, in the attempt to provide relief from inflationary price spikes while pushing forward with the green transition, last August, President Biden signed the Inflation Reduction Act (IRA), "the largest climate and energy spending package in US history".[447] IRA has a climate- and energy-dedicated budget of $370 billion, which will be allocated to streamline domestic production of solar

---

[443] Federal Consortium for Advanced Batteries, (2021), "Executive Summary. National Blueprint for Lithium Batteries 2021-2030", p. 15.

[444] The White House, (31.03.2022), "FACT SHEET: President Biden's Plan to Respond to Putin's Price Hike at the Pump", https://www.whitehouse.gov/briefing-room/statements-releases/2022/03/31/fact-sheet-president-bidens-plan-to-respond-to-putins-price-hike-at-the-pump/?utm_campaign=Press%2FMedia%20Outreach&utm_medium=email&_hsmi=208653202&_hsenc=p2ANqtz-_Q0ffmJOHAWL-D7Z5LZ4VFTUukayztJICXlTevL7e6II-icdY2-T-kjPVquu2pH3CCyJyxMsJ53deXsGO8Xs6ApKqCHkLboVha6umJvzJ2zQZfxe0&utm_content=208653202&utm_source=hs_email; Federal Emergency management Agency, *Defense Production Act*, https://www.fema.gov/disaster/defense-production-act#:~:text=The%20Defense%20Production%20Act%20is,to%20promote%20the%20national%20defense.

[445] Ibidem.

[446] The White House, (19.10.2022), "FACT SHEET: Biden – Harris Administration Driving U.S. Battery Manufacturing and Good-Paying Jobs", https://www.whitehouse.gov/briefing-room/statements-releases/2022/10/19/fact-sheet-biden-harris-administration-driving-u-s-battery-manufacturing-and-good-paying-jobs/.

[447] R. Kennedy, (16.08.2022), "The largest climate and energy package in U.S. history becomes law", *pv magazine*, https://pv-magazine-usa.com/2022/08/16/the-largest-climate-and-energy-package-in-u-s-history-becomes-law/#:~:text=President%20Joe%20Biden%20signed%20the%20Inflation%20Reduction%20Act%20(IRA)%20of,spending%20package%20in%20U.S.%20history.

panels, wind turbines and critical raw materials; cut methane emissions; provide raw materials and battery manufacturers with tax credits to modernize existing facilities and expand their production capacity, besides also promoting carbon capture, removal, transport and storage, and hydrogen production.[448] It places great emphasis on the transition to clean mobility, also through incentives for consumers of second-hand or new electric vehicles, and on nuclear and geothermal innovative practices. Through IRA, the current administration expects ambitious goals to be reached by 2030, such as the installation of 950 million solar panels, 120,000 wind turbines and 2,300 grid-scale battery plants, gathering a tremendous amount of additional investments estimated in the order of $3.5 trillion.[449] As a matter of fact, according to the White House's press release of October, companies engaged in EVs and battery manufacturing and charging infrastructure have already announced more than $100 billion investments in the domestic supply chain.[450]

Following the example of the Li-Bridge Alliance, President Biden also launched the American Battery Materials Initiative, with the goal to channel all government efforts in securing reliability and sustainability of the access to CRMs for the electricity and clean mobility sectors.[451] This initiative will help allocate available funding to build a solid domestic battery supply chain through an inclusive approach of all stakeholders, both national and international, with particular attention to natives communities engagement and consultation. By doing so, it will attempt to increase resilience and reliability of the supply chain, while working to ease public permitting procedures and increase cost-efficiency. An *ad-hoc* White House Committee will be in charge of leading it, in coordination with the Department of Energy and the Department of the Interior.[452]

Under the impulse of these measures and the emerging trend to localize instead of delocalizing raw material and battery production, there have been multiple announcements of expansion plans by mining and processing corporations based in the US and the launching of various joint ventures among these latter and automakers, in the attempt to improve their standing in the market and in critical supply chains.[453] This trend has been observed in Europe as well, where mining claims have been increasing rapidly in line with the EU's goal to strengthen CRMs domestic sourcing. According to *Inside Climate News*, it is expected that current US production capacity of 109.7GWh per year of

---

[448] Clean Air Task Force, (25.08.2022), "The Inflation Reduction Act of 2022: What it is, what it means, and how it came to pass", https://www.catf.us/2022/08/inflation-reduction-act-what-it-is-what-it-means-how-it-came-to-pass/.
[449] R. Kennedy, (16.08.2022), "The largest climate and energy package in U.S. history becomes law".
[450] The White House, (19.10.2022), "FACT SHEET: Biden – Harris Administration Driving U.S. Battery Manufacturing and Good-Paying Jobs".
[451] Ibidem.
[452] Ibidem.
[453] D. Gearino, (27.10.2022), "The EV Battery Boom Is Here, With Manufacturers Investing Billions in Midwest Factories", *Inside Climate News*, https://insideclimatenews.org/news/27102022/the-ev-battery-boom-is-here-with-manufacturers-investing-billions-in-midwest-factories/.

Li-ion batteries will raise by more than 740% by 2030, highlighting the urgency to bring new raw material production capacity online.[454]

As concerns mining activities, the only active lithium mine in the US at present is located in Silver Peak, Nevada, and supplies less than 2% of lithium globally, while the country hosts 3.6% of global lithium reserves.[455] New mining capacity is key to build a solid domestic battery supply chain. Thus, companies like US-based Albemarle and Lithium Americas Corp., Australian Piedmont Lithium and Controlled Thermal Resources have announced new operations on American soil. Albemarle intends to double its mining pit in Nevada, nearby Tesla's gigafactory and, in any case, in a state that offers interesting opportunities for further lithium exploration, given the existence of 17,000 pending mining claims.[456] Thacker Pass, in Nevada, is the location of Lithium Americas Corp.'s new mining project, while East-coast states such as Maine and North Carolina have also attracted great attention due to the presence of old lithium mining pits or untapped deposits.[457] On the contrary, the almost depleted Salton Sea in California and lithium reserve has attracted Controlled Thermal Resources, that plans to implement its groundbreaking and highly sustainable mining project there, through the adoption of Direct Lithium Extraction.[458]

Nevertheless, not all that glitters is gold. Despite being of critical importance, the new mining projects are facing many of the same issues arising elsewhere in the world when it comes to lithium mining or mining in general. According to an article published by the Yale School of the Environment, in the US, 97% of all nickel reserves and 89% of copper reserves are to be found nearby Native American communities, as it is the case in the lithium triangle in South America or, although to a lesser extent, in Australia.[459] The mining project at Thacker Pass, for instance, is causing fierce local opposition, since it would destroy what are deemed sacred lands by local Natives, as a massacre happened there back in 1865.[460] In addition, local populations worry about environmental and social impacts, especially on local ecosystems and biodiversity, that they might bear as a consequence of mining activities.

---

454 Ibidem.

455 P. Whittle, (28.03.2022), "U.S. seeks new lithium sources as demand for clean energy grows", *PBS NewsHour*, https://www.pbs.org/newshour/economy/u-s-seeks-new-lithium-sources-as-demand-for-clean-energy-grows; D. Abrams Kaplan, (01.11.2022), "How the US plans to transform its lithium supply chain".

456 K. Fehrenbacher, (31.10.2022), "Made in America: A lithium supply chain for EV batteries", *GreenBiz*, https://www.greenbiz.com/article/made-america-lithium-supply-chain-ev-batteries.

457 P. Whittle, (28.03.2022), "U.S. seeks new lithium sources as demand for clean energy grows".

458 J. Lewis Mernit, (20.12.2022), "For U.S. Companies, the Race for the New EV Battery is On", *Yale Environment 360*, https://e360.yale.edu/features/alternate-ev-battery-technology#:~:text=Spurred%20by%20federal%20mandates%20and,battery%20technologies%20for%20electric%20vehicles.

459 Ibidem.

460 B. Flin, (02.12.2021), "'Like putting a lithium mine on Arlington cemetery': the fight to save sacred land in Nevada", *The Guardian*, https://www.theguardian.com/us-news/2021/dec/02/thacker-pass-lithium-mine-fight-save-sacred-land-nevada.

Although being the site of an innovative lithium mining project, Salton Sea in California has undergone similar critics, since besides being a lithium reserve, it is first and foremost an exemplary case of environmental disaster. Known in the past as popular tourist destination, inhabited by a mostly Latino community and surrounded by agricultural activities, the lake's waters are now almost depleted, due to both warmer temperatures and farmers' water consumption, as well as contaminated from pesticides.[461] This suggests that the aim to build a *sustainable* domestic CRMs supply chain is kind of a challenge that shouldn't be taken for granted. Despite research and innovation do make progress, mining will inherently keep having an impact on the surrounding environment, biodiversity and population. Localizing mining activities in countries with high ESG standards, such as the United States or the European Union, won't per se be a panacea.

