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DECARBONIZATION AS A BUSINESS OPPORTUNITY FOR SMEs AND MNCs IN THE INTERNATIONALIZATION PROCESS AND THE OIL AND GAS AREA TO REDUCE CO2 EMISSIONS

Anis BENABED*[1]

Abstract: *This paper presents and analyzes the process of decarbonization as a new key business industrial process for the industrial and energy sector; as an alternative business opportunity and partnership for Small and Medium Sized Enterprises (SMEs) and Multinational Companies (MNCs) or Global Companies (GCs) as large companies. Decarbonizing and reducing the CO2 emissions means contributing to sustainability in the carbon market and globalization. The author set the following research questions to structure the research: Could CO2 emissions be a useful for companies' business partnership in globalization? Can decarbonization be a business opportunity for innovative SMEs to lift their status? How can SMEs and large companies such as MNCs and GCS collaborate in the carbon market for decarbonization? Could CO2 help in regenerating fossil fuels such as oil and gas in globalization? The methodology of research based on designed conceptual frameworks to design and illustrate the process and its values linking the related literature review to the part of research and analysis. The results showed that CO2 emissions could be a business opportunity for companies especially innovative SMEs in the decarbonization process and the carbon market. However, Small and Medium Sized Enterprises should seek some help and support by large global and multinational companies in order to survive in this operational process. Large companies will need the innovative perspectives of SMEs and SMEs will need large companies for funding their process and rise in the internationalization process. The conclusions showed that the carbon market needs CO2 emissions as a business option, Oil and gas are main energy resources worldwide that is why their use is necessary. Companies such as Innovative SMEs may collaborate with MNCs in the carbon market and the energy sector to regenerate them for an alternative energy storage and satisfaction in case of crises. Companies that engage in this process are able to participate in both processes of sustainability and internationalization to advance globalization to a better phase with business values and energy satisfaction.*

Keywords: *Decarbonization, globalization, business values, scalability, SMEs, company, internationalization, Multinational companies (MNCs), sustainability,*

JEL Code: *F23, F60, F63, F64 L71, L95, M13, Q01, Q02.*

UDC*: [620.9:334.7.012.6]+[504.05:551.588.74]*

Introduction

Globalization relies on energy resources in its process since one of its biggest dimension is economic globalization. The reality of energy satisfaction has been a challenge to the global economy since energy is one of the main engine of the global economy.

For more than a decade globalization has been facing a decline in its process and dimensions moving towards the phase of Slowbalization or as it is called economically deglobalization. Climate change has been one of the main issues in deglobalization due to

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its importance. Worrying about energy efficiency and satisfaction has led many advanced economies that lack energy resources in their land to think over the importance of fossil fuels and present more interest in renewable energy resources. However, renewable energy resources remain difficult and expensive to generate and use compared to the benefits and advantages of energy that comes from oil and gas as main energy resources globally. Renewable energy resources remain weak and alternatives for many economies in front of coal, oil and gas. Oil and gas companies cannot abandon their equipment for fossil fuel and energy business to follow only renewable energy resources but they may save their potential and existence for fossil fuels and incorporate renewable energy resources as auxiliaries for their business resources and values.

Decarbonization could be a great business initiative for oil and gas companies since it bases on reducing the CO2 emissions in the atmosphere. Carbon Capture and Storage (CCS) is relevant for decarbonization and the carbon market because it helps global and multinational large energy companies to transform the captured CO2 to fossil fuels using the power of renewable energies as clean energy resources. CO2, oil and gas are important for many industrial operations that is why it is barely impossible to give up on them.

Innovative Small and Medium Sized Enterprises (SMEs) could focus on decarbonization as a business perspective for their internationalization and multinationalization process but they need the help of multinational companies (MNCs) to rise. MNCs could help fund and incorporate SMEs in their business or lift them for mutual partnership especially if they innovative.

This research paper aims at demonstrating the value of decarbonization as a business potential option for SMEs to grow focusing on a relevant partnership with large companies such as multinational companies (MNCs). This research shows the process of decarbonization as a business opportunity to regenerate fossil fuels and use CO2 as a business opportunity for more innovation in the energy industry and the carbon market. Since CO2 emissions are considered a symbol of deglobalization together with the phenomenon of climate change, using them to regenerate other energy resources in a clean way would be a great opportunity for companies business and internationalization process.

This full paper is a continuous complementary designed research to the author's prior published doctoral research, it is an original actual chapter that could be added to what was published before by the same author and other ones from the same research area.

Related literature review

Globalization, Internationalization, Slowbalization and AI for business trends

The increasing challenges in the global economy have led globalization to move towards the processes of de-globalization and slowbalization (Benabed, 2024). The main factors contributing to the slowdown of globalization include the ups and downs of global GDP (Benabed, 2024). The reality of inequality between economies creates a gap in business values (Benabed, 2024).

Today, the world faces the reality of thinking machines with programmed hardware or software that perform specific designed processes in shapes of artificial intelligence. Hence, artificial intelligence (AI) is the ability of a machine or virtual program to mimic intelligent behavior (Benabed and Tudoran, 2023). Promoting corporate resilience is highly important in business and the internationalization process of companies (Benabed, 2023a). Companies need to rely on the creation of suitable resilience models to mitigate the expected and unexpected risks (Benabed, 2023a). Companies may introduce their conditions in any foreign market and location where they intend to operate because will enhance their competitiveness especially in close markets that lack competitors (Benabed, 2023b).

