

Corporations' Adaptation of Green Strategies in the EU: Transformation of Oil and Gas Companies

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Abstract: The purpose of this study to assess the adaptation of the oil and gas companies' green strategies under the influence of ambitious EU's and Paris Agreement's climate initiatives. The primary aim is to elaborate more on the literature which were reviewed to provide analytical framework for the green transformation of the oil and gas companies and highlight how could they be applied in the above-mentioned research scheme. Furthermore, the study reveals at what extent the EU policies are affecting sustainable strategies of oil and gas companies compared to those entities which are outside of the EU. At this phase of the research 6 companies have been already analyzed: Orsted, Neste, Shell, British Petroleum and OMV and PKN Orlen. These companies are clustered according to their pace and maturity in green transformation. In the next phase of the research these companies are going to be grouped by their spendings on green projects, and their maturity in the green transformation will be categorized based on the portion of the green capital expenditures and divestment of carbon-heavy products.

Keywords: *energy transition, sustainability, oil and gas companies, green investments, EU*

JEL Codes: *Q56, Q53, O13, O16, O19*

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Introduction

The rapid climate change is urging policy makers and nation states to shape their decision-making processes and to introduce regulations to mitigate uprising environmental conditions and trigger net-zero economy. The impact of global warming has been proven by extreme weather conditions of the last two decades. The Greenhouse Gas (GHG) emission is not only affecting the Arctic regions where the ice scientists – Nathan Kurtz and Rachel Tilling – (Koo et al., 2023; Mersmann, 2022; Tilling et al., 2018) have been continuously analyzing the level of melting ice, but also all the continents with severe floods, typhoons, forest fires and hurricanes. In the recent years, Europe was hit by unusual weather conditions, and the rising temperature triggered that the European Union (EU) has been becoming the frontrunner in climate policies on reducing CO₂ emissions, especially after the Paris Summit of 2015. The global parties, 181 countries agreed on to keep temperature increases below 2 Celsius degrees, preferably to 1.5 Celsius. Moreover, the European Commission has been upgrading its climate ambitions in the frame of the Green Deal to reach net-zero economy by 2050. It is articulating the 2030 climate goals and energy framework and the 2050 long-term strategy (European Commission, 2020). Not only the member states, but also the corporations are incentivized to fulfill requirements in the frame of solid policy and fiscal instruments presented in the European Green Deal, and in detailed program of Fit for 55 package (European Parliament, 2018).

The goal of this paper is to provide an overview about the literatures which assess the green transition of the oil and gas companies and highlight the most relevant theoretical frameworks to explain the relations between multinational, national actors, and entities. The reason is why I have been choosing the oil and gas (O&G) industry because they are contributing indirectly and directly roughly 50% to the CO₂ emissions (Beck et al., 2020). Therefore, any change in their operations to become sustainable has significant impact on the environment. The green transition, the corporations' adaptation to the EU's climate initiatives are the focal point of this study. The green transition is quite debatable topic, several theories are dealing with it, especially from the corporations' point of view. In the next chapter I am going to provide an overview of the literature highlighting the role of the EU to set climate goals and their adaptations by the companies.

Literature Review

Climate policies and sustainability are representing those dimensions where both economic and political factors need to be closely investigated in the frame of the research scheme. In terms of sustainability the one of the most critical areas are the energy companies where the transition is essential for climate protection. The policy makers both domestic and international ones have the power to influence the strategies of these entities. Lindenberg's concept stating that climate policies cannot be analyzed without incorporating social and economic dimensions (Lindenberg & Bruno, 1993). My aim is to provide an extensive analysis over the triggering points of the green transformation of oil and gas companies and to elaborate further on the regulative instruments which might speed up the transformational path.

Relevant concepts for green transition

The recent research contains some important concepts such as net-zero economy, decarbonization, Green Deal, Taxonomy, Fit for 55, the EU's climate policy (European Commission, 2020) and transformation of oil and gas companies. The environmental impact of the EU directives has significant results already in both economic and social dimensions. The European Commission (EC) is the frontrunner to take huge leap towards commitments and implementations of net-zero economy. Based on the last few years assessment it is obvious that EC is nurturing more intense and faster transition by increasing reduction targets from 40% to 55% by 2030 compared to the level of 1990. The European Council has also contributed to the unified actions in the climate and energy policies by introducing the framework of the energy union which might provide common standards for each of the member states regarding energy security, fully integrated energy market, improving energy efficiencies, climate actions towards decarbonization and research, innovation for remaining competitive. These strategic points can support the main pillars of energy and climate policies of the EU (Kengyel, 2020). The research as it is in progress, requires deeper analysis related to policy making process within the EU institutions. The theory of Multilevel Governance (MLG) supports the analysis in relation with the complex decision making within the institutions in the international and domestic arena. Furthermore, it is used to highlight how do the corporations' approach the EU institutions to express their interests with the support of domestic governments. There is a popular platform

which is used for certain level of the lobbyist activities called EU public consultations where the major companies can express their interests and evaluations regarding the regulations which also fits to the above highlighted polycentric view.

The Green Deal concept is one of the most important policy frameworks which is supporting to achieve the ambitious targets to achieve climate neutrality for Europe by 2050 and to ensure realistic implementation of net-zero economy from economic, social, and environmental aspects (Wolf et al., 2021). The set of policy initiatives tends to be supportive pillars to enhance the achievements of the well-defined targets. The corporations' transformational paths are framed by various newly introduced dominant instruments such as EU Taxonomy, updated Emission Target Systems (ETS), and dimensions like circular economy and Carbon Capture and Storage (CCS).