As regards the other production stages in battery supply chain, the US and the EU are currently going at almost the same pace, despite currently lacking an actually competitive production capacity, considering that China supplied 685KWh in 2021 only. [462] In 2021, the US produced 38GWh Li-ion batteries, a figure that increases if considered that the whole North American battery production capacity lies in the US, reaching 63GWh per year.[463] Production capacity in Western Europe is negligible, while Central European countries like Poland and Hungary are outstanding as battery production hubs in the continent, with more than 20GWh each supplied per year.[464] They are both succeeding in attracting considerable investments from large corporations, like Korean LG and SK Innovation, also thanks to higher cost-efficiency in their skilled workforce and proximity to European automakers.[465]

In the US, a key player is Tesla, but it isn't the only one. Cross-industrial joint ventures like BlueOvalSK, between Ford and South Korean SK On, and Ultium Cells, funded by General Motors and South Korean LG Energy Solutions, have been proliferating. BlueOvalSK is planning to invest $5.8 billion to build a plant in Kentucky, whereas Ultium Cells will build new facilities in Tennessee, Ohio and Michigan.[466] Similarly, Japanese Panasonic will open a new plant in Kansas with a total investment of $4 billion adding to its already operative facility in Nevada and possibly another new facility

---

461 J. Lewis Mernit, (20.12.2022), "For U.S. Companies, the Race for the New EV Battery is On".
462 Ibidem.
463 G. Hering, (03.10.2022), "US ready for a battery factory boom, but now it needs to hold the charge", *S&P Global*, https://www.spglobal.com/marketintelligence/en/news-insights/latest-news-headlines/us-ready-for-a-battery-factory-boom-but-now-it-needs-to-hold-the-charge-72262329; S. Jayanthan, (20.05.2022), "Growth of Li-ion battery manufacturing capacity in key EV markets", *S&P Global*, https://www.spglobal.com/mobility/en/research-analysis/growth-of-liion-battery-manufacturing-capacity.html#:~:text=The%20law%20outlines%20several%20actions,is%20in%20the%20United%20States.
464 Ibidem.
465 W. Kość, (10.02.2021), "Central Europe becomes the EU's e-car battery supplier", *Politico*, https://www.politico.eu/article/central-europe-eu-e-car-battery-supplier/.
466 D. Gearino, (27.10.2022), "The EV Battery Boom Is Here, With Manufacturers Investing Billions in Midwest Factories".

in Oklahoma, while Honda and LG are planning to expand battery production in Ohio.[467] Even if on its own, Toyota has further increased its investments by $2.5 billion for its battery manufacturing facility in North Carolina as well.[468] North Carolina is also the state where Albemarle has decided to build a lithium concentrator facility, which would increase its lithium production capacity.[469]

The SWOT analysis provided by the National Blueprint for Lithium Batteries 2021-2030 on US battery production industry is an opportunity to weigh US's standing up against Europe's positioning in the market.[470] As concerns its strengths, the US lies on an extremely natural-resource rich territory, where the whole automotive supply chain stands out for its solidity and skilled workforce. As a matter of fact, it hosts global leading automakers and battery manufacturers that have significant R&I capacity and access to capital and financial markets. This is in part also the case in Europe, where there are leading automakers as well, operating in complex supply chains. Yet, even if there is an untapped natural resources potential that could help diversify mineral supplies, Europe is currently more divided than the US on what are the next steps forward. If the need to source raw materials domestically is considered a priority by the European Commission, Member States often encounter difficulties in delivering on it, due to fierce local opposition. Moreover, access to capital is much easier for large companies rather than for start-ups and small and medium enterprises that want to enter battery supply chains in Europe.

Among US weaknesses, the Blueprint warns against the lack of harmonization between federal and state policies, the lack of an industrial policy and a national strategy on battery supply chains, insufficient barriers to entry against competitors in the US, high labour costs and environmental policy. In this regard, the EU shares the issue of policy fragmentation, as the presence of diverse mining laws in Member States suggests. It also traditionally presents higher labour costs compared to other leading markets, such as in the Asia Pacific, and very stringent ESG standards, which, in the case of the proposal to classify lithium and its compounds as toxic, do challenge European ambitions to build a domestic EV battery supply chain.

Nevertheless, both the US and the EU intend to seize the opportunities coming from a localization of key battery manufacturing stages, namely economic growth, employment, growth of their respective automotive sectors, and a vibrant domestic EV battery market following the expectations on demand growth. But to do so, they should develop tools to defend themselves against threats over which they might not have direct control. Some of these latter could be dumping from international

[467] Ibidem; A. Fisher, (23.09.2022), "Battery manufacturing ramps up in the U.S.", *pv magazine*, https://www.pv-magazine.com/2022/09/23/battery-manufacturing-ramps-up-in-the-u-s/.
[468] Ibidem.
[469] K. Fehrenbacher, (31.10.2022), "Made in America: A lithium supply chain for EV batteries".
[470] Federal Consortium for Advanced Batteries, (2021), "Executive Summary. National Blueprint for Lithium Batteries 2021-2030", p. 16.

competitors, especially Asian ones, and supply disruptions, if, for example, commissioned production capacity increases were not to be brought to fruition in time, failing to serve a fast-growing demand and putting pressure on the entire supply chain. Other threats may have to do with price hikes and shortage of domestic cells production facilities.

On a concluding note, the European Union and the United States present various similarities as for the characteristics of their current EV battery manufacturing industry, from their current almost negligible production capacity compared to China to fragmentation on the policy level. The way in which they will deal with their differences, and, above all, their gaps will determine their competitiveness on a global scale. Nevertheless, a more collaborative approach rather than a strictly competitive one would certainly produce more mutual benefits, which is why initiatives like the partnership between the Li-Bridge Alliance and the European Battery Alliance are key to steer coordination in their efforts to make advances in R&I and to progressively influence other states to apply more stringent ESG standards, so as to raise awareness around the ecological and social impact of the green transition and to possibily require it to be fairer.

CONCLUSIONS

Based on the structural changes that the recent energy crisis has propelled in Europe, causing a reorientation of EU's policy priorities in the energy field, the general goal of this thesis was to understand, in a comparative way, how green markets/policies and fossil fuels ones are interplaying with each other, contributing to reshape the concepts of energy security and energy diplomacy. Such a comparative perspective appears to have been indeed understudied so far in the European literature on the topic, especially when it comes to analyse the repercussions on energy diplomacy, given the still embryonic status of this latter in the EU. Thus, the increased politicization of energy security and diplomacy emerged over the last two years has been viewed hereby as an opportunity to shed light on underling interactions and dynamics key to understand the prospects of EU's green transition in the medium-term, with particular regard to clean mobility. This thematic focus derives from the fact that the mobility sector is exemplary of the transition from the use of fossil fuel energy sources to the use of renewable sources, in light of its still high contribution to GHGs emissions. In this regard, the impulse to electrification is significant in Europe, the impact of which has been highlighted through the concepts of raw materials security and diplomacy.

The thesis has first provided general knowledge on the concepts of energy security and energy diplomacy to then advance the discussion around their European declination, which has highlighted some key aspects and/or gaps to be filled, besides recent evolutions. The focus on conventional energy sources has indeed provided insights into some "lessons for the future", in order to enhance the adoption of more balanced and efficient measures to secure supplies of energy sources (also raw materials) and to pave the way for more resilient strategic partnerships, that will help build a solid transition pathway. Such lessons have been interpreted in a comparative way, by analysing the current legislation, strategies and positioning of the EU concerning CRMs, in the attempt to assess common challenges and opportunities. In this regard, the discussion has been focused on examining the entire EV battery supply and value chains to establish where the EU should push for more market penetration, according to its current policy priorities and efforts, and international coordination, also in comparison to the case of US lithium industry. Attention has been given above all to the lithium extractive and refinement stages, through which it has been possible to throw some light on the most controversial issues concerning a "green" transition based on electrification, and, building on this, describing EU's civil society's sceptic response in Europe.

Contrarily to what expected at the beginning, it has emerged that both energy security and energy diplomacy are blurred concepts, in which many aspects have become embedded over time, especially under the impulse of prolific environmental and climate agendas. Yet, the conflicting nature of energy and climate/environmental priorities have turned energy security into a progressively vague and controversial term, which appears to not being able to deliver on its promises, at least at the European level. Of course, this has been determined only in part by the semantic confusion, instead other deeper causes have been highlighted, such as policy fragmentation, Member States' reluctance to further deepen the integration process, policymaking short-sightedness in the adoption of a market-based approach to energy markets and the prevalence of demand-control measures over supply-side ones. Current market turbulence has prompted some changes, especially in the energy diplomacy domain, which has assumed a more strategic approach, embodied by the EU Joint Action Plan REPowerEU and by the joint communication on "EU external energy engagement in a changing world". Still, efficient energy security measures appear to have been taken only belatedly, as a consequence of skyrocketing natural gas prices and diffused anxiety over the restock of gas reserves amid the Russian war in Ukraine, thus highlighting the still insufficient timeliness of response and resilience of EU's energy security mechanisms vis-à-vis energy crises.

In light of these considerations, it appears urgent to envision long-term corrective actions to make the liberal approach to energy markets more resilient to shocks and more flexible in the way it responds to these latter. Such approach was initially deemed necessary to enhance greater transparency and efficiency in the domestic energy market, but it outreached these goals, contributing to make Europe more vulnerable to external variables. Yet, promoting more stability in European markets means increasing Europe's capacity to respond to global energy market dynamics and to attract more investments. To do so, one of the main challenges to tackle is policy fragmentation, an obstacle that has been inevitably delaying the creation of a common European energy diplomacy, which instead entails more integration among Member States rather than closure to reinforce collaboration both domestically and internationally. The relative unity showed by EU Member States last year to tackle rising energy prices and supply constraints can be regarded as a positive change, that should be kept and reinforced when the crisis will be ended, because resilience is better consolidated in times of quietness rather than during market turbulence.

