

Impact of Good Governance on Environmental Quality: An Empirical Investigation



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CERTIFICATE

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DEDICATION

To my beloved Parents, Siblings, wife and son Shafin Hassan

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TABLE OF CONTENTS

LIST OF TABLES	vi
ABSTRACT.....	vii
CHAPTER 1	1
INTRODUCTION.....	1
1.1 Background of the Study.....	1
1.2 Significance of the Study	5
1.3 Research Question.....	5
1.4 Research Objectives	6
1.5 Public Policy Relevance.....	6
CHAPTER 2.....	8
LITERATURE REVIEW	8
2.1 Evolution of Governance	8
2.2 Governance vs Government.....	9
2.3 Governance and Good Governance.....	10
2.4 Governance and Development	11
2.5 Economic Growth and Environment.....	12
2.6 Governance and Environment.....	12
2.7 Carbon Dioxide Emission CO ₂	13
2.8 Particulate Matter PM _{2.5}	14
CHAPTER 3.....	15
METHODOLOGY	15
3.1 Conceptual Framework	16
3.2 Hypothesis.....	17
3.3 Empirical Model for Ambient PM _{2.5}	17
3.4 Empirical Model for CO ₂ Emission.....	18
3.5 Data	18

3.6 Estimation Technique.....	19
3.7 Hausman Test.....	19
3.8 Fixed Effect Model.....	19
3.9 Empirical Quantification.....	20
CHAPTER 4.....	21
DATA SOURCES AND DESCRIPTION.....	21
4.1 Good Governance.....	21
4.2 Descriptive Statistics.....	24
CHAPTER 5.....	29
RESULTS AND DISCUSSION.....	29
5.1 Results and Discussion.....	30
5.2 Results and Discussion for CO2.....	37
CHAPTER 6.....	40
CONCLUSION AND RECOMMENDATIONS.....	40
6.1 Policy Recommendations.....	42
REFERENCES.....	43
APPENDIX-1.....	49
Good Governance.....	49
APPENDIX-2.....	51
PM _{2.5} and CO2.....	51

LIST OF TABLES

Table	Description	Page No.
Table 4.1:	Governance Indicators	21
Table 4.2:	List of Independent variables	22
Table 4.3:	List of dependent variables	23
Table 4.4:	Descriptive Statistics for Overall Sample	24
Table 4.5:	Descriptive Statistics for High Income Countries	26
Table 4.6:	Descriptive Statistics for Middle Income Countries	27
Table 4.7:	Descriptive Statistics for Low Income Countries.....	28
Table 5.1:	Regression Results of $PM_{2.5}$	29
Table 5.2:	Regression Results of CO_2	33
Table 5.3:	Aggregate Regression Results of Pre and Post Kyoto Protocol Bindings..	34

ABSTRACT

Industrial growth, economic development and population growth are negatively affecting the environment while inefficient utilization is rapidly depleting natural resources. Higher demand of energy and industrial goods are creating water and air pollution while demand for housing and agriculture goods result in deforestation. These all factors have dire consequences for the environment resulting in climate change and global warming issues which ultimately affect human lives. Effective governance is essential to deal with currently prevailing climate challenge, extreme changes in the ecosystem and to fully enjoy the nature. The present study takes CO_2 and $PM_{2.5}$ as environmental measures while Governance, Gross Domestic Production and its square, Energy Consumption and Trade are taken as explanatory variables. The study used world bank panel data set of 160 countries for the period 1995-2017 as overall sample. The analysis was also undertaken at disaggregated level for high, middle and low income countries. It is evident from empirical evidence that by adopting good governance strategies, we can abate the environmental damage and hence ameliorate the global warming issues which are badly affecting the human lives as well as the mother Nature.

CHAPTER 1

INTRODUCTION

1.1 Background of the Study

Environmental quality is being damaged by natural changes and human activities since the early signs of human dwelling on earth. Industrial growth, economic development and population growth are negatively affecting the environment. Industrial and economic development are causing air and water pollution, ecosystem degradation and climate change (Cropper & Griffiths, 1994). Growing population of the world is depleting natural resources, and polluting air due to high demand of vehicles, higher demand of industrial good and energy use causing water pollution whereas demand of housing, cooking and agricultural goods results in deforestation. These all factors are severely affecting the environment. Climate change, and global warming contribute to increasing levels of CO_2 emission and deforestation and hence becoming a concern for human kind (Ehrlich & Holdren, 1971).

