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The Economic Growth and Environmental Kuznets Curve Hypothesis Evolution and Assessment, Causes and Prospective: A Review of Literature under a Critical Analysis

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1.0. Abstract:

Based on econometric estimates, recent research has shown an inverted-U link between environmental quality indices and income, known as an environmental Kuznets curve. This may affect economic and environmental policies. This paper examines this research as a whole and finds that unequivocal evidence for an environmental Kuznets curve relationship is very scant; that important indicators show a monotonically increasing relationship; and that even if there is a relationship, most of the world's population is still on the increasing section of the curve, so income growth based on this relationship would result in con In conclusion, the income—environment link is still problematic and requires deliberate environmental policy if future income increase is to be sustainable. If the environmental Kuznets curve is correct, economic growth in both developed and developing nations may prevent environmental issues, which are largely caused by economic development. Global environmental talks are biassed to follow the environmental Kuznets curve theory. Environmentalists say economic growth has done a lot of damage to the environment, especially with higher energy demand, but economists say it will solve these issues in the long run. Since the cause is the remedy, the link between environmental change and economic development has broken. The environmental Kuznets curve compares pollution indicators to per capita income. Economic expansion first causes environmental pollution, but as incomes rise, it improves the environment. Environmental economics examines water quality, air pollution, solid waste, global warming, and other environmental concerns' costs and benefits.

1.1. Key words: Environmental Kuznets Curve, Economic Growth, Economic Structure, Equation of EKC, Level of Environmental Degradation, Key Takeaways.

1.2. Introduction:

Using Simon Kuznets's income distribution theory from 1955 as a starting point, the Environmental Kuznets curve shows the link between the environment and growth. Kuznets' research showed that level growth, which he measured by per capita income, had an inverted U-shaped link with measures of income inequality. During the early stages of economic growth, income inequality rises, and by the later stages, it is clear. Gene Grossman and Alan Krueger both found an inverted U-shaped link between environmental damage and economic growth in the research they did on the topic. The Environmental Kuznets Curve (EKC) shows that negative environmental impact leads to positive economic growth. This idea describes the most likely connection between the environment and economic growth. It says that environmental damage is low when the economy isn't growing very fast. When the economy is just starting to grow, environmental damage gets worse. As the economy grows, decline slows down. In other words, environmental damage gets worse at the beginning of growth but stops after a certain amount of income. The global community has good reasons to care about two things: protecting the earth and growing the economy. The world is now more open to trade, there are stronger economic ties between countries, and there is more competition than ever before as countries try to become more alike. Many people think and have learned that lowering hurdles to trade and

investment across borders can help the economy grow and make people happier. Others, though, have questioned whether this kind of progress can last. Because faster growth has done a lot of damage to the environment, it seems like economic growth and a good environment are naturally at odds with each other. One thing that goes against this idea of growth vs. environment is the EKC, which promotes more economic growth as a way to fix environmental issues.

1.3. Meaning of Environmental Kuznets Curve Hypothesis:

The environmental Kuznets curve (EKC) depicts how economic growth affects environmental deterioration. It says pollution rises as nations grow. However, pollution diminishes as the economy grows. For various nations, environmental variables like water, air, etc. exhibit this tendency, according to empirical investigations. The figure below depicts how economic progress affects economic deterioration. The curve is named after economist Simon Kuznets' famous inequality-economic development research. That research similarly found an inverted U shape between inequality and economic development, with inequality increasing initially and then decreasing with development and per capita income.

1.4. Definitions of Environmental Kuznets Curve:

Prof. Simon Kuznets defines it as the environmental The Kuznets curve argues that economic expansion first degrades the environment, but beyond a certain level, society improves its interaction with the environment and environmental degradation decreases. At a glance, economic expansion seems to be environmentally friendly. Critics say economic expansion doesn't always enhance the environment; in fact, usually the contrary. To ensure economic development is consistent with an improved environment, the policies and attitudes must be more focused. Technological advancement and institutional and ideological changes enable a nation to deliver more diversified economic commodities to its people, resulting in long-term economic development.

1.5. Equation of Environmental Kuznets Curve:

The pattern most often encountered is B, which follows if δ is positive and statistically significant and φ is negative and statistically significant. In this case, the estimated EKC has a maximum turning point per capita income level, calculated as $Y^* = (-\delta/2\varphi)$.

1.6. Objectives of the study:

The study shall have the following specific objectives.

