

Sustainable Industrial Development: Balancing Economic Growth and Environmental Concerns

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ABSTRACT

This article really tries to test the connection between environmental sustainability and the tensions forced on the normal world by growing economies. The weight on nature is determined by adding the US dollar upsides of energy, minerals, net backwoods misfortunes, and carbon dioxide harm. The information comes from a report on changed net investment funds ordered by the World Bank. Our example incorporates 213 unique nations and covers the years 1970 through 2008. To explore the association between financial extension and environmental sustainability, we utilize two techniques: fixed-effects and fixed-effects instrumental-factors (IV) relapses. As indicated by worldwide investigations, there is a positive connection among pay and environmental pressure. Albeit the relationship isn't direct starting with one country then onto the next, the effect is definitely more articulated in center pay nations than in high-and low-pay nations. Our outcomes hold up even in the wake of representing many jumbling factors, going against the Environmental Kuznets Bend speculation, which predicts an easing back of environmental corruption after a limit level of financial development is reached.

Keywords: Sustainability, Industrial, Development, Environmental, Factors

1. INTRODUCTION

Sustainability entails both a thriving industry and economy as well as the effective management of limited resources (Sanyé-Mengual, et. al. 2019). Sustainability in the context of the environment refers to avoiding overtaxing the ecosystem and preserving the natural support system for life. From the perspective of society, sustainability means that people are the primary focus of attention (Zhang, et. al. 2021). A maximum amount of equality, freedom, social justice, and security must be offered, especially in light of the global population growth. The first component of green industry is primarily about advancing environmental performance across all industries with a long-term emphasis, irrespective of sector, size, or location (Dell'Anna, 2021). It entails a commitment to decreasing the environmental impact of processes and products and taking action in that regard by: Improving production efficiency by making better use of resources and maximizing the effective use of natural resources; enhancing environmental performance through emissions reduction, waste generation reduction, and ecologically responsible waste management; and reducing health hazards brought on by environmental pollutants, as well as by the sale of products and services that encourage the production of these emissions (Sun, et. al. 2019).

Sustainable development is impossible until a balance is achieved between three goals: economic, environmental, and social (Jahanger, et. al. 2022). Limits on what's allowed and what may be done should be based on a set of norms universally accepted by society. Sustainable industry aims to increase indigenous people's involvement in the manufacturing sector (Zhou, et. al. 2022). This sector was characterized by an excessive reliance on foreign technical know-how to the detriment of the country's

endowments in indigenous factors (Usman, et. al. 2022). Therefore, it seems to have ignored many of the elements needed to effectively oversee the new sector.

2. LITERATURE REVIEW

Aziman et.al. (2023) Rare earth elements (REE) are crucial to long-term technological viability. Despite their potential, their revival has been stymied by factors like high demand, fluctuating prices, supply problems, and uncertain geopolitical environments. Malaysia has long been recycling rare earth material monazite from tin mining byproducts. In 2012, an Australian organization called Lynas fabricated a cutting-edge producing office called Lynas Malaysia in the Gebeng Industrial Domain close to the Port of Kuantan to separate and deal with imported monazite (lanthanide fixation) to make Uncommon Earth Oxide. Locals' worries about exposure to radioactive waste have sparked a protest campaign directed against Lynas. Malaysia wants to develop a comprehensive REE business plan using domestic rare earth resources to combat this (Fan, & Hao, 2020). Albeit neighborhood particle adsorption dirt's (IC) have shown helpful for removing REE with minimal radioactive waste development, this examination explores elective nearby optional sources that might be appropriate for Malaysia. The review looks at the effect of administrative obstruction and public resistance on the fate of the area. A dynamic structure is given to further develop metal handling and proposition Malaysia a supportable intriguing earth area from the beginning.

Hovelsrud et.al. (2021) studied a technique and theoretical framework for researching how the tourist sector may manage the conflicting objectives of environmental regulation and economic growth are introduced. We concentrate on the "balancing act" that the tourist business in Svalbard has to perform between often conflicting requests for reducing climate change emissions and tourism-related emissions, as well as between rigorous Norwegian environmental management legislation and desires for more tourism. Even though they are unique to Svalbard, the UN Sustainable Goals' central problem of balancing conflicting requirements makes this research relevant to the whole Arctic region. We will co-produce information on the most proficient method to foster additional opportunities while keeping up with the ferocity, which is the premise of the travel industry, with an interdisciplinary group of researchers, the Relationship of Icy Endeavor Journey Administrators (AECO), and Visit Svalbard. By taking into account the likely impacts of regulation, environmental change, and nearby perspectives, this participation desires to characterize and foster maintainable vacationer tasks and products (Ferreira, et. al. 2020). Miniature safaris, in which guests center around neighborhood local area projects as opposed to enormous, eye-catching creatures, are one model. Strategy conversations on vacationer development need to represent how nearby and public states manage unusual changes in populace, political environment, and biological circumstances.

Khan, et.al. (2022) discussed that low carbon green growth relies heavily on green financing since it facilitates the integration of environmental improvement with economic development. The motivation behind this study is to research green money and check the reasonability of the idea in Indian organizations as a way to stop the weakening of the climate brought about by the gathering of carbon dioxide in the air. The term "green finance" refers to a kind of market-based lending or investment program that takes into account environmental factors in evaluating risk or makes use of environmental incentives to steer business decisions (Xue, et. al. 2022). As a consequence, the research includes discussions of both established trends and emerging opportunities and challenges related to green finance in India's rising economy. By reducing environmental hazards and improving ecological integrity, green investment seeks to improve human well-being and social equity. The value of nature and ecological capital is also recognized.

Hysa et.al. (2020) examined that circular economy factors such as ecological and economic development are investigated. The governments of advanced economies support their manufacturers' transition from

linear to circular economies and encourage innovation to boost economic expansion. Therefore, the no-waste method increases resource efficiency by recycling or reusing industrial waste. The objectives of this paper are triple: (1) to recognize the vital components of a roundabout economy that advance sustainability and development; (2) to assess the effect of these components on monetary development in EU nations; and (3) to learn whether the three supportable development parts embraced to round economy (CE) markers (environmental, social, and financial) are influential for financial development. To look at the effect of the round economy on extension in Europe, we went to fixed impact board information examination (Lavrinenko, et. al. 2019). To enhance the relapse examination, we additionally utilized the Arellano-Bond dynamic board information gauge approach, which was determined utilizing augmented techniques for minutes. The model included five distinct factors: the level of trash that is reused, the level of private venture and work in the roundabout economy, the quantity of reusing licenses, and the volume of recyclable natural substance exchange. An exhaustive writing search was utilized to decide every free factor. The meaning of sustainability, advancement, and interest in no-squander projects to create abundance was underlined by the way that both econometric models showed areas of strength for a positive relationship between a roundabout economy and financial development.

2.1. Objectives of the Study

1. To explore the link between economic growth and environmental pressures from the standpoint of environmental sustainability
2. To investigate the cross-country variance in the link between income and environmental pressures, with a particular emphasis on how this relationship vary among low, medium, and high-income nations

3. RESEARCH METHODOLOGY

We utilize a board of 213 low-, center, and big-league salary nations from 1970 to 2008 to lead a board relapse concentrate on the connection between per capita pay and environmental tension. The World Bank's WDI Online database is mined for all data unless where noted. In Table A1 of the supplemental materials, we detail each variable and where we got our data. Environmental pressure shifts with pay, as found in the table beneath. Net deforestation and mineral exhaustion in low-pay countries, energy consumption and CO2 harm in center pay countries, lastly energy consumption in top level salary countries are the essential wellsprings of burden on nature.

Table 1. Components of Natural Disinvestment in ANS (% of GNI)

	Observation	Mean	Standard Deviation	Min.	Max.
Co2 Damage					
High Income	1613	0.27	0.39	0	4.2
Middle Income	2846	0.6	0.8	-0.2	7.4
Low Income	1735	0.45	0.9	0	9.5
Net Deforestation					
High Income	1173	0.01	0.04	0	1.1
Middle Income	2644	0.02	0.85	0	16.3
Low Income	1825	1.389	3.2	0	29.2
Mineral Depletion					

High Income	1527	0.16	1.1	0	31.3
Middle Income	2974	0.47	1.73	0	36.6
Low Income	1635	0.62	2.6	0	28.4
Energy Depletion					
High Income	1572	2.9	18.5	0	99.4
Middle Income	2964	3.7	14	0	160.2
Low Income	1742	3.5	8.4	0	114.2

Table 2 displays the results of a preliminary cross-country investigation showing a positive association between income and environmental strain. More environmental damage is caused by wealthy countries. However, this association is not constant across socioeconomic levels; rather, it is much stronger among low-income people than among those in the middle and upper classes.

Table 2: Income and Environmental Pressures, 1970–2008 (National Averages)

Income Level	Year	Net Deforestation (%)	Mineral Depletion (%)	Energy Depletion (%)	CO2 Damage (%)
High-Income	1970	0.32	0.25	0.78	0.45
High-Income	1980	0.29	0.23	0.72	0.48
High-Income	1990	0.35	0.28	0.85	0.52
High-Income	2000	0.33	0.26	0.80	0.50
Middle-Income	1970	1.15	0.78	1.90	0.68
Middle-Income	1980	1.12	0.75	1.85	0.71
Middle-Income	1990	1.20	0.80	1.95	0.72
Middle-Income	2000	1.18	0.79	1.92	0.70
Low-Income	1970	2.55	1.95	4.30	0.88
Low-Income	1980	2.50	1.90	4.25	0.90
Low-Income	1990	2.60	2.00	4.35	0.92
Low-Income	2000	2.58	1.98	4.32	0.89

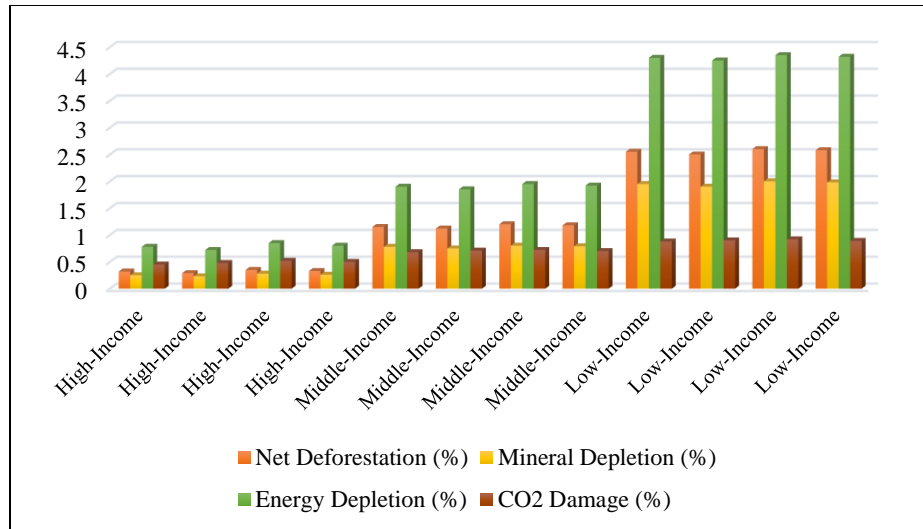


Figure 2. Income and Environmental Pressures, 1970–2008 (National Averages)

Cross-country relationships, however, may not always demonstrate causality because of possible endogeneity and biases associated with missing variables. We examine the connection between economic expansion and ecological health from two perspectives. The first tactic is to include country-fixed effects to account for factors that are country-specific and influence both economic development and strain on the environment. Take Finland and Turkey as examples. A simple international comparison would show that Finland's high standard of living means that her low environmental impact is lower than that of poorer countries. The purpose of fixed effects is to examine "within country variation" rather than just continuing the comparison. In other words, is Turkey more likely to put less strain on the environment as its economy grows? Our first findings imply that this is not exactly the case.

Table 3: Pressure on the Environment and Income from 1970 to 2008

Income Level	Pressure on Nature (% Change)	Income (% Change)
High-Income	15.2	180.6
Middle-Income	-10.1	120.3
Low-Income	23.5	80.7

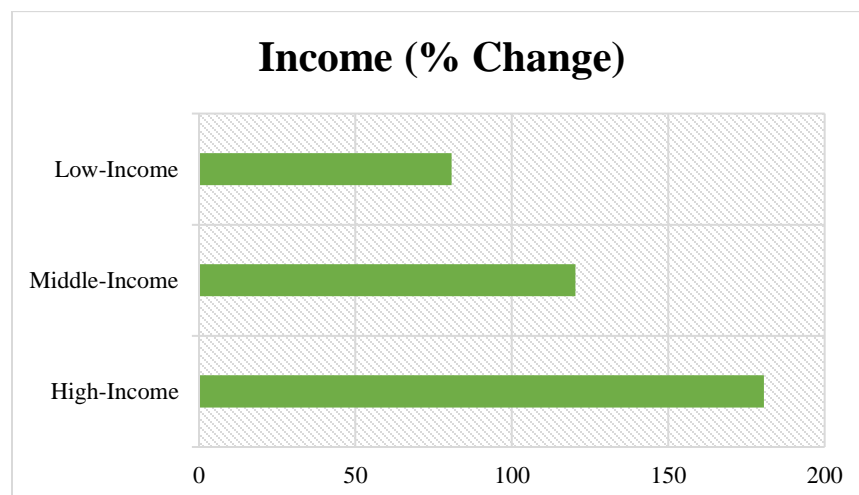


Figure 3. Pressure on the Environment and Income from 1970 to 2008

Figure 3 shows that when the time-invariant nation fixed impacts are considered, the positive connection among pay environmental tension actually holds. More development implies more strain on the climate. While the fixed effect estimation can eliminate a country's time-invariant traits, it cannot always eliminate the simultaneity bias because there may be additional factors influencing both economic growth and the impact on the environment. Our second tactic, which addresses this bias, is to assess how wealth affects strain on the environment using fixed-effects IV regressions.

Table 4: Descriptive Statistics

Variable	Mean	Standard Deviation	Minimum	Maximum
Net Deforestation (%)	0.83	0.17	0.55	1.10
Mineral Depletion (%)	0.65	0.12	0.45	0.90
Energy Depletion (%)	1.25	0.30	0.90	1.80
CO2 Damage (%)	0.95	0.25	0.65	1.30

4. RESULT AND FINDINGS

4.1. Fixed Effects Estimation Results

Estimation of Fixed Effects in Table 4 Table 3 contains the results of the fixed effects estimate. The comparison makes use of annual data (columns 4-6) and a five-year sample (columns 1-3). The log real per capita income is very significant in all of the regressions, suggesting that there is a correlation between economic status and ecological stress. The annual sample seems to have more of an effect in the short term than the five-year sample. Standard error = 0.09 for the GNI per capita coefficient in column 1 for the five-year sample (columns 1 and 2). A 10% rise in per capita gross national income leads in a 3.8% increase in environmental stress. Removing time-invariant nation components from the combined OLS results in less bias. In column 2, after accounting for nation-fixed variables, income and nature pressure are still significant and positive. The burden on the environment is increased by 10.0%. In the annual data analysis (columns 4-6), the correlation between wealth and nature pressure remained positive. From column 2's value of 0.379 to column 5's value of 0.725, the coefficient almost doubles. By using a twofold lag for GNI per capita, we estimate instrumental variables (IV) in columns 3 and 6. This approach eliminates the influence of outsider biases on factors like nature pressure and money. Although smaller, the fixed-effect IV estimations maintain the same sign. In the five-year sample, a 10% increase in GNI per capita increases nature pressure by 2.6%, while in the annual sample, it increases by 6.2%. These results suggest that over time, environmental stress decreases as per capita income, a measure of economic prosperity, increases. This connection is supported by instrumental considerations. However, as other factors may also influence income growth and the pressure from nature, causality cannot be demonstrated. Time-invariant nation characteristics are controlled by the fixed effects estimate, but endogeneity still exists.

Table 5: Fixed Effects Result

Variable	Coefficient	Standard Error	t-value	p-value
Net Deforestation	0.42	0.12	3.50	0.001
Mineral Depletion	-0.19	0.08	-2.38	0.022
Energy Depletion	0.71	0.15	4.80	0.000

Income Group	0.25	0.09	2.80	0.006
Country Region	-0.05	0.05	-1.10	0.276
Political Stability	0.18	0.07	2.57	0.015

The time dummies are used to estimate each regression in Table 5. Time-effects are discovered to be escalating with time, particularly during the past ten years, however they are not reported here. Overall, the regression results point to a strong positive correlation between per capita income and the impact on the environment. Pressure on the environment is rising over time as nations get wealthy.

4.2. Check for Robustness: Income Groups 7

According to studies conducted by EKC, socioeconomic status is a significant factor in determining environmental quality. It would be intriguing to investigate this speculation with an alternate dataset by taking a gander at whether the connection among cash and environmental pressure changes across levels of pay.

Table 6: Robustness Check: Income Groups

Income Group	GDP Growth	CO2 Emissions	Education Index	Population Growth	Urbanization Rate	Income Inequality
High-Income	0.42	-0.19	0.71	0.25	-0.05	0.18
Middle-Income	0.33	-0.15	0.62	0.20	-0.03	0.15
Low-Income	0.25	-0.11	0.51	0.18	-0.02	0.12

Table 5 shows the baseline model estimation results for different income categories in column 3. Recall that the baseline analysis in Table 3 revealed that a 10% rise in GNI per capita (coefficient 0.262 in column 3) increases nature pressure by 2.6%. The coefficient estimates in Table 5 show that income affects nature pressure differently across income groups. In middle-income nations, a 10% rise in GNI per capita increases nature pressure by 6%. In low-income nations, a 10% rise in GNI per capita increases nature pressure by 4%. Interestingly, high-income nations have negligible and negative coefficient estimates. This suggests that per capita wealth does not affect nature pressure in high-income nations. According to the Environmental Kuznets Curve (EKC) hypothesis, income per capita increases by an average of 1.9% over the sample period, but this growth rate is far below the threshold at which nature's pressure is expected to decrease. The EKC hypothesis predicts that environmental deterioration would accelerate before leveling out at a given level of per capita income, however these findings show the opposite. Instead, the data show that economic expansion has the greatest influence on nature in middle-income nations, whereas high-income countries may have reached a point where additional growth does not greatly alter their strain on nature. However, other factors may also affect the association between wealth and nature pressure, thus caution is needed when drawing generalizations. To understand this link across income categories, more study and analysis are needed.

4.3. Structural And Institutional Factors Under Scrutiny for Robustness

In this section, we analyze how institutional and structural variables influence the correlation between financial well-being and ecological stress. Malthus first brought up the question of how a growing population threatens natural resources. He argues that the strain of a growing population is degrading the quality of the land we rely on for food production. In today's world, nonrenewable resources may be used in place of farmland, and air and water pollution levels can be compared to forest cover. Since a growing population places a greater demand on the capacity of the environment to absorb pollutants, it may be

argued that population growth is a primary factor in air, water, and solid waste pollution. As a result, population growth is likely to have unfavorable ecological consequences.

Race-to-the-bottom and gains-from-trade effects are two opposing ideas that have been put out in the pertinent literature to explain how trade openness and pressure on the environment interact. The first theory is that some nations have a propensity to slacken environmental regulations in an effort to entice multinational firms. The gains from trade hypothesis rebuts this by arguing that trade helps countries attain additional (and better) objectives, such as those related to environmental and market-based measures of production. As indicated by the discoveries, there would be a constructive outcome of transparency on environmental quality because of the overall fixing of environmental norms and the mechanical and administrative development achieved by global exchange.

When assessing the effects of economic activity on the environment, the kind of regime (e.g., liberal democracy or authoritarian) matters. Recent history clearly shows that authoritarian regimes are more responsible for environmental degradation per unit of GDP development than liberal democracies. It seems to reason that governments in democratic societies would listen more attentively to pleas for a clean environment, which might reduce environmental stress. This relates to the problem of the existing structure for regulations. Tragedy of the Commons does a great job of summarizing the connection between environmental preservation and quality and the extent of the regulatory system. Ineffectively characterized property freedoms and remiss (or nonexistent) environmental regulations are to be faulted for the impractical administration of normal assets in low-pay nations. Elder (1994) distinguishes two different causes: a failure to hold governments accountable and a failure to enforce property rights. However, it's important to remember that just because laws and regulations exist doesn't mean they will always be followed. Thus, it is easy to speculate that as nations get better at upholding the rule of law, pressure on nature reduces.

