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The Impact of Green Investment Practices on Economic Growth Strategies in the Libyan Companies

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Abstract

The current study focuses on the significance of green investments as a part of Libya's economic growth strategies during the period 2008 to 2023 and relies on secondary data acquired from trustful institutional sources, such as the World Bank, African Development Bank (AfDB), International Renewable Energy Agency (IRENA), and United Nations Development Program (UNDP). The researcher employed a quantitative descriptive method for the analysis, with the goal to unveil the interconnections of the factors: renewable energy investment, energy efficiency, CO_2 emissions, and environmental expenditure, with GDP growth, diversification, and productivity. The results reveal that both renewable energy investment and energy efficiency are economically rewarded while the increase of carbon emissions is punished. Furthermore, the results point out that in order to achieve the diversity, long-term robustness, and synchronization with the world's sustainability objectives, the green investment should be deeply rooted in the national economic agenda of Libya. The policy implications reveal that institutional reforms, the creation of green financing mechanisms, and the establishment of strong regulatory framework are prerequisites to the success of Libya's transition towards a low-carbon innovation-driven growth model.

Keywords: Green Investment, Economic Growth, Renewable Energy, Sustainability, Libya, Energy Efficiency

1. Introduction

The global concerns about the fast-changing climate, the environment slowly deteriorating, and the getting-less resources has made the sustainable development strategies more urgent, thus, the governments and firms have been forced to think about the environment in their economic planning. Green investments—money put into projects that are environmentally friendly, become less polluting, more resource efficient, and the transitions to a low-carbon world—have become a major partner in the environment and economy coupling. Green investment as noted, incorporates ways of producing electricity with the sun and wind, non-polluting means of getting people and goods from one place to another, and the use of earth-friendly technology and even the building of green infrastructure, thus giving the economies the chance to grow without putting more pressure on nature.

There is an impressive amount of articles that back up the claim of green investments to be a driving force for innovation, productivity and competitive advantage. The ability to lead the market because of the technology developed and being able to operate for a long time without risks are among the reasons for the schools of thought to have come up with such conclusions. As such, according to the studies referred to in the thesis, the firms that are doing environmental innovation get benefits in terms of efficiency, compliance with regulations, and being trusted by stakeholders, while the economies of the countries as a whole receive benefits in terms of jobs, diversification, and eco-resilience (Chen & Ma, 2021; Doval & Negulescu, 2014). To sum up, these findings view green investment as a tool for both economic and environmental purposes, leading the countries' development paths to be in line with the current sustainability requirements.

The situation is even more critical for Libya when we come to the matter of the strategic necessity for green investment. The Libyan economy has always been mainly supported by oil and gas and this sort of reliance makes the country susceptible to market price fluctuations, environmental degradation and weak governance. The dissertation draws attention to the fact that Libya is in dire straits with respect to three problems: the environment being degraded, little diversity in the economy, and the lack of proper policies in place for going green. Although the country is endowed with extensive solar and wind resources, large-scale renewable energy installment and green infrastructures are still very much in the offing owing to the weak institutions, lack of incentives and absence of coordinated national strategies for sustainability.

On the flip side, Libya's post-conflict healing phase is the time when the country can transfer the sustainability principles to reforms in the economy. The UNDP, AfDB and the Green Climate Fund are among the international organizations that have already initiated aid-programs to enhance the capacities of the local authorities, thus, the policies regarding green finance, climate resilience, and renewable-energy integrative approaches are going to be receiving more attention. Furthermore, the thesis pointed out that green investment was the right thing to do for Libya since it entailed the transformation of the economy through the creation of new industries, green jobs, less dependence on oil, plus a more stable and better economy in the future.

The research work presented in the thesis cites the correlation between solar and wind power investments and their positive impact on energy-efficient GDP growth as a strong one. CO_2 emissions, on the other hand, have been found to significantly correlate with the negative side of economic performance. The Indian and African studies done also confirm this and the results are in line with the global and regional studies that green investments not only promote growth but also reduce environmental pollution, and thereby, the economic expansion is no longer viewed as a negation of ecological sustainability.