The EU Taxonomy is supposed to become the most efficient instruments which supports the implementation of sustainable projects and clearly identifies the dimensions, quotas, and ecolabels for the green investments. Taxonomy is the newest tool which promoting sustainable development and ensuring that corporations are capable to adapt climate change as sufficiently as possible. It has a classification system which categorizing the sustainable activities. This tool is aiming at forging the investors, corporations, and policy makers during the transformational path, and helping to the corporations to avoid greenwashing acts while mitigating economic fragmentation and inducing developments where it is the most needed (Kooth, 2022). The Taxonomy was launched to establish a clear framework for the sustainable activities and support the corporations to boost their climate-friendly initiatives (European Parliament, 2023). These specific guidelines might eliminate the different understanding of sustainable activities and might accelerate successful transformations. However, this instrument was criticized from different angles, because the recommended KPIs are quite difficult to implement and measure.

Up to this point majority of the corporations were creating their own sustainability reports without commonly acknowledged indexes. As the below table is presenting the Taxonomy matrix including various dimensions, however the critics stating that the transport section is well-established and constructed with indicative measurable items while the other ones are not so transparent and clear. The criteria can be applied either on firm or project levels for instance linked to new power plant, production facility, or building (Wolf et al., 2021).

Environmental Economics

In the green transition, it is important to consider the cost-benefit analysis of the climate initiatives especially for industries which are heavily involved with the emissions. William Nordhaus (2019), an American economist, Nobel prize winner attempts to calculate the Social Cost of Carbon (SCC) which is representing the economic cost of every additional ton of carbon-dioxide emission. It is evaluating the discount rates on consumption denominated with current consumption per unit of additional current emissions (Nordhaus, 2019). However, the literature which is assessing the estimation of the price of any additional CO₂ emissions are quite scattered, there are quite big uncertainties regarding the economic impact of the cost of climate change (Bergh, 2004). On one hand, policy makers in different industries are tempting to apply the SCC to estimate the benefits of decreasing CO₂ emissions. The targets for CO₂ reductions could be set based on cost-benefit analysis (CBA) including discount rate which shows the economic benefit over specific timeframe (Bergh, 2015). According to Nordhaus (2011) any green investments should be accepted and considered with the lowest yield compared to other projects. On the other hand, there is also a debate whether the recent level of growth can be maintained for longer time or in case of the sustainable projects low and negative return can be accepted for the sake of protecting our environment (Bergh, 2015).

The aim in the empirical part of my research is to examine the level of adaptations of climate goals in the oil and gas corporations' short- and long-term strategies based on the EU climate regulations and directives. For this purpose, the multilevel governance theory of Hooghe and Marks (2020) where different level of decision-making process among supranational, national, and corporate actors' could be analyzed. Furthermore, the green transition is going to be measured based on the investments in green projects according to the articulated green strategies of the corporations.

Business ethics are also important notions, any action of corporations is formulated based on social norms, identities, and interests. To conclude, the transformational process of the corporation could apply the normative approach of constructivist theories, however, I would not gauge the driving factors behind the transformation neither from universal nor contextual point of views towards ethical questions (Buckley, 2013). I have purposefully avoided business ethics strain as it might result in 'indeterminate' outcome (Buckley, 2013).

Degrowth Theories

As the climate change arises attention of the society, policy makers on both international and national arenas, the corporations need to face the new reality, the conscious acceptance of degrowth. The trends of the recent economic growth cannot be kept without major negative impact on the environment, therefore a new concept, sustainable degrowth are gradually becoming the new reality for the corporations (Hankammer et al., 2021). Technological innovation was a trusted notion to further maintain the recent pace of growth, however, there are some limitations concerning our environment. Downscaling instead of descaling is the primary approach among the degrowth scholars (Schneider et al., 2010). The degrowth theory not only involve economic dimensions, but it also considering the social aspect of the changes in potential wealth by the green transition (Kallis, 2011). As the GDP is declining it is a consequence of a societal decision (Schneider et al., 2010), therefore, not only the corporations, but also the society, consumer behavior has essential impact on a success to reach net-zero economy.

Energy Transition Theories

Wide ranges of theorists are dealing with concept of energy transition. According to Václav Smil (2022), our civilization is fossil-fueled based where the transformation cannot happen within the determined time frame which opposing the EU's well-defined targets to reduce CO₂ by 55% by 2030 and to become net zero by 2050. He is quite critical about eliminating fossil fuels on a global scale which would be essential from the environment point of view. Four basic commodities were highlighted – ammonia, steel, concrete and plastics which are heavily dependent on fossil fuels. The net-zero economy will not be achieved without highly advanced technical achievements. The Canadian-Czech professor has stated that slow transformation of the companies is more realistic in line with the changes in the mindsets of the consumers (Smil, 2022). These two notions are interconnected and cannot be separated from each other. Another representative of energy transition theories is Benjamin K. Sovacool who is dealing with the timing concept of the transition on both national and international level (Sovacool, 2016). Time scale in energy transition is quite crucial element, as the EU is setting very specific goals in set timeframe for reducing CO₂ emissions, therefore Sovacool's findings are highly considered. On the other hand, the International Energy Agency announced the immediate actions need to be taken, if the transition does not occur

fast, it might be too late to make any effort to change climate trends (Sovacool, 2016). Sovacool has an opposite view with Smil's statements that energy transition can happen quite speedily in certain cases. Stanford scientists Rubio and Folchi stated that fast transition is possible only in small scale or unique cases (Sovacool, 2016). While the concept of climate protection is growing Chilvers and Longhurst (2016) highlighted the importance of the participation of the public in the green transformation, and more focus on the social aspects of this change instead of focusing on technical dimensions.