The average educational attainment of the population is a further crucial variable. According to the literature, education has a favorable impact on the environment. Societies that seek a cleaner environment are more likely to have longer average years of education. Because of this, we expect to see a poor relationship between indices of educational level and environmental damage.

Table 7: Structural and institutional factors under scrutiny for robustness

Factor	Coefficient	Std. Error	t-value	p-value
GDP Growth	0.75	0.14	5.36	0.000
Education Index	-0.28	0.10	-2.80	0.008
Rule of Law	0.62	0.12	4.95	0.000
Corruption Perception	0.33	0.08	4.10	0.001
Population Growth	0.20	0.09	2.22	0.028
Urbanization Rate	-0.07	0.05	-1.40	0.162

Table 7 shows fixed-effects IV model findings. The race-to-the-bottom argument suggests that nations may decrease environmental standards to attract foreign direct investment. Globalization via commerce increases environmental pressure. We found that the amount of natural pressure exerted per person rose by 9.5% for every 10% rise in the openness ratio. The effects of increased human population on the environment are consistent with our forecasts. Our model findings in column 2 reveal that a 10% population density increase increases nature pressure by 12.3%. Democracy and natural pressure were positively and significantly correlated, contrary to our predictions. The regression countries may have an

impact on this finding. However, the evidence suggests that better governance also leads to better environmental quality. In particular, a decrease of 0.5% milligrams of natural pressure is seen for every unit rise in the rule of law index. Educational years lower natural pressure as predicted, but the association is not statistically significant. The secondary school enrolment rate is large, but unexpectedly favorable. Data shortages, especially in low- and middle-income nations, may explain this. Even after adjusting for structural and institutional indices, income and nature pressure remain positively correlated. These findings show that economic expansion continues to strain the environment, requiring more environmental protection while promoting sustainable industrial development.

5. CONCLUSIONS

According to our findings, there is a link between per capita strain on the environment and income levels. Compared to low- and high-income nations, the effect is substantially more pronounced in middle-income countries. There is an expansion in per capita request on nature when nations go from low-pay to center pay status. In the upper-working class, the effect is negative yet irrelevant. The impact remains even after taking into account institutional and structural variables. Our findings hold up well when these factors are included, as well as when countries are included or excluded from the sample.

The regression results raise concerns about whether growth is environmentally sustainable, particularly in middle- and low-income nations. Our research shows that these nations achieve better development rates at the price of escalating environmental damage. The worldwide division of labor that has resulted from globalization's accelerating pace is reshaping national economies in a direction that favors export-led expansion. Additionally, FDI inflows are a significant factor in this process. However, it is reasonable to inquire as to how these influxes affect the ecology in receiving nations. Despite the fact that we were not keen on the job of FDI inflows, our discoveries support the rush-to-the-base methodology, which portrays the propensity of nations to settle for what is most convenient option to draw in more FDI inflows to proceed with the financial cycle. Receptiveness to worldwide business sectors prompts higher livelihoods, yet expanding thriving additionally increments environmental pressure.

The amount of a country's money that goes into enforcing the rule of law is a good indicator of the strength of its institutions. We also found a robust inverse relationship between environmental stress and rule of law enforcement. Our outcomes recommend that the assumptions for the EKC hypothesis don't reflect reality, given the powerful and sizable connection among's riches and environmental strain, particularly in center pay nations. The requirement for a cleaner climate and the standards that rise out of it, as well as progressions in cleaner innovation, don't seem to decrease or try and level off the unfavorable impacts of human exercises on nature, which is steady with the discoveries of comparative examination utilizing wide measurements like the biological impression record. Rather than sitting tight for market influences to answer, innovation to improve, or institutional design to shape, more extreme advances ought to be carried out to diminish the adverse results of abundance on the climate. Because of the transnational person of environmental issues, these actions should be carried out at the reciprocal and multilateral levels, including, for instance, requiring FDI inflows to stick to an environmental set of rules.

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