These findings have been then instrumental to further explore the meaning and implications of raw materials security and diplomacy for the EU. It was found that there are more similarities than differences in the consequences that they could have if not managed well, as it was the case of fossil fuels. Cleantech, especially EV batteries and related CRMs, appears to present a considerable geographic concentration both in terms of mining sites and production facilities. There is an evident Chinese market dominance, against which the EU and the US have been moving belatedly. Actions in this context are above all oriented to regain global competitiveness, increase market penetration, invest in groundbreaking R&I projects and enhance sustainability and transparency along value chains. Nevertheless, both the EU and the US appear to lag far behind China, with but a few initiatives that actually promote coordination rather than competition between them. For this reason, collaborative approaches should be better enhanced, in a way that it could potentially serve energy/mineral security needs and competitiveness goals simultaneously. More concretely, they represent an interesting opportunity to develop joint R&I initiatives and to channel common standards of production and best practices to be spread around the world, in contrast to the notoriously much less environmentally friendly and ethical practices in China.

Alongside the need to promote more collaborative external relations, there is also the need for the EU to repurpose existing external relations that have been so far based on fossil fuels imports, particularly in the case of its neighbouring countries. The focus will have to gradually shift towards the development of renewable energy sources and other cleantech, for which the potential is high, so that not only such a structural change will be guided, possibly keeping under control major disruptions, but also, more sustainable and forward-looking relations will be built. In these terms, energy and raw materials diplomacy are going to be increasingly intertwined with broader development goals, international cooperation issues, capacity building, and industrial strategies. In this way, such relations could further enhance the much-needed flexibility in terms of security of supplies.

On the domestic side, the EU has been indeed launching diverse initiatives to increase its market penetration in EV batteries and CRMs supply chains, particularly in relation to R&I funding programmes, projects and related public-private partnerships. It emerged that policymaking and coordination in this case happens following a multi-stakeholder approach, that is including all relevant stakeholders in the discussion and decisions around the topic, an approach that aims to build engagement, create opportunities for co-creation of more efficient governance systems and improve transparency. Yet, while these efforts have been reinforced recently, meaning that a more strategic perspective is being adopted, they are still negligible. As concerns Europe's lithium extraction capacity, it is interesting to note that currently the lithium mined in Europe is completely used in the glass and ceramic industry; thus, if the EU wants to achieve its goal of open strategic autonomy its lithium market structure will inevitably have to undergo major changes, to divert part of that lithium to the battery industry. As concerns R&I, it appears that focus should be made more on scalability and accessibility than on the development of innovative solutions that are inevitably going to be a niche product. Furthermore, a pivotal subsector in which Europe can aim to gain market shares, if sufficient co-funding is made available to the cause, is recycling and re-use of minerals, which are currently underdeveloped. Their potential should be better untapped in the places where batteries are consumed and disposed of, which places Europe at the forefront behind Asia.

Still besides industrial competitiveness issues, there is another major challenge that the EU needs to tackle. Domestic scepticism on mining is but the greatest obstacle for the EU to deliver on its priority to diversify suppliers by expanding domestic sourcing as well. Protests and conflicting relations with mining industries convey a different image on the acceptance of a transition that is based on electrification and on the related repurposing of mining operations. Currently, these latter take place above all in outer fragile ecosystems that are paying the highest price. A transition that is based only on outer sourced minerals cannot be deemed solid and future-proof, especially if it disregards the socio-environmental impacts it produces there, because it would be betraying its own purposes.

The dominant narrative on the transition to clean mobility through electrification is in fact more focused on describing its advantages in terms of lower GHGs emissions than giving sufficient coverage of its actual environmental impacts. The affirmation reported in the European Green Deal according to which it aims to decouple economic growth from resource use is controversial and does not adhere to what reality suggests. The gradual phase-out from fossil fuels and the simultaneous expansion of mining activities suggest indeed the exact opposite. There are marginal but still important sceptical voices that criticize such transition for keeping the exact business as usual model, under the assumption that clean energy technologies have *at least* a lower impact on climate than fossil fuels do. Interestingly, the EU appears to have entered the transition race to clean mobility with a preferential attention to supply-security issues rather than demand-control policies, as opposed to what happened in the early 2000s with fossil fuels, when the focus was mainly on energy efficiency. This is not conveying the right messages to consumers, who should instead be more empowered and better informed when buying EVs or other clean technologies. They should have a better knowledge on the mineral intensity in their cars, portable electronics, etc, otherwise the transition, as it has been envisioned so far, could be interpreted, not without reason, as a green-washed resemantization of business as usual.

The findings to which this thesis has come intend to highlight the challenges and the opportunities that the EU will find itself dealing with in the medium term. The evolution of the concepts of energy security and diplomacy demonstrates the cross-sectoral and multi-level nature of these concepts, which are inherently intertwined with a vast range of variables and issues and will be even more so with the transition to cleantech for the reasons explained before. What is important to note that, in order to be resilient, the impulse to electrification and relevant R&I initiatives and international collaborations should be based on the principle of technological neutrality, that is policies should not be focused only on one innovative solution but should keep their doors open to other innovations too, so as to not create distortions, enhance scale-up and accessibility, and promote higher flexibility. This should be ultimately accompanied by actual efforts to design cleantech production processes on the basis of circular business models, without which any transition would fail at least in principle.

Certainly, the topics discussed in this thesis and the comparative approach used to deal with them have left many open questions, for the interdisciplinary nature of even the sole concepts of energy security and diplomacy. The interaction of these latter with the dynamics describing clean mobility is just one of the possible research paths that a comparative approach can offer in this context. There are many other understudied aspects of the transition that the future for this research area can be only bright. But, as far as this thesis is concerned, other possible aspects to deepen the abovementioned findings have to do with water use and rights along the whole EV batteries supply chain, not only in relation to mining. Such further insight could be extremely interesting if focused on the European territory and coupled with the problem of heatwaves and climate change-driven droughts, which for the proximity of mining pits or industrial refining facilities to watercourses and residential settlements could potentially represent a major problem and possible cause of conflicts on water resources.

On a conclusive note, this thesis and its findings have shed light on the need to consider more broadly all environmental impacts, not only those that are strictly connected to climate change, and that for the visibility of the issue at the international level tend to dominate the discourse nowadays. It is crucial to have an open mind and a critical eye when it comes to assess the potential of innovative solutions, because what can actually solve one problem might leave others behind, which maybe are not perceived by the whole population, but still affect the planet and local populations. The transition is not expected to be neither smooth nor flawless, like any other time of great changes. But it is in time of great changes that innovative perspectives make the difference, and in this case a broader "circular" take could be the actual game-changer.

REFERENCES

PRIMARY SOURCES

Albemarle, *Albemarle breaks ground to mark the start of construction of new lithium conversion facility*, [date not available], https://www.albemarle.com/blog/albemarle-breaks-ground-in-china-to-support-the-expansion-of-lithium-conversion-capacity.

Albemarle, *Albemarle establishes battery materials Innovation Center in North Carolina*, 30.06.2021, https://www.albemarle.com/news/albemarle-establishes-battery-materials-innovation-center-in-north-carolina#:~:text=CHAR-LOTTE%2C%20N.C.%20%2C%20June%2030%2C,Mountain%2C%20North%20Caro-lina%20%2C%20site.

Birol Fatih, *Europe and the world need to draw the right lessons from today's natural gas crisis*, 13.01.2022, Paris, International Energy Agency, https://www.iea.org/commentaries/europe-and-the-world-need-to-draw-the-right-lessons-from-today-s-natural-gas-crisis.

Clean Air Task Force, *The Inflation Reduction Act of 2022: What it is, what it means, and how it came to pass*, 25.08.2022, https://www.catf.us/2022/08/inflation-reduction-act-what-it-is-what-it-means-how-it-came-to-pass/.

Commissione Europea, *Per una politica energetica dell'Unione Europea*, COM (94) 659 def., 11.01.1998, EUR-Lex, https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CE-LEX%3A51994DC0659.

Council of the European Union, *Council and Parliament strike provisional deal to create a sustainable life cycle for batteries*, 09.12.2022, https://www.consilium.europa.eu/en/press/press-releases/2022/12/09/council-and-parliament-strike-provisional-deal-to-create-a-sustainable-life-cycle-for-batteries/.

Council of the European Union, *Council conclusions on Climate and Energy Diplomacy – Delivering on the external dimension of the European Green Deal*, 25.01.2021, 5263/21, https://www.consilium.europa.eu/media/48057/st05263-en21.pdf.

Council of the European Union, *Statement by President Michel at the G7 summit side event on Partnership for global infrastructure and investment*, 26.06.2022, https://www.consilium.europa.eu/it/press/press-releases/2022/06/26/remarks-by-president-g7-summit-side-event-on-partnership-for-global-infrastructure-and-investment/.

Cui H, Hall D, *Annual update on the global transition to electric vehicles: 2021*, The International Council on Clean Transportation, 29.06.2022, https://theicct.org/publication/global-ev-update-2021-jun22/#:~:text=In%202021%2C%202.3%20million%20EVs,compared%20to%2042%25%20in%202020.

Directorate-General Internal Market, Industry, Entrepreneurship and SMEs, *Critical raw materials*, European Commission, https://single-market-economy.ec.europa.eu/sectors/raw-materials/areas-specific-interest/critical-raw-materials_en.

Directorate-General Internal Market, Industry, Entrepreneurship and SMEs, *European Commission and U.S. Department of Energy support collaboration between the European Battery Alliance and U.S. Li-Bridge Alliance to strengthen supply chain*, 14.03.2022, https://single-market-economy.ec.europa.eu/news/european-commission-and-us-department-energy-support-collaboration-between-european-battery-alliance-2022-03-14_en.

Directorate-General for Internal Market, Industry, Entrepreneurship and SMEs, *Report on Critical Raw Materials and the Circular Economy*, Publications Office, 05.11.2018, https://data.europa.eu/doi/10.2873/167813.

Directorate-General for Internal Market, Industry, Entrepreneurship and SMEs, *Study on the EU's list of critical raw materials (2020): final report*, Publications Office, 2020, https://data.europa.eu/doi/10.2873/11619.

Directorate-General for Trade, *Agreement in principle reached on Modernised Energy Charter Treaty*, European Commission, 24.06.2022, https://policy.trade.ec.europa.eu/news/agreement-principle-reached-modernised-energy-charter-treaty-2022-06-24_en.

Directorate-General GROW, Joint Research Centre, *Study on the EU's list of Critical Raw Materials (2020), Factsheets on Critical Raw Materials*, September 2020, https://single-market-economy.ec.europa.eu/sectors/raw-materials/areas-specific-interest/critical-raw-materials_en.

European Union, *Treaty establishing the European Community (Amsterdam consolidated version)*, 10.11.1997, Document 11997E, *Official Journal C 340, 10/11/1997 P. 0173 – 0306*.

European Commission, *A European Strategy for low-emission mobility*, 20.07.2016, https://ec.europa.eu/commission/presscorner/detail/et/MEMO_16_2497.

European Commission, *A framework Strategy for a Resilient Energy Union with a Forward-Looking Climate Change Policy*, 25.02.2015, COM(2015) 80 final, EUR-Lex, https://eur-lex.europa.eu/resource.html?uri=cellar:1bd46c90-bdd4-11e4-bbe1-01aa75ed71a1.0001.03/DOC_1&format=PDF.

European Commission, *A new Circular Economy Action Plan. For a cleaner and more competitive Europe*, 11.03.2020, COM(2020) 98 final, EUR-Lex, https://eur-lex.europa.eu/legal-content/EN/TXT/?qid=1583933814386&uri=COM:2020:98:FIN.

European Commission, *A New Industrial Strategy for Europe*, 10.03.2020, COM(2020) 102 final, EUR-Lex, https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A52020DC0102.

European Commission, *Annex 2 – Strategic Action Plan on Batteries. EUROPE ON THE MOVE. Sustainable Mobility for Europe: safe, connected and clean*, 17.05.2018, COM(2018) 293 final Annex 2, EUR-Lex, https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A52018DC0293&qid=1665146521178.

European Commission, *Annex to The European Green Deal*, 11.12.2019, COM(2019) 640 final ANNEX, EUR-Lex, https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=COM%3A2019%3A640%3AFIN.

European Commission, *Critical Raw Materials Resilience: Charting a Path towards greater Security and Sustainability*, 3.09.2020, COM(2020) 474 final, DocsRoom – European Commission, https://ec.europa.eu/docsroom/documents/42849.

European Commission, *Digital in the EU-US Trade and Technology Council*, Policies, https://digital-strategy.ec.europa.eu/en/policies/trade-and-technology-council.

European Commission, *Energy 2020. A strategy for competitive, sustainable and secure energy*, 10.11.2010, COM(2010) 639 final, EUR-Lex, https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex%3A52010DC0639.

European Commission, *Energy Union Package*, 25.01.2015, COM(2015) 80 final, EUR-Lex, https://eur-lex.europa.eu/resource.html?uri=cellar:1bd46c90-bdd4-11e4-bbe1-01aa75ed71a1.0018.01/DOC_1&format=PDF.

European Commission, *EU Energy Platform*, Energy Security, https://energy.ec.europa.eu/topics/energy-security/eu-energy-platform_en.

European Commission, *European Innovation Partnerships (EIPs)*, Strategy on research and innovation, https://research-and-innovation.ec.europa.eu/strategy/past-research-and-innovation-policy-goals/open-innovation-resources/european-innovation-partnerships-eips_en#:~:text=Existing%20EIPs-,What%20are%20European%20Innovation%20Partnerships%20(EIPs)%3F,society%2C%20modernise%20sectors%20and%20markets.

European Commission, *EU Taxonomy for sustainable activities*, Sustainable Finance, https://finance.ec.europa.eu/sustainable-finance/tools-and-standards/eu-taxonomy-sustainable-activities_en.

European Commission, *Factsheet – Global Europe: Neighbourhood, Development and International Cooperation Instrument*, Funding instruments, https://international-partnerships.ec.europa.eu/funding/funding-instruments/global-europe-neighbourhood-development-and-international-cooperation-instrument_en.

European Commission, *Green Paper. A 2030 framework for climate and energy policies*, 27.03.2013, COM(2013) 169 final, EUR-Lex, https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A52013DC0169&qid=1488204560202.

European Commission, *Green Paper. For a European Union Energy Policy*, 11.01.1995, COM(94) 659 final, EUR-Lex, https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A51994DC0659&qid=1488204560202.

European Commission, *Green Paper. Towards a European strategy for the security of energy supply*, 29.11.2000, COM(2000) 769 final, EUR-Lex, https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A52000DC0769&qid=1488204560202.

European Commission, *Green Paper. Towards a secure, sustainable and competitive European energy network*, 13.11.2008, COM(2008) 782 final, EUR-Lex, https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52008DC0782&qid=1488204560202&from=EN.

European Commission, *Impact Assessment*, [accompanying the relative communication on "Stepping up Europe's 2030 climate ambition], 17.09.2020, SWD(2020) 176 final, EUR-Lex, https://eur-lex.europa.eu/resource.html?uri=cellar:749e04bb-f8c5-11ea-991b-01aa75ed71a1.0001.02/DOC_2&format=PDF.

European Commission, *In focus: Reducing the EU's dependence on imported fossil fuels*, 20.04.2022, https://ec.europa.eu/info/news/focus-reducing-eus-dependence-imported-fossil-fuels-2022-apr-20_en.

European Commission, *Questions and Answers on the Hydrogen and Decarbonised Gas Package*, 15.12.2021, https://ec.europa.eu/commission/presscorner/detail/en/QANDA_21_6685.

European Commission, *REPowerEU: Joint European action for more affordable, secure and sustainable energy*, 8.03.2022, https://ec.europa.eu/commission/presscorner/detail/en/ip_22_1511.

European Commission, *REPowerEU: Joint European Action for more affordable, secure and sustainable energy*, 08.03.2022, COM(20229 108 final, EUR-Lex, https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52022DC0108&from=EN.

European Commission, *State aid: Commission adopts revised State aid rules on Important Projects of Common European Interest*, 25.11.2021, https://ec.europa.eu/commission/presscorner/detail/en/IP_21_6245.

European Commission, *State aid: Commission approves €2.9 billion public support by twelve Member States for a second pan-European research and innovation project along the entire battery value chain*, 26.01.2021, https://ec.europa.eu/commission/presscorner/detail/en/IP_21_226.

European Commission, *State aid: Commission approves €3.2 billion public support* by seven Member *States for a pan-European research and innovation project in all segments of the battery value chain*, 9.12.2019, https://ec.europa.eu/commission/presscorner/detail/en/ip_19_6705.

European Commission, *Strategia europea di sicurezza energetica*, 28.05.2014, COM(2014) 330 final, EUR-Lex, https://eur-lex.europa.eu/legal-content/IT/TXT/PDF/?uri=CELEX:52014DC0330&from=SK.

European Commission, *Sustainable and Smart mobility Strategy – putting European transport on track for the future*, 09.12.2020, COM(2020) 789 final, EUR-Lex, https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A52020DC0789.

European Commission, *Tabella di marcia per l'energia 2050*, 15.12.2011, COM(2011) 885 definitivo, EUR-Lex, https://eur-lex.europa.eu/legal-content/IT/TXT/PDF/?uri=CELEX:52011DC0885&from=EN.

European Commission, *The EU Global Technical Assistance Facility for Sustainable Energy (EU GTAF)*, International Partnerships, https://international-partnerships.ec.europa.eu/policies/programming/projects/eu-global-technical-assistance-facility-sustainable-energy-eu-gtaf_en.

European Commission, *The European Green Deal*, 11.12.2019, COM(2019) 640 final, EUR-Lex, https://eur-lex.europa.eu/resource.html?uri=cellar:b828d165-1c22-11ea-8c1f-01aa75ed71a1.0002.02/DOC_1&format=PDF.

European Commission, *The raw materials initiative – meeting our critical needs for our growth and jobs in Europe*, 4.11.2008, COM(2008) 699 final, EUR-Lex, https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52008DC0699.

European Commission and High Representative of the Union for Foreign Affairs and Security Policy, *EU external energy engagement in a changing world*, 18.05.2022, JOIN(2022) 23 final, EUR-Lex, https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=JOIN%3A2022%3A23%3AFIN&qid=1653033264976.

Eurostat, *Energy Statistics – an overview*, February 2022, https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Energy_statistics_-_an_overview#Primary_energy_production.

Eurostat, *Where does our energy come from?*, [date not available], https://ec.europa.eu/eurostat/cache/infographs/energy/bloc-2a.html?lang=en.

Federal Consortium for Advanced Batteries, *Executive Summary. National Blueprint for Lithium Batteries 2021-2030*, June 2021, https://www.energy.gov/eere/vehicles/articles/national-blueprint-lithium-batteries.

International Energy Agency, *Electric vehicle share of vehicle sales by mode and scenario in Europe, 2030*, Paris, International Energy Agency, 2022, https://www.iea.org/data-and-statistics/charts/electric-vehicle-share-of-vehicle-sales-by-mode-and-scenario-in-europe-2030.