Multi-level Governance Theory

One of the most relevant theoretical implications which has been found in the reviewed literature is the Multi-level Governance Theory which provides framework for analyzing decision making process and lobby actions in the EU institutions. All parties not only its member-states, but also the non-state actors and the citizens are obliged to follow the climate initiatives. As the requirement of green transformation are affecting multiple actors on various layers in the international arena, therefore the Multi-level Governance Theories by Gary Marks and Hooghe is chosen to characterize the process of policy making and execution of certain directives. The polycentric view explains how the state and non-state actors shape the climate policies, especially when the corporations are using either the EU institutions or the national governments as a platform for lobbying (Hooghe & Marks, 2003). The EU public consultations providing forums for the non-state actors to express their interests and critics about any regulations, directives and law which might be introduced. The corporations might use these forums to express their views regarding the policies which were implemented, and they can suggest improvement areas or highlight any gaps that might be occurred. However, the statistics over the successful claims need to be further investigated. As the climate policies are formulated on multiple levels including interests of different lobbyist groups and subnational actors, therefore the polycentric structure could clearly support the analysis of different layers of policy- and decision-making process. Schakel (2016) and Stephenson (2013) both highlighted that the theory has been applied widely by the academic literature, therefore it is essential to find in detail the multiple layers not only between the EU and governmental relations, but also understanding of evolution of the governance within the state.

Compliance Theories

One of the most relevant theoretical implications related to the corporate sector are the Compliance Theories (Etienne, 2011) which might be considered as the most relevant one in relation with the corporate world. As the compliance or non-compliance approach tackle complex behavioral standards, the transformation of the oil and gas companies might be fitted the most into this framework. The compliance notion helps to pursue goals which are aiming at fulfilling moral behaviors or highlighting areas where actors are following rules due to fear to be penalized financially by not complying with certain standards. According to empirical evidence of certain compliance theorists the most typical motivational factors to comply with the regulations rooted in the combination of material, emotional and normative goals (Etienne, 2011). The logic of consequences and logic of appropriateness are the main characteristics of the actors in action along certain regulations and incentives. These combined motivations consist of cost-benefit calculations and moral indicators, former is generated by the regulators and latter one by the consumers and shareholders (Etienne, 2011). These dimensions are suitable to analyze the adaptation process of the oil and gas companies towards the climate policies. Along with the increasing carbon prices and the social pressure to become sustainable, the transition is very much triggered and accelerated in the past few years. The notion of compliance along with the impact of the regulations is extensively and empirically proven in the academic world, one of the greatest examples are Lindenberg's goal framing theories which representing the heterogenous motivations of the actors in parallel with the decision-making processes. In case of climate policies there are very strong convergences between social and economic dimensions, where the rational choice might be applied to explain social actions (Lindenberg & Bruno, 1993). The climate change as a social issue triggering multiple economic and market related actions via regulations, therefore the actors in these conditions are choosing heterogenous goals which are triggered autonomously or by the pressure of the environmental changes (Etienne, 2011). The level of commitment of the oil and gas companies towards the net-zero economy and the motivational factors are situated in the crossroads of hedonic gains and normative goals. Another essential angle is highlighted by Scholz in his contractual compliance theory which indicates the procedural justice might trigger effective applications of policies, as some of the actors are fulfilling the obligations if they are coerced (Scholz,

2003). In the transformational process the procedural justice offers estimations whether the cost of fulfilling the environmental obligations will be exceeded with the long-term benefits related to saving our planet and preserving the environment (Scholz, 2003). Thus, it is important to distinguish between national and multinational implications of the policies and directives for CO₂ reductions.

Essentials of the Theories

All in all, there are three main factors, the economic development, technological innovation and policy change which can support a successful energy transition. According to Cherp only the meta-theoretical framework can support the deep analysis of energy sector's transition as it implies national security, economic development, and sociological aspects of consumer behaviors. Some of the sectors can apply relatively faster transition than others. Oil industry belongs to the ones which cannot only accelerate new technologies or new economies of scale, reconfiguration is the dimension what is ultimately needed (Cherp et al., 2018) which supports the assumption of the relatively slow transition compared to other sectors. Additionally, corporations as rational actors being profit-oriented need to be incentivized financially either with subsidies for green investments which are quite capital heavy or with penalties by not fulfilling set targets for greener operations. The EU plays an important role in the green transition by incentivizing the acceleration of green projects and penalizing the CO₂ heavy operations. Besides financial incentives, quite complex structural changes required at the oil and gas companies. One of the greatest examples for the portfolio shift is divesting the heavy infrastructure of Upstream sector which requires quite long time until it has no effect on the environment.