In the age of globalization and its challenging aspects, strong market forces and companies that directly aim at having long-term customers, profits, business protection and resources have to focus on sustainable business and sustainability aspects (Benabed and Boeru, 2023). Internationalization enables companies to secure competitive advantages by expanding their presence in international markets (Benabed 2023c). Therefore, careful planning of these strategies is essential, as it forms the basis for entering new markets and increasing added value, profit, customer base, and revenue (Benabed, 2023c).

Decarbonization, fossil fuels and renewables

Fay et al (2015) argue that the most important question is to focus on the possible technological options that are at acceptable costs since the process of decarbonization is difficult for the sectors of industry and transport (Fay et al., 2015). Lechtenbohmer et al (2015) states that the decarbonization of the industrial and transport sectors is not discussed yet at the economic scales, it lacks the focus on the economic issues and it needs significant low carbon investments in both emerging and industrial economies (Lechtenbohmer et al., 2015). While Gielen et al (2017) argue that reducing fossil fuels is a complex process for such sectors since they are main energy resources for it (Gielen et al., 2017).

Kroposki et al (2017) add that decarbonizing the energy sector has been a crucial research topic with increased attention due to its relevance (Kroposki et al., 2017). However, implementing renewable energies could be the most compatible option for companies (Kroposki et al., 2017).

The international Energy Agency (IEA) affirmed in 2009 that since many derived elements that come from petroleum energy are important, oil remains important even for the future use due to its essential demand (International Energy Agency, 2009). Furthermore, Oil accounts for the largest share of primary energy demand globally that is why liquid and gas (International Energy Agency, 2009).

CO2 emissions in tests and production

Real World (RW) emissions are a crucial indicator since they show and reflect the vehicles environmental impact, the driving patterns and actual use that are neither seen nor captured in labour tests (Tu et al, 2012). The traffic and environmental state, temperature ad road types provoke more CO_2 emissions (Ghaffarpasand and Pope, 2013). There are disparities between official and real world (RW) emissions that appear observed globally.

Japan reduced vehicle fleet by transiting to a WLTP standardized laboratory test that estimates and counts the consumed emissions and its electric range to ensure harmonized results (Tanishita and Kobayashi, 2021).

Prior research reported that there are various gaps among countries due to the differences between the type approval series of steps and real world (RW) conditions (Tietge et al., 2017). Fitzmaurice et al (2022) state that vehicles are exposed to diverse road conditions requiring a variability in fuel consumptions and CO_2 emissions (Fitzmaurice et al., 2022). According to Pavlovic et al (2020) there are three main factors that can characterize the vehicles' operations in function with the CO_2 emissions. These factors could be environmental traffic influences, vehicle related and driver related aspects (Pavlovic et al., 2020). Fontaras et al (2017) argue that the worldwide harmonized light vehicles' test procedure (WLTP) lowered the discrepancies focusing on conditions and relevant protocols (Fontaras et el., 2017).

Cheng et al (2023) argue that decreasing the level of CO_2 emissions that come out from cement production is critical due to the fact that a significant amount of emissions increases from the process of calcination of limestone that is a basic chemical process for cement production (Cheng et al., 2023). In this process, the released CO_2 emissions cannot be reduced through the application of traditional methods or energy innovation alone. Besides, as there are disparities in traditional cement production and those that come out from obsolete technologies and low-quality operational management may obviously lead to other additional CO_2 emissions (Khaiyum et al., 2023).

The International Energy Agency (IEA) predicts that the percentage of cement demand will rise by at least 12-23% by 2025 in many Asian and South African regions (Monteiro et al., 2017). However, this process could increase the amount of CO_2 emissions; for this reason, the Global Cement and Concrete Association (GCCA) following the Paris agreement requirements proposed zero net cement emissions by 2025 (Kajaste and Hurme, 2016). Thus, this case will require more attention because increasing cement production will produce more CO_2 emissions in the upcoming years, it will require various decarbonization and CO_2 reduction strategies in the cement production industries (Kajaste and Hurme, 2016).

Data and Methodology

The methodology of research relied on the incorporation of a related literature review to the body and structure of this full paper together with the application of both quantitative and qualitative research approaches (see figure 1).

Figure 1 illustrates the main phases of the author's designed research methodology where phase 1 started by establishing the main the research questions of the full papers (RQs) of the paper since they are essential to structure the paper and identify its results and analysis.

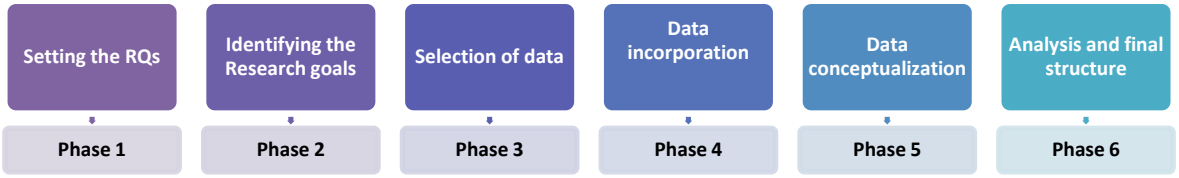

Figure 1. Main phases of the author's designed research methodology

Source: Author's design and research, 2025

In phase 2, the author identified the main research goals to optimize and boost the research relevance and analysis (see figure 1). In phase 3, the author selected the relevant data for the literature review in qualitative way from the relevant international scientific databases together after a filtration process to exclude the unnecessary details. In phase 3, the author selected as well the most relevant related numerical data in statistics' approach (see figure 1). In phase 4, the author incorporated the relevant theoretical and numerical data in the body of the research paper. After that, in phase 5, the author embodied the conceptual designed data in a shape of models and frameworks following the design thinking approach. Sixth, the author in figure 6 started the analysis and structure of the results in accordance with the literature review (see figure 1).

The qualitative research approach relied on the use conceptual frameworks to illustrate the author's designed ideas following the design thinking concept. The studied figures illustrates various relevant data for the analytical aspect of the research paper where figure 2 illustrates the global GHG emissions from 1970 to 2024 in billion metric tons of CO2. Figure 3 illustrates the accruing CO2 emissions from land and fossil fuels' use globally from 1850 to 2023. While figure 4 illustrates the amount of CO2 emissions from land and fossil fuels' use globally from 1850 to 2023. Figure 5 shows and presents the global crude oil global demand in the period of 2005 and 2024 with a 2025 forecast and a complimentary point figure 6 presents the 2023 Global number of jobs by commodity type in millions. Conceptually, the author designed figure 7 to illustrate the useful steps for companies wishing to engage in decarbonization with internationalization partnership. Additionally, in figure 8 the author designed a suggested a business internationalization Partnership Model between MNC and SMEs for Decarbonization and Sustainable Business.

The author set the following research questions to start and go further with the research:

- **RQ1:** Could CO2 emissions be useful for companies' business partnership in globalization?
- **RQ2:** Can decarbonization be a business opportunity for innovative SMEs to lift their status?
- **RQ3:** How can SMEs and large companies such as MNCs and GCS collaborate in the carbon market for decarbonization?
- **RQ4:** Could CO2 help in regenerating fossil fuels such as oil and gas in globalization?

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The main research goal of this full paper and research is demonstrating the value of decarbonization as a business potential option for SMEs to grow focusing on a relevant partnership with large companies such as multinational companies (MNCs). This research shows the process of decarbonization as a business opportunity to regenerate fossil fuels and use CO2 as a business opportunity for more innovation in the energy industry and the carbon market. The research is independent, original, and presents the interconnection between scientific research and practical analysis. The article uses current literature and cites relevant sources.

Results and analysis

1. Data illustration and Analysis

Figure 2 illustrates the global greenhouse gas emissions (GHG) in the period of 1970 to 2024 in billion metric tons of CO2. It is observed in figure 2 according to the available illustrated data that the number of CO2 emissions has been constantly increasing. If we check the year 1970, the number of global GHG emissions was 23.23 billion metric tons. However, if we check the data of 2024, we see that the number is 53.21 billion metric tons.

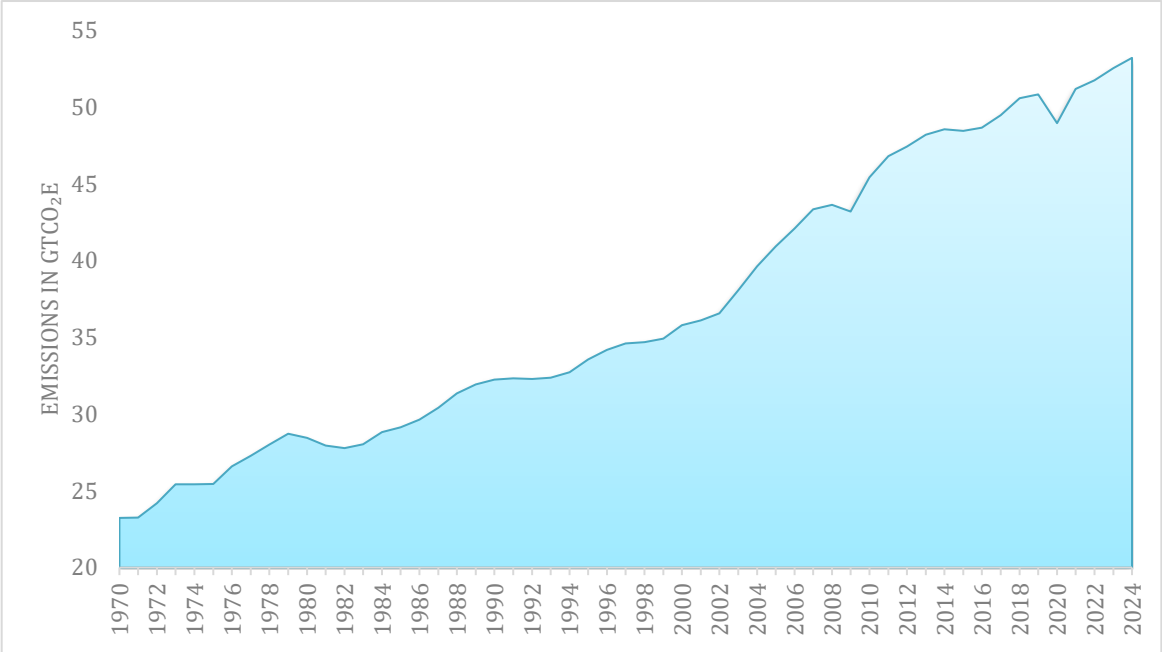

Figure 2. Global GHG emissions from 1970 to 2024 in billion metric tons of CO2

Source: Author's contribution, IEA data, Statista data, 2025

The increase of global GHG CO2 emissions is related to the increase in industrial use and technological emergence. Other factors that have been increasing the number of CO2 emissions could be the high deforestation in many areas globally and the rise in carbonization by the means of transport, the extensive use and production of fertilizers in the agricultural sector as well (see figure 2).

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Figure 3 illustrates the accruing CO2 emissions from land and fossil fuels' use globally from 1850 to 2023. We observe that the US is the first in the list with the amount of CO2 emissions from fossils with 431.7 billion metric tons but Brazil is the first with the amount of CO2 emissions from land with 121.3 billion metric tons.

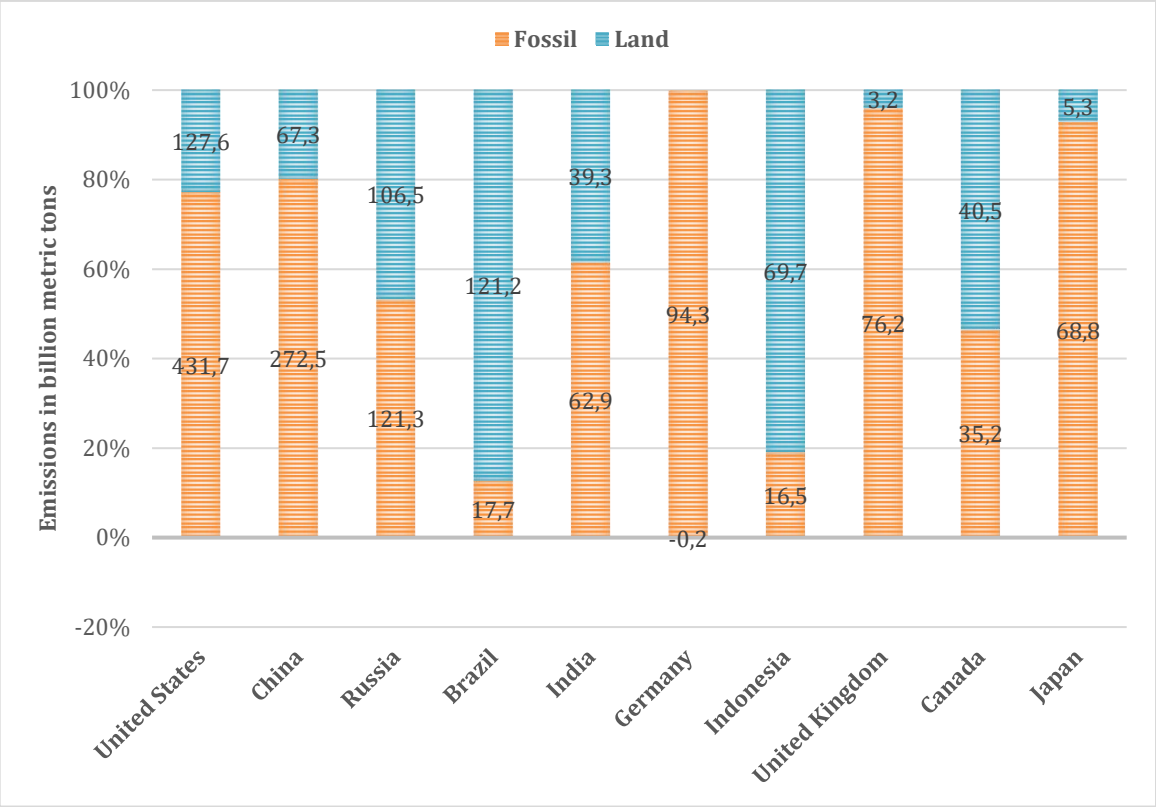

Figure 3. Accruing CO2 emissions from land and fossil fuels' use globally from 1850 to 2023
Source: Author's design 2025, OWID and Global Carbon Project data 2024, Statista data 2024

Germany appears as the only country from the list with low accumulated CO2 emissions from land with -0.2 billion metric tons and with 94.3 billion metric tons. The country with the lowest amounts of accumulated CO2 emissions from land are Germany, the UK and Japan. The countries with the highest accumulated CO2 from fossil fuels' use are the US, China, Russia, Germany, the UK and Japan. After analysing the available data, we consider that the accruing CO2 emissions from fossils are related more to the industrial operations since all the mentioned countries with the highest amount are global energy industrial economies. Whereas, the economies with the highest accruing CO2 emissions from land use such as Brazil and Indonesia could be facing crowded transport activities with less renewable opportunities and emit more CO2 through the transport and agricultural activities (see figure 3).