Therefore, the purpose of this article is to distill the theoretical underpinnings, methodological approach, and the main empirical findings of the thesis so that a targeted and publishable academic study can be produced. It analyses the impact of the green investment practices on economic growth strategies in Libya and signals the policy pathways that could speed up its transition toward a resilient, diversified and low-carbon economy. The introduction lays out the conceptual and contextual foundation for the analysis and provides a solid understanding of the reasons why green investment is now a must for the long-term development path of Libya.

2. Literature Review

2.1. Empirical Evidence from Global and Regional Studies

The global shift toward sustainability and low-carbon growth has made the empirical link between green investments and economic development a hot topic for researchers. There is evidence that green investments, when accompanied by new technology, strong institutional ability, and determined supportive policies, can boost economic growth in both developed and developing nations. The investments indicated above are linked to advances in GDP growth capacity, energy efficiency, the transition to a green economy, and environmental issues including carbon emissions and resource depletion, according to empirical findings (Zhang et al., 2022).

The dynamic nexus of green investment, economic growth, natural resource consumption, and green technological innovation was examined in a thorough research effort carried out in China by Zhang et al. (2022). It is possible that investments with an emphasis on the environment could be a powerful force in bringing about ecological modernization and sustainable development, since their findings corroborated a strong positive linear relationship between green investment and GDP growth. On top of that, their research shows that green investments have more of an impact on the economy in the long run when they combine environmental factors with technological advancements, and it also shows that regional innovation capacities can boost the economic advantages of green investments.

Similarly, a panel analysis of Chinese provinces conducted by Wan and Sheng (2022) shows that green investment leads to higher clean energy consumption, which in turn stimulates economic growth and decreases carbon emissions. It shows that green investment promotes economic development and environmental sustainability simultaneously, which is especially true in economies that rely heavily on energy.

Green investment, in conjunction with technical innovation, is critical in reducing CO2 emissions and reflects favorably on the relationship with economic growth, according to Luo, Ullah, and Ali (2021), who offered a broader Asian viewpoint by mentioning a few chosen Asian countries. Their research proves that considering sustainability when making investments is not a compromise, but rather a win-win that helps the economy and the planet.

Kwilinski, Lyulyov, and Pimonenko (2023) were worried about the potential worldwide impact of greenfield investment on green growth promotion. Their findings provide credence to the idea that greenfield investments in sustainable agriculture, green infrastructure, and renewable energy can improve economic production and job creation while also helping to achieve climate goals. It has been shown that these investments boost productivity without compromising the environment, in line with sustainable development ideals.

Particularly after the financial crisis, "green investments" and "green innovations" are crucial to recovery plans, according to Zenghelis (2012). Countries can boost employment, productivity, and investor confidence by investing in clean technology and high-quality low-carbon infrastructure. In his policy brief, he stresses the need for fiscal stimulus programs that include green investments in order to build economic resilience for the long run. Additionally, Fan et al. (2023) discovered that green investment, along with developments in ICT, substantially helps the government achieve its sustainability goals in relation to economic growth goals. Digital change, green financing, and economic growth are all interdependent, as their research shows.

Green investment, according to Kaur and Tanwar (2024), helps in several areas of sustainable development, including innovation-driven competitiveness, inclusive growth, and resource efficiency. Incorporating green investment into national development strategies for balanced and inclusive economic growth will be made easier with the empirical evidence given by their research.

2.2. Green Innovation and Firm Competitiveness

As the world moves toward sustainable development, green innovation has emerged as a crucial factor in improving firm-level competitiveness. This is due to the mounting positive evidence from consumer choices, regulatory frameworks, and investor behavior, which has led firms to see green innovation as essential to their long-term survival and competitive advantage, rather than just a voluntary act of corporate responsibility (Zhang et al., 2022).

Green innovation is favorably associated with corporate competitiveness, according to the empirical studies. Therefore, in regards to the Chinese economy, Zhang et al. (2022) found that energy-intensive industries, in particular, had a notable improvement in performance on two tiers of businesses due to green technology advancements driven by focused green investment. The gains are a result of more efficient operations, reduced production costs over time, and a better image as a brand among eco-conscious consumers. These findings provide

more evidence that green innovation helps businesses stay competitive both at home and abroad by ensuring that their practices meet the growing demands of consumers and environmental regulations.