There are two aspects in the reviewed literature which have not been elaborated sufficiently, one is the impact of the EU climate initiatives on the short- and long-term strategies oil and gas companies and the other one is the clustering global and national oil and gas corporation to assess the maturity of the green transition within and outside of the EU. While many studies have been focusing on the EU climate policies and instruments, however, fewer studies took into consideration the industry analysis regarding the transformational path to fulfill those ambitious targets. The adaptations of the climate initiatives in case of corporate sector are essential to assess because the transformation will result in real impacts on our environment. Though there have been already some great examples

where the green transformation has reached a mature level. The biggest challenges are the implementation of domestic climate policies at the lowest cost possible (Böhringer, 2014). This implies the importance to examine the regional specifications from industrial and economic point of views. Additionally, there are extensive ranges of debates which are highlighting the gaps in the EU climate policies and real environmental impacts initiated by the companies resulted in emerging concepts such as greenwashing and carbon leakage. Majority of these articles appearing in non-academic sources, however, a few of them have already been published on the academic level as well. Greenwashing refers to activities when the corporations are communicating green activities without any positive impact on the environment (Vries et al., 2015). The framework and specifications about the green activities is essential to eliminate the concept of greenwashing where companies' narratives and marketing include more the sustainability than their real actions. That is why the attempt from the EU to categorize green investments per industries in the framework of Taxonomy is a great advancement. Multiple articles are criticizing the existence of carbon leakage where the biggest issue is that developed countries outsourcing their production to developing states. Since introduction of Green Deal in 2019 some of the CO₂ heavy production were placed outside of the EU. The carbon intensive products are imposed to taxes within carbon border adjustment to find the most optimal solutions for all international and domestic actors (Mörsdorf, 2022). The strict monitoring approach is essential regarding GHG emission from production and consumption point of view as well (Nielsen et al., 2021) to reduce CO₂ heavy production and accelerate the green transition on global scale.

The recent research is intending to address gap in the literature related to transformation of the oil and gas industries and reveal the positive impact of the EU policies and instruments affecting the speed of sustainable transformation. Étienne's combined motivation logic of cost-benefit and moral indications (Etienne, 2011) supporting the analysis of the transitional path of the corporations. Compliance theory is a relevant framework to analyze the transformation process to reach net-zero economy in the corporate sector. The most dominant goals of the companies are the combination of the material, emotional and normative ones (Etienne, 2011). On the one hand, the cost-benefit calculations representing the power of the supranational institutions to enhance environmental actions with regulations and fiscal incentives, penalties towards the oil and gas companies. On the other hand, the moral indication of the transformation is rooted in

the expectations of the consumers and shareholders to create more sustainable operations and offer products which serve the sustainable development. The latter one is started to be dominant industry-wise. According to Étienne the multidimensional factors which influencing actors' behavior cannot be taken individually, the fear from penalties and legal sanctions, the search for gains and fulfillment via social norms should be considered together. These multiple and complex motivational factors need to be considered together to provide relevant framework for actors' decisions and behaviors especially in case of green transition in the international arena (Etienne, 2010).

Methodology

In the previous chapter the diverse literature about green transition was assessed including economic, social, and political aspects of the green movement. It was essential to understand how the interactions between supranational, national, and subnational actors behave and influence in each other during the process of leading such a great change. All the oil and gas companies need to change fully their core, fossil-fuel based businesses to comply with the targets of net-zero economy. The multilevel governance theories and the compliance ones are essential frameworks to understand and evaluate the achievements in green transition and understand the motives of the oil and gas companies in the way how they handle and perform all the green targets articulated in the long-term strategies. It is also important to highlight the responsibility of the supranational organizations such as the EU and the society, consumers in the green energy transition.

The transformation is a complex process which is shaped by social, political and economic impacts as well. Therefore, the energy transition of the companies should be analyzed in multitier framework which allows to apply several disciplines (Cherp et al., 2018). Therefore, extensive theories from different disciplines economics and political sciences, or philosophical background are applicable. In most of the cases the green transition requires longer process. Some of the critical areas are the decomposition of the refineries or change is consumers behavior. The most influential factors in the adaptation process will be analyzed during this research scheme to reveal how the corporations are going through the transformational path and what is the role of the EU policy makers, domestic

governments and the customers, stakeholders, and shareholders in that change. Implementation of sustainable strategy with a real environmental impact is a highly debatable topic.

Theoretical Framework

At the recent study several theories were presented, out of which the most relevant ones for the climate goals' adaptation of the corporations are the multilevel governance, compliance theories and energy transition theories. These could primarily support the theoretical framework of the research which is the green transformation of the oil and gas corporations.

The linkage between the corporations' shifting portfolios and the EU policies is essential to derive how much the oil companies are adapting the EU policies. On the other hand, it needs to be assessed how feasible are the ambitious targets announced by the EU, and whether the short-term gains in the green transformation can be maintained on long-term as well. Therefore, the involvement of non-state actors such as corporations in the target setting is essential on supranational level. The polycentric multilevel governance represented by Elinor Ostrom is highly adaptable for the corporations' potential influence in the international policy making especially around climate initiatives. The center of this approach is that there are multiple authorities at different scales are involved in the decision-making process which generally shifting power away from national governments and supranational institutions (Ostrom, 2010). This would be essential in the transformation process of the corporations which are mostly responsible for the CO₂ emissions. The realistic goals and implementation could be ensured with this extended network of corporate agents where all the aspects of operation, strategy, business, and policy stream could be presented from different angles. The key aspect is not to let the EU institutions to be influenced by the oil corporations, it is more about following both regional and industry specifications in the frame of polycentric approach could result in tangible achievement in climate protections instead of following global goals and treaties (Ostrom, 2010). By the EU's recently introduced instruments. Fit for 55 and Taxonomy with more concrete industrial quotas, specification of green projects, serve the purpose of successful adaptation of climate initiatives (*Figure 1*).