Population is increasing at a rapid speed which need more resources (i.e. food, land, energy, water etc.) to survive. Forests are disappearing because we need more land to grow food, get raw material and build houses. Technical and industrial development also play their part in environmental degradation by producing vehicles emissions and carbon emissions and toxic waste, all are causing air pollution. These all are human products contributing to global warming. Given our overexploitation, the reproduction of resources by earth is slower than our use (FAO, 2017).

Approximately 55 billion tons of energy and other natural resources are extracted from the earth annually. We have already lost 80% of forests and losing continuously at the

ratio of 375 KM per day globally. At the present ratio, 5-10% tropical forests species will vanish after every ten year. Hourly, 1692 acer productive land converting in to deserts. 27% of coral reefs have been destroyed, we are using 50% more resources than the earth can reproduce (Counts, 2019).

Human activity has threatened one million species with extinction. The earth's population has doubled in last 50 years. Due to increasing trends in life expectancy and consumption patterns, we have extracted 80 percent more natural resources within last few decades which reaches to 60 billion tones. Since 1980 greenhouse gas emission has doubled and caused global temperature to rise by 0.7^c. Similarly, we dump 400-million-ton waste in oceans and rivers each year. 75% of land, 40% of ocean and 50 percent of rivers are under severe impact of degradation from human activity. 100 million hectares of forest were lost between 1980-2000. 25% of animals and plants are threatened. Plastic pollution has increased 10 fold since 1980. 33% of fish stocks harvested and unsustainable level (United Nations, 2019). Due to this over-exploitation, world hence seen ozone depletion, storms, climate change and desertification. There is great concern of these effects which is calling for joint action to overcome the climate issues for sustainability.

Leadership of world community has committed to sustainable development for all in the United Nations conference held in 2012 for balanced socioeconomic development and environmental protection. One of the Principle outcome of that conference was set of universal sustainable goals SDG's for balanced socio-economic development and environmental protection. Countries saw SDG's as chance to overcome the environmental issues and achieve sustainable development. International community has adopted number of international agreements. Approximately 500 such agreements regarding the safe use of water, chemical, biodiversity, climate change has been adopted

by the world community. United Nations Environmental agency examined the progress on 90 goals committed by the world community. The result was alarming, as only 4 goals have shown significant progress. Hence, still much is needed to be done on SDG's agenda of sustainable development and global environmental goals (UNEP, 2013).

Rising need of governance for sustainable development is not difficult to identify. Human actions are key in creating complexity in environmental management (Gunderson, 2001). Humans are causing climate, biological diversity, depletion of fish stocks, destruction of forests often unintentionally. But it does not mean that we can afford to ignore the problem or at least guide humans to reduce their impact on planet's life support system. Governance is essential to avoid extreme changes on the climate system and fully enjoy the ecosystem services. These calamities clearly indicating the need to address the issue globally. National commitments also have to play critical role by exercising innovative approaches in implementing the newly devised strategies. There may not be any alternative of governance to tackle the issue globally (Gunderson, 2001).

Can we rely only on governments for growing demand of governance for environmental issue? Governments are very slow in response to solve the problem and make blunt statement even if they do not solve the problem. Governments lack the discipline of market and pressure of performing efficiently. The desire of re-election of political leadership force them to think in distributive terms while governments are also often involved in corruption. Scope of governance is global, but we do not have global government hence, there are little prospects of having such concept and model to address such issues. States, governments, and individuals are required to cooperate with each other. The distinction between the two concepts make it clear that we should think

out of the box on emerging trends in governance to overcome the environmental issues (Delmas & Young, 2009).

From an economic viewpoint, it is rational to think for the demand and supply of environmental governance. Demand generally arises from the segment of the society which has concerns on environmental quality. They may show their concern as member of civil society, consumer or member of any non-governmental organization. The supply of governance is the outcome of political process in the form of legislation and government rules. It may come from the negotiation between NGOs and corporations or it may come on the demand of the consumer to provide environment- friendly products or priority of investor to build environment-friendly businesses. A good environmental governance is the nexus of above three processes (Delmas & Young, 2009).