International Energy Agency, *Gas Market Report, Q1-2022*, IEA Publications, January 2022, https://iea.blob.core.windows.net/assets/4298ac47-e19d-4ab0-a8b6-d8652446ddd9/GasMarketReport-Q12022.pdf.

International Energy Agency, *Global Energy Review 2021*, Paris, International Energy Agency, April 2021 https://www.iea.org/reports/global-energy-review-2021.

International Energy Agency, *Global EV Outlook 2022. Securing supplies for an electric future*, IEA Publications, May 2022, https://www.iea.org/reports/global-ev-outlook-2022.

International Energy Agency, *World Energy Outlook 2022*, IEA Publications, October 2022, https://www.iea.org/reports/world-energy-outlook-2022.

International Labour Organization, *C169 – Indigenous and Tribal Peoples Convention*, 1989, https://www.ilo.org/dyn/normlex/en/f?p=NORMLEXPUB:12100:0::NO::P12100_INSTRUMENT_ID:312314.

Jaskula Brian W., *Mineral Commodity Summaries – Lithium*, National Minerals Information Center, United States Geological Survey (USGS), January 2022, https://www.usgs.gov/centers/national-minerals-information-center/lithium-statistics-and-information.

Ministerio de Minería, *Decreto Ley 2886*, 14.11.1979, Biblioteca del Congreso Nacional de Chile, https://www.bcn.cl/leychile/navegar?idNorma=7029&idVersion=1979-11-14.

Ministerio de Minería, *Ley 18248 Código de Minería*, 14.10.1983, Biblioteca del Congreso Nacional de Chile, https://www.bcn.cl/leychile/navegar?idNorma=29668&idParte=.

The White House, *FACT SHEET: President Biden' Plan to Respond to Putin's Price Hike at the Pump*, 31.03.2022, https://www.whitehouse.gov/briefing-room/statements-releases/2022/03/31/fact-sheet-president-bidens-plan-to-respond-to-putins-price-hike-at-the-pump/?utm_campaign=Press%2FMedia%20Outreach&utm_medium=email&_hsmi=208653202&_hsenc=p2ANqtz-_Q0ffmJOHAWL-D7Z5LZ4VFTUukayztJICXlTevL7e6II-icdY2-T-kjPVquu2pH3CCyJyxMsJ53deXsGO8Xs6ApKqCHkLboVha6umJvzJ2zQZfxe0&utm_content=208653202&utm_source=hs_email.

The White House, *FACT SHEET: Biden – Harris Administration Driving U.S. Battery Manufacturing and Good-Paying Jobs*, 19.10.2022, https://www.whitehouse.gov/briefing-room/statements-releases/2022/10/19/fact-sheet-biden-harris-administration-driving-u-s-battery-manufacturing-and-good-paying-jobs/.

U.S. Department of Energy, *DOE and European Commission Support Collaboration Between the U.S. Li-Bridge Alliance and European Battery Alliance to Strengthen Supply Chain for Battery Technologies*, 15.03.2022, https://www.energy.gov/articles/doe-and-european-commission-support-collaboration-between-us-li-bridge-alliance-and.

World Bank, *A Shock Like No Other: The Impact of Covid-19 on Commodity Markets*, Special Focus, Commodity Markets Outlook, Washington, April 2020, https://thedocs.worldbank.org/en/doc/558261587395154178-0050022020/original/CMOApril2020SpecialFocus1.pdf.

Monographies

Adelle Camilla, Biedenkopf Katja and Diarmuid Torney, *European Union External Environmental Policy. Rules, Regulation and Governance Beyond Borders*, Cham, Palgrave Macmillan Cham, 2018.

Emergen Research, *Lithium Mining Market. Market Synopsis*, September 2022, https://www.emergenresearch.com/industry-report/lithium-mining-market.

Gili Alessandro, Belladonna Alberto, *The great game of gas: geopolitics & new technologies*, Istituto per gli Studi di Politica Internazionale, 2020, https://www.ispionline.it/sites/default/files/pubblicazioni/ispi_dossier_gas_5_0.pdf.

Grand View Research, *Lithium market size, share & trends analysis report*, 2022, https://www.grandviewresearch.com/industry-analysis/lithium-market.

International Energy Agency, *The role of Critical Minerals in Clean Energy Transitions*, International Energy Agency, May 2021, https://www.iea.org/reports/the-role-of-critical-minerals-in-clean-energy-transitions.

Lazard Olivia, Youngs Richard, *The EU and Climate Security: Toward Ecological Diplomacy*, Carnegie Europe and Open Society European Policy Institute, 2021, https://carnegieeurope.eu/2021/07/12/eu-and-climate-security-toward-ecological-diplomacy-pub-84873.

Maugeri Leonardo, *L'era del petrolio. Mitologia, storia e future della più controversa risorsa del mondo*, Milano, Feltrinelli, 2006.

Mordor Intelligence, *Lithium market – growth, trends, covid-19 impact, and forecasts (2022-2027)*, 2022, https://www.mordorintelligence.com/industry-reports/lithium-market.

Oberthür Sebastian, Tänzler Dennis, Wright Emily and Khandekar Gauri, *European Foreign Policy in a Decarbonising World*, London, Routledge, 2022.

Observatorio Plurinacional de Salares Andinos, *Salares Andinos. Ecología de Saberes por la Protección de Nuestros Salares y Humedales*, 2021, https://cl.boell.org/es/2020/12/18/salares-andinos-ecologia-de-saberes-por-la-proteccion-de-nuestros-salares-y-humedales.

Sovacool Benjamin K., *The Routledge Handbook of Energy Security*, New York, Routledge, 2011.

The CORE team, *The Economy*, 2017, [online], https://www.core-econ.org/the-economy/book/text/12.html#eb-7.

World Bank, *Commodity Markets Outlook. Urbanization and Commodity Demand*, Washington, October 2021, https://openknowledge.worldbank.org/bitstream/handle/10986/36350/CMO-October-2021.pdf.

ESSAYS AND JOURNAL ARTICLES

Amighini Alessia, "Belt and Road: 2020, l'anno della svolta", *Istituto per gli Studi di Politica Internazionale*, 30.09.2020, https://www.ispionline.it/it/pubblicazione/belt-and-road-2020-lanno-della-svolta-27622.

Azevedo Marcelo, Campagnol Nicolò, Hagenbruch Toralf, Hoffman Ken, Lala Ajay, Ramsbottom Oliver, "Lithium and cobalt – a tale of two commodities", *McKinsey & Company*, 22.06.2018, pp. 1-20, https://www.mckinsey.com/industries/metals-and-mining/our-insights/lithium-and-cobalt-a-tale-of-two-commodities.

Babidge Sally, "Contested value and an ethics of resources: Water, mining and indigenous people in the Atacama Desert, Chile", *The Australian Journal of Anthropology*, vol. 27, no. 1, 2015, pp. 84-103.

Barteková Eva, Kemp Rene, "Critical raw material strategies in different world regions", *MERIT Working Papers*, *United Nations University – Maastricht Economic and Social Research Institute on Innovation and Technology*, 2016, pp. 1-52, https://ideas.repec.org/p/unm/unumer/2016005.html.

Bennis Amine, "North Africa's Energy Transition: A Kew Asset in the War?", *Istituto per gli Studi di Politica Internazionale*, 4.04.2022, https://www.ispionline.it/it/pubblicazione/north-africas-energy-transition-key-asset-war-32916.

Berg Ryan C., Sady-Kennedy Andrew T., "South America's Lithium Triangle: Opportunities for the Biden Administration", *Centre for Strategic and International Studies*, 17.08.2021, https://www.csis.org/analysis/south-americas-lithium-triangle-opportunities-biden-administration#:~:text=Policy%20Recommendations%20for%20the%20Biden%20Administration&text=Internationally%2C%20strong%20public%2Dprivate%20partnerships,global%20scale%20reduce%20carbon%20emissions.

Boer Lukas, Valckx Nico, Pescatori Andrea, Stuermer Martin, "Metals may become the new oil in net-zero emissions scenario", *VOXEU Centre for Economic Policy Review*, 05.11.2021, https://cepr.org/voxeu/columns/metals-may-become-new-oil-net-zero-emissions-scenario.

Bordoff Jason, "Why this energy crisis is different", *Foreign Policy*, 24.9.2021, https://foreignpolicy.com/2021/09/24/energy-crisis-europe-gas-coal-renewable-prices-climate/#.

Bordoff Jason, O'Sullivan Meghan L., "Green Upheaval. The New Geopolitics of Energy", *Foreign Affairs*, January-February 2022, https://www.foreignaffairs.com/articles/world/2021-11-30/geopolitics-energy-green-upheaval.

Bovan Ana, Vučenović, Perić Nenad, “Negotiating Energy Diplomacy and its Relationship with Foreign Policy and National Security”, *International Journal of Energy Economics and Policy*, 2020, vol. 10, no. 2, p. 1-6, https://www.econjournals.com/index.php/ijeep/article/view/8754.

Buyung Agusdinata Datu, Liu Wenjuan, Eakin Hallie, Romero Hugo, “Socio-environmental impacts of lithium mineral extraction: towards a research agenda”, *Environmental Research Letters*, n. 13, 2018, pp. 1-14.

Česnakas Giedrius, “Energy resources in foreign policy: a theoretical approach”, *Baltic Journal of Law & Politics*, 2010, vol. 3, no. 1, pp. 30-52.

Chaban Natalia, Knodt Michèle, “Energy diplomacy in the context of multistakeholder diplomacy: the EU and BICS”, *Cooperation and Conflict*, vol. 50, no. 4, pp. 457-474.

Crowson Phillip, “The European mining industry: What future?”, *Resource Policy*, vol. 22, no. 1 / 2, 1996, pp. 99-105.

Drobe Malte, “Lithium - Sustainability Information”, *Bundesanstalt für Geowissenschaften und Rohstoffe*, July 2020, pp. 1-13, https://www.bgr.bund.de/EN/Gemeinsames/Produkte/Downloads/Informationen_Nachhaltigkeit/lithium_en.html.

Ebensperger Arlene, Maxwell Philip, Moscoso Christian, “The lithium industry: Its recent evolution and future prospects”, *Resources Policy*, vol. 30, no. 3, September 2005, pp. 218-231.

Enerdata, The French Institute for International and Strategic Affairs (IRIS), Cassini, “The European Battery Alliance”, 1.06.2021, pp. 1-7 https://www.enerdata.net/publications/executive-briefing/global-battery-market-outlook.html.

Giglio Elena, “Extractivism and its socio-environmental impact in South America. Overview of the ‘lithium triangle’”, *América Crítica*, vol. 5, no. 1, 2021, pp. 47-53.

Gilbert Alex, Bazilian Morgan D., Gross Samantha, “The emerging global natural gas market and the energy crisis of 2021-2022”, *Brookings*, December 2021, https://www.brookings.edu/research/the-emerging-global-natural-gas-market-and-the-energy-crisis-of-2021-2022/.

Gili Alessandro, “La crisi europea: cosa ci aspetta?”, *Istituto per gli Studi di Politica Internazionale*, 14.01.2022, https://www.ispionline.it/it/pubblicazione/la-crisi-europea-cosa-ci-aspetta-32865.

Goldthau Andreas, Sitter Nick, “A liberal actor in a realist world”, *Journal of European Public Policy*, 2014, vol. 21, no. 10, pp. 1452-1472.

Goldthau Andreas, “Energy Diplomacy in Trade and Investment of Oil and Gas” in Goldthau A. and Witte J.M. (ed.), *Global Energy Governance. The new rules of the game*, Washington, Brookings Press, 2010, pp. 25-48.

Herranz-Surrallés Anna, “An emerging EU energy diplomacy? Discursive shifts, enduring practices”, *Journal of European Public Policy*, 2015, vol. 23, no. 9, pp. 1386-1405,.

Herranz-Surrallés Anna, “European External Energy Policy: Governance, Diplomacy and Sustainability”, in A.K. Aarstad et al. (ed.), *Sage Handbook of European Foreign Policy*, London, Sage, 2015, vol 2, pp. 913-927.

Kaunda Rennie B., “Potential environmental impacts of lithium mining”, *Journal of Energy & Natural Resources Law*, vol. 38, 2020, pp. 237-244.

Labbate Silvio, “Energia e Mediterraneo: le iniziative italiane nel secondo dopoguerra (1945-1979)”, *Storia e problemi contemporanei*, no.73, 2016, pp. 25-41.

Leonard Mark, Pisani-Ferry Jean, Shapiro Jeremy, Tagliapietra Simone, and Wolff Guntram, “The geopolitics of the European Green Deal”, *European Council on Foreign Relations*, February 2021, pp. 1-33, https://ecfr.eu/publication/the-geopolitics-of-the-european-green-deal/.

Lin Max Tingyao, “Energy Charter Treaty “modernized” to reflect low-carbon transition needs after two years of talks”, *IHS Markit*, 30.06.2022, https://cleanenergynews.ihsmarkit.com/research-analysis/energy-charter-treaty-modernized-to-reflect-lowcarbon-transiti.html.

Mathieu Carole, “The EU Battery Alliance. Can Europe Avoid Technological Dependence?”, *Institut français des relations internationales*, 20.02.2018, pp. 1-10, https://www.ifri.org/sites/default/files/atoms/files/mathieu_eu_battery_alliance_2018.pdf.

Mišík Matúš, “The EU needs to improve its external energy security”, *Energy Policy*, 2022, vol. 165, pp. 1-5.

Nakhle Carole, “Russia’s energy diplomacy in the Middle East, in N. Popescu and S. Secrieru (ed.), *RUSSIA’S RETURN IN THE MIDDLE EAST: BUILDING SANDCASTLES?*, Paris, European Union Institute for Security Studies, 2018, pp. 29-36.

Niestadt M, Bjørnåvold A, “Electric road vehicles in the European Union: Trends, impacts and policies”, *European Parliamentary Research Service*, April 2019, pp. 1-11, https://www.europarl.europa.eu/thinktank/en/document/EPRS_BRI(2019)637895.

Paron Francesco, "Europe's Dependence on Critical Raw Materials: Implications for the Competitiveness and Independence of Strategic Industries", *Istituto Affari Internazionali*, 2.08.2018, pp. 1-6, https://www.iai.it/en/pubblicazioni/europes-dependence-critical-raw-materials.

Pastukova Maria, Pepe Jacopo Maria, Westphal Kirsten, "Beyond the Green Deal: Upgrading the EU's Energy Diplomacy for a New Era", *Stiftung Wissenschaft und Politik*, June 2020, no. 31, pp. 1-8, https://www.swp-berlin.org/10.18449/2020C31/.

Perotti Remco, Coviello Manlio, "Governance of strategic minerals in Latin America: the case of lithium", *Community of Latin American and Caribbean States*, September 2015, pp. 1-56, https://www.cepal.org/en/publications/38961-governance-strategic-minerals-latin-america-case-lithium.

Petri Franziska, "Revisiting EU Climate and Energy Diplomacy: a starting point for Green Deal Diplomacy", *European Policy Brief*, November 2020, no. 65, pp. 1-9.

Petrini Francesco, ""Jumped on the boat of a territorialist organization": State and capital at the origins of oil imperialism", *Journal of Energy History*, no. 3, 2020, pp. 1-19.

Proskuyakova L. N., "Updating energy security and environmental policy: energy security theories revisited", *Journal of Environmental Management*, no. 223, 2018, p. 203-214.

Quijano Gabriela, "Lithium Might hold the Key to our Clean Energy Future, but Will this Star Metal Fully Deliver on its Green Potential?", *Business and Human Rights Journal*, vol. 5, no.2, July 2020, pp. 276-281.

Reisch Viktoria, "The Race for Raw Materials", *Stiftung Wissenschaft und Politik*, no. 1, 01.06.2022, pp. 1-8, https://www.swp-berlin.org/10.18449/2022JR01/.

Ruiz Guix Pau, "Critical mass: Raw materials, economic coercion, and transatlantic cooperation", *European Council of Foreign Relations*, 17.12.2021, https://ecfr.eu/article/critical-mass-raw-materials-economic-coercion-and-transatlantic-cooperation/.

Sovacool Benjamin K., Kim Jinsoo, Yang Minyoung, "The hidden costs of energy and mobility: A global meta-analysis and research synthesis of electricity and transport externalities", *Energy Research & Social Science*, vol. 72, February 2021, pp. 1-20.

Tagliapietra Simone, Zachmann Georg, "Is Europe's gas and electricity price surge a one-off?", *Bruegel*, 13.09.2021, https://www.bruegel.org/2021/09/is-europes-gas-and-electricity-price-surge-a-one-off/.

Thaler Philipp, Pakalkaite Vija, "How EU external energy policy has become "supranationalised" – and what this means for European integration", *London School of Economics and Political Science*, 30.06.2020, https://blogs.lse.ac.uk/europpblog/2020/06/30/how-eu-external-energy-policy-has-become-supranationalised-and-what-this-means-for-european-integration/.

Toke David, Vezirgiannidou Sevasti-Eleni, "The relationship between climate change and energy security: key issues and conclusions", *Environmental Politics*, vol. 22, n.4, 2013, pp. 537-552.

Umbach Frank, "Critical raw materials: Assessing EU vulnerabilities", *Geopolitical Intelligence Services*, 30.03.2021, https://www.gisreportsonline.com/r/critical-raw-materials/.

Umbach Frank, "Critical Raw Materials for the energy transition: Europe must start mining again", *Energy Post*, 10.01.2022, https://energypost.eu/critical-raw-materials-for-the-energy-transition-europe-must-start-mining-again/.

van Shaik Louise, Ramnath Akash, Cretti Giulia, "Turning EU green diplomacy into reality", *Netherlands Institute of International Relations*, 15.12.2021, pp. 1-9, https://www.clingendael.org/publication/turning-eu-green-energy-diplomacy-reality.

Varvelli Arturo, "Burn time: The case for a new European energy union", *European Council on Foreign Relations*, 21.04.2022, https://ecfr-eu.cdn.ampproject.org/c/s/ecfr.eu/article/burn-time-the-case-for-a-new-european-energy-union/?amp.

Veugelers Reinhilde, Tagliapietra Simone, "How Europe could yet take the lead in the global electric-vehicle development race", *Bruegel*, 9.01.2019, https://www.bruegel.org/blog-post/how-europe-could-yet-take-lead-global-electric-vehicle-development-race.

von Wieringen Kjeld, Álvarez Fernández Marcos, "Securing the EU's supply of critical raw materials", *European Parliamentary Research Service*, July 2022, pp. 1-2, https://www.europarl.europa.eu/thinktank/en/document/EPRS_ATA(2022)733586.

Williams Carl A., "Greener lithium mining: Lithium is crucial for greening transportation and energy networks. Let's make mining greener, too.", *Canadian Mining Journal*, 18.04.2022, https://www.canadianminingjournal.com/featured-article/greener-lithium-mining-lithium-is-crucial-for-greening-transportation-and-energy-networks-lets-make-mining-it-greener-too/.

Wilson Alex, "Impact of coronavirus on energy markets", *European Parliamentary Research Service*, April 2020, pp. 1-2, https://www.europarl.europa.eu/RegData/etudes/ATAG/2020/649372/EPRS_ATA(2020)649372_EN.pdf.

Wilson Alex, “Trans-European energy infrastructure”, *European Parliamentary Research Service*, March 2022, p. 1, https://www.europarl.europa.eu/RegData/etudes/ATAG/2022/729335/EPRS_ATA(2022)729335_EN.pdf.

Winzer Christian, “Conceptualizing energy security”, *Energy Policy*, vol. 46, July 2012, pp. 36-48.

Yu Jianhua, Dai Yichen, “Energy Politics and Security Concepts from Multidimensional Perspectives”, *Journal of Middle Eastern and Islamic Studies (in Asia)*, 2012, vol. 6, no. 4, pp. 91-120.

Zhiznin Stanislav, “Russian energy diplomacy and international energy security (geopolitics and economics)”, *Baltic Region*, 2010, no. 1, pp. 7-17.

NEWSPAPER ARTICLES

Abnett Kate, “EU lawmakers back ban on new fossil-fuel cars from 2035”, *Reuters*, 8.06.2022, https://www.reuters.com/business/autos-transportation/eu-lawmakers-support-effective-ban-new-fossil-fuel-cars-2035-2022-06-08/.

Abrams Kaplan Deborah, “How the US plans to transform its lithium supply chain”, *Utility Dive*, 01.11.2022, https://www.utilitydive.com/news/us-strengthening-lithium-supply-processing-ev-batteries/635338/.

Ainger John, Marsh Alastair, Schwartzkopff Frances, “Big finance and Activists Slam ‘Disappointing’ EU Gas Vote”, *Bloomberg*, 6.06.2022, https://www.bloomberg.com/news/articles/2022-07-06/eu-slammed-over-gas-vote-as-bankers-warn-of-new-greenwash-risks.

Baker R. David, Stapczynski Stephen, Murtaugh Dan, Morison Rachel, “Global energy crisis is the first of many in the clean-power era”, *Bloomberg*, 5.10.2021, https://www.bloomberg.com/news/articles/2021-10-05/global-energy-crisis-is-the-first-of-many-in-the-clean-power-era#:~:text=The%20next%20several%20decades%20could,are%20left%20vulnerable%20to%20shocks.

Baxter Alice, “Bolivian Indigenous People Lose Out On Lithium”, *Human Rights Pulse*, 29.08.2020, https://www.humanrightspulse.com/mastercontentblog/bolivian-indigenous-people-lose-out-on-lithium#:~:text=The%20Bolivian%20government%20has%20been,inhabited%20by%20Indigenous%20Aymara%20people.

Becker Astrid, “La transición energética y la guerra por los recursos del Sur global”, *Nueva Sociedad*, November 2021, https://nuso.org/articulo/transicion-energetica-recursos-sur-global-litio/.

Bhutada Govind, “Charted: Lithium Production by Country (1995-2020)”, *Visual Capitalist*, 09.02.2022, https://www.visualcapitalist.com/sp/charted-lithium-production-by-country-1995-2020/#:~:text=By%20contrast%2C%20the%20U.S.%20produced,lithium%20reserves%20at%20750%2C000%20tonnes.

Boddenberg Sophia, “Chile’s lithium – blessing or curse?”, *Deutsche Welle*, 05.11.2018, https://www.dw.com/en/chiles-lithium-blessing-or-curse/a-43721539.

Boffey Daniel, “Rio Tinto’s past casts a shadow over Serbia’s hopes of a lithium revolution”, *The Guardian*, 19.11.2021, https://www.theguardian.com/global-development/2021/nov/19/rio-tintos-past-casts-a-shadow-over-serbias-hopes-of-a-lithium-revolution.

Bolton Robin, “Lithium mining is booming – here’s how to manage its impact”, *GreenBiz*, 11.08.2021, https://www.greenbiz.com/article/lithium-mining-booming-heres-how-manage-its-impact.

Brusini Chiara, “Rincari dell’energia, Cingolani: ‘colpa della speculazione sul mercato europeo’. Ma non parla degli extra-profitti degli imprenditori”, *Il Fatto Quotidiano*, 16.03.2022, https://www.ilfattoquotidiano.it/2022/03/16/rincari-dellenergia-cingolani-colpa-della-speculazione-sul-mercato-europeo-ma-non-parla-degli-extra-profitti-degli-importatori/6527218/.

Cabot Cyrielle, “Europe joins the ‘white gold’ rush for lithium and faces an energy transition challenge”, *France24*, 19.10.2022, https://www.france24.com/en/europe/20221019-europe-joins-the-white-gold-rush-for-lithium-and-faces-an-energy-transition-challenge.

Cater Leonie, Zimmermann Antonia, “The EU wants to mine its way out of reliance on China for raw materials. It’ll have to convince locals”, *Politico*, 20.10.2022, https://www.politico.eu/article/the-eu-wants-to-mine-its-way-out-of-reliance-on-china-for-raw-materials-itll-have-to-convince-the-locals/.

Cater Leonie, Zimmermann Antonia, “Toxic or magic? Batteries industry freaks out over EU proposal to classify lithium as a toxin”, *Politico*, 14.07.2022, https://www.politico.eu/article/eu-commission-toxic-or-magic-batteries-industry-freaks-out-over-proposal-to-classify-lithium-as-a-toxin/.

Cornwell Alexander, Rashad Marwa, Chestney Nina, “Another headwind?: global energy price spike worries energy execs”, *Reuters*, 21.9.2021, https://www.reuters.com/business/energy/another-headwind-global-gas-price-spike-worries-energy-execs-2021-09-21/.

Deutsche Welle, “EU agrees to gas price cap”, 19.12.2022, https://www.dw.com/en/eu-agrees-to-gas-price-cap/a-64154256#:~:text=After%20months%20of%20negotiation%2C%20the,180%E2%82%AC%20per%20megawatt%20hour.

Doyle David Henry, "A short guide to the EU's taxonomy regulation", *S&P Global*, 12.05.2021, https://www.spglobal.com/esg/insights/a-short-guide-to-the-eu-s-taxonomy-regulation.

EIT InnoEnergy, "BASQUEVOLT, the Basque initiative for production of solid-state batteries, is launched with the aim of producing 10GWh by 2027", 10.06.2022, https://www.eba250.com/basque-volt-the-basque-initiative-for-production-of-solid-state-batteries-is-launched-with-the-aim-of-producing-10gwh-by-2027/.

EIT InnoEnergy, "First homegrown European battery company to qualify as Tier One supplier", 21.06.2022, https://www.eba250.com/first-homegrown-european-battery-company-to-qualify-as-tier-one-supplier/.

Energia Oltre, "Gas, perché l'hub olandese Ttf sta spopolando nel mondo", 6.11.2020, https://energiaoltre.it/gas-perche-lhub-olandese-ttf-sta-spopolando-nel-mondo/.

Erickson Camille, "EV impact: Battery disruptors are jolting metal supply chains", *S&P Global, 21*.09.2021, https://www.spglobal.com/marketintelligence/en/news-insights/latest-news-headlines/ev-impact-battery-disruptors-are-jolting-metal-supply-chains-66518783.

Evans Scarlett, "Lithium's water problem", *Mining Technology*, 27.01.2021, https://www.mining-technology.com/features/lithiums-water-problem/.

Fehrenbacher Katie, "Made in America: a lithium supply chain for EV batteries", *GreenBiz*, 31.10.2022, https://www.greenbiz.com/article/made-america-lithium-supply-chain-ev-batteries.

Fischer Anne, "Battery manufacturing ramps up in the U.S.", *pv magazine*, 23.09.2022, https://www.pv-magazine.com/2022/09/23/battery-manufacturing-ramps-up-in-the-u-s/.

Flin Briana, "'Like putting a lithium mine on Arlington cemetery': the fight to save sacred land in Nevada", *The Guardian*, 02.12.2021, https://www.theguardian.com/us-news/2021/dec/02/thacker-pass-lithium-mine-fight-save-sacred-land-nevada.

Fox Benjamin, "The Brief – EU energy diplomacy, a carrot that could become a stick", *Euractiv*, 26.01.2021, https://www.euractiv.com/section/energy/opinion/the-brief-eu-energy-diplomacy-a-carrot-that-could-become-a-stick/.

Gearino Dan, "The EV Battery Boom Is Here, With Manufacturers Investing Billions in Midwest Factories", *Inside Climate News*, 27.10.2022, https://insideclimatenews.org/news/27102022/the-ev-battery-boom-is-here-with-manufacturers-investing-billions-in-midwest-factories/.

Goldie-Scot Logan, “A Behind the Scenes Take on Lithium-ion Battery Prices”, *BloombergNEF*, 05.03.2019, https://about.bnef.com/blog/behind-scenes-take-lithium-ion-battery-prices/.

Gonzalez Elizabeth, “Explainer: Latin America’s Lithium Triangle”, *Americas Society / Council of the Americas*, 17.02.2021, https://www.as-coa.org/articles/explainer-latin-americas-lithium-triangle.

Hering Garrett, “EV impact: electric vehicle surge resonates across global economy”, *S&P Global*, September 2021, https://www.spglobal.com/marketintelligence/en/news-insights/latest-news-headlines/ev-impact-electric-vehicle-surge-resonates-across-global-economy-66518519.

Hering Garrett, “US ready for a battery factory boom, but now it needs to hold the charge”, *S&P Global*, 03.10.2022, https://www.spglobal.com/marketintelligence/en/news-insights/latest-news-headlines/us-ready-for-a-battery-factory-boom-but-now-it-needs-to-hold-the-charge-72262329.

Heubl Ben, “Lithium firms depleting vital water supplies in Chile, analysis suggests”, *Engineering & Technology*, 21.08.2019, https://eandt.theiet.org/content/articles/2019/08/lithium-firms-are-depleting-vital-water-supplies-in-chile-according-to-et-analysis/.

Hewett Frederick, “The dark side of green tech”, *WBUR*, 19.01.2022, https://www.wbur.org/cognoscenti/2022/01/19/lithium-batteries-frederick-hewett.

International Battery Metals, “All you need to know about the Direct Lithium Extraction process”, 24.06.2021, https://www.ibatterymetals.com/insights/all-you-need-to-know-about-the-direct-lithium-extraction-process.

Jayanthan Srikant, “Growth of Li-ion battery manufacturing capacity in key EV markets”, *S&P Global*, 20.05.2022, https://www.spglobal.com/mobility/en/research-analysis/growth-of-liion-battery-manufacturing-capacity.html#:~:text=The%20law%20outlines%20several%20actions,is%20in%20the%20United%20States.

Katwala Amit, “The spiralling environmental cost of our lithium battery addiction”, *Wired*, 05.08.2019, https://www.wired.co.uk/article/lithium-batteries-environment-impact.

Kennedy Ryan, “The largest climate and energy package in U.S. history becomes law”, *pv magazine*, 16.08.2022, https://pv-magazine-usa.com/2022/08/16/the-largest-climate-and-energy-package-in-u-s-history-becomes-law/#:~:text=President%20Joe%20Biden%20signed%20the%20Inflation%20Reduction%20Act%20(IRA)%20of,spending%20package%20in%20U.S.%20history.

King Neil, Muller Natalie, “How long until lithium supply is depleted?”, *Deutsche Welle*, 22.07.2021, https://www.dw.com/en/is-e-mobility-going-to-crash-over-lithium-shortages/a-58214328.

Kość Wojciech, "Central Europe becomes the EU's e-car battery supplier", *Politico*, 10.02.2021, https://www.politico.eu/article/central-europe-eu-e-car-battery-supplier/.

Latham Emmanuel, Kilbey Ben, "Lithium supply is set to triple by 2025. Will it be enough?", *S&P Global*, 24.10.2019, https://www.spglobal.com/en/research-insights/articles/lithium-supply-is-set-to-triple-by-2025-will-it-be-enough.

Lewis Mernit Judith, "For U.S. Companies, the Race for the New EV Battery is On", *Yale Environment 360*, 20.12.2022, https://e360.yale.edu/features/alternate-ev-battery-technology#:~:text=Spurred%20by%20federal%20mandates%20and,battery%20technologies%20for%20electric%20vehicles.

Mathis Will, Starn Jasper, "Europe's Never paid So Much for power as 2021 Breaks Record", *Bloomberg*, 30.12.2021, https://www.bloomberg.com/news/articles/2021-12-30/europe-has-never-paid-so-much-for-power-as-2021-costs-hit-record.

Meaker Morgan, "Europe's Biggest Lithium Mine Is Caught in a Political Maelstrom", *Wired*, 02.04.2022, https://www.wired.com/story/serbia-europe-lithium-mining-electric-cars/.

Mitchell Jason, "Soaring demand, rising prices … what now for the lithium market?", *Investment Monitor*, 23.08.2021, https://www.investmentmonitor.ai/sectors/extractive-industries/lithium-price-demand-environment-supply.

Mitsotakis Kyriakos, "A '6-point plan' to save Europe's gas market", *Politico*, 9.03.2022, https://www.politico.eu/article/europe-russia-gas-trade-energy-ukraine-war/.

Nugent Ciara, "The fight to control the narrative over climate and energy security", *Time*, 13.10.2021, https://time.com/6106450/europe-gas-crisis-climate-change/.

Palmer Caroline, "Can Chile avoid resource curse from lithium?", *Reuters*, 16.03.2021, https://www.reutersevents.com/sustainability/can-chile-avoid-resource-curse-lithium.

Panzeri Davide, "Tassonomia: il gas vince sulle rinnovabili e depotenzia la finanza sostenibile", *ECCO The Italian Climate Change Think Tank*, 7.01.2022, https://eccoclimate.org/tassonomia-il-gas-vince-sulle-rinnovabili-e-depotenzia-la-finanza-sostenibile/ [accessed on 31 August 2022].

Pizarro Gabriela, Ramírez Pedro, "El entierro del caso SQM IV: la formalización de Longueira, el "perdonazo" del SII y la renuncia de los fiscales", *Centro de Investigación Periodística*, 04.05.2018, https://www.ciperchile.cl/2018/05/04/el-entierro-del-caso-sqm-iv-la-formalizacion-de-longueira-el-perdonazo-del-sii-y-la-renuncia-de-los-fiscales/.

O'Farrell Seth, "Can Europe mine lithium?", *fDi Intelligence*, 27.04.2022, https://www.fdiintelligence.com/content/feature/can-europe-mine-lithium-80851.

Reuters, "We must invest in renewables for more stage energy prices", 6.10.2021, https://www.reuters.com/business/energy/eus-von-der-leyen-we-must-invest-renewables-more-stable-energy-prices-2021-10-06/.

Rochabrun Marcelo, "Legendary lithium riches from Bolivia's salt flats may still just be a mirage?", *Reuters*, 23.05.2022, https://www.reuters.com/markets/commodities/legendary-lithium-riches-bolivias-salt-flats-may-still-just-be-mirage-2022-05-23/.

Roddan Michael, "Vulcan 'pauses' Rhine application amid public opposition", *Financial Review*, 21.11.2021, https://www.afr.com/companies/energy/vulcan-pauses-rhine-application-amid-public-opposition-20211121-p59aoa.

Ruby Kristian, "Winning the Electric Decade: 'Electrification Strategy' at the heart of 'Fit for 55' package", *Euractiv*, 25.05.2021, https://www.euractiv.com/section/energy-environment/opinion/winning-the-electric-decade-electrification-strategy-at-the-heart-of-the-fit-for-55-package/.

Rustici Camille, "Lithium: What Are the Main Mining Projects in Europe", *DirectIndustry*, 03.11.2022, *https://emag.directindustry.com/2022/11/03/lithium-what-are-the-main-mining-projects-in-europe/#:~:text=European%20Lithium%20is%20developing%20the,of%20approximately%20200%2C000%20electric%20vehicles*.

Sheppard David, "Gas shortages: what is driving Europe's energy crisis?", *Financial Times*, 11.10.2021, https://www.ft.com/content/72d0ec90-29e3-4e95-9280-6a4ad6b481a3.

Strauss Marina, "European Commission declares nuclear and gas to be green", *Deutsche Welle*, 2.02.2022, https://www.dw.com/en/european-commission-declares-nuclear-and-gas-to-be-green/a-60614990.

Stretton Chris, "EU battery passport regulation requirements", *Circularise*, 11.07.2022, https://www.circularise.com/blog/battery-passports-and-the-battery-regulation-amendment-requirements#top.

Taylor Kira, "Investors warn 'green' label for gas undermines EU taxonomy", *Euractiv*, 04.02.2022, https://www.euractiv.com/section/energy-environment/news/investors-warn-green-label-for-gas-undermines-eu-taxonomy/.

Tiday Alice, “Lithium could help end the EU’s oil addiction. But does Europe have enough of it?”, *Euronews*, 14.04.2022, https://www.euronews.com/my-europe/2022/04/14/lithium-could-help-end-the-eu-s-oil-addiction-but-does-europe-have-enough-of-it.

Valentino Andrea, “How Chile’s lithium mining industry is cleaning up its act”, *NS Energy*, 28.07.2021, https://www.nsenergybusiness.com/features/chiles-lithium-mining-industry/.

von Dalwigk Ilka, “A domestic raw material supply chain is essential for Europe’s battery ambition”, *EIT InnoEnergy*, 6.09.2022, https://www.eba250.com/a-domestic-raw-material-supply-chain-is-essential-for-europes-battery-ambition/.

Whittle Patrick, “U.S. seeks new lithium sources as demand for clean energy grows”, *PBS NewsHour*, 28.03.2022, https://www.pbs.org/newshour/economy/u-s-seeks-new-lithium-sources-as-demand-for-clean-energy-grows.

Yao Shunyu, “Lithium costs up in 2021, continuing to surge in 2022”, *S&P Global*, 12.07.2022, https://www.spglobal.com/marketintelligence/en/news-insights/research/lithium-costs-up-in-2021-continuing-to-surge-in-2022#:~:text=Total%20cash%20costs%20of%20lithium%20chemicals%20%E2%80%94%20lithium%20carbonate%20and%20lithium,%245%2C048%2Ft%20LCE%20in%202021.

Yergin Daniel, “The Major Problems Blocking America’s Electric Car Future”, *Politico*, 31.08.2021, https://www.politico.com/news/magazine/2021/08/31/biden-electric-vehicles-problems-yergin-507599.