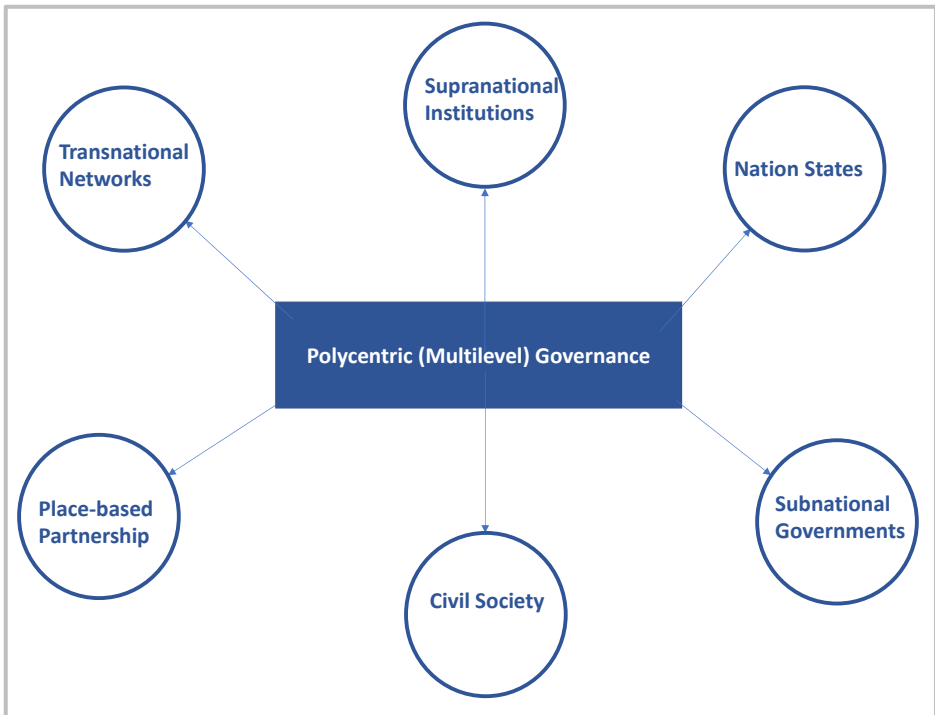


Figure 1: Polycentric (multilevel) governance

Source: Bulkeley et al. (2003)

The adaptation of the 2030 and 2050 climate goals to reduce CO₂ emissions and potentially reach net-zero economy are fitting into the above-mentioned polycentric approach where besides supranational and national actors, also different relevant interest groups, associations and representative of the corporations concerted action aims to accelerate the transition. On top of that, territorial partnership could be induced to enhance corporate green strategies, the best practice could accelerate the transition, and the problematic areas could be tackled together along with common interests which could support future strategy creation at the oil and gas companies.

Qualitative Research Method

In the frame of researching the green transition of oil and gas companies, I am aiming to review strategy papers, and seek correlation between EU instruments and introduction of green project. This article applies qualitative approach to review press news at the corporations' website and strategy

papers to collect how many of those green projects appearing in strategy papers have been launched. The period which serves basis for the analysis is between 2017 and 2022. Along with the 2015 Paris Climate Summit the EU instruments to accelerate green transformation were launched thus climate protection has become a global mission. By comparing the green strategies of the companies, the aim of the research is to analyze the maturity of the transformation of the companies into green operations and evaluate the feasibility of reaching net-zero economy by 2050. To assess the green transformation of the companies I am evaluating long-term strategies whether the companies are choosing projects which are fully green and emitting zero CO₂ such as renewables or choosing a less carbon intensive path like natural gas or hydrogen. These dimensions are gathered via content analysis method in the frame of qualitative research method. As the interpretations are dominant in the process therefore accurate and quality content analysis are essential in the research process (Bengtsson, 2016). Therefore, the research scheme is applying manifest analysis by staying close to the text of the strategic papers which are going to be analyzed in relation with the investment and divestment actions in case of the six companies. Inductive reasoning applied to ensure credibility and derive as accurate conclusions as possible from the collected data (Polit & Beck, 2006).

In the frame of qualitative research specific words in the strategic reports of oil and gas companies supported the following categorization in the green transition. There are two main groups in initiatives one of them represents clean energy while the other group are the lower carbon footprint alternatives. The relationship for this method to collect the categorized words representing strategic directions of the companies are close relation with the polycentric (multilevel governance) theory. The implication of the theory is that forged effort of supranational, national, subnational, and transnational actors could accelerate the transition path of the companies (Bulkeley et al., 2003). The main finding is that the partnership of companies and acquisition of those entities which have an expertise in the building wind and solar farms, or in the recycling technologies have positive effect on green transformation and could transfer the efforts into positive results. The *Table 1* represents and collects the main green dimensions of the companies which are published in the strategic papers for 2030. All of the six companies build their green strategies on wind power, and then solar energy in categories of renewables. From the list of clean alternatives geothermal energy appears only in case of OMV which has high potential to contribute to the planned yearly 10 TWh (Terawatt hour)

energy production from 2030. In the lower carbon footprint categories biofuels, biogas and hydrogen are the most common alternatives. The option of carbon capture storage (CCS) which has significant capacity for CO₂ storage appears as alternative strategic elements mainly at the oil majors like Shell and BP, and in case of the medium-sized companies such as OMV and PKN Orlen. Dominant role has a circular economy and high value petrochemical production in the strategic directions of OMV and Neste. All these strategic directions are induced by successful synergies of companies which contribute to the know-how and technological implementation (see in the last column of *Table 1*).