$PM_{2.5}$ is an air Particulate Matters which have dimension of 2.5 micrometer and can only be seen through electronic micrometer, burning of woods, agricultural burning, automobiles, forest fire, and energy consumption are major sources of Particulate Matters. Since the last decade, many studies have shown significant relationship between particulate matters and human health specially $PM_{2.5}$ which is refined form of PM_{10} . Mortality, heart attack, asthma and lung infection are among the major diseases caused by $PM_{2.5}$ (Allan, 1997; Miettinen, 2019).

The alarming increase of CO_2 emission and greenhouse gasses considered the highest threat to environment. CO_2 is the main source that is affecting plant growth, development and functions hence caused global environmental changes. It almost contributes 60 % in enhancement of greenhouse gasses. Energy production and consumption are the main source of increasing trend of CO_2 emissions (Ozturk and Acaravci, 2010).

More than 90% of people worldwide live in areas exceeding the WHO Guideline for healthy air. More than half live in areas that do not even meet WHO's least air quality standard (WHO, 2019).

The main sources of black carbon emissions are diesel-driven combustion engines (in road vehicles, non-road mobile machinery and ships), residential burning of wood and coal, power stations using heavy oil or coal, field burning of agricultural wastes, as well as forest and vegetation fires. Hence, this study aims to explore the association between environmental quality and governance in the light of above discussion using cross-country analysis.

1.2 Significance of the Study

Governance plays imperative role to solve phenomena of human interests. Governance has positive impact on eradication of poverty, corruption, improved social conditions and service delivery in almost all facets of human lives by supplanting traditional ways of administration.

To the best of knowledge, previous studies rarely examined role of governance in amelioration of environmental hazards and mitigation of odious climate changes. Current study is aimed at assessing the role of governance on environmental quality by using cross country data on selected variables. Besides empirical analysis, it guides the policy makers and leaders to incorporate good governance practices to achieve global environmental targets by mitigating severe climate change threat.

1.3 Research Question

The study aims to answer following question:

- Whether governance has any impact on environmental quality?

1.4 Research Objectives

The objectives of the study are to examine the impact of governance on the following environmental indicators.

- $PM_{2.5}$ air pollution
- CO_2 Emission

1.5 Public Policy Relevance

Policy making contains technical and political dimensions with due process to achieve the desired objectives. Policies are actions which have some goals and process to achieve them but often lack identification of problem, rationalization and formulation (Howlet & Cashore, 2014) .

The simplest definition of public policy by Dye is “anything a government choose to do or not to do.” (Dye, 1972). The definition clearly shows that principal agent for policy making is government. Social groups, private businesses and interest groups may be important stake holders in policy making process. Government has the ability and can make authoritative decisions on behalf of citizens (Howlet & Cashore, 2014). .

There are three types of policies: a) Redistributive, mainly concerned with economic policies which collect resources from higher income groups and redistribute to lower income groups of the society i.e. income tax. b) Distributive also deals with economic effects which distribute resources on a whole within the society on demand i.e. subsidies. c) Regulatory policies are formulated to maintain order and stop citizen from the actions which endanger the Society (Peters, 1977). Public policy is a long-standing decision made by governments, public authorities to address the public concerns or solutions to public problems. Governance is the process of governing an organization, or system where the decision-making process is involved, and decisions are

implemented. Environment is public good that is non-excludable and non-rivals across borders. Our study is concerned with regulatory type to policies adding the question that by improving governance whether we can improve the quality of environment.

CHAPTER 2

LITERATURE REVIEW

2.1 Evolution of Governance

The term governance is defined by Oxford dictionary as “the action or manner of governing a state, organization etc.”. Before the global recognition, the term was being used in business and academic literature with reference to micro behavior of firms (Weiss, 2000) and in the public and private sector for social purposes (Hyden, 1992). Now the international practitioners use the term to define a phenomenon beyond government. The Global Governance Commission describes governance as actions taken by public or private individuals to manage their activities (Commission on Global Governance, 1995). Similarly, the World Bank defined governance as “the manner in which power is exercised in the management of a country’s economic and social resources.”. The bank also indicates three unique characteristics of governance. “(I)The form of political regime, (II) the process by which authority is exercised in the management of country’s economic and social resources for development, (III) the capacity of governments to design, formulate and implement policies and discharge functions” (World Bank, 1994).