1. To study the key takeaways environmental Kuznets curve hypothesis in India.
2. To analyze the origin of environmental Kuznets curve hypothesis in India.
3. To study the proximate factors of environmental Kuznets curve hypothesis in India.
4. To assess the environmental Kuznets curve hypothesis on literature reviews in India.
5. To analysis the causes of environmental Kuznets curve hypothesis in India.
6. To study the critical analysis of environmental Kuznets curve hypothesis in India.

1.7. Methodology of the study:

The main types of this work are analytical and descriptive. “The Economic Growth and Environmental Kuznets Curve Hypothesis Evolution and Assessment Causes and Prospective: A Review of Literature under a Critical Analysis” is the topic of analysis in this article. In accordance with the requirements of this research, only secondary sources provided the data utilized in it. The work of the article is based on a thorough analysis of secondary data gathered from a variety of sources, including books, national and international journals, and public and private publications on a range of topics related to women's contribution to modern Indian society that are accessible on websites and in libraries.

1.8. Review of the literatures of the study:

1. Panji Kusuma Prasetyanto et at all (2021), **"Environmental Kuznets Curve: Economic Growth with Environmental Degradation in Indonesia",** This research aims to prove that economic growth affects environmental degradation in the U-shaped EKC hypothesis and to determine how primary energy consumption, income inequality, education level, and environmental degradation affect Indonesia's sustainable development. The research estimated Indonesia's 1994-2018 short- and long-term effects using the Error Correction Model Engel and Granger estimating methods.

2. Muhammed Ashiq Villanthenkodath et at all (2021), **"Impact of Economic Structure on the Environmental Kuznets Curve (EKC) hypothesis in India",** This research examines how economic structure affects India's Environmental Kuznets Curve (EKC). Analysis of 1971–2014 long-term and short-term relationships with Auto-Regressive Distributed Lag (ARDL). Since economic development and its components have a U-shaped influence on environmental quality in India, both aggregated and disaggregated models showed that the standard EKC hypothesis does not hold.

3. Archana and Barna Ganguli Maulick (2016), **"A Nexus between Environment and Economic Development",** Economic growth and the environment are complementary. Development that ignores the environment will suffer. Society cannot progress without sustainable development. Ecological Kuznets curve theory shows an inverted U-shaped link between economic development and environmental deterioration.

4. Goapl Gopakumar et at all (2022), **"Analysis of the Existence of Environmental Kuznets Curve: Evidence from India",** The study uses autoregressive distributed lag (ARDL) counteraction technique to estimate the Environmental Kuznets Curve (EKC) in India from 1991 to 2018 by considering economic growth, renewable energy, foreign direct investment, stock market size, energy intensity, and private energy sector investment. The findings indicate an inverted U-shaped EKC link between economic growth and CO2 emissions.

5. Alexandra Soberon et at all (2020), **"The Environmental Kuznets Curve: A Semi parametric Approach with Cross-Sectional Dependence",** This research suggests a novel way to study CO2 emissions and economic development. In particular, we propose to test the Environmental Kuznets Curve (EKC) hypothesis for a panel of 24 OECD and 32 non-OECD countries using a more flexible estimation technique that accounts for functional form misspecification, cross-sectional dependence, and heterogeneous variable relationships simultaneously.

1.9. Key Takeaways:

1. The Kuznets curve is an economic theory proposed by Simon Smith Kuznets in the 1950s to understand the impact of economic growth on income inequality.
2. This curve depicts an inverted U-shaped or mountain-shaped curve that shows the relationship between economic growth and per capita income.
3. Developed or rich countries typically have less income inequality than developing nations.
4. The Environmental Kuznets Curve (EKC) is a related theory that studies how a country's development impacts the environment.

1.10. Origin of Environmental Kuznets Curve Hypothesis:

EKC is named after Nobel laureate Simon Kuznets, who proposed an inverted-U link between economic growth and income disparity. Curios about changes in the personal distribution of income, Kuznets analysed data for the US, England, and Germany and found that annual income incidence in broad classes was moving towards equality, especially after World War I. He noted that inequality changed as the high-income contemporary sector expanded at the cost of the low-income traditional sector. This shift from traditional to contemporary is projected to create an inverted-U relationship between income disparity and growth. As a society industrialises and urbanises, wealthy people have more options while inexpensive labour from rural regions moves to cities for better work. Under these circumstances, the urban population would vary from low-income newcomers to high-income established groups.