Table 1: Strategic dimensions and their relations to the Theories

Oil and Gas Companies	Green Energy Transition Strategies by 2030		Theory Implications
	Clean Energy	Lower Carbon Footprint Alternative	Polycentric Governance
Shell	Floating wind energy, Solar Energy (45 GW), Electric vehicle (EV) Charging station	Biofuels & Hydrogen, Develop Carbon Capture Storage (CCS) (25 mn t / year)	Acquisition of Sprng Energy, Solar & Wind platform in India, & SBRS (German company) electric charging services for buses, trucks and vans
BP	Wind & Solar Energy (50 GW)	Hydrogen & CCS (10 mn t / year)	Partnership with Equinor for Solar Energy and joint venture with Lightsource bp
OMV	Geothermal, solar & wind (10 TWh)	Sustainable aviation fuel, CCS storage (5 mn t / year), higher value chemical products & recycling, circular economy	Purchasing higher share in Borealis, no. 1 producer of ethylen & propylene in Europe
PKN Orlen	Wind & solar farms (9 GW), small nuclear reactor, EV charging points (+10 000)	Biofuel & biogas, CCS (3 mn t / year)	Acquiring other fossil fuel based company (LOTOS) to increase revenues & thus investments
Orsted	Offshore & onshore wind farms, solar panels (50 GW), renewable hydrogen	Energy storage facilities, green fuels	Stakeholders accelerated green transition; acquisition of A2SEA wind turbine installation company, acquisition of Deepwater wind a leader at offshore wind development & Lincoln Clean Energy onshore wind & solar platform
Neste	Wind power	Circular Economy, recycling plastic waste, Sustainable Aviation fuel, renewable diesel	Joint partnership with Eppendorf, a leading manufacturer of renewable raw materials for lab products

Source: Own Edition based on Annual reports of Orsted (2022), Neste (2022), Shell (2022), British Petroleum (2022), OMV (2022) and PKN Orlen (2022)

Triggering points of green transition

Besides the EU policy instruments, the fiscal incentives induce actively the transformation of oil and gas companies. This topic could be articulated from two angles, firstly, the continuously increasing carbon prices are accelerating the transition path of the companies while secondly the available funds for green projects providing enough incentives for the domestic governments to boost the transformation process in the O&G industry. Additionally, the Environmental, Social and Government (ESG) targets are the newly introduced dimensions at the corporations to measure the achievements in this area. These indicators are continuously raising attention of the shareholders. As it is a significant measuring tool for the performance of the companies which are actively working on the transformation in line with the external factors which are continuously articulated and shaped by the EU institutions. ESG concept supports the compliance of the corporations in relation with the environmental laws and criteria articulated by the supranational organizations. ESG means a safeguard in the recent environmental conscious circumstances for the corporations by contributing to maintain cashflow and boost green investments (Beck et al., 2020). On the other hand, to avoid penalties for carbon emissions the companies are incentivized enough to engage themselves in clean energy transitions and in the alternatives, energy mixes which has lower carbon footprint compared to the traditional fossil fuel.

Results

All the companies in the O&G sector are in the transformation process, however, the corporations within the EU are in the regulatory environment where the transformation are incentivized. Meaningful impacts might be achieved by applying all sorts of instruments: Taxonomy, Fit for 55 and Carbon Capture and Usage. The EU policies, regulations are having essential role in the transformation of the oil and gas companies. The maturity of the green strategies of the European Oil and Gas companies indicate the effectiveness of the EU's active policy making processes.

The literature reviewed about the adaptation of climate policies of the corporations provide wide spectrum from the field of economy, society and policy making. Certainly, the multi-level governance polycentric theory and the transition theories provide supportive framework for the adaptation model of oil and gas companies' green strategies. The ambitious

2030 and 2050 goals can be achieved only with concerted actions among the EU, the national governments and the subnational actors, civil organizations, and corporations. The polycentric approach indicates that applying active discourse about the ambitious climate goals not only on supra-national and national level, but also on lower tiers of the society and geographic proximity could lead to a successful implementation (Anfinson et al., 2023). At this stage the EU is a frontrunner at climate protection, however, still essential leaps need to be taken by the domestic and local governments and oil and gas corporations to be able to fulfill 55% reduction targets by 2030 compared to the 1990 level (Delgado-Tellez et al., 2022).

After the extensively overviewed literature it can be derived that the main motivational factors of the oil and gas companies in the green transformation, as Lindenberg's Goal Framing Theory (GFT) is confirming, the combination of the fiscal incentives of Carbon taxes and penalties based on GHG emissions and the compliance towards climate protection (Etienne, 2011). Green transformation strategies of the corporations are triggered by heterogenous motivation of adapting and fulfilling supranational regulations, financial commitments and meeting expectations of customers, shareholders to become green (Etienne, 2011).