Developing countries face much criticism from donors and investors due to the deficiencies in the political and economic management. World Bank and IMF stressed political and institutional changes for effective economic reforms. Internal policies and priorities were the main hindrance for these changes. As a result, these policies and priorities become norms and efforts made that term part of academic debates to capture the several aspects that are not the instruments of the state and governance embodied with state and society interactions. Governance is established as dominion of state and

civil society. Critical to governance is civil domain which is established from state and society by the political actors. Governance is clearly concerned with public institutions by including the non-governmental and informal institutions working within the public domain (Bøås, 1998).

2.2 Governance vs Government

There seems no big difference between governance and government. In-fact, they are vastly different. As political administration process by the state, governance also requires power and authority to maintain social order. There are two main differences between government and governance.

First governance requires authority to maintain social order just like government, but it may not come from the state. The body of the government is necessarily the public institution in a society while the body of governance can either be a public or private or mixture of both. Governance is the process of cooperation between state institutions and civil society, public and private organizations on complementary or voluntary basis. The main characteristics are “Contracting rather than supervision, decentralization rather than centralization, cooperation between public and private sector rather than guided by the state.” (Merrien, 1999). So, governance is a broader concept than government. From a small level to big corporations all can be run without government but not without governance.

Second, use of authority in administration process. For government, it is always one way, top to down process on public and social affairs by issuing order and implementation of policies. In contrast, administration process of governance is based on collaboration between upper and lower tiers of management based on teamwork,

conciliation, mutual interest to achieve common goals. The governance mechanism is multi-directional rather than uni-directional (Jessop, 1999).

The popularity of governance term is closely associated with the government's role of managing an economy of the state. World donor agencies including World Bank, International Monetary Fund, United Nations used the term in late 20th century due to inefficient and incompetence of governments towards economic development and wellbeing of the people in developing countries. Two factors contributed to transition from government to governance, first inefficiency, incapability and ineffectiveness of governments to deliver public goods and services to citizens and second emergence of world governance in the development literature (Mathur, 2008).

2.3 Governance and Good Governance

The term good governance originated from the global non-state institutions which marked the in-competencies of state institutions to manage the economy in inefficient manner (Rhodes, 2007). The fact is that most of the development projects in developing and third world countries are based on foreign technical and financial aid of long-term loans from international funding agencies. All developing countries facing huge gaps between their developmental objectives and financial resources. Developing countries need huge amount of loans from developed countries and agencies for economic growth to improve living standards of people. The disappointing results from aid-receiver countries in spite of receiving all the money started a serious debate about the effectiveness of aid and most of the countries were on the same page in economic development and welfare of citizens. For the said reason, development agencies started thinking seriously on standards of governance. The effectiveness of aid became the prime objective of donors which opens new ways of thinking about good governance. The experts started thinking of incorporating all good factors in existing governance

models which can lead to good results. In the above scenario, the donor agencies suggest that the criteria of aid should not be only the poverty but also good governance (Aubut, 2004).

The concept of governance had two main features. First, mainly concerned with managerial and administrative side while the second elaborates the nexus between democratic politics and development. These concepts are often mixed with each other which needs to be treated separately. First aspect is concerned with administrative side whereas the second defines the relationship between democracy and development. The extensively used concept of good governance includes the meanings of both perspectives. The characteristics of both the aspects of governance has been obtained from the official documents of funding agencies and good practices adopted by the developed countries of the world (Nelson, 1996)¹.

Governance refers to the dynamic and fruitful linkages between state and citizen and success of the system depends on the political power players. If citizens have sufficient political power to contribute in policy process, supervision and administrative tasks, this can take part to maintain social order and public authority which is key to good governance (Keping, 2018).

2.4 Governance and Development

Democratic development as well as economic growth are dependent on governance. Variations in economic growth, productivity and accumulation of wealth in different nations is due to social structure. Long run growth of any country depends on social structure. Social structure means institutions and state policies that provide encouragements to entities and businesses in economy (Hall & Jones, 1999). Slowing

¹ (See Appendix for detail)

of economic growth in different countries is not due to macroeconomic conditions but also due to dropping the standard and quality of institutional structure, judicial system, corruption levels and facilities for doing business (Kