Inequality and pollution: A reassessment of the Environmental Kuznets Curve in the case of the SAARC countries

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Abstract

The research article examines the impact of income inequality on pollution in the environmental Kuznets curve (EKC) framework in the perspective of the South Asian Association of Regional Cooperation (SAARC) countries. The data has been gathered from world development indicators and other sources for the period 1995-2018. The results of Fully Modified Ordinary Least Square Model (FMOLS) indicate the existence of the EKC with a high-income level turning point for CO_2 *emissions in the SAARC countries. The income inequality has a significant positive impact on pollution. Similarly, literacy rate, political rights & civil liberties that are the proxy of power equalities also has a significant impact on the environment.*

Introduction

In the context of environmental issues, public concerns have enhanced the efforts to address such issues more widely. By the recent possible data, one way to answer this question is through international comparison of countries by examining the environmental quality, which is dependent upon several factors. The literature has suggested per capita income of countries as a key determinant (Myles, 2000). The association between environmental quality and per capita income is further dependent upon the effects of technology, composition, and scale. It is observed that if the intensity of pollution for total output is assumed constant for all countries, the environmental quality and income are expected to have a positive relationship, which is explained as the scale effect. However, the increase in income could improve environmental quality if other effects offset the scale effect. Firstly, as per capita income grows, the output intensity shifts from the manufacturing sector (more pollution-intensive) to the services sector (lesser pollution-intensive), known as the composition effect. The aforementioned scale effect is partially offset by the composition effect (Fujioka, 2001).

Secondly, the technological effect can further offset the scale effect, which could be achieved when various sectors of the economy use improved technologies that are less pollution-intensive. This technological effect is either due to the advancement of market-driven technologies or governmental regulation to control pollution. These regulations may include various standards in the production process, pollution taxes, emission permits among others. There is no reason for assuming a strictly monotonic relationship between environmental quality and income. Instead, this relationship is negative to a certain level of income while it turns to be positive after a threshold income level. Additionally, there is no reason to believe that this relationship holds for all the environmental quality dimensions. For instance, the responses of government regulations may be strict when pollution primarily affects locally than globally (Xu, Luo, & Lin, 2016).

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Among various other research studies, Selden and Song (1994) have found an inverted U shaped relationship between environmental degradation and per capita income for various proxies of environment. This inverted U shaped relationship assumes a positive relationship between environmental degradation and per capita income up to a certain level of income, which turns to negative after that threshold level. This gave birth to the “Environmental Kuznets Curve” since it is similar to Simon Kuznet’s (1955) curve of inequality. Grossman and Krueger (1955) revealed such evidence for different 12 out of 14 water and air quality proxies in their research.

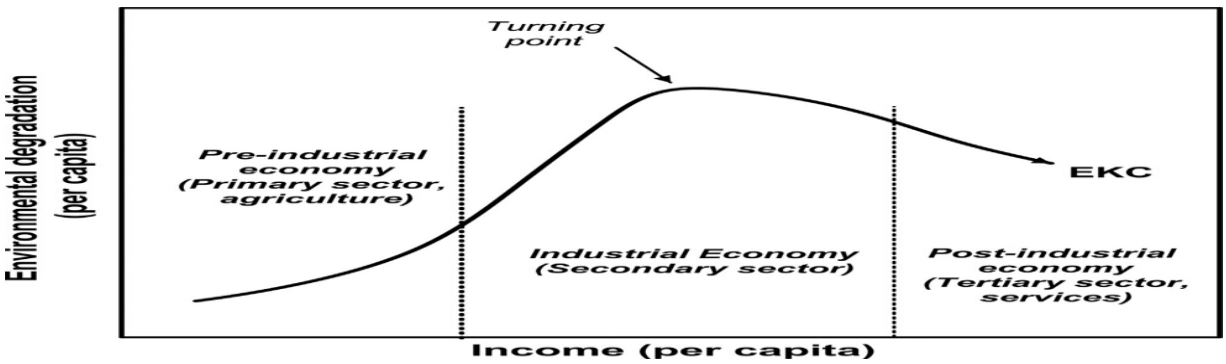

Figure 1:
The EKC relationships between Income and Environmental degradation(Gill, Viswanathan, & Hassan, 2018)