Access to green financing and benefits, as well as the chance to comply with stricter environmental regulations, are two ways in which green innovation gives businesses an edge. New delivery services should be involved in the flexible adoption of green technology under the best resource management, according to Wan and Sheng (2022). Because they are better able to satisfy most legislative criteria and/or financial conditions related to energy efficiency and carbon emissions, businesses that have adopted environmentally friendly technologies can enjoy preferential financing and reduced compliance costs.

Green innovation opens the door to product and process differentiation, two key sources of competitive advantage, which in turn boosts firms' competitiveness. According to Kaur and Tanwar (2024), eco-innovation is a major market trend that could offer developers and innovators an edge over their competitors. This is because, for example, eco-friendly products, energy-efficient appliances, and non-polluting vehicles are practically unheard of in the market. Businesses that differentiate themselves in this way not only attract new consumers, but also hold on to the ones they already have. People are willing to pay a premium for eco-friendly products, so when these products are promoted effectively, sales can be rather high.

In the context of Green Innovation, investments in the environment have emerged as a hot topic. Green financing and public policies create an environment where businesses and their partners are more likely to invest in R&D for environmentally friendly processes and goods, according to research by Kwilinski, Lyulyov, and Pimonenko (2023). Green practices spread throughout businesses and investments in research and development spur technical advancements, which in turn benefit the economy and the environment. Particularly in emerging markets with less innovation potential, these investments often usher in cutting-edge sustainable technology and management methods.

In their 2023 publication, Fan et al. further expound on these synergistic links of digital technology and green innovation. According to their research, green innovations like predictive maintenance tools, automatic waste segregation, and smart energy management systems all benefit from the integration of ICT. These structures have a multiplicative effect on competitive advantage because they boost environmental performance while simultaneously enhancing the agility and cost of labor behavior.

Economic leaders may secure a leg up in the upcoming wave of industrial change by investing in green innovation early on, claims Zenghelis (2012). With decarbonization as a worldwide trend, being an early adopter of green technology may provide the biggest rewards in terms of price advantages and favorable trade relations, thus it is important to look at the big picture.

3. Methodology

The research employs a quantitative, descriptive, and analytical methodology relying solely on secondary data to scrutinize the effect of green investment practices on Libya's economic growth strategies during 2008-2023. The selection of secondary-data-based method is in line with macro-level sustainability research, especially in places where institutional instability and data-collection constraints hinder the practicality of primary surveys. Datasets collected from reputable global agencies— including World Bank (WDI), African Development Bank (AfDB), International Renewable Energy Agency (IRENA), UNDP, IMF, and UNCTAD— that were used in the study, are cited in the thesis for ensuring the reliability, comparability, and replicability of the research over time and across regions.

By means of drawing up theoretical propositions based on sustainable development theory, environmental economics, and green growth schemes, the research has a deductive rationale and then empirically verifies the propositions that are relevant to Libya's economic and environmental situation using empirical indicators. The study comprises both longitudinal and cross-sectional facets: the longitudinal aspect is responsible for recording the changing trends happening in Libya's economy during the fifteen years-long period, while the cross-sectional

comparisons have the MENA countries of Tunisia, Egypt, and Algeria singled out to provide the context of regional development for Libya's performance. This dual method enhances both the internal and external validity of the findings.

Research made use of the annual dataset that contained data on green investment variables, which include renewable energy investment, renewable energy capacity, energy efficiency indicators, CO_2 emissions per capita, and environmental spending, along with principal economic growth measures, i.e., GDP growth, GDP per capita, productivity, and sectoral diversification indices. These variables have been selected, because they are common in global empirical research and can be found in credible institutional databases. Meanwhile, the missing data points were handled using interpolation methods that are in accordance with AfDB statistical protocols to ensure the smoothness of the data and minimize the chance of bias.

There are two major phases in the analytical procedure. At the first stage, the descriptive statistical methods are used to throw light on the trends in green investment and the economy across the study period. This also involves looking into the yearly variations in renewable energy installation, emission levels, and GDP growth paths. In the second phase, inferential analysis is carried out by means of correlation matrices and multiple linear regression models to express the direction and strength of the associations between green investment and economic growth variables quantitatively. For data cleansing, statistical calculations, and results illustration SPSS 25.0 and Microsoft Excel were the two software applications used. The regression model used allows one to measure both the independent and combined effects of renewable energy investment, energy efficiency, and CO_2 emissions which are the main enablers, by having GDP growth as the dependent variable.