Figure 4 illustrates the accruing CO2 emissions from land and fossil fuels' use globally from 1990 to 2024 according to the available data. According to the illustrated data, the sector of power industry has been the biggest sector with the number of accumulated CO2 emissions. It followed by the sectors of transport, fuel exploitation and agriculture.

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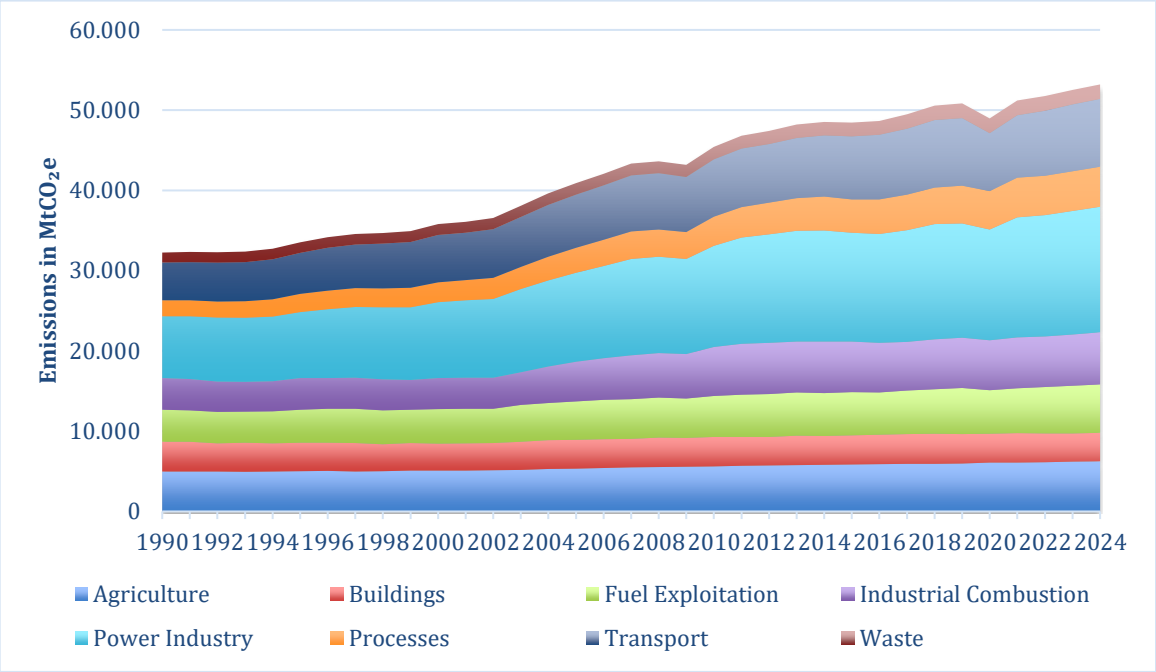

Figure 4. Accruing CO2 emissions from land and fossil fuels' use globally from 1850 to 2023

Source: Author's design, OWID data, World Bank data, 2025

The areas that contribute and accumulate more CO2 are the ones of agriculture, fuel exploitation, industrial combustion, transport, building activities accumulated waste and processes (see figure 4). All these area are major business field for companies and if they generate more CO2 emissions, they have to take majors in tackling climate change by participating in the carbon market and the decarbonization process either by funding the decarbonization projects of other companies or by having assets at least in a decarbonization project with scalability.

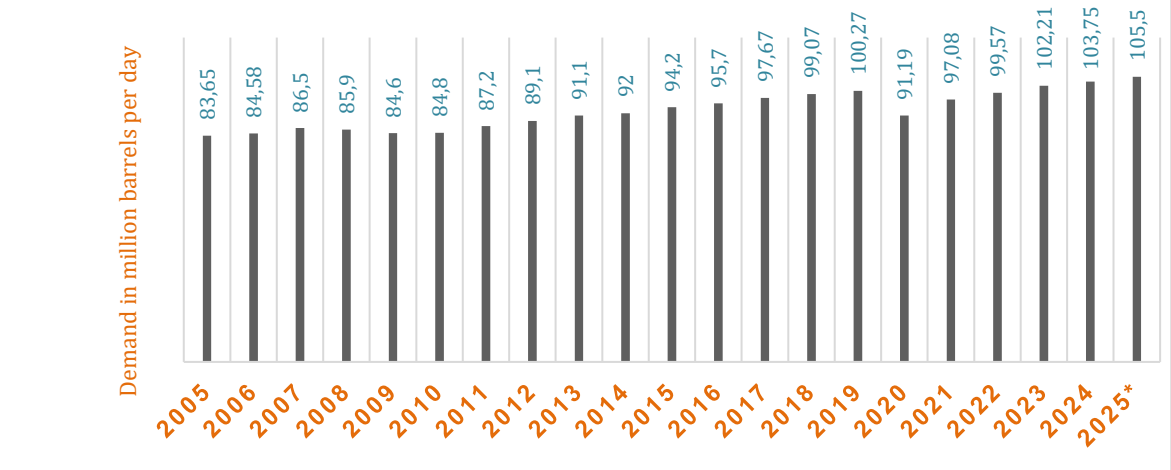

Figure 5. The crude oil global demand in the period of 2005 and 2024 with a 2025 forecast globally

Source: Author's design 2024, OPEC data 2024, Statista data 2023.

Figure 5 illustrates and shows the crude oil global demand in the period of 2005 and 2024 with a 2025 forecast. The constant increase in oil demand worldwide shows the importance of the energy source globally for companies, economies, markets and the energy sectors.

As we observe in figure 5 since 2005 the oil demand has not declined to zero, it has been constantly increasing from 83.65 million barrels per day to 103.75 million barrels per day in the late 2024 according to the available data (see figure 5).

Many economies still claim energy satisfaction due to the rise in transportation costs and low investments' opportunities. The recoil of globalization to slowbalization has affected the stability of oil and gas production in times of financial crises such as the financial crisis of 2008 and the global widespread of the covid-19 pandemic in 2019 and 2020. The periods of geopolitical conflicts have affected the stability of crude oil transportation and its negotiation process globally (see figure 5). In 2020 we observe that the number of demands on oil barrels declined to 91.19 million barrels per day from 100.27 million barrels per day in 2019, this huge gap and difference shows the impact of the Covid-19 pandemic on the crude oil demand globally. Hence, a decarbonization business process by local energy companies could be an alternative solution in these cases of crises for companies and economies to avoid waiting to receive the energy supply in hard times.

Figure 6 illustrates the 2023 global number of jobs by commodity types in oil, natural gas and liquefied natural gas (LNG) in millions. According to the available and illustrated data in figure 6, we notice that the number of jobs in the oil sphere was really high with a value of 8.27 million jobs, it is even higher than the number of jobs in the natural gas field that was 4.13 million jobs and the number of jobs in the LNG field that was 0.61 million jobs in 2023 (see figure 6).

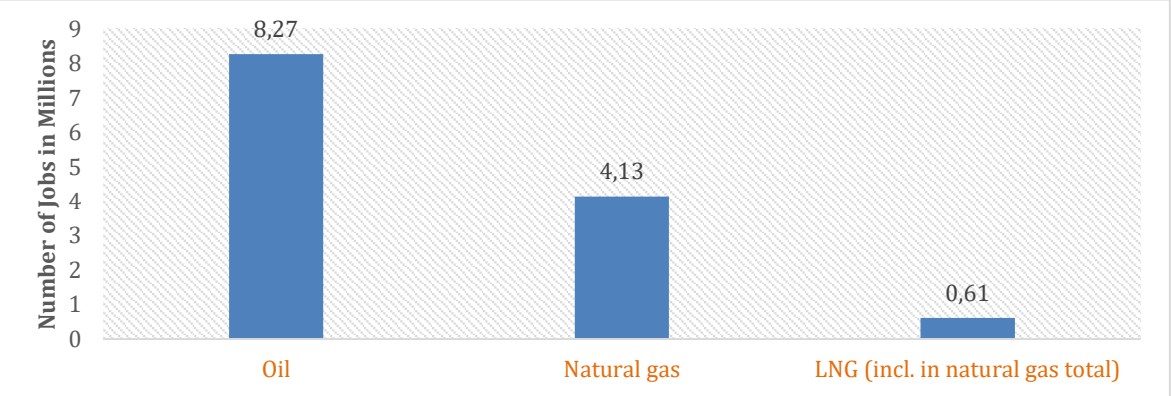

Figure 6. The 2023 Global number of jobs by commodity type in millions

Source: Author's design 2024, IEA data 2023, Statista data 2023.

A high number of jobs in these global commodities shows their importance and relevance in globalization and its energy sectors. Skilled individual in these commodity areas will never quit their jobs and move to renewable energy jobs since are well prepared to participate in this kind of energy generation that still appear useful for many industries globally (see figures 5 and 6).

2. Data conceptualization and analysis

Decarbonization is a complex process to reach but it could offer many future opportunities to companies, economies and markets as an alternative way to energy storage and transformation. According to this research decarbonization could help in energy distribution and auto-generation based on the idea of carbon capture and storage (CCS). It may be a relevant approach for energy efficiency if it relies on the use and incorporation of renewable energy resources to advance them. It needs also the incorporation of artificial intelligence (AI). Decarbonization is a key aspect for companies' success and it should rely on the quality and opportunities of investments that have the power to lift break its limits in business with more values and competitiveness. It is a type of business and it should rely on creative models in order to be applied for short and long terms. Companies should define and identify suitable models and strategies in order to reach an impacting leadership style in the both industry and carbon markets.

Decarbonization as a business project should rely on the implementation of creative recent innovative technologies. Thus, innovative SMEs may contribute to this by investing their innovative aspects and endeavours in this kind of initiatives for business values. SMEs may learn in this kind of contribution to strengthen their existence and long-term profit. However, they should rely on the help of large companies such multinational, global or transnational companies that may fund their innovations and help them grow more.

Figure 7 illustrates some useful steps for companies that wish to engage in the decarbonization process. As illustrated in figure 7, companies have to start with an analysis and investigation of the suitable locations for decarbonization, they need to check and focus on their internalization abilities. In case they lack financial satisfaction to fund their process, they have to look for internationalization partnership for funds. Taking the case of SMEs, once they are innovative for this kind of process, they may get incorporated in the multinational or global process of internationalization by either MNCs or GCs that are engaged in the energy area and the oil and gas industry (see figure 7).

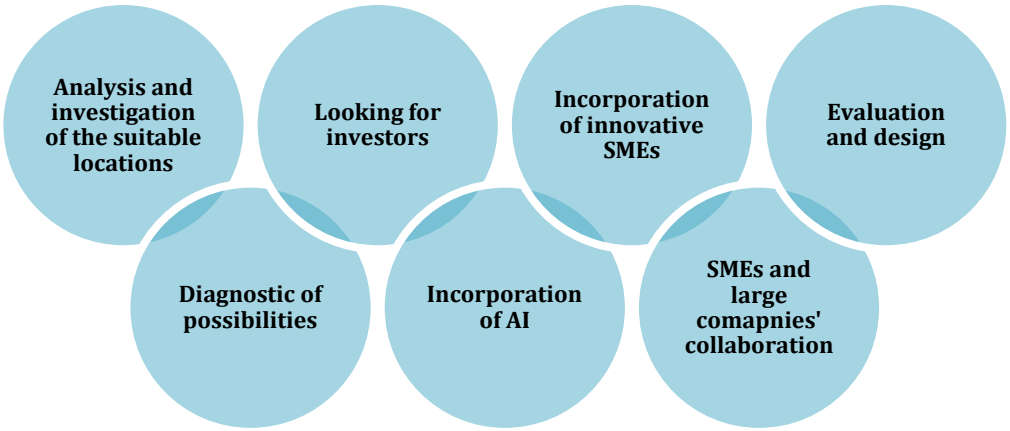

Figure 7. Useful steps for companies wishing to engage in decarbonization with internationalization partnership

Source: Author's design and research, 2025

All companies that engage in the decarbonization process have to keep in mind that it is a huge business opportunity for business worth and values in case they base on cooperation, experience exchange and the internationalization process. However, they have to evaluate and design carefully their steps and strategies with novel models to avoid losses and conflicts. Preparing and making up a diagnostic of possibilities for the steps and developed partnership will be a great opportunity for the engaged companies to check their advances and losses in the process. Any business opportunity scales between profits and losses that is why for many companies the case of cooperation with other companies will be necessary for mutual survival. Since Artificial Intelligence (AI) has become highly important, it is highly important for energy security and automation with the decarbonization process, AI incorporation is a key for companies' partnership and mutual trust, it is necessary to detect the possible risks during capturing and string the CO2 emissions, the whole decarbonization process and the operations of business internationalization (see figure 7).

The Oil and Gas partnership model for CO2 incorporation and decarbonization between SMEs and MNCs

Figure 8 illustrates the author's suggested Oil and Gas partnership model for CO2 incorporation and decarbonization between SMEs and MNCs since MNCs can use the decarbonization process as a great opportunity for their foreign direct investments (FDIs).

As illustrated in figure 8 Small and Medium Enterprises (SMEs) and Multinational Companies (MNCs) may contribute together to the decarbonization process taking this option as a business opportunity for their internationalization process (see figure 8).

Reducing the CO2 emissions in the atmosphere through the Carbon Capture and Storage (CCS) offer the global environment more climate security and energy storage.

Technically, the captured stored CO2 emissions may be used to regenerate fossil fuels and oil since they are still considered main energy resources globally. The designed illustrated model in figure 8 shows that SMEs and MNC may collaborate together for mutual survival and common benefits in the carbon market and the internationalization process (see figure 8). Small and Medium Sized Enterprises (SMEs) may be lifted by Multinational companies for their innovative skills and relevance in the business of decarbonization of the energy sector, they may be merged or purchased by them with the foreign direct investment process (FDI).

Since Multinational companies (MNCs) are famous and known for their goal of foreign direct investments according to the prior research and publications by the author of this paper and other authors as well; SMEs can benefit from their experience in their locations by guiding them in case the lack knowledge and experience in the locations of SMEs (see figure 8).

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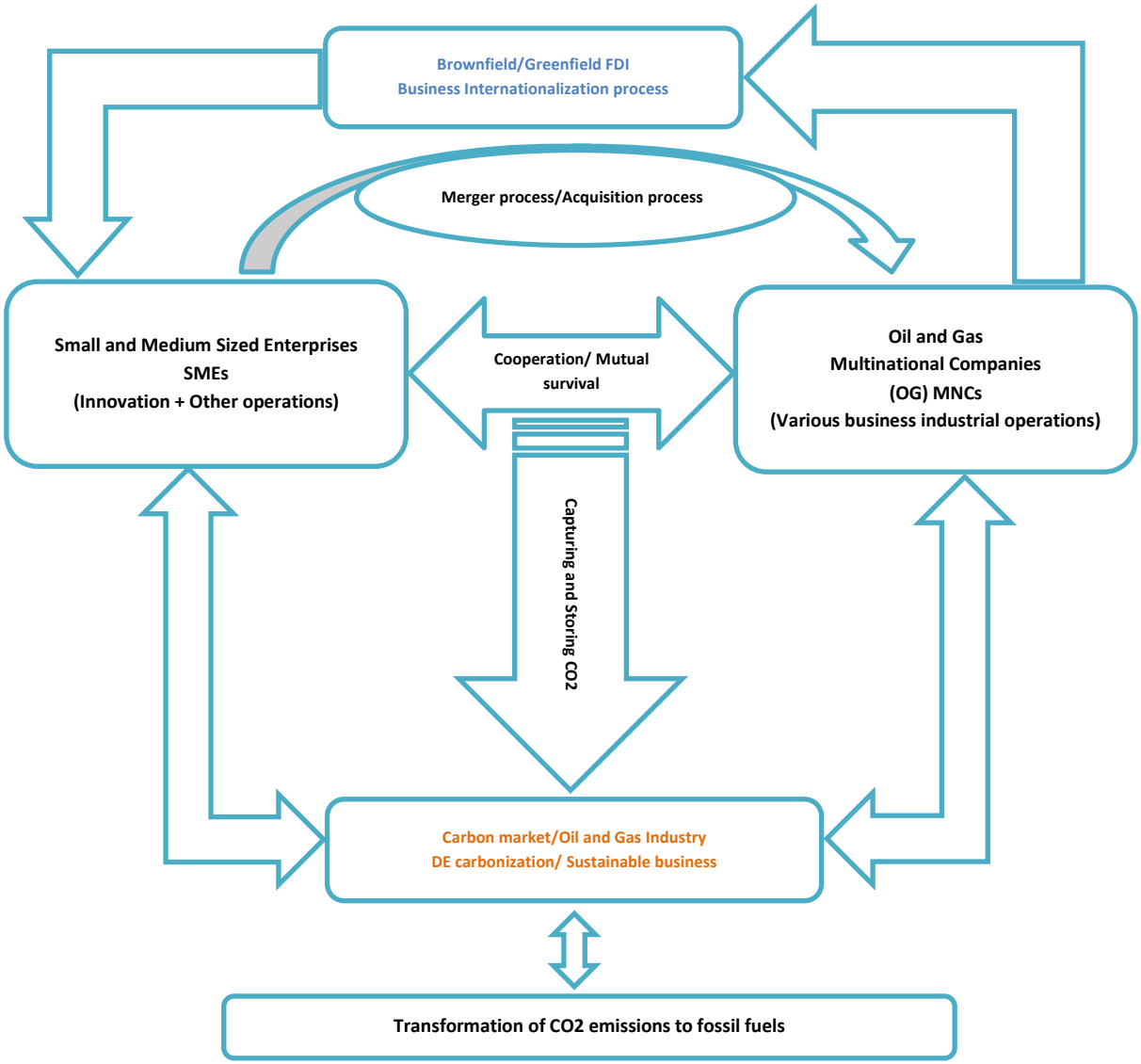

Figure 8. Suggested Business internationalization Partnership Model between MNC and SMEs for Decarbonization and Sustainable Business

Source: Author's own design and doctoral research, 2024-2025.

Foreign direct investments (FDIs) are good for foreign locations because they engender various benefits and renew the infrastructures. They could be Brownfield or Greenfield FDIs since they symbolize the process of internationalization of multinational companies (MNCs). The model of figure 8 shows the decarbonization process and a business opportunity for a mutual collaboration between MNCs and the SMEs of different locations for sustainability and tackling climate change consequences. Hence, this way companies that engage in this process are able to participate in both processes of sustainability and internationalization to advance globalization to a better phase with business values and energy satisfaction (see figure 8).

Conclusions

In conclusion, decarbonization appears an important process for business and raising companies. All companies that engage in the decarbonization process have to keep in mind that it is a huge business opportunity for business worth and values in case they base on cooperation, experience exchange and the internationalization process. However, they have to evaluate and design carefully their steps and strategies with novel models to avoid losses and conflicts.

Companies such as SMEs and MNCs will need to rely on innovative perspectives to rise in the internationalization process. The carbon market needs CO2 emissions as a business option, Oil and gas are main energy resources worldwide that is why their use is necessary. Companies such as Innovative SMEs may collaborate with MNCs in the carbon market and the energy sector to regenerate them for an alternative energy storage and satisfaction in case of crises. Companies participating in the process can contribute to both sustainability and internationalization; thereby, advancing globalization in terms of economic and energy efficiency. Reducing CO2 emissions through carbon capture and storage (CCS) offers greater climate security for the global environment and enables energy storage.

Technologically and chemically, the captured stored CO2 emissions may be used to regenerate fossil fuels and oil since they are still considered main energy resources globally. Decarbonization as a business project should rely on the implementation of creative recent innovative technologies. Thus, innovative SMEs may contribute to this by investing their innovative aspects and endeavours in this kind of initiatives for business values. SMEs may learn in this kind of contribution to strengthen their existence and long-term profit. However, they should rely on the help of large companies such multinational, global or transnational companies that may fund their innovations and help them grow more. The full paper answers all the research questions and points out that CO2 emissions could be a useful for companies' business partnership in globalization and decarbonization can be a business opportunity for innovative SMEs to lift their status. SMEs and large companies such as MNCs and GCS may collaborate in the carbon market for decarbonization. CO2 help in regenerating oil and gas in globalization companies collaborate for that in the carbon market and the internationalization process.

The research is independent, original, and presents the interconnection between scientific research and practical analysis. The article uses current literature and cites relevant sources.

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