Disappointingly, the conclusions are drawn from the Kuznets curve and the environmental Kuznets curve are the same. This asserts that an increase in per capita income will encourage countries to further increase to clean their environments since economic growth is considered as a remedial to environmental degradation. The advocates of trickle-down effects of development subordinated distributional concerns to growth, likewise, the environmental degradation is considered as a temporary phenomenon that can be resolved through enhanced growth.
Grossman and Kruger (1994) at page 37, asserted, “There is no reason to believe the process is an automatic one and there is nothing at all inevitable about the relationships that have been observed in the past”. They recommended such a policy response that is driven by the demand of the citizens having rigorous environmental standards and is more strictly implemented. Such an environmental policy has shown a strong association between pollution and income. In such an attempt, they repeated Kuznets (1955, p. 28) & (Kuznet, 1975) main distribution of

income conclusion: “Effective toil in this area must calls for a move from market economics to the political and social economy”.

South Asians are the highly populated countries of the world who have placed fabulous strain on existing resources. Almost all South Asian countries are facing a hastily rising pollution problem due to prodigious population expansion. From the South Asian countries Bangladesh, India and Pakistan’s condition seems to be the most frantic. Bangladesh is the second highly populated country in South Asia (Dyer, 2010). Due to rising environmental corrosion trends in terms of increasing CO_2 emission, rising inequality, population growth and climate changes, this paper has chosen the area of South Asian countries for analysis since 1995.Moreover, South Asian countries situated at such location where great economic diversity present among the region. Although South Asian region comprises on developing economies but due to fast growth rate these economies acknowledged as growth center of world since last few years (Ota, 2017).On the other side there is extensive gap between rich and poor in the region as compare to other developing economies of the world. So, unfair income distribution, rising population and urban sprawl is a cause and a consequence of environmental deterioration in the region.

Secondly, another reason for the selection of SAARC countries is millennium development goals (MDGs) as targets of MDGs could not fulfilled by this region. According to SAEO (2009) connotation between environment quality and income inequality is not explored for SAARC countries within the EKC framework. Thus, current study also efforts to fill this gap by adding income inequality as additional channel in clarification the link between environment and economic growth. So, the study includes variables to control for the effects of urbanization, industrialization, literacy rate and political rights & civil liberties on environmental degradation.

Additionally, this study aims to remove the econometric drawbacks by adopting latest econometrics techniques of panel data analysis with latest data, spanning the period 1995-2018 while the other studies related to EKC and role of inequality have been carried out at county level by employing time series data. These have limitations as time series data do not contain sufficient information and their findings may lead to incorrect policy implications. Thus, the current work also contributes in the existing literature by considering more environmental quality variables.

This understanding postulates the beginning point for this research. Particularly, the present study aims to examine the potential cause and effect relationship between income distribution, as investigated by the research of Kuznets and many succeeding authors have studied the incidence of EKC but only few have analyzed the role of unequal income distribution in EKC framework but for developed countries., and level of pollution – an association that is considerably lacking in the literature pertaining environment until now. It is hypothesized that fluctuations in power distribution play a key role in associating the two phenomena.

The paper is structured as follows: the theory of environmental Kuznets curve is briefly recapped in Section 2 with a summary of the approach used by the present study and model-based upon it. Successively, the data, variables used and methodology employed in the present paper are presented in Section 3. Likewise, the results are presented in Section 4. Sequentially, the discussions and the implications for the relationship between pollution levels and growth in income levels are stated in Section 5. Similarly, the summary of the research findings and concluding remarks are presented in Section 6 of the paper.

