



Deindustrialization and Poverty in Developing Countries: Examining Economic Shifts and Policy Responses (1990-2022)

^a Fatima Gulzar, ^b Shazia Khalid, ^c Kainat bibi

^a Lecturer, Department of Economics, Ghazi University, Dera Ghazi Khan

E-Mail: Fgulzar@gudgk.edu.pk

^b Lecturer, Department of Economics, Ghazi University, Dera Ghazi Khan

E-Mail: skhalid@gudgk.edu.pk

^c M.Phil. Scholar, Department of Economics Ghazi University, Dera Ghazi Khan

E-Mail: kainatahmed367@gmail.com

ARTICLE DETAILS

History:

Accepted 01 January 2025

Available Online January 2025

Keywords:

Macroeconomic Indicators,
Developing Nations, Early
Deindustrialization, and Poverty
Reduction

JEL Classification:

DOI: [10.47067/ramss.v8i1.436](https://doi.org/10.47067/ramss.v8i1.436)

ABSTRACT

This research analyzes the decoupling of poverty from deindustrialization in 44 underdeveloped nations between the years of 1990 and 2018. Using a fixed-effects approach, it examines how the changing structure of the economy from industry to services-age effect poverty levels. It is shown that the process of deindustrialization contributes significantly further to the deepening of poverty in developing economies. To be precise, a 1 percent change in the share of services in relation to the share of manufacturing means an increase of 0.417 percent in the measures of poverty. Remarkably, even after controlling for other factors, this effect remains significant. Deindustrialization is a major barrier to economic growth, reduces job standards, and eradicates conventional manufacturing, all of which contribute to poverty, according to an examination of the underlying mechanisms. The report also highlights the issue of early deindustrialization as a contributing cause to poverty. Low agricultural output and workforce exodus are the primary drivers of early deindustrialization. Thus, the report offers policy recommendations for these countries aimed at combating the negative effects of shrinking industrial sectors. For this case it has been proposed that improving agricultural production and managing labor migration could help prevent a further deepening of poverty as a result of deindustrialization. This study stresses that emerging economies are required to design appropriate economic policies to address the specific challenges posed by deindustrialization.

© 2025 The authors. Published by SPCRD Global Publishing. This is an open access article under the Creative Commons Attribution-NonCommercial 4.0

Corresponding author's email address: fgulzar@gudgk.edu.pk

1. Introduction

Whatever case we may advocate for international trade, it is evident from the recorded literature that a lasting sustainable development is likely to come from a well-developed industrial base. [1][2] The United Nations has endorsed SDG 9 as one of the sustainable development goals, which primarily focuses on the enhancement of the quality and efficacy of infrastructures, the strengthening of economies by promoting fair and equitable industrial perspectives and the fostering of innovative trademarks. Nonetheless, facts congruously point to the fact that Africa has a low level of manufacturing at present to solve these problems since the continent is at best making halting attempts towards the development of a strong base of an economy. It then becomes necessary to rethink the present trend and devise better solutions to withstand the trend. Industrialization in Africa offers advantages such as reduced production of intermediate and tertiary sectors, economies of scale in manufactured goods, and job opportunities. [3] Factors contributing to modernization in Africa include manufacturing, but further analysis is needed due to the minimal commercialization in neighboring regions. Energy poverty negatively impacts societal costs, well-being, obesity risk, health conditions, and human capital. It also affects environmental SDGs 12 and 13. [4] Conventional cooking energy, inefficient and causing emissions and deforestation, is a major motivator for promoting clean cooking energy.

Lack of access to affordable, clean energy sources is referred to as energy poverty. Climate change is significantly impacted by this issue. By 2030, contemporary, reasonably priced, dependable, and sustainable energy is the target of the seventh Sustainable Development Goal set forth by the UN. Global power access increased from 78% in 2000 to nearly 91% in 2021 as a result of efforts to meet this target.

Energy constraint and a drop in the sector's GDP share have caused Africa's industrial activity to decline. By emphasizing the need for countermeasures, this study seeks to close the information gap about the effect of energy poverty on modernization. [5] This study examines how industrialization affects development and relates its causes to energy poverty. It looks at how economic growth, the share of the manufacturing sector, and the accumulation of human capital are related. Finding important factors to help African governments reach SDG 9 is the goal of the investigation. [6] This study looks at four dimensions of energy poverty: overall energy use, availability of ecologically acceptable cooking fuels and technology, electricity usage per person, and access to power. [7] Unlike earlier studies, it takes a novel method by assessing these factors and formulating suggestions for industrialization.

Using mediation analysis, the study looks at ways to improve industrial structure while lowering energy poverty in African nations. It shows that reducing energy poverty improves industrialization, and that businesses gain from less poverty. For sustainable development, this is essential. Even while energy accessibility has a favorable correlation with industry because it is necessary for the use of machinery, [8] its efficiency, and the advancement of technology, the continent's poor energy endowment and high energy poverty impede industrial development.

In Kenya, energy poverty has an impact on living standards, health, and education, as well as the overall economy and social scene. The usage of traditional biomass results in indoor pollution and degradation of health. Poverty cycles are further prolonged by energy poverty, which also makes it more difficult to get resources for contemporary healthcare and education.

In order to address energy poverty in Africa, the report proposes a number of strategies, such as increasing energy production, enhancing infrastructure, and supporting renewable energy sources.

Energy accessibility can be greatly increased by the appropriate application of clean power technologies such as hydroelectricity, wind, and solar power. Sub-Saharan Africa's energy poverty impedes social, economic, and regional advancement. [9] A multifaceted strategy involving green technologies, foreign investment, and regulation is needed to address this. This study examines the connection between FDI, GTI, and "no electricity," highlighting global collaboration and funding for SDG 7 objectives.

By contrasting several areas of Beijing, a significant megacity, this study investigates energy poverty in the area. In order to comprehend the spatial distribution of energy poverty at the household level, it focuses on the geographical determinant and employs primary survey data. The study improves knowledge about urban energy issues. [10] The COVID-19 epidemic has made it more difficult to reduce poverty in emerging nations, especially in Africa. A 30% drop in 2020 would have hampered attempts to eradicate poverty, even as foreign direct investment (FDI) increased significantly from \$15 billion in 1985 to \$706 billion in 2018. Experts continue to disagree on the connection between FDI and poverty alleviation.

A complicated topic, foreign direct investment (FDI) involves many parties and geopolitical manipulation. Its efficacy in developing nations, especially those in sub-Saharan Africa, is frequently questioned. Researchers are looking into how FDI affects poverty and economic advancement. International organizations and experts are attempting to identify the causes of the ongoing difficulties in attaining both food security and economic growth.

The usefulness of global capital mobility and its influence on financial growth are topics that are frequently discussed in the literature. According to scholarly research, FDI can alleviate poverty by promoting economic expansion. [11] The majority of research, however, ignores the significance of governance in favor of economic growth. The degree to which FDI reduces poverty can be influenced by the quality of government.

By promoting economic growth with investible capital and cutting-edge technologies, FDI indirectly reduces poverty. The quality of governance, however, might have an impact on this link. [12] In order to assist policymakers in creating initiatives that will improve well-being and reduce poverty in developing and transitioning countries, this study attempts to comprehend the relationship between foreign direct investment (FDI) and GDP growth while taking government quality into account. With an emphasis on EMs, this study investigates how FDI affects poverty levels in Asia, Latin America, Eastern Europe, and Africa. It looks at how governance might lessen the effects of poverty while taking into account factors including political stability, institutional quality, legality, corruption, and the efficacy of regulations.

This study looks at how governance and foreign direct investment affect the fight against poverty in developing countries. [13] It implies that while bad governance can result in financial crises and corruption, which hinder the accumulation of theoretical advantages, excellent governance can increase the beneficial effects of foreign direct investment. The study looks at how deindustrialization affected the patterns of poverty in 44 developing nations between 1990 and 2018. It shows a distinct tendency of deindustrialization, which worsens poverty through job degradation, economic restrictions, and the loss of traditional manufacturing jobs. [14] The elimination of poverty is severely hampered by early deindustrialization, with low agricultural output and labor mobility being major contributing causes.

This study explores deindustrialization's impact on poverty in developing nations, using cross-country panel analysis and examining agricultural productivity and labor migration as causes.

2. Systematic Review

Corruption hinders industrialization in Africa by discouraging private investment and jeopardizing governance effectiveness. [15] Strong institutions, rule of law, efficient government regulations, and reduced political risk are essential for promoting industrial development. Social variables like political power and entrepreneurship also impact industrialization. Increased human capital, particularly literacy and advanced knowledge, is crucial for industrialization [16]. Factors like financial development, trade openness, natural resources, and foreign direct investment also influence industrialization. Effective management of these resources and addressing energy poverty are essential for accelerating modernization in African nations.

The study highlights the complex interplay of institutional, sociological, and macroeconomic factors driving industrialization in emerging nations, particularly in Africa. Key macroeconomic characteristics include FDI, trade openness, natural resource use, economic development, and infrastructure. [17] Energy poverty is a significant issue affecting the economy, environment, and various aspects of society. Research shows that access to reliable energy sources improves literacy and educational performance, while increasing respiratory illnesses and lowers educational attainment in countries like Cambodia, Laos, and other nations. In developing countries like Latin America, the Caribbean, and sub-Saharan Africa, renewable energy availability enhances human development, while South Asia experiences less benefit. [18] Reducing energy poverty can boost productivity and reduce environmental issues, but it also exacerbates economic inequality. Addressing energy poverty is crucial for improving health, education, reducing climate change, and promoting economic growth.

In order to end energy poverty, regional strategies are required in the western regions and the middle Yangtze River basin. [19] To address the needs of every region and encourage equitable economic growth, specific measures are required. Giving less developed places priority ignores energy-poor problems in rapidly urbanizing areas. It is imperative that energy poverty be addressed throughout China. [20] With renewable energy technologies replacing traditional sources and lowering energy poverty, technological developments and energy deprivation are linked. Green innovations like wind and solar technologies provide cost-effective answers, expanding access to electricity in remote regions. Nevertheless, even though these technologies have long-term advantages, their hefty initial prices can prevent their widespread use. [21] Research using data from China Family Panel Studies and moment quantile regression models shows that advancements in energy technology have significantly reduced energy poverty. This suggests that technical changes can't fully eradicate energy poverty, as they may be influenced by existing environmental conditions that may worsen energy costs.

Foreign Direct Investment (FDI) and poverty alleviation have a complicated and nuanced relationship. [22] According to empirical research, FDI and top-notch institutions significantly reduce poverty in MENA nations; nonetheless, strong governance is essential for both welfare gains and poverty alleviation. According to a Taiwan-focused study, wealth redistribution necessitates trade openness and sound governance, but continued economic growth is essential to reducing poverty. [23] Additionally, FDI widens the income gap, especially between urban and rural areas, and may fuel political and social discontent. According to the present literature assessment, the country's political risks and level of governance determine how severe the consequences of foreign direct investment (FDI) on poverty are. [24] In order to maximize FDI's benefits for economic expansion and poverty alleviation, efficient

The quality of governance and political risks in the nation where foreign direct investment is permitted determine how severe the consequences of FDI on poverty are, according to the current research assessment. [25] Therefore, it is crucial to implement good governance, in fact, FDI does not have the capacity to fully realize its benefits when there is insufficient good governance or significant political risk; in fact, it may even exacerbate already-existing inequities for the same reasons. [26] Therefore, there is a complicated and nuanced relationship between FDI, political risk, governance, and poverty alleviation. Furthermore, it should be noted that FDI can only stimulate economic growth in the presence of an effective governance structure, and it is in this context that it affects poverty. [27] If governments want to effectively use FDI to combat poverty, they must appropriately handle political instability, enhance institutional quality, and guarantee the equitable distribution of FDI-acquired resources. With the aid of this strategy, they might foster an atmosphere that is conducive to investment, thereby amplifying the impact of investment on poverty reduction and sustainable development.

3. Theoretical frame work

According to the idea, economic development is shown by the structural shift from the agricultural sector to the industrial and service sectors. However, this change may have a detrimental effect on the economy and raise poverty rates in developing countries that lack industrial growth. This shift can also be hampered by the service sector's dominance.

Dependency theory states that the less developed country's development is dependent upon that of the more developed country. In essence, deindustrialization may increase poverty by reducing these countries' capacity to develop independent industrial sectors and making them more reliant on low-paying service occupations.

According to the hypothesis, demand industrialization may impede developing countries' ability to grow as a result of outside economic shocks, which would increase poverty. The quality of jobs is impacted when manufacturing gives way to services, which could result in poverty and underemployment in emerging countries. In order to adapt to changes in the economy and lessen poverty, this idea places a strong emphasis on investing in human capital and developing new skills. Industrialization drives economic growth and poverty eradication, while lack can hinder diversification. Deindustrialization may increase urban poverty and unofficial business growth, while skill mobility in rich nations may increase poverty.

Neoclassical economists' concept of total income change is incorporated into new Keynesian and neoliberal approaches to poverty, which emphasize government actions and public goods. Both strategies have benefits including quantifiable poverty measurement, simple policy recommendations, an emphasis on efficiency and earnings, and an understanding of how subsidies affect people's behavior.

The neoclassical theory, which developed from the classical theory, emphasizes elements other than people's preferences, such as scarce social and financial resources, market imperfections, obstacles to education, immigrant status, ill health, and job limitations. The former makes prescribing policies easier and measures poverty in monetary terms. Critics contend that this strategy ignores communal relations and overconcentrates on individuals. Since economic expansion does not ensure that the poor class benefits, Marxian/radical economic stress that it is insufficient to end poverty on its own. They emphasize class, confining people to duties within their class, and they call for drastic changes in the

socioeconomic structure. Even though poverty has decreased in a capitalist economy, minimum wages, anti-discrimination laws, and parallel labor markets are still required.

4. Materials and Method

Using panel data and a fixed-effects model that eliminates heteroscedasticity, the study examines the relationship between deindustrialization and poverty rates in 44 developing nations between 1990 and 2018.

$$Poverty_{it} = \alpha_0 + \alpha_1 X_{it} + \sum \theta_{it} control_{it} + \phi_i + \nu_t + \mu_{it}$$

By adjusting for variables such as food production, employment, rural population, infrastructure level, and foreign aid, as well as for confounding variables and country-specific effects, the model evaluates deindustrialization across nations using a constant term and coefficient.

According to the 2018 poverty distribution, extreme poverty affects 45.2% of low-income nations while it only affects 0.6% of high-income nations. Poverty is more severe in nations with low middle incomes. The distribution of poverty is not greatly affected by raising the poverty level to \$3.2 per day.

Table 1:

	\$1.9 poverty line			\$3.2 poverty line		
	Headcount ratio (%)	Number of poor people (million)	2000-2018	Headcount ratio (%)	Number of poor people (million)	2000-2018
Region						
East Asia & Pacific	1.1	2.8	-33.7	8	22.0	-53.7
Europe & Central Asia	1	0.8	-6.5	4.6	4.2	-13.3
Latin America & Caribbean	4	2.6	-8.7	10.2	6.4	-15.1
Middle East & North Africa	7.4	3.5	4.2	18.8	8.1	-1.9
South Asia	16.3	27.5	-24.3	52.7	94.3	-23.7
Sub-Saharan Africa	39.8	43.28	-19.8	66.5	71.6	-11.1
Income levels						
Low income	45.3	27.6	-15.2	72.5	46.1	-7.4
Low middle income	10.8	37.2	-25.8	38	124.8	-31.9
Upper middle income	1.3	3.5	-24.7	7	12.9	-41.6
High income	0.5	0.5	0.2	0.8	1.2	0
Word	8.5	67.0	-19	25	183.7	-25.2

Source: Author generated

Since national poverty lines might be more precise, the World Bank's target poverty metric aids in comparing poverty levels across nations. Extreme poverty is defined as the proportion of the world's population that subsists on less than \$1 USD a day. Using current PPP statistics, the threshold is established based on the national poverty income of fifteen low-income nations. Additionally, the World Bank has raised the poverty limits for nations with higher levels of per capita income. The World Bank PovcalNet database provided the data used in this investigation.

The study reveals declining manufacturing employment and income development in deindustrializing nations, particularly in low-middle income countries. Japan's per capita income fell due to demographic transitions and structural changes, while Botswana experienced a decline. This raises concerns about income distribution and the need for inclusive policies.

Table 2: Illustrates the degree of structural change that occurred in emerging nations between 1990 and 2018

Phase	Year	Mean	Std. Dev.	Min	Max
Phase 1	190-1995	3.361	1.558	1.972	11.060
Phase 2	1996-2000	3.449	1.424	1.946	6.929
Phase 3	2001-2005	3.584	2.446	0.219	8.148
Phase 4	2006-2010	3.874	1.703	1.244	11.582
Phase 5	2011-2015	4.358	2.982	1.367	12.432
Phase 6	2016-2018	4.572	1.003	1.693	12.555

This study examines how changes in food production affect poverty. The index calculates variations in the amount of nutrient-dense and edible crops compared to a base year. This data is essential for comprehending how economic success and food accessibility are related, as well as for developing policies that use sustainable agriculture to fight poverty. Changes in this rating aid policymakers in assessing the level of financial participation and creating policies that promote economic growth and job creation. The goal of the study is to reduce measuring mistakes and biases.

In developing nations, high birth rates and the expansion of rural communities result in an excess of unskilled labor, more poverty, and a shortage of food. Data on rural population increase from the World Development Indicators database is analyzed in this study. Building infrastructure, especially in the area of energy, encourages wealth equity and economic growth. Large-scale infrastructure, however, frequently helps the underprivileged, momentarily making poverty worse. To combat poverty and guarantee long-term economic growth, authorities must place a high priority on appropriate spending on social welfare and infrastructure.

In developing nations, official development assistance (ODA) is essential for reducing poverty and enhancing government spending on infrastructure and development. This study examines the feasibility and accessibility of 44 rising economies using imbalanced panel data from 1990 to 2018. The effectiveness of aid can be evaluated and the relationship between aid and poverty reduction can be managed with the use of quantitative metrics such as Net ODA per capita. 4 provides a summary of the factors using quantitative metrics.

Table 3:

Variable	Obs	Mean	Std. Dev.	Min	Max
Poverty	1275	0.278	0.248	0.000	0.952
De-ind_1	1276	2.817	1.760	0.947	10.556
De-ind_2	1276	0.838	0.066	0.638	0.964
Food_index	1273	75.154	22.757	16.88	157.05
Labor force	1276	66.915	11.288	44.18	87.36
Rural pop	1276	0.827	1.355	-6.866	6.227
Infrastructure	1093	63.489	34.465	0.535	100
Oda_rec	1272	32.545	32.694	-22.725	378.474

5. Empirical Results and Analysis

Using a panel fixed-effects design, the study investigates how industrialization affects poverty levels in developing countries. According to the findings, deindustrialization raises the chance of poverty in developing nations by 417 percent. This is a result of economic shifts, and the results lend credence to the idea that deindustrialization contributes to the high rates of poverty. For these economies, shifting from industries focused on manufacturing to services is a major problem. The findings emphasize the necessity of additional study and action.

first-level results of regression.

Table 4:

	(1)	(2)	(3)	(4)
De-ind_1	0.604***		0.417***	
	(6.357)		(3.582)	
De-ind_2		4.403***		3.480***
		(7.284)		(3.075)
Food_index			0.478***	0.456***
			(3.377)	(3.183)
Labor force			-0.021***	-0.022***
			(-2.283)	(-2.453)
Rural_pop			0.007	0.002
			(0.227)	(0.038)
Infrastructure			0.576***	0.700***
			(11.294)	(11.760)
Oda_rec			-0.002**	-0.002*

	(1)	(2)	(3)	(4)
			(-2.024)	(-1.897)
Country	✓	✓	✓	✓
Year	✓	✓	✓	✓
_cons	-2.061***	-0.725***	-4.417***	-3.378***
	(-17.219)	(-5.430)	(-6.208)	(-4.815)
Within-R²	0.587	0.582	0.638	0.636
N	1275	1275	1091	1091

Poverty, infrastructural investment, and food production have a complicated relationship. Lower grain prices brought on by increased food output may impact farmers and exacerbate their financial issues. Better information flow and stable food price restrictions are required. While improving infrastructure can spur development in developing nations, it can also deplete resources and exacerbate poverty. Allocating resources and conducting strategic planning are essential. Programs such as "food for work" help alleviate poverty and assist those with limited resources. To eradicate poverty and promote sustainable economic growth, these aspects must be balanced.

6. Examining the effects of deindustrialization on poverty in developing countries

This section builds on the model (2) and examines the theoretical studies of how deindustrialization affects poverty in emerging nations [84].

$$M_{it} = \alpha_0 + \alpha_1 X_{it} + \sum \theta_{it} control_{it} + \phi_i + \nu_t + \mu_{it} \quad (2)$$

In developing nations, deindustrialization raises poverty levels by lowering the quality of work. Poor job quality brought on by outsourcing and offshoring increases family labor and self-employment. Economic instability, occupational accidents, and health problems are the outcomes of this. Research indicates that deindustrialization has a direct correlation with low-quality jobs, which exacerbates poverty. To lessen the impact of deindustrialization on labor markets and support healthier development, programmatic initiatives are required to enhance job quality, offer social security, and stimulate economic diversification. Deindustrialization, which shifts manufacturing to services, may lead to Baumol's sickness, where productivity gains are insufficient to offset structural costs. This negatively skewed economy may hinder economic development, as it shifts to a service-based economy, crucial for sustainable development.

The study employed a number of techniques to guarantee its strength and dependability. Better measures of poverty, including the Poverty Gap, were substituted for explanatory factors using variable replacement. The results were confirmed by the positively signed deindustrialization coefficient. The results were also validated using regression analysis utilizing the RE, FE, and OLS models. The credibility of the first observations was confirmed by the notable positive consequences of deindustrialization.

The study uses dynamic panel regression techniques to overcome endogeneity concerns in the incidence of poverty and deindustrialization. While the System GMM approach tackles omitted variable bias, endogenous repressors can be managed with Instrumental Variables (IV) or Two-Stage Least

Squares (2SLS). According to the study, deindustrialization coefficients are still substantially positive, suggesting that it plays a large part in poverty growth. Deindustrialization in developing nations raises poverty levels and crosses the poverty line, according to differential GMM research. Diagnostic tests confirm the GMM estimator's validity, emphasizing how urgently deindustrialization is needed to alleviate poverty and emerging nations' problems.

The study takes into account a number of variables that affect the rise of poverty, such as labor income share, secondary school enrollment rates, shifting demographics, and the rule of law. Standardized sources are used to get control variables. The findings, which show a high correlation between deindustrialization and poverty, hold up well when these additional variables are taken into account. By include instrumental factors, possible endogeneity issues are resolved and the study's conclusions are more reliable.

The quality of governance and political risk have a significant impact on the economic effects of foreign direct investment (FDI) on reducing poverty. Although FDI might boost economic expansion, poverty levels may not always decline as a result of it. Law and order, government stability, violence, corruption, and democratic accountability are some of the factors that affect FDI flows. According to a Taiwanese study, poverty can be reduced by steady economic expansion. Strong institutions, low levels of corruption, and the rule of law are necessary to optimize the benefits of FDI. Authorities need to concentrate on luring foreign direct investment and fortifying governance frameworks.

The relationship between FDI, governance, political risk, and poverty alleviation is examined in this research. It shows that the efficiency of the host nation's governance determines how effective FDI is. Countries must manage political risks, enhance institutional quality, and make sure investment returns reduce poverty levels in order to combat poverty effectively. Deindustrialization has a detrimental effect on poverty rates by impeding industrial employment, job quality, and the expansion of the new economy.

H1: Deindustrialization will increase poverty rates in developing nations.

H2: Deindustrialization will make poverty in emerging nations worse by delaying financial growth.

H3: Deindustrialization exacerbates poverty in developing nations by degrading working conditions.

H4: Deindustrialization in emerging nations will result in the loss of more traditional manufacturing jobs, which will raise poverty levels.

7. Conclusions

Deindustrialization in emerging nations leads to increased poverty and a decrease in growth and employment. Slow growth and obsolete formal employment can hinder poverty reduction efforts. Unsatisfied workers may cut wages, leading to increased street beggars. Policymakers must enhance economic diversification and employment quality to prevent other negative effects of deindustrialization, such as poverty.

Simultaneously, developing countries have experienced an unprecedented economic shift, with the service sector gradually displacing manufacturing as the primary driver of change. Therefore, it is even more crucial to consider how deindustrialization may affect the steadily rising rate of poverty, as suggested by the following suggestions in this paper:

Emerging nations should implement reasonable industrial policies that guarantee the expansion and fortification of the manufacturing sectors in order to prevent early deindustrialization and the spread of poverty. Sustainability may suffer if economic growth is achieved exclusively through service provision. In order to maintain a high pace of economic growth, these nations should instead concentrate on modernizing their manufacturing sectors, increasing Therefore, significant industrialization is required to lift low-income sub-Saharan African nations out of poverty and enable them to utilize their abundant resources without succumbing to the "curse of resources."

The industrial base must be developed, resource consumption must be optimized, and manufacturing barriers must be removed in order to support sustainable development. Funding for energy and transportation infrastructure, avoiding resource abuse, and simplifying rules can all help achieve this. Developing nations should encourage technical developments and modernize antiquated sectors with new technologies. Achieving these objectives requires adjusting strategies to suit specific requirements and economic development stages.

To combat employment polarization and guarantee equitable salaries, the government should give manufacturing first priority and support SMEs. Tax laws, specific training, and technological use are all necessary to address income inequality in the service industry. Health and education are examples of non-creating industries where growth might increase. Important actions include enacting laws pertaining to equitable wages, separating resources, and improving high school degrees and vocational training. Stability of the job market and worker rights also require strict government oversight.

Because it is essential to the advancement of agricultural production modernization, it is imperative that investments in rural human capital be improved in a way that boosts the creation of human capital. Much more improvement may be seen if farmers receive the right guidance and training and allocate more funds to agricultural research and development. Precision farming and the use of digital architectures are two examples of how current ICT is being applied to enhance agricultural methods. Efforts to expand the value chains of agriculturally generated commodities by building out local processing facilities and infrastructure also aid in development. Long-term economic growth and significant change in the agriculture industry are ensured by putting sound legislation into place and employing sustainable practices.

The study looks at how deindustrialization affected poverty in 44 developing nations between 1990 and 2018. But there are drawbacks, such as data accessibility, dependability, and possible biases. The study mainly uses secondary data, which may be insufficient or of low quality, and the consistency and quality of the data may differ throughout nations and time periods. These restrictions can restrict how broadly the findings can be applied and what areas should be the focus of further study. Because of varying social, political, and cultural aspects, the study, which was carried out in developing nations, might not fully reflect the subtleties of deindustrialization. Future studies are advised to take a more detailed approach at the national level or in smaller groups with comparable traits. Further study employing sophisticated econometric tools or experiments could strengthen causal relationships. The empirical analysis, which relies on statistical associations, may not always show a causal relationship between deindustrialization and poverty.

The study draws attention to the possible drawbacks of early deindustrialization, but it must concentrate on certain legislative solutions to lessen such effects. Government policies, globalization, and international trade are some examples of factors that can either accelerate or prevent the

dissolution of industries. The study also identifies labor force mobility and low crop yield as important contributors to early deindustrialization. However, it ignores environmental issues, changes in global supply chains, and technological advancements. Case studies and qualitative information are also required for the research in order to support quantitative findings and offer a comprehensive understanding of the problem.

As a result, this study provides a useful knowledge of how deindustrialization affects poverty in third-world nations. It would be incorrect, nevertheless, to ignore the drawbacks associated with this type of study. Therefore, it is crucial to remember that focusing on resolving these issues in subsequent projects will aid in avoiding these limitations. Later on, this will improve poverty reduction measures in reaction to significant economic shocks by producing more precise and practical findings.

References

- S. S. Asamoah, J. Parbey, I. K. Yankey, and A. Awuah, "Techno-economic assessment of a central grid-connected wind farm in Ghana using RETScreen® Expert," *Heliyon*, vol. 9, no. 1, Jan. 2023, doi: 10.1016/j.heliyon.2023.e12902.
- K. Dong, Q. Jiang, M. Shahbaz, and J. Zhao, "Does low-carbon energy transition mitigate energy poverty? The case of natural gas for China," *Energy Econ.*, 2021, doi: 10.1016/j.eneco.2021.105324.
- X. Zhao and P. Jia, "Towards sustainable small-scale fisheries in China: A case study of Hainan," *Mar. Policy*, vol. 121, Nov. 2020, doi: 10.1016/J.MARPOL.2020.103935.
- R. Bera, P. Mishra, and P. Patnaik, "Renewable energy for women empowerment: Experiences from rural West Bengal," *Renew. Sustain. Energy Rev.*, vol. 198, p. 114446, 2024, doi: <https://doi.org/10.1016/j.rser.2024.114446>.
- J. Wątróbski, A. Bączkiewicz, E. Ziemba, and W. Sałabun, "Sustainable cities and communities' assessment using the DARIA-TOPSIS method," *Sustain. Cities Soc.*, vol. 83, Aug. 2022, doi: 10.1016/j.scs.2022.103926.
- M. N. Khatun, S. Mitra, and M. N. I. Sarker, "Mobile banking during COVID-19 pandemic in Bangladesh: A novel mechanism to change and accelerate people's financial access," *Green Financ.*, vol. 3, no. 3, pp. 253-267, 2021, doi: 10.3934/GF.2021013.
- C. Zhao, K. Dong, K. Wang, and R. Nepal, "How does artificial intelligence promote renewable energy development? The role of climate finance," *Energy Econ.*, vol. 133, p. 107493, May 2024, doi: 10.1016/J.ENECO.2024.107493.
- M. Nashihin and L. Harahap, "The Analysis of the Efficiency of BPR-S: Production Function Approach Vs Financial Ratios Approach," *Procedia - Soc. Behav. Sci.*, vol. 115, pp. 188-197, Feb. 2014.
- M. Hasan, M. Z. Abedin, M. Bin Amin, M. Nekmahmud, and J. Oláh, "Sustainable biofuel economy: A mapping through bibliometric research," *Journal of Environmental Management*. 2023. doi: 10.1016/j.jenvman.2023.117644.
- Y. Fang, "Influence of foreign direct investment from China on achieving the 2030 Sustainable Development Goals in African countries," *Chinese J. Popul. Resour. Environ.*, vol. 19, no. 3, pp. 213-220, Sep. 2021, doi: 10.1016/J.CJPRE.2021.12.023.
- I. Lopez-Ercilla *et al.*, "The voice of Mexican small-scale fishers in Lopez-Ercilla, I., Espinosa-Romero, M. J., Fernandez Rivera-Melo, F. J., Fulton, S., Fernández, R., Torre, J., Acevedo-Rosas, A., Hernández-Velasco, A. J., & Amador, I. (2021). The voice of Mexican small-scale f," *Mar. Policy*, vol. 131, Sep. 2021, doi: 10.1016/j.marpol.2021.104606.
- S. Gao, P. Zhou, and H. Zhang, "Does energy transition help narrow the urban-rural income gap? Evidence from China," *Energy Policy*, vol. 182, p. 113759, 2023, doi: <https://doi.org/10.1016/j.enpol.2023.113759>.

- S. R. Khandker, D. F. Barnes, and H. A. Samad, "Are the energy poor also income poor? Evidence from India," *Energy Policy*, vol. 47, pp. 1–12, 2012, doi: <https://doi.org/10.1016/j.enpol.2012.02.028>.
- F. Rao, Y. M. Tang, K. Y. Chau, W. Iqbal, and M. Abbas, "Assessment of energy poverty and key influencing factors in N11 countries," *Sustain. Prod. Consum.*, vol. 30, pp. 1–15, 2022, doi: [10.1016/j.spc.2021.11.002](https://doi.org/10.1016/j.spc.2021.11.002).
- H. Shi *et al.*, "The unequal impacts of extremely high temperatures on households' adaptive behaviors: Empirical evidence from fine-grained electricity consumption data," *Energy Policy*, vol. 190, Jul. 2024, doi: [10.1016/j.enpol.2024.114170](https://doi.org/10.1016/j.enpol.2024.114170).
- G. Wan, J. Zhang, T. Zeng, and X. Zhang, "Multidimensional energy poverty and its urban-rural and regional disparities: Evidence from China," *J. Clean. Prod.*, vol. 466, Aug. 2024, doi: [10.1016/j.jclepro.2024.142874](https://doi.org/10.1016/j.jclepro.2024.142874).
- W. Zhao, X. Sun, and D. Jiang, "Role of financial inclusion and green resources for alleviating energy poverty in the Republic of Korea," *Resour. Policy*, vol. 82, 2023, doi: [10.1016/j.resourpol.2023.103505](https://doi.org/10.1016/j.resourpol.2023.103505).
- N. Ö. İyigün, "What could Entrepreneurship do for Sustainable Development? A Corporate Social Responsibility-Based Approach," *Procedia - Soc. Behav. Sci.*, vol. 195, pp. 1226–1231, Jul. 2015, doi: [10.1016/j.sbspro.2015.06.253](https://doi.org/10.1016/j.sbspro.2015.06.253).
- K. Kakar *et al.*, "Current Situation and Sustainable Development of Rice Cultivation and Production in Afghanistan", doi: [10.3390/agriculture9030049](https://doi.org/10.3390/agriculture9030049).
- J. Liu, J. Hu, Q. Wan, J. Ming, and C. Shuai, "Energy services for solar PV projects: Exploring the accessibility and affordability of clean energy for rural China," *Energy*, vol. 299, p. 131442, Jul. 2024, doi: [10.1016/j.energy.2024.131442](https://doi.org/10.1016/j.energy.2024.131442).
- V. Palmeira Wanderley *et al.*, "Socio-environmental and hematological profile of landfill residents (São Jorge landfill–Sao Paulo, Brazil)," *Int. J. Environ. Res. Public Health*, 2017, doi: [10.3390/ijerph14010064](https://doi.org/10.3390/ijerph14010064).
- E. Dogan, M. Madaleno, and D. Taskin, "Which households are more energy vulnerable? Energy poverty and financial inclusion in Turkey," *Energy Econ.*, vol. 99, 2021, doi: [10.1016/j.eneco.2021.105306](https://doi.org/10.1016/j.eneco.2021.105306).
- V. Lekavičius, V. Bobinaitė, A. Galinis, and A. Pažeraitė, "Distributional impacts of investment subsidies for residential energy technologies," *Renew. Sustain. Energy Rev.*, vol. 130, 2020, doi: [10.1016/j.rser.2020.109961](https://doi.org/10.1016/j.rser.2020.109961).
- Q. Tao, Q. Tao, Q. Tao, and M. Haroon, "Heliyon Enhancing Financial Development for Sustainable Resource Efficiency : Cultivating Green Growth in Natural Resource Markets QiangTao made substantial contributions to this research project and writing of the paper . He was".
- S. Pachauri, A. Mueller, A. Kemmler, and D. Spreng, "On measuring energy poverty in Indian households," *World Dev.*, vol. 32, no. 12, pp. 2083–2104, 2004.
- L. W. Niessen *et al.*, "Tackling socioeconomic inequalities and non-communicable diseases in low-income and middle-income countries under the Sustainable Development agenda," *Lancet*, vol. 391, no. 10134, pp. 2036–2046, 2018, doi: [10.1016/S0140-6736\(18\)30482-3](https://doi.org/10.1016/S0140-6736(18)30482-3).
- A. Raihan, M. I. Pavel, D. A. Muhtasim, S. Farhana, O. Faruk, and A. Paul, "The role of renewable energy use, technological innovation, and forest cover toward green development: Evidence from Indonesia," *Innov. Green Dev.*, vol. 2, no. 1, Mar. 2023, doi: [10.1016/j.igd.2023.100035](https://doi.org/10.1016/j.igd.2023.100035).
- D. F. Hakam, H. Nugraha, A. Wicaksono, R. A. Rahadi, and S. P. Kanugrahan, "Mega conversion from LPG to induction stove to achieve Indonesia's clean energy transition," *Energy Strateg. Rev.*, vol. 41, May 2022, doi: [10.1016/j.esr.2022.100856](https://doi.org/10.1016/j.esr.2022.100856).
- J. M. Aberilla, A. Gallego-Schmid, L. Stamford, and A. Azapagic, "An integrated sustainability assessment of synergistic supply of energy and water in remote communities," *Sustain. Prod. Consum.*, vol. 22, pp. 1–23, Apr. 2020, doi: [10.1016/j.spc.2020.01.003](https://doi.org/10.1016/j.spc.2020.01.003).

- R. Duarte, S. Miranda-Buetas, and C. Sarasa, "Household consumption patterns and income inequality in EU countries: Scenario analysis for a fair transition towards low-carbon economies," *Energy Econ.*, vol. 104, 2021, doi: 10.1016/j.eneco.2021.105614.
- M. P. Bhandari, "Environmental Performance and Vulnerability to Climate Change: A Case Study of India, Nepal, Bangladesh and Pakistan," *Clim. Chang. Manag.*, pp. 149-167, 2013, doi: 10.1007/978-3-642-31110-9_10.
- I. Siksnelyte-Butkiene, D. Streimikiene, and T. Balezentis, "Multi-criteria analysis of heating sector sustainability in selected North European countries," *Sustain. Cities Soc.*, vol. 69, Jun. 2021, doi: 10.1016/J.SCS.2021.102826.
- F. A. Kitole and E. L. Genda, "Empowering her drive: Unveiling the resilience and triumphs of women entrepreneurs in rural landscapes," *Womens. Stud. Int. Forum*, vol. 104, p. 102912, 2024, doi: <https://doi.org/10.1016/j.wsif.2024.102912>.
- B. K. Sovacool, M. Martiskainen, and D. D. Furszyfer Del Rio, "Knowledge, energy sustainability, and vulnerability in the demographics of smart home technology diffusion," *Energy Policy*, vol. 153, Jun. 2021.
- L. Dingru, S. T. Onifade, M. Ramzan, and M. A. S. AL-Faryan, "Environmental perspectives on the impacts of trade and natural resources on renewable energy utilization in Sub-Sahara Africa: Accounting for FDI, income, and urbanization trends," *Resour. Policy*, vol. 80, 2023, doi: 10.1016/j.resourpol.2022.103204.
- B. N. Stram, "Key challenges to expanding renewable energy," *Energy Policy*, vol. 96, pp. 728-734, 2016, doi: 10.1016/j.enpol.2016.05.034.
- Y. A. Phillis, V. S. Kouikoglou, and C. Verdugo, "Urban sustainability assessment and ranking of cities," *Comput. Environ. Urban Syst.*, vol. 64, pp. 254-265, Jul. 2017, doi: 10.1016/J.COMPENVURBSYS.2017.03.002.
- A. Sinha, D. Balsalobre-Lorente, M. W. Zafar, and M. M. Saleem, "Analyzing global inequality in access to energy: Developing policy framework by inequality decomposition," *J. Environ. Manage.*, vol. 304, 2022, doi: 10.1016/j.jenvman.2021.114299.
- B. Glaeser, "Chapter 37 - Human-Nature Relations in Flux: Two Decades of Research in Coastal and Ocean Management," in *Coasts and Estuaries*, E. Wolanski, J. W. Day, M. Elliott, and R. Ramachandran, Eds., Elsevier, 2019, pp. 641-659. doi: <https://doi.org/10.1016/B978-0-12-814003-1.00037-X>.
- F. Green and N. Stern, "China's 'new normal': structural change, better growth, and peak emissions," *Cent. Clim. Chang. Econ. Policy Grantham Res. Inst. Clim. Chang.*, 2015.
- E. B. Barbier, "A global green new deal: Rethinking the economic recovery," *A Glob. Green New Deal Rethink. Econ. Recover.*, pp. 1-308, Jan. 2010, doi: 10.1017/CBO9780511844607.
- P. T. Rodriguez-Gonzalez, R. Rico-Martinez, and V. Rico-Ramirez, "An integrated stochastic economic-ecological-social model with stratified-population," *Ecol. Modell.*, vol. 368, pp. 15-26, Jan. 2018, doi: 10.1016/J.ECOLMODEL.2017.11.012.
- S. Lamichhane, G. Eğılmez, R. Gedik, M. K. S. Bhutta, and B. Erenay, "Benchmarking OECD countries' sustainable development performance: A goal-specific principal component analysis approach," *J. Clean. Prod.*, vol. 287, 2021, doi: 10.1016/j.jclepro.2020.125040.
- G. Hilson, "Small-scale mining and its socio-economic impact in developing countries," *Nat. Resour. Forum*, vol. 26, no. 1, pp. 3-13, Feb. 2002, doi: 10.1111/1477-8947.00002.
- IPCC, "Framing and Context," *Glob. Warm. 1.5°C*, pp. 49-92, May 2022, doi: 10.1017/9781009157940.003.
- E. B. Barbier and J. C. Burgess, "Sustainable development goal indicators: Analyzing trade-offs and complementarities," *World Dev.*, vol. 122, pp. 295-305, Oct. 2019, doi: 10.1016/j.worlddev.2019.05.026.

- R. Zeb, L. Salar, U. Awan, K. Zaman, and M. Shahbaz, "Causal links between renewable energy, environmental degradation and economic growth in selected SAARC countries: Progress towards green economy," *Renew. Energy*, vol. 71, pp. 123-132, 2014, doi: 10.1016/j.renene.2014.05.012.
- N. Rafa, T. T. Van To, M. Gupta, and S. M. N. Uddin, "The pursuit of energy in refugee contexts: Discrimination, displacement, and humanitarian energy access for the Rohingya refugees displaced to Bangladesh," *Energy Res. Soc. Sci.*, vol. 83, 2022, doi: 10.1016/j.erss.2021.102334.
- B. K. Sovacool, D. Furszyfer Del Rio, S. Griffiths, D. F. Del Rio, and S. Griffiths, "Contextualizing the Covid-19 pandemic for a carbon-constrained world: Insights for sustainability transitions, energy justice, and research methodology," vol. 68, p. 101701, Oct. 2020.
- H. P. Bedi, "'Our energy, our rights': National extraction legacies and contested energy justice futures in Bangladesh," *Energy Res. Soc. Sci.*, 2018, doi: 10.1016/j.erss.2018.04.009.
- D. Salampasis and A. L. Mention, "FinTech: Harnessing Innovation for Financial Inclusion," *Handb. Blockchain, Digit. Financ. Incl.*, vol. 2, pp. 451-461, 2018, doi: 10.1016/B978-0-12-812282-2.00018-8.
- Q. Wang, M. Su, and R. Li, "Toward to economic growth without emission growth: The role of urbanization and industrialization in China and India," *J. Clean. Prod.*, vol. 205, pp. 499-511, Dec. 2018, doi: 10.1016/J.JCLEPRO.2018.09.034.
- M. Mohsin, F. Taghizadeh-Hesary, N. Iqbal, and H. B. Saydaliev, "The role of technological progress and renewable energy deployment in green economic growth," *Renew. Energy*, vol. 190, pp. 777-787, May 2022, doi: 10.1016/j.renene.2022.03.076.
- B. K. Sovacool, D. Furszyfer Del Rio, and S. Griffiths, "Contextualizing the Covid-19 pandemic for a carbon-constrained world: Insights for sustainability transitions, energy justice, and research methodology," *Energy Res. Soc. Sci.*, vol. 68, Oct. 2020.
- E. B. Ali, V. P. Anufriev, and B. Amfo, "Green economy implementation in Ghana as a road map for a sustainable development drive: a review," *Sci. African*, vol. 12, 2021, doi: 10.1016/j.sciaf.2021.e00756.
- H. P. Singh, A. Singh, F. Alam, and V. Agrawal, "Impact of Sustainable Development Goals on Economic Growth in Saudi Arabia: Role of Education and Training," *Sustainability*, vol. 14, no. 21, 2022, doi: 10.3390/su142114119.
- B. van der Zwaan, T. Kober, F. D. Longa, A. van der Laan, and G. Jan Kramer, "An integrated assessment of pathways for low-carbon development in Africa," *Energy Policy*, 2018, doi: 10.1016/j.enpol.2018.03.017.
- World Bank, *The Human Capital Index 2020 Update : Human Capital in the Time of Covid-19*. 2021.
- C. D. Diale, M. G. Kanakana-Katumba, and R. W. Maladzhi, "Ecosystem of renewable energy enterprises for sustainable development: A systematic review," *Adv. Sci. Technol. Eng. Syst.*, 2021, doi: 10.25046/ajo60146.
- J. G. Weber, "How should we think about environmental policy and jobs? An analogy with trade policy and an illustration from U.S. coal mining," *Rev. Environ. Econ. Policy*, vol. 14, no. 1, pp. 44-66, 2020, doi: 10.1093/REEP/REZ016.
- E. K. Kanda, E. Lusweti, and K. O. Odhiambo, "Water-energy-food nexus in Kenya: A review of policy interventions," *World Water Policy*, vol. 9, no. 4, pp. 823-836, Nov. 2023, doi: 10.1002/WWP2.12147.
- N. Hewa Wellalage, A. I. Hunjra, R. Manita, and S. M. Locke, "Information communication technology and financial inclusion of innovative entrepreneurs," *Technol. Forecast. Soc. Change*, vol. 163, p. 120416, 2021, doi: <https://doi.org/10.1016/j.techfore.2020.120416>.
- J. A. Foster and A. Poston, "Domestic energy consumption: temporal unregulated electrical energy consumption in kitchens in Scottish affordable and social housing," *Energy Effic.*, 2023, doi: 10.1007/s12053-023-10143-3.

- S. Lindley, S. Pauleit, K. Yeshitela, S. Cilliers, and C. Shackleton, "Rethinking urban green infrastructure and ecosystem services from the perspective of sub-Saharan African cities," *Landsc. Urban Plan.*, vol. 180, pp. 328–338, 2018, doi: 10.1016/j.landurbplan.2018.08.016.
- L. E. Natividad and P. Benalcazar, "Hybrid Renewable Energy Systems for Sustainable Rural Development: Perspectives and Challenges in Energy Systems Modeling," *Energies* 2023, Vol. 16, Page 1328, vol. 16, no. 3, p. 1328, Jan. 2023, doi: 10.3390/EN16031328.
- H. Aimon, A. P. Kurniadi, and S. Amar, "Analysis of fuel oil consumption, Green economic growth and environmental degradation in 6 Asia Pacific countries," *Int. J. Sustain. Dev. Plan.*, vol. 16, no. 5, pp. 925–933, 2021, doi: 10.18280/IJSDP.160513.
- M. N. Khatun, S. Mitra, and M. N. I. Sarker, "Mobile banking during COVID-19 pandemic in Bangladesh: a novel mechanism to change and accelerate people's financial access," *Green Financ.*, vol. 3, no. 3, pp. 253–267, 2021, doi: 10.3934/gf.2021013.
- M. R. Betz, M. D. Partridge, M. Farren, and L. Lobao, "Coal mining, economic development, and the natural resources curse," *Energy Econ.*, vol. 50, pp. 105–116, Jul. 2015, doi: 10.1016/J.ENERCO.2015.04.005.
- O. J. Olujobi, U. E. Okorie, E. S. Olarinde, and A. D. Aina-Pelemo, "Legal responses to energy security and sustainability in Nigeria's power sector amidst fossil fuel disruptions and low carbon energy transition," *Heliyon*, vol. 9, no. 7, Jul. 2023, doi: 10.1016/j.heliyon.2023.e17912.
- P. Karani and P. Failler, "Comparative coastal and marine tourism, climate change, and the blue economy in African Large Marine Ecosystems," *Environ. Dev.*, vol. 36, Dec. 2020, doi: 10.1016/J.ENVDEV.2020.100572.
- Q. Fu, L. Liu, and H. Wang, "Role of fossil fuels resources on high-quality economic development: Evidence from China," *Resour. Policy*, vol. 86, p. 104126, 2023, doi: <https://doi.org/10.1016/j.resourpol.2023.104126>.
- J. Goldemberg and S. Teixeira Coelho, "Renewable energy—traditional biomass vs. modern biomass," *Energy Policy*, vol. 32, no. 6, pp. 711–714, 2004, doi: [https://doi.org/10.1016/S0301-4215\(02\)00340-3](https://doi.org/10.1016/S0301-4215(02)00340-3).
- P. Ritu, "Energy poverty in Nepal: A Case Study on the Use of Biomass in the Rural Villages of Biratnagar," no. May, 1782.
- M. L. Wilson, E. Renne, C. Roncoli, P. Agyei-Baffour, and E. Y. Tenkorang, "Integrated assessment of artisanal and small-scale gold mining in Ghana — Part 3: Social sciences and economics," *Int. J. Environ. Res. Public Health*, vol. 12, no. 7, pp. 8133–8156, Jul. 2015, doi: 10.3390/IJERPH120708133.
- United Nations, *World Economic and Social Survey 2013*. 2013. doi: 10.1016/j.compind.2010.10.001.
- A. Gatto and F. Busato, "Energy vulnerability around the world: The global energy vulnerability index (GEVI)," *J. Clean. Prod.*, vol. 253, 2020, doi: 10.1016/j.jclepro.2019.118691.
- C. Wang, J. Shuai, L. Ding, Y. Lu, and J. Chen, "Comprehensive benefit evaluation of solar PV projects based on multi-criteria decision grey relation projection method: Evidence from 5 counties in China," *Energy*, vol. 238, Jan. 2022, doi: 10.1016/J.ENERGY.2021.121654.
- N. Patel, "Performing energy justice futures: How visions of just futures shape discourses and practices in the United Kingdom's community energy sector," *Energy Res. Soc. Sci.*, vol. 111, p. 103475, 2024, doi: <https://doi.org/10.1016/j.erss.2024.103475>.
- D. Hartono, S. H. Hastuti, A. A. Balya, and W. Pramono, "Modern energy consumption in Indonesia: Assessment for accessibility and affordability," *Energy Sustain. Dev.*, vol. 57, pp. 57–68, Aug. 2020, doi: 10.1016/j.esd.2020.05.002.
- I. M. Hezam, A. R. Mishra, P. Rani, A. Saha, F. Smarandache, and D. Pamucar, "An integrated decision support framework using single-valued neutrosophic-MASWIP-COPRAS for sustainability assessment of bioenergy production technologies," *Expert Syst. Appl.*, vol. 211, 2023, doi:

10.1016/J.ESWA.2022.118674.

- B. E. K. Nsafon, N. N. Same, A. O. Yakub, D. Chaulagain, N. M. Kumar, and J. S. Huh, "The justice and policy implications of clean energy transition in Africa," *Front. Environ. Sci.*, 2023, doi: 10.3389/fenvs.2023.1089391.
- D. Chirambo, "The Climate Finance and Energy Investment Dilemma in Africa: Lacking amidst Plenty," *J. Dev. Soc.*, vol. 30, no. 4, pp. 415-440, 2014, doi: 10.1177/0169796X14545581.
- A. Boar, E. Palau Pinyana, and M. Oliveras-Villanueva, "Alternatives to solve SDG trade-offs and to enforce SDG synergies: a systematic literature review," *Manag. Environ. Qual. An Int. J.*, 2022, doi: 10.1108/MEQ-07-2021-0181.
- C. C. Lee, R. Lou, and F. Wang, "Digital financial inclusion and poverty alleviation: Evidence from the sustainable development of China," *Econ. Anal. Policy*, vol. 77, pp. 418-434, 2023, doi: 10.1016/j.eap.2022.12.004.
- C. Wang *et al.*, "Evaluation of energy and environmental performances of Solar Photovoltaic-based Targeted Poverty Alleviation Plants in China," *Energy Sustain. Dev.*, vol. 56, pp. 73-87, Jun. 2020, doi: 10.1016/J.ESD.2020.04.003.
- L. Taylor, "Fuel poverty: from cold homes to affordable warmth," *Energy Policy*, vol. 21, no. 10, pp. 1071-1072, 1993.
- K. Drescher and B. Janzen, "Determinants, persistence, and dynamics of energy poverty: An empirical assessment using German household survey data," *Energy Econ.*, 2021, doi: 10.1016/j.eneco.2021.105433.
- L. Chester and A. Morris, "A new form of energy poverty is the hallmark of liberalised electricity sectors," *Aust. J. Soc. Issues*, 2011, doi: 10.1002/j.1839-4655.2011.tb00228.x.
- K. Zhou, Y. Wang, H. Wang, and J. Tan, "Does China's outward foreign direct investment alleviate energy poverty in host countries? Evidence from countries along the belt and road initiative," *Renew. Energy*, vol. 223, p. 120034, 2024, doi: <https://doi.org/10.1016/j.renene.2024.120034>.
- L. El-Katiri, "The energy poverty nexus in the Middle East and North Africa," *OPEC Energy Rev.*, 2014, doi: 10.1111/opec.12029.
- G. Sherriff, D. Butler, and P. Brown, "'The reduction of fuel poverty may be lost in the rush to decarbonise': Six research risks at the intersection of fuel poverty, climate change and decarbonisation," *People, Place and Policy Online*, 2022, doi: 10.3351/ppp.2022.3776894798.