Table 2: Comparative Cases of Oil and Gas Companies

Oil and Gas Corporation	Country	EU's MLG	Compliance Theory	Green transformation
<i>Orsted</i>	Denmark	Non-applicable	Heterogenous	Frontrunner
<i>Neste</i>	Finland	Partially Applicable	Heterogenous	Frontrunner
<i>Shell</i>	Great Britain (Netherlands)	Applicable	Heterogenous	Moderate
<i>BP</i>	Great Britain	Applicable	Heterogenous	Moderate
<i>OMV</i>	Austria	Applicable	Heterogenous	Moderate
<i>PKN Orlen</i>	Poland	Partially Applicable	Customers, Shareholders	Moderate

Source: Own Edition based on Annual reports of British Petroleum (2017–2022), Neste (2017–2022), OMV (2017–2022), Orsted (2017–2022), PKN Orlen (2017–2022), and Shell (2017–2022)

The empirical part of this study involves 6 cases and compares their achievements in green transition in line with the EU's climate initiatives. Below table is summarizing in nutshell the selected cases and impact of

the compliance and MLG theories. The companies are listed in relation to the EU where the climate initiatives and measures are analyzed, while in the frame of the compliance theory all the motives were observed behind the companies' action towards green transition (see in *Table 2*). The former was taken based on the news and strategy reports, the latter one from the narratives and communicated mission statements of the companies were extensively analyzed.

Table 3: Strategic Direction of Oil and Gas companies between 2000–2015

Oil and Gas Companies	2000-2009		2010-2015	
Shell	Increased portfolio and proved reserves: Nigeria, Kazakhstan, China, Malaysia and Russia		Upgrades in upstream business: Liquefied natural gas, oil sands	Extension of Downstream business: petrochemical capacity
BP	Expansion in the USA market acquiring ARCO lubricants and specialty chemical company, Burmah Castrol	Taking share in Baku-Tbilisi-Ceyhan pipeline to transport crude oil from Azerbaijan	Joint venture with the Russian energy giant Rosneft	Reopening the major North Sea gas field jointly owned with Iran
OMV	VIVA is acquired functioning as filling station shop	Continental expansion of the filling stations	Expanding services at filling stations with Banking service via partnership with Erste Bank and Sparkassen	Investments in Upstream Business
PKN Orlen	Financial stability of petrochemicals, mining and refineries		Developments of petrochemicals, mining and refineries	
Orsted	Coal intensive power generation	Extensions of offshore wind farms	Phasing out coal and investing into offshore / onshore wind energy	
Neste	Strengthen the Operation of Finnish Oil Refinery	Renewable Diesel Production	Renewable Refineries in Singapore and Rotterdam	Sustainable aviation fuel

(Dimensions of grey transformational projects are highlighted with green.)

Source: Own Edition based on Annual reports of Orsted (2000–2015), Neste (2000–2015), Shell (2000–2015), BP (2000–2015), OMV (2000–2015) and PKN Orlen (2000–2015)

Based on the summary of the cases above it is derived that the EU's multilevel governance structure and the heterogenous motives of compliance including motives of fiscal incentives have positive impact on green transformation of the companies. Out of the six listed companies Orsted and Neste are outstanding in the green transition from a traditional fossil fuel entity they transferred into a green operation (Neste, 2022b; Orsted, 2021). Certainly, the transition is easier on smaller scale compared to the oil giants such as Shell or BP. Customers and shareholders expectations to become sustainable have a significant positive impact on their green strategies despite of the fact that these entities are out of the influence of the EU, and they are not facing any penalties by not blending enough bio-fuels or not complying with the GHG reduction targets.

The three phases of time dimensions shown in the *Table 3* and *Table 4* are clearly indicating that only Orsted and Neste companies started to launch projects related to the green transition before the EU started to launch its climate initiatives more actively since 2017. Therefore, in these cases the pro-environmental governments have induced green transformation by supporting companies since the year of 2005. The other four companies Shell, BP, OMV and PKN Orlen have articulated green projects since 2017 mainly with a mixed energy concept after the EU has become frontrunner in energy transition. The multi-level dimensions between the EU and national governments are applicable mostly in case of Shell, BP and OMV, while partially applicable in Neste and PKN Orlen. These companies are at the two different angles in transformation, Neste is among the front runner companies, however, its green strategies are based on energy mix with renewables and less carbon heavy portfolios such as Renewable Diesel production or Sustainable aviation fuel. While the Polish company, PKN Orlen is very slow at green transition, even the EU has accepted some exemptions from the Green Deal, as Poland in a difficult situation due to the dependency on coal and carbon-heavy productions (Kyriazi & Miró, 2022). The developing markets like Poland need to accelerate their energy transformation and find solutions which based on energy mix (Johnston et al., 2020). That is why from the strategy point of view PKN Orlen has been combining renewables and petrochemicals in their green transition. Orsted is the only oil and gas company which was able to fulfill the requirements of the successful green transformation. Based on the above table they started to eliminate their coal

intensive business already between 2000–2009 and turn its portfolio to clean energy business built on offshore and onshore wind farms (*Table 2*).