The political economy of environmental Kuznets curve

The environmental Kuznets curve shows “a reduced-form” relationship of how pollution level is a function of per capita income, however, the link between income and pollution is not specified. Grossman and Krueger (1995, p. 359) described such omitted associations as “environmental rules, change in infrastructure or technology and industrial composition”. The benefit of employing the reduced form offers a direct estimation of the net impact of changes in per capita income on the level of pollution in addition to eliminate the need for intervening variables data.

The structural model presented by Grossman and Krueger has at least two worth mentioning features. The first is related to partial offsetting the scale effect through industrial-composition effect lest pollution-intensive sectors of the economy shrink. This can be done either if inferior goods are produced by the pollution-intensive sectors that are not consumed by society due to the rise in income or if imported goods substitute such products. The pollution problem is not addressed by the latter solution since pollution will be relocated to other societies and the former does not seem practical.

The second feature of the model needs further attention since it asserts that technological advancement can play a vital role in declining total pollution in a country. The innovation is bifurcated in autonomous and induced innovation by Hicks (1932) since autonomous innovation is exogenous while induced innovation is endogenous. If total pollution across countries is systematically declined with an increase in per capita income, induced technological innovation is the probable reason. The process of such inducement is highly dependent upon market forces. However, the governmental policies that include the issuance of emission permits, pollution taxes and regulatory standards among others have been the most compelling approach in reducing pollution through technological advancement. Grossman and Krueger (1995, p. 372) argued on similar grounds that “the sturdiest connection between income and pollution is through an induced policy retort”, and the popular demands induce such policies:

The economic prosperity in nations brings demand for noneconomic aspects of their lives in their citizens. The air quality and river basins are relatively cleaner in richer countries since they have quite inflexible environmental standards with strict compliance as compared to poorer and lower-middle-income countries. The effective solution to market failure is required for effective demand. A simple theory of induced innovation is the implicit meaning of such policy-based interpretations of the EKC, which states that market failures are redressed by the societies with an increase in their per capita income. If there exists empirical evidence in support of the above statement, then a question arises about higher-income countries. It can further be asked as; is it only per capita income or other explanatory factors historically related to this phenomenon?

Grossman and Krueger (1996, p. 120) had given a hint to its answer: “If environmental improvements are mediated by changes in government policy, then growth and development cannot be a substitute for environmental policy. In the absence of vigilance and advocacy in every location, there is always the possibility that greater output will mean greater consumption of (or a waste of) scarce resources.”

With an increase in per capita income, why ‘vigilance and advocacy’ (vigilance hereafter) in any country? One possible explanation might be the increase in individual environmental quality demand. Second is the political process which makes the individual demand effective through enhanced power.

All types of pollution control policies are not favored by people. The economic activities by some individuals produce pollution, and the producers who are direct beneficiaries of such a subsidy receive the pollution subsidy. Templet (1995) at page 143 asserted that pollution subsidy consists of unspent pollution control money and consumers getting benefit through lower prices. Technically, these two parts of the benefit are known as producer surplus and consumer surplus, respectively. Both the health and financial cost of pollution is borne by other individuals, and such individuals practice vigilance for strengthening or establishing environmental laws. On the other hand, counter-vigilance is exercised by the beneficiaries who try to weaken environmental laws.

Let us define the net benefits from pollution producing activity to an ith individual as b_i (if $b_i < 0$, it will be a net cost). As recommended in the normative rule of the cost-benefit analysis, the pollution level is set where a total net benefit is maximized such that:

$$\max \sum_i b_i$$

Since the marginal benefits of pollution producing activity are declining and marginal costs are increasing, the socially optimal pollution level will be at the point where marginal cost equates marginal benefit.

A “power-weighted social decision rule (PWSDR)” had been described by Boyce (1994) & (1996) to define the outcomes of actual policy, which states that net benefits are maximized weighted by the power of those to whom they accrue:

$$\max \sum_i \pi_i b_i$$

where, π_i = an exogenous factor, the power of the ith individual. The role of “influence” in fiscal policy determination is ascribed by Becker (1983).

The cost-benefit rule is followed in the PWSDR approach only if all individuals enjoy an equal level of power. This approach predicts inefficiently higher pollution levels when beneficiaries of pollution producing activities are more powerful than those bearing the cost of pollution. On the other hand, this approach predicts inefficiently lower pollution levels when power is skewed towards individuals bearing the pollution cost.

The relationship between π_i and b_i determines the situation. A positive correlation between these two parameters means the beneficiaries of pollution producing activities have more power. This situation will cause PWSDR approach to predict inefficiently higher pollution levels.

A positive relationship between income levels of individuals and their pollution producing activities (bi) is a priori expected since the consumption level of individuals with higher incomes and assets is generally higher as compared to their low-income counterparts. Therefore, people with higher incomes are expected to enjoy more consumer surplus as well as producer surplus. This does not imply that rich people want dirty water to drink and air to breathe, but their vigilance to environmental policies is tamed to such policies. Their tension between better consumer goods and profits, and their environmental quality taste would be reduced when they channel their environmental quality demands into country clubs, luxury housing and vacations in comparatively pollution-free destinations.

Likewise, the coefficient of power π_i is highly likely to have a high correlation with income levels. This positive correlation seems obvious to all except few and Simon Kuznets was one of those. As Kuznets (1963) recommended that power inequality

is dependent upon per capita income and income inequality. As Kuznets (1963, p. 49) stated:
"One may argue that not only the welfare equivalents but also the power equivalents of the same relative income spread show a much wider range when the underlying average income is low than when it is high".
This is referred to as the "Kuznets unsung hypothesis" because this hypothesis is far less popular than his inverted U-shaped hypothesis stating the relationship between per capita income and income inequality. The distribution of power is not only affected by income distribution, yet it is affected by several other factors such as political framework, gender, ethnicity and race which are vital in translating income into power. Adding these factors to Kuznets' unsung hypothesis, we get:

$$\pi = \pi(G, Y, X), \pi_G > 0, \ \pi_Y < 0 \quad \ldots \quad \text{(Eq. 1)}$$

where, $\pi =$ power inequality, Y= per capita income, G = income inequality, and vector X includes non-income factors affecting power.
The preceding discussion helps us to predict a positive association between the level of pollution and power inequality because beneficiaries of pollution are in power instead of cost bearers. This hypothesis is tested in the present study. The functional form of the hypothesis is given as:

$$\text{ENV} = f(Y, \pi, Z) \quad \ldots \quad \text{(Eq. 2)}$$

where, ENV = the pollution level, Y= per capita income and Z represents the non-income factors affecting pollution. Because, direct proxies of power inequality are not available, the variables on the right side of Equation (1) are used as a proxy for π.
The empirical validity of this hypothesis is tested using the following equation:

$$\text{ENV} = \alpha_0 + \alpha_1 Y + \alpha_2 Y^2 + \gamma_1 \text{GINI} + \gamma_2 \text{LIT} + \gamma_3 \text{RIGHTS} + \delta_i Z_i + \epsilon \quad \ldots \quad \text{(Eq. 3)}$$

where ENV = the level of pollution as CO_2 , Z_i= vector of other non-income factors particularly geographical factors, $RIGHTS$ = political rights and civil liberties, LIT= the literacy rate, GINI= the measurement of income inequality, the GINI coefficient, and Y = per capita income as GDP.

Methodology

Data and Variables

The panel data of SAARC countries for the period 1995-2018 has been employed for the analysis.
Data for under discussion variables has been taken from World Development Indicator, World Income Inequality Database, United Nations Educational, Scientific, and Cultural Organization and The Freedom House Website. Following the (Bouvier (2014), Hao, Zhang, Liao, Wei, and Wang (2016)Yu Hao 2016, Ota (2017), Guo (2017), Thanh, Phuong, and Ngoc (2019), Mansur and Sheriff (2019); (Zhao & Sing, 2017) current study employs CO_2 emission as a proxy of the environment and GDP as a proxy of economic growth . The data for CO_2 and GDP has been taken from the World Development Indicator (WDI, 2019). Following the Berthe and Elie (2015), Uzar and Eyuboglu (2019) and Ciegis, Dilius, and Andriuskevicius (2017), Grunewald, Klasen, Martínez-Zarzoso, and Muris (2017) Gini-coefficients(GINI) have been taken as a proxy of income inequality and data of Gini is taken from the World Income Inequality Database (WIID,2019). While the data for literacy rate (LIT), also a proxy of power equality, has been taken from the United Nations Educational, Scientific, and Cultural Organization (UNESCO, 2018). The Freedom house website is used for data of power equality (RIGHTS) which is aggregate of two variables namely, Political Rights & Civil Liberties. For getting data of power equality the study adds both, and subtract the total from 14 to

attain 0-12 scale. The upper value use for more freedom. Additionally, Industrialization(INDCM) , Population Density(PD) and Urbanization(URB) is used as an exogenous and control variable in the model as used by Torras and Boyce (1998) . The data of urbanization is taken from (WDI,2019) in the form of urban population as a ratio of total population same as it has been used by Ridzuan (2019).The data of population growth is also taken from WDI,2019 in the form of Population density that is population divided by land area in square kilometers. The data of industrialization is also taken from WDI,2019.

Model

Fully Modified Least Square (FMOLS) is used for estimation of equations. Data for pollution (CO2) URB, Pd and INDCM variables are collected from same site for total time span but data for power inequality variables such as GINI, LIT and RIGHTS gathered from different sites, have inimitable values for each country. So, if the study uses fixed effect or any other model would hence result in perfect linear dependence. Moreover, this paper focus on cross-country changes as compare to time series variations.

Results

The results section includes descriptive statistics and the estimation of regression coefficients using Fully Modified Ordinary Least Square (FMOLS) technique. Firstly, the summary statistics, which include mean standard deviation maximum and minimum values in the series, are presented in Table 3.1. to examine the descriptive characteristics of the variables of interest.

Descriptive Analysis

Table 1 Descriptive Analysis of all the Variables

Variable	Mean	Standard Deviation	Minimum	Maximum
CO_2	257756.7	570821.7	249.3560	2585794
GDP	90236.43	91866.38	15448.87	435778.7
GDP^2	1.65E+10	3.59E+10	2.39E+08	1.90E+11
GINI	0.568483	0.094211	0.410000	0.770000
URB	27.22221	7.906433	10.88300	40.16700
LIT	67.35042	19.34381	35.31930	98.64826
RIGHTS	3.834437	1.313674	2.000000	7.000000

Unit Root Test

The non-stationary panel data analysis starts with testing the existence of unit root in the series. This is performed in the present study by employing the most popular techniques of stationarity testing proposed by Im, Pesaran, and Shin (2003) and Levin, Lin, and Chu (2002).

The results are shown in above table, which reveals that selected variables included in the study are stationary at first difference. Though, none of the given variables is stationary at I (2). Since all variables are stationary at the first-order difference, therefore, it is imperative to examine the existence of cointegration among variables of interest. This will help us in choosing the appropriate technique for investigating the relationships among variables of interest.

Table 2. Unit Root Test

Variables		IPS	LLC
CO2	Statistic	3.418	1.106
	p-values	1.000	0.698
ΔCO2	Statistic	5.540	8.523
	p-values	0.000*	0.000*
GDPC	Statistic	2.132	1.002
	p-values	0.814	0.710
ΔGDPC	Statistic	-11.316	10.652
	p-values	0.000*	0.000*
GDPC2	Statistic	-0.741	-0.895
	p-values	0.314	0.347
ΔGDPC2	Statistic	-6.968	-15.579
	p-values	0.000*	0.000*
GINI	Statistic	-2.919	-1.124
	p-values	0.898	0.110
ΔGINI	Statistic	-6.284	-9.421
	p-values	0.000*	0.000*
URB	Statistic	0.831	2.298
	p-values	0.678	0.879
ΔURB	Statistic	-2.231	6.492
	p-values	0.011**	0.000*
LIT	Statistic	0.431	0.925
	p-values	0.589	1.000
ΔLIT	Statistic	-7.643	3.874
	p-values	0.000*	0.000*
RIGHTS	Statistic	1.018	0.807
	p-values	0.225	0.636
ΔRIGHTS	Statistic	2.634	6.512
	p-values	0.006*	0.000*

Note: Variables names with and without Δ sign show first difference and level. Also, * and ** represent a significance level at 1 per cent and 5 per cent, respectively.

Panel Cointegration Tests

To test the existence of cointegration among series of interest, panel cointegration test statistic developed by Pedroni (1999) is employed in the present study. The test results are represented in Table 3. Since Pedroni (1999) approach tests seven different equations for examining the presence of cointegration, it is observed from the analysis of data available for current study that five out of seven statistics show the existence of cointegration for all three models used for answering the research questions. The statistics showing the existence of cointegration are shown in bold in Table.

Table 3. Results of Panel cointegration Test

	Model 1		Model 2		Model 3	
Test Equation	Stat.	Prob.	Stat.	Prob.	Stat.	Prob.
Panel v-stat.	**21.651**	**0.000***	**18.032**	**0.000***	**17.768**	**0.000***
Panel rho-stat.	1.432	0.897	0.441	0.996	1.584	0.860
Panel PP stat.	**-3.225**	**0.001***	**-3.132**	**0.003***	**-3.681**	**0.000***
Panel ADF stat.	**-3.110**	**0.002***	**-3.471**	**0.000***	**-3.258**	**0.001***
Group rho-stat.	3.506	0.881	0.969	0.788	2.474	0.999
Group PP stat.	**-2.454**	**0.006***	**-1.999**	**0.012****	**-2.591**	**0.002***
Group ADF stat.	**-2.904**	**0.000***	**-1.932**	**0.025****	**-1.897**	**0.033****

Note: * and ** represent the rejection of the null hypothesis of no cointegration at 1 per cent and 5 per cent level of significance, respectively.

Panel Correlation test

Table 4. Results of Panel correlation Test

Variable	CO2	GDP	GDP^2	GINI	URB	LIT	RIGHTS	PG
CO_2	1.000							
GDP	-0.480	1.000						
GDP^2	0.466	0.901	1.000					
GINI	0.703	0.420	0.453	1.000				
URB	0.501	-0.305	-0.370	0.819	1.000			
LIT	-0.748	0.410	0.440	-0.970	-0.824	1.000		
RIGHTS	-0.401	0.310	0.290	0.108	0.006	-0.181	1.000	
PG	0.734	-0.502	-0.480	0.701	0.606	-0.720	0.253	1.000

In correlation table three power inequality variables GINI, Literacy rate and RIGHTS show strong associations with pollution as compare to other variables. Thus, the inequality variables strongly effect in the SAARC countries, showing Kuznets' intuition of power equivalents of a given income distribution in the low- or middle-income economies like SAARC. The above results are showing that unfair distribution of income and inequality in the distribution of power leads more pollution.

Long-Run FMOLS Estimates

After discovering the long-run relationship amid variables, the panel fully modified least square model is used to evaluate the long-run co-integration relationship between the variables. Table number 5 indicates the results. The results of the model are mentioning that the coefficient of income is positively related and statistically significant while the coefficient of squared income is negatively related to a significant value which corroborates of EKC for SAARC countries. The coefficient of control variables is also been given positive and significant values in the said area.

Table 5. Analysis without variable inequality $\text{þ} = \alpha + \beta_1 y + \beta_2 y^2 + \beta_3 \text{ind} + \beta_4 \text{pd} + \delta\zeta + \mu$

Dep. Variable	**Indep. Variables**	**Coeff.**	**SE**	**t-Stat**	**Prob.**
	GDP	1.271	0.320	3.972	0.000
	GDP^2	-0.001	0.00000	-2.911	0.005
	INDCM	0.990	0.128	7.752	0.000
CO_2	PD	1.246	0.228	5.442	0.000
	Constant	-3.541	0.423	-8.377	0.000
	R-square	0.60			

Table 4 presents the analysis of the determinants of CO_2 emissions without considering inequality. The results of this analysis confirm the inverted U-shaped Kuznets curve in SAARC countries since pollution significantly increases with an increase in income while it decreases as shown by the statistically significant coefficient of GDP square. The same relationship mentioned by Zhu, Xia, Guo, and Peng (2018) for BRICS economies and Wolde-Rufael and Idowu (2017) for China. The coefficients of INDM and PD have positive relationship and are also statistically significant. DG Omotor (2017) has also found such type of association for ECOWAS economies.

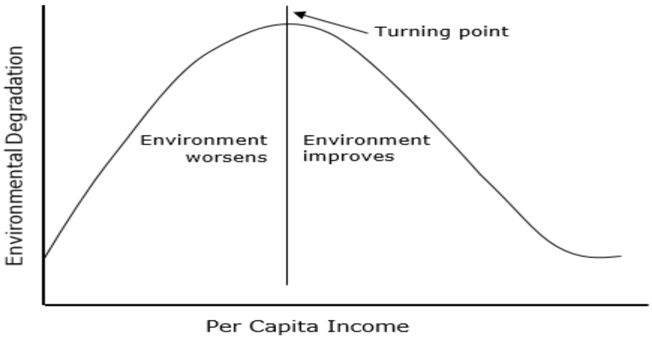

Figure 2. The EKC relationship between environment and income for SAARC economie

Table 6
Analysis with variable inequality $þ = \alpha + \beta_1 y + \beta_2 y^2 + \beta_3 \text{§ini} + \beta_4 \text{ind} + \beta_5 \text{pd} + \delta \zeta + \mu$

Dep. Variable	**Indep. Variables**	**Coeff.**	**SE**	**t-Stat**	**Prob.**
	GDP	1.167	0.638	1.829	0.059
	GDP^2	-0.010	0.006	-1.667	0.098
	GINI	1.122	0.463	2.423	0.017
CO_2	INDCM	4.124	0.264	15.621	0.000
	PD	7.537	24.015	0.314	0.754
	Constant	-1.229	0.238	-5.161	0.000
	R-square	0.65			

In addition to the above analysis, the study has highlighted the effect of literacy rate on pollution and the results are presented in Table 6. The coefficient of literacy rate (LIT) is negative showing a negative relationship of literacy rate with pollution, which is a priori hypothesized. Same analysis has explored by Tamizi (2016) and Ajaero, Nzeadibe, and Ikejiofor (2012) for African countries and Torras and Boyce (1998) for 56 high , medium and low income countries. According to the present analysis, literacy rate helps to reduce pollution in the SAARC region.

Table No.7 The determinants of pollution including inequality
$þ = \alpha + \beta_1 y + \beta_2 y^2 + \beta_3 \text{§ini} + \beta_4 \text{lit} + \beta_5 \text{rights} + \delta \zeta + \mu$

Dep. Variable	**Indep. Variables**	**Coeff.**	**SE**	**t-Stat**	**Prob.**
	GDP	1.370	0.896	1.530	0.128
	GDP^2	-0.018	0.009	-1.923	0.057
	GINI	1.642	1.009	-1.626	0.106
CO_2	RIGHTS	-2.523	0.332	-7.600	0.000
	LIT	-6.903	4.796	1.439	0.015
	Constant	15.767	3.907	4.035	0.000
	R-square	0.55			

The tendency of unfair distribution of income in the SAARC economies as presented by Kuznets that “unfair income distribution produces a broader difference when low incomes participate in the power competition of rights as well as counterparts of literacy” (Kuznets’ 1998). The study thus gives the idea that increase indifference of power and income inequality increases pollution levels in SAARC countries and vice versa. This study keeps in view that society’s less awareness regarding environmental problems or issues and frequent vigilance of the public is most problematic in the implementation of rules and regulations.

DOLS estimation

Table No. 8 Results of DOLS model

Dep. Variable	Indep. Variables	Coeff.	SE	t-Stat	Prob.
CO_2	GDP	1.449	3.423	4.221	0.009
	GDP^2	-2.161	5.251	-4.120	0.081
	GINI	6.324	0.772	8.192	0.001
	INDCM	-0.001	0.003	-0.581	0.050
	PD	0.001	0.002	5.847	0.000
	URB	0.034	0.020	1.650	0.010
	LIT	-0.009	0.006	0.103	0.010
	RIGHTS	-0.035	0.013	2.584	0.017
	Constant	-2.230	0.324	-5.161	0.001
	R-square	0.95			

DOLS model is also used for analysis. In this model income inequality show positive relation with environment. Urbanization, population growth, and industrialization also positive association while power equality variable such as literacy rate, political rights and civil liberties show negative associations with environment.

Conclusion and Policy Recommendations

The current study includes political and social economy in the Environmental Kuznets Curve (EKC) framework. The study analyzes the hypothesis that citizens demand, vigilance and advocacy are critical factors behind the strategies and modernization in technology to curtail the pollution as pollution is not a simple function of the income. Rather, Boyce (1998) claimed that more equal circulations of income and power results in better environmental quality. The empirical output of the current study is consistent with this hypothesis. The literacy rate (LR) and political rights (PR) appeared to be an effective determinant of the pollution in the SAARC countries. Further, per capita income deteriorate environment as inequality effects are included in the model. The presence of polluted industries and old infrastructure are also responsible of EKC occurrence. The SAARC economies key interest is on growth as compare to environmental issues in the region. Above findings propose that SAARC economies should espouse such technologies and modify environmental rules & parameters to get sustainable growth. Furthermore, Policy makers give such policies for industrial sector that industries should construct far away from the cities or residential areas which will be helpful to reduce pollution.

However, in case the rise in income per capita is related to a decrease in pollution, three possible explanations can be offered. Firstly, income-related changes in power inequality may not be fully captured by the proxies of the model, Secondly, the demand for environmental quality may increase more than other goods and services with the increased income even income is unevenly distributed. Thirdly, the pollution-intensive industries may relocate to other countries with increased income. This relocation may decrease pollution and reflect the power inequalities within the countries.

Population growth and urbanization have positive link with pollution. This result show that increase in population and urbanization sprawl need additional environmental resources. This extra use of environmental resources is cause of environmental corrosion. The problem of overpopulation & urbanization may be solved with appropriate strategies to reduce poverty, provision of employment opportunities' in rural areas and increasing awareness in the local community.

The empirical output of the current study implicates that promoting the equal distribution of power is a wise strategy to tackle the environmental issues in developing economies like the SARCC countries. The strategy includes wider literacy, more civil liberties, and more equal distribution of the wealth as the impact of these variables appeared to have a significant impact on the environment. These results give idea that government should promote equality in the society to save the environment. Further, it cannot be assumed that economic growth and environmental improvement will be accompanied to each other as the EKC suggest a trade-off between them at early stages of economic development. However, this trade-off can be minimized with more equitable distribution of the power that is a key finding of the current study.

Finally, it is strongly recommended that government should plan such procedures through which information feast to the local community about the detrimental effects of environmental degradation. This will be happened through educational ventures. In SAARC countries where literacy rate is low, information & awareness about environmental glitches must be given through media. Moreover, it is also need of time that SAARC economies should create pressure internationally and arrange rendezvous via effective politicization for environmental sources.

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