In the end, the methodological framework embraces the interpretation of institutions and policies besides the numerical results, thereby guaranteeing that statistical outcomes are linked to the larger political, economic, and environmental contexts of Libya. Thus, the mixed descriptive-analytical design not only improves the explanatory power of the study but also offers insights that are relevant for policy making in Libya's green transition.

4. Results

The investigation's findings depict an interconnected scenario concerning the trends of green investments in Libya and their impact on economic growth from 2008 to 2023. The analysis based on descriptions discloses a considerable swing in the macroeconomic indicators of Libya, which was mainly caused by the prevailing political instability and oil production that kept changing. As per Table 1, the growth of GDP was marked by very drastic contractions during the periods of conflict and temporary recoveries during the times when stabilizing oil output was taking place, demonstrating the vulnerability of Libya's growth model as well as its reliance on hydrocarbons.

Table 1: Libya GDP Growth and Key Economic Indicators (2008–2023)

Year	Real GDP Growth (%)	Inflation (%)	FDI Inflows (% of GDP)	Oil Output ('000 bbl/day)	Unemployment (%)
2008	6.3	9.6	4.2	1,680	18.5
2011	–62.0	15.1	0.3	390	27.4
2012	76.3	6.1	2.8	1,530	20.2
2016	–3.0	24.5	1.0	620	21.9
2020	–31.3	22.0	0.5	360	25.0
2023	3.2	9.0	1.6	1,170	19.3

Reference: World Bank (2024), IMF (2023), AfDB (2023).

Libya's green investment metrics over the analyzed time frame have shown slow but still limited development. The data displayed in Table 2 shows that the capacity of renewable energy was still very small until the early 2010s, and only then were there small changes that followed the establishment of international collaboration and the UNDP-financed programs aimed at making Libya energy-efficient. Apart from that, the extent of the deployment of renewable energy was still very small when compared to Libya's vast solar potential. The energy-efficiency categories reflected the slight advancements that were caused by occasional investments in the

upgrading of the old infrastructure and the loss of electricity through transmission lines. On the other hand, CO_2 emissions per person continued to be very high until they were a clear indicator that the country was still overly reliant on fossil fuels and that there was not much diversification in the mix of energies used.

Table 2: Renewable Energy and Green Investment Indicators in Libya (2010–2023)

Year	Installed Renewable Capacity (MW)	Renewable Share of Electricity (%)	Energy Intensity (MJ/USD GDP)	CO_2 Emissions (t per capita)	Government Spending on Environmental Projects (% of GDP)
2010	5	0.2	7.8	8.9	0.1
2015	22	0.6	7.5	8.2	0.2
2018	80	1.1	7.3	7.8	0.3
2020	120	2.0	7.1	7.5	0.4
2023	160	2.8	6.9	7.2	0.5

Reference: IRENA (2024); UNDP (2023); Libyan Renewable Energy Authority (2023).

The economic structure of Libya, which is depicted in Table 3, further emphasizes the hydrocarbon sector's supremacy. Even though the authorities were talking about diversification, the non-oil industries such as manufacturing, agriculture and, and services recorded only small-scale growth. The diversification index reveals that the Libyan economy was still dependent on oil revenues to a great extent, hence weakening its ability to withstand crises and making it difficult to achieve long-term sustainable growth. Such structural factors should be taken into account when assessing the interaction between the changes in GDP and the green investment variables.

Table 3: Sectoral Composition of GDP and Diversification Index (2010–2023)

Sector	2010 Share of GDP (%)	2023 Share of GDP (%)	Average Growth (%)	Comment
Oil and Gas	67	55	–0.9	Still dominant but declining share after 2016
Construction	7	10	+2.3	Growth linked to reconstruction projects
Trade & Services	9	13	+1.9	Gradual expansion in urban centres
Manufacturing	6	8	+1.6	Slow progress due to energy constraints
Agriculture	3	3	0.0	Minimal change over period
Diversification Index (0–1)	0.23	0.31	+0.8	Incremental improvement post-2016

Reference: World Bank (2024); UNDP (2023); AfDB (2023).

The outcomes of the regression analysis present strong empirical support regarding the influence of green investment indicators on economic growth. The data in Table 4 exhibit the conclusions of the multiple regression model, signaling a statistically significant positive outcome of the renewable-energy investment on GDP growth. This implies that the economic growth will not be very noticeable if there are only minor additions to the renewable-energy application, but rather, they would be there through the process of cutting down the energy inefficiencies and encouraging people to spend money in the local areas that are involved. The quality of energy used was also contributing positively to GDP, where energy optimization being globally accepted as reducing operational costs and increasing productivity fits with the situation. On the contrary, CO_2 was deemed to have a negative and a statistically significant impact on the economic growth of the country, suggesting that, the case of the country might be that the higher CO_2, the lower the economy which is possibly the outcome of the environmental degradation, higher medical costs in public due to pollution and less efficient institutions made so by fossil-fuel dependence.

Table 4: Regression Results: Effects of Green Investment Variables on GDP Growth (Libya, 2008–2023)

Variable	Coefficient (β)	Std. Error	t-Statistic	p-Value	Interpretation

Constant (α)	0.92	0.38	2.41	0.03	Baseline GDP growth rate
Renewable Investment (REINV)	**0.47**	0.18	2.61	**0.02**	Positive and significant impact
CO_2 Emissions (CO_2)	**−0.35**	0.15	−2.33	**0.03**	Negative and significant relationship
Energy Efficiency (ENEFF)	**0.29**	0.14	2.07	**0.04**	Efficiency improvements enhance GDP
FDI Inflows (FDI)	0.21	0.16	1.31	0.19	Positive but not statistically significant
Inflation (INF)	−0.18	0.10	−1.80	0.09	Weak negative relationship
R^2 = 0.69	**Adjusted R^2 = 0.62**	**F-statistic = 9.87 (p = 0.001)**			

Reference: Author's computation based on World Bank (2024), IRENA (2024), UNDP (2023), AfDB (2023).

The results of regional comparison, depicted in Table 5, show that Libya is trailing behind its neighboring countries of Tunisia, Morocco, and Egypt when it comes to the aspects of renewable energy usage, diversification of energy sources, and investment in green infrastructure. The mentioned nations are indicative of not only making a continuous progress in terms of green-energy capacity but also of being able to harmonize and collaborate with the global trend of sustainability. The status of Libya being the one with the least chances in the region signifies the lost possibilities that are a result of the slow pace of green investment strategies' adoption.

Table 5: Selected Green Investment and Economic Growth Indicators in North Africa (2010–2023)

Indicator (2023)	Libya	Tunisia	Egypt	Morocco	Regional Mean (MENA)
Renewable-Energy Share of Electricity (%)	2.8	17.5	12.3	37.1	18.7
Installed Renewable Capacity (MW)	160	1,100	6,800	4,700	3,400
Energy Intensity (MJ/USD GDP)	6.9	3.8	4.1	3.6	4.5
CO_2 Emissions (t per capita)	7.2	5.0	2.9	2.2	4.3
Real GDP Growth (2008–2023 avg %)	−1.8	2.4	4.2	3.5	3.0
Diversification Index (0–1 scale)	0.31	0.46	0.55	0.61	0.45
Government Environmental Expenditure (% GDP)	0.5	1.4	1.1	1.6	1.2

Reference: World Bank (2024); IRENA (2024); UNDP (2023); AfDB (2023).

The findings overall lead to the conclusion that there was a definite and measurable correlation between the green investments and the economic performance of Libya. Investments in the solar energy sector and energy-efficient improvements are identified as the main drivers of the GDP growth, while high carbon dioxide emissions are limiting the country's capacity to grow economically. The evidence provided, notwithstanding the structural and institutional challenges that Libya faces, the economically strategic potential of green investment as part of the national growth planning stays confirmed.

5. Discussion

The results of the study provide very strong support that the green investment practices not only have an economic impact but also contribute to Libya's economic growth trajectory. The regression analysis reveals that the investments in renewable energy and energy-efficiency upgrades have a favorable impact on GDP growth which is in accord with the global empirical patterns that the green investments have been reducing the costs of energy and stimulating structural modernization. These results have given support to the theoretical expectations derived from the sustainable development and green growth theories that environmentally friendly investments can lead to both economic growth and less ecological risks in the long run.

The negative and statistically significant correlation between CO_2 emissions and GDP growth has again provided substantiation for the environmental economics viewpoint that the diminishing of the environment has a bearing on the economic side as it imposes certain costs. The Libyan situation is such that high emissions are associated with the antiquated energy infrastructure, low productivity, and unyielding dependence on fossil fuels which altogether make the economy unsustainable. Thus, this economic loss has made the necessity of emissions reduction an even more pressing issue for the economy rather than an environmental goal only. According to the thesis, Libya's inability to shift to different sources of energy leads to long-term stability limitations together with the rise in vulnerability to external shocks especially that of global oil price fluctuations.

Comparisons on a regional basis highlight the unfavorable position of Libya when compared with neighboring countries that have put in place more aggressive green investments. For example, Morocco and Egypt have gone ahead with large renewable-energy projects and also established clear institutional frameworks for the private sector to take part easily. Libya is facing challenges such as the splitting of its institutions into factions, lack of the requisite supportive policies, and poor green-finance mechanisms all of which have hindered the country from making progress similar to that of the countries mentioned above. This view concurs with the thesis that poor regulatory clarity and lack of incentives discourage the local and also foreign investors from taking part in the green projects.

These findings back up the claim that green investment can make it easier for economic diversification—this being the most urgent development goal for Libya. The green investments through injecting into the sectors such as non-oil, renewable energy, sustainable manufacturing, and environmental services would assist in erecting a more tough economic structure that is somewhat less reliant on the unpredictable revenues from hydrocarbons. This is in line with the wider national priorities as pointed out in the international assessments by AfDB and UNDP which highlight the green transition as one of the main features of Libya's rebuilding and economic reform process.

In general the findings bring to light a very large and still unutilized opportunity: though Libya has a lot to offer in renewable-energy resources and there is also a growing awareness of the sustainability challenges the country is facing, the institutional weakness has not allowed the successful mobilization of green capital. On the other hand, reinforcing governance, moving towards the adoption of coherent green-alternating-investment policies, and increasing the public's accessibility to green finance can tremendously speed up the changing of Libya into a low-carbon, diversified, and innovation-oriented economy.

6. Conclusion

The research analyzed the influence of green investment practices on the economic growth strategies of Libya from 2008 to 2023 and gave empirical proof that the investment in renewable energy and the application of energy-efficient measures have a positive impact on the economy whereas high CO_2 emissions impede growth. The study results suggest that investing in an eco-friendly manner is not only conflicting with economic growth but can also be a driving force behind it, especially allowed in countries that are trying to change their reliance on resources as the main economic structure.

The evaluation points out the considerable but largely unexploited potential of Libya for green investments. Although the country has an abundance of solar and wind resources, the renewable energy sector has got a little attention because of divided institutions, unstable policies, and a lack of proper financing. What the results show is that even the little increase in renewable energy investment has a measurable positive effect on GDP growth, thus, suggesting that the larger scale initiatives could lead to significant long-term benefits in stability and sustainability of the economy.

On the other hand, a very important conclusion drawn is that the reduction of emissions has to be part of Libya's economic planning. The relationship between CO_2 emissions and GDP growth being negative indicates the economic losses caused by environmental degradation and at the same time, it points out the need for better energy

efficiency, modernized infrastructure, and a diversified national energy mix. It is necessary to confront these structural limitations, to be economically resilient and to keep in line with global sustainability commitments.

The research results also suggest that Libya's geographical location is indicative of a lost chance. Countries in the MENA region which are close to Libya have made strides in the areas of green finance, renewable energy, and institutional reform which puts more emphasis on the need for coherent policy frameworks. Libya can gain from the adoption of similar governance models where the private sector is encouraged to take part and where the range of green financial instruments is broadened.

The research, in a nutshell, has it that green investment is a strong candidate for being the prime mover of Libya's economic transformation. To seize this chance, Libya has to make the regulatory framework stronger, green financing instruments wider, and the sustainability principles part of the national economic strategies. All of this would help in diversifying the economy, increasing productivity, lowering the environmental risks, and putting Libya on the road to a more stable and sustainable growth path.

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