Table 4: Strategic Direction of Oil and Gas companies between 2016–2022

Oil and Gas Companies	2016–2022			
Shell	Green hydrogen	Biofuel	Electric Vehicle (EV) charging ; Renewables solar and wind power to generate electricity	Carbon Capture Storage (25 million t CO ₂ / year by 2030)
BP	Green hydrogen	Bioenergy from waste or plants	EV charging ; renewables from sun and wind	Carbon Capture Storage (10 million t CO ₂ / year by 2030)
OMV	Electrolyser plant to produce green hydrogen	Reoil Project – convert plastic waste into oil (16 000 t /year) Sustainable Aviation Fuel	Largest solar (photovoltaic) plant in Austria to generate electricity	Carbon Capture Storage (5 million t CO ₂ / year)
PKN Orlen	Green hydrogen production	Biogas, biofuel and biomethane	Acquiring Energa to generate renewable based electricity	Carbon Capture Storage (3 million t CO ₂ / year)
Orsted	Green hydrogen	Bioenergy Plants	Global Leader at offshore wind; onshore and solar farms	Energy Storage Facilities
Neste	Renewable Diesel Hydrotreated Vegetable Oil (HVO made from used cooking oil and animal fat) reduces GHG emissions up to 90% compared to fossil diesel	Chemical recycling, circular solutions	Solar panels generating electricity at the filling stations	Carbon Capture Storage (4 million t CO ₂ / year)

Source: Own Edition based on Annual reports of Orsted (2016–2022), Neste (2016–2022), Shell (2016–2022), BP (2016–2022), OMV (2016–2022) and PKN Orlen (2016–2022)

The comparative case studies need to be further elaborated to derive firm and accurate conclusions by assessing capital expenditures of these companies related to green projects and deeply investigate the components of green sustainable strategies within two major milestones for the year of 2030 and 2050 when net-zero economy is desired to be achieved.

Limitations and Managerial Implications

The overall aim of the study is to collect data about the strategic directions of oil and gas companies in line with green transformation to understand how these entities would contribute to achieve net-zero economy by 2050. The strategic papers and reports in the annual reports were reviewed. The green narratives of the oil and gas companies started to be analyzed in the frame of manifest analysis where the original source of announced strategic directions were applied in the tables. Despite of the fact that the green energy transition of oil and gas companies are receiving increasing attention from the academia and the corporate world there are little studies which providing adequate case analysis and thorough examination of the green transformation of the specific oil and gas companies. The limitations are important to highlight in this research scheme which is evidently hinder to breakthrough analysis in this topic.

The most important limitations are the confidentiality of the strategic data and information of the oil and gas majors. The measurements and the key indicators of green transition such as the green capital expenditures, divestments are difficult to collect, therefore, to evaluate the recent stage of the green transformation of specific cases are challenging. The meaningful data collection and real implications of the strategic directions hard to analyze and share publicly. Another limitation in the green transition of the oil and gas companies that the external factors like recent Russian-Ukraine war might reshuffle the attention and momentum from green transformation as the energy security overwrites all the climate initiatives. Although this aspect is out from the radar of the recent article.

These factors are completely out of the control of the researcher which indicate that the study will have some levels of limitations though it might present still valuable findings and outputs for the academia. The case based representation of the green transformation of oil and gas companies is an essential contribution to the existing literature and stakeholders' knowledge.

Conclusion

The recent study gauging the adaptation of corporations' green strategies in the academic literature. The empirical part of the research of conducting comparative study approach of the oil and gas companies going to be continued. The analysis is aiming to bridge academic and corporate environment to evaluate policy makers and business leaders' instruments to achieve climate goals and to contribute to environmental protection.

There are several literature and theories about adaptation of climate goals by the companies where different dimensions economic, political, and social aspects are combined and evaluated. Out of the above highlighted theories in the recent studies the environmental economists are contributing to academy by assessing challenges to determine social cost of carbon (Nordhaus, 2011) which is tempting to estimate the cost of any additional CO₂ emission. The theory would be essential for the policy makers to determine penalties or fiscal incentives in case of green transitions. However, the proper unit cost of CO₂ emission is determined at wide scale indicating that the climate protection is quite complex dimension, and it is difficult to quantify in dollar amount the damage caused by pollution.

While the energy transition theories are quite skeptical regarding pre-defined timing for the climate goals, Smil is assuming more importance for fossil fuels and shifting the dominant role from the corporations to the consumers in the green transition (Smil, 2022).

The MLG and Compliance theories play central role at analyzing the adaptation of corporations' green strategies. The polycentric view (Bulkeley et al., 2003) is essential while assessing the impacts of the green transformation. Multiple channels in shaping climate goals could lead to their realistic implementation especially if platforms are ensured for corporations as well to express best practices and consider regional specifications. Etienne's compliance theory based on the combined heterogenous motives of material, emotional and normative aspects can be applied when analyzing green transformation of the oil and gas companies under the influence of the EU (Etienne, 2011). In parallel with the rapid evolution of the EU's climate policies the strategic shift of the O&G sectors towards green operations is accelerated.

From the above highlighted analysis, it can be concluded that the multilevel governance framework with polycentric view provide an essential theoretical background to boost green transition of oil and gas companies

and support the multitier approach where the EU institutions, national governments and subnational actors ensure successful transition and realistic goal setting to reach net-zero economy by 2050 articulated in Paris Climate Summit (Europe Commission, 2020).

To conclude, all the six selected oil and gas companies are on the transition path, however, the motives behind the green movements are different in each case. According to the analysis the Nordic companies such as Orsted and Neste started the green transformation already before the supranational organizations have taken leading role in it. While the other bigger, BP and Shell and medium-sized companies like OMV and PKN Orlen launched green initiatives in their strategies after 2016 when Paris Climate Agreement was ratified, and climate protection has become a critical dimension for the countries to protect the environment.

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