Due to tiny individual firms, urban income inequality would be substantially higher than for the agrarian population. After the stormy years of industrialization, a developing and free economic society would increase the income proportion of lower-income urbanites. Inequality should diminish. Thus, income inequality would rise in the early stages of economic development when the transition from pre-industrial to industrial civilization was fastest, stabilise, and then contract. The EKC hypothesis aims to show a long-term link between economic expansion and environmental deterioration, following Kuznets. Grossman and Krueger (1993) reported an EKC pattern for several contaminants in NAFTA, sparking interest in this link. The 1992 World Bank World Development Report also recommended accelerating fair income development to boost global production and environmental conservation. The paper stressed that economic growth and environmental protection were complimentary. It claimed that "The view that greater economic activity inevitably hurts the environment is based on static assumptions about technology, tastes and environmental investments" and that "As incomes rise, the demand for improvements in environmental quality will increase, as will the resources available for investment". This sparked EKC as a major research focus.

1.11. Proximate Factors in Environmental Kuznets Curve:

Therefore, at one level the EKC is explained by the following 'proximate factors':

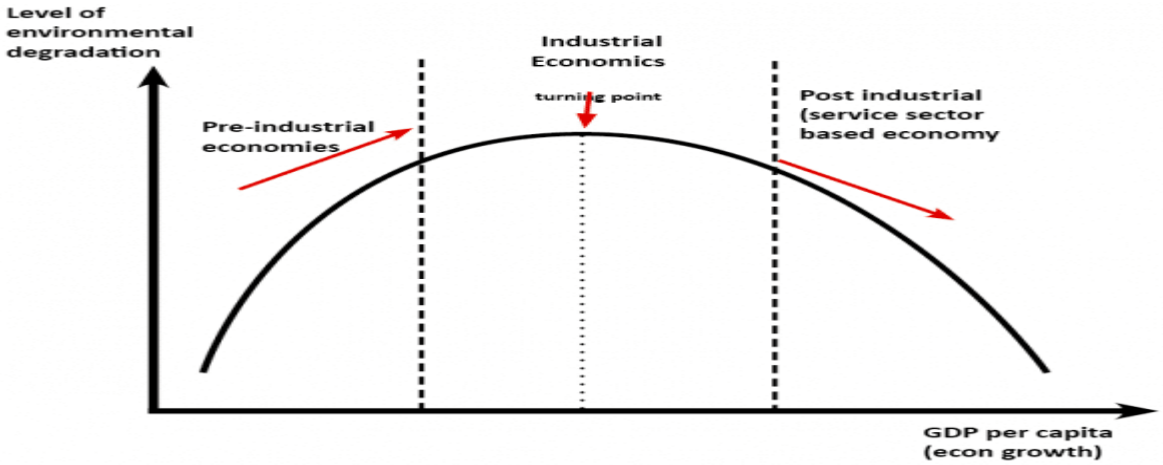
1. Scale: At a certain factor-input ratio, output mix, and technological stage, scale of production refers to growing output at such levels.
2. production mix: The pollution intensity of various sectors varies, and the production mix usually changes as the economy develops.
3. Input mix: Modifications to the input mix include exchanging less harmful inputs for more harmful inputs and vice versa.
4. State of technology: Advances in this field need modifications to both:

a. Production efficiency: The ability to produce a unit of output while utilising less polluting inputs, ceteris paribus.

b. Process modifications that are particular to emissions: These modifications reduce the amount of pollution released per unit of input.

1.12. Diagram of Environmental Kuznets Curve on Literature Reviews:

The Kuznets curve shows that when a nation undergoes industrialization, the center of the nation's economy will shift towards urban centers. As internal migration by farmers looking for better-paying jobs in urban hubs causes a significant rural-urban inequality gap, the rural population will decrease and the urban population will increase. When a certain level of average income is set and the process of industrialization is in full swing, inequality is expected to decrease. Kuznets believed that inequality would follow an inverted "U" shape as it rises and falls with an increase in income per capita.



The environmental Kuznets curve (EKC), shows the relationship between economic progress and environmental degradation through time as an economy progresses. It describes that as countries develop initially, pollution increases. But later, as the economy achieves further development, pollution decreases. Empirical studies show that usually environmental factors like water, air etc. shows this path for several countries. Following diagram shows that relationship between economic development and level of economic degradation. The curve is known after economist Simon Kuznets who made a well-known study about the relationship between inequality and economic development. In that study also, the relationship between inequality and economic development gives an inverted U shape; showing an increase in inequality first with economic development and then, inequality decreases with further development and per capita income.

1.13. The inverted U shape (∩):

Using economic progress as the X axis and environmental deterioration as the Y axis, the Environmental Kuznets curve forms an inverted 'U' shape (∩). Early growth increases pollutants, according to the Environmental Kuznets curve. But economic growth reduces pollution. Pollution decreases with economic advancement because low-income individuals favour development above environmental quality. They exploit nature and resources. Wealth makes them care more about environmental quality and improvement. Environment and economic activity are closely related. Uncontrolled economic growth has caused global warming and climate disruptions. Environmental protection requires regulation of economic activity, particularly industrial ones.

1.14. Causes and Prospective of Environmental Kuznets curve:

1. Empirical evidence of falling pollution levels with economic growth: Research revealed that although automotive usage rose in the US as a result of economic expansion, air pollution levels decreased at the same time because of regulations.
2. Spare income with growth: People are more willing to pay higher prices in exchange for improved environmental standards when there is more economic development because they have more discretionary money after meeting their fundamental needs.
3. Emphasis on living standards rather than real GDP growth: Conventional economic theory focuses on raising real GDP and growth rates. However, there is increasing recognition that there may not always be a strong correlation between economic development and living standards. It may gain political traction to concentrate on living standards.
4. Better technology: Higher productivity and better technology are the main engines of long-term economic development. We may achieve more production while using fewer raw resources when productivity is better. For instance, since the 1950s, fuel economy has greatly increased because to advancements in automotive technology. Many automobiles from the 1950s had very low miles per gallon. Automobile manufacturers have begun to develop hybrid technology and have made significant progress in cutting fuel usage in recent years.
5. Solar and renewable energy: The development of solar technology is an excellent illustration of how better technology has decreased the possibility of environmental harm. The price of solar energy has dropped dramatically in recent years, which bodes well for sustainable technologies.
6. De-industrialization: Farming gives way to industry as a result of economic growth. More environmental deterioration results from this. But there is a third movement from the industrial to the service sectors due to higher productivity and growing real earnings. Industrialization has decreased as a percentage of the GDP in a country like the United Kingdom. Compared to industry, the service sector often has less of an influence on the environment.
7. The role of government regulation: Development and economic expansion often result in an increase in the size of government as a percentage of GDP. In an effort to address environmental externalities that negatively impact people's health and way of life, the government might impose taxes and restrictions.

8. Declining marginal utility of income: The marginal utility of increasing income is declining. The yield on your initial £10,000 each year is pretty substantial. However, the benefit is quite little if income increases from £90,000 to £100,000 in contrast. It doesn't matter how wealthy you are if you have to live with environmental deterioration (traffic jams, pollution, poor health). As a result, a logical person will start to emphasise raising other facets of living standards more as they see their money growing.

1.15. Criticisms of Kuznets Environmental Curve:

1. There is conflicting empirical evidence: A decrease in pollutants does not always follow economic expansion.
2. There are other variables that contribute to pollution, not only income: For instance, the efficiency of governmental regulations, the growth of the economy, and the population density.
3. Global pollution: Despite a decline in manufacturing and an increase in the service sector, many wealthy economies continue to import products from poorer nations. They are exporting environmental devastation in that sense. While pollution in the US and the UK may be decreasing, environmental deterioration is increasing in the nations that export to the US and the UK. Deforestation serves as one example. Richer nations often halt the deforestation process, but they continue to purchase furniture and livestock from nations that are turning their forests into farms.
4. Growth results in increased resource use: According to some economists, there has been some less environmental deterioration since industrialization. Nonetheless, some resources will unavoidably continue to be exploited more extensively as the economy grows. Long-term environmental deterioration levels may not necessarily continue to decline.
5. The nations with the largest GDPs also have the biggest CO2 emissions: the US, for instance, emits 17.564 tonnes of CO2 per person. In contrast, Ethiopia has 0.075 tonnes per person. From 1,500 million tonnes in 1981 to 8,000 million tonnes in 2009, China was the world's largest emitter of CO2.
6. The curve may take on an N-shaped form rather than an imagined one. U-Shaped: if, when a country's wealth rises, environmental degradation levels begin to rise again after a period of decline. Arrow claims that if pollution rises once again towards the end as a result of more affluence and mass consumption, the inverted U-shaped connection would seem to be untrue.
7. Suri and Chapman suggested that there may not be a substantial decrease in pollution: globally, since wealthier nations often export pollution-intensive industries, such as the production of furniture, clothes, and other goods, to developing nations. As a result, while pollution levels in wealthy nations may be down, they are still rising in emerging nations. So, even if economies grow, the amount of pollution in the world may not alter.

1.16. Findings of the study:

1. Kuznets found an inverted U-shaped relationship between the indicators of income inequality and the level development as measured by per capita income.
2. The study used the Error Correction Model Engel and Granger estimation techniques to determine the short-term and long-term impact of the 1994-2018 periods in Indonesia.
3. In particular, we propose to test the Environmental Kuznets Curve (EKC) hypothesis for a panel of 24 OECD countries and 32 non-OECD countries.
4. The report emphasized that economic development and sound environmental management were complementary aspects of the same agenda.
5. Environmental Kuznets curve suggests that the empirical studies show that usually environmental factors like water, air etc. shows this path for several countries.
6. Thus, the level of pollution may be declining in the developed countries but it is compensated by the increase in pollution in developing countries.

1.17. Suggestions and Recommendations of the study:

1. Kuznets believed that inequality would follow an inverted "U" shape as it rises and falls with an increase in income per capita.
2. The Environmental Kuznets curve shows an increasing pollution with initial development. But further economic progress brings down pollution.
3. The benefit from your first £10,000 annual income is very high. But, if income rises from £90,000 £100,000 the gain is very limited in comparison.
4. US have CO2 emissions of 17.564 tones per capita. Ethiopia has by comparison 0.075 tones per capita. China's CO2 emissions have increased from 1,500 million tones in 1981 to 8,000 million tones in 2009.
5. An economy like the UK has seen industrialization shrink as a share of the economy. The service sector usually has a lower environmental impact than manufacturing.
6. This transition from the traditional to the modern sector is expected to foster an inverted-U shaped association between income inequality and growth over time.

Further suggestion on economic growth and sustainable growth on environmental Kuznets curve hypothesis:

1. **Green and Clean Technologies:** Encourage the development and adoption of green and clean technologies across sectors. This includes investing in renewable energy sources, promoting energyefficient practices, and supporting research and development in sustainable technologies.
2. **Circular Economy:** Promote the transition to a circular economy, where resources are used more efficiently, waste is minimized, and materials are recycled and reused. This approach reduces environmental impact and creates new business opportunities.
3. **Sustainable Infrastructure:** Prioritize sustainable infrastructure development, such as renewable energy infrastructure, green buildings, and efficient transportation systems. These investments can contribute to economic growth while minimizing resource consumption and environmental degradation.
4. **Sustainable Agriculture and Food Systems:** Support sustainable agricultural practices that promote food security, reduce environmental impacts (e.g., water use, soil degradation), and ensure the livelihoods of farmers. Encourage sustainable food systems that minimize food waste and prioritize local, organic, and fair-trade products.
5. **Education and Awareness:** Invest in education and awareness programs that promote sustainable development principles and practices. Foster environmental literacy and encourage sustainable behaviour change among individuals, communities, and businesses. By implementing these suggestions, we can foster economic growth that is sustainable, inclusive, and environmentally responsible, ensuring a better future for both current and future generations.

1.18. Concluding Remarks:

The Environmental Kuznets curve shows economic progress first degrades the environment. Later, economic progress improves society's interaction with the environment, reducing environmental deterioration. Thus, economic expansion benefits the environment. Income has a modest correlation with environmental deterioration. Economic expansion can enhance the environment, but it takes purposeful policy and a desire to generate energy and things sustainably. The link between the environment and economic growth is complicated and unexpected. The environmental Kuznets curve attempts to link environmental deterioration to economic progress. Environmental deterioration rises early in development, according to the idea. As growth reaches a certain level, people become more environmentally conscious and spend more in environmental conservation. This reduces environmental damage. The environmental Kuznets curve (EKC) links environmental degradation indicators to per capita income. In the early stages of economic expansion, pollutant emissions rise and environmental quality falls, but beyond a certain per capita income (which will vary for various indicators), the tendency reverses, and economic growth

improves the environment. Thus, environmental effects or emissions per capita are an inverted U-shaped function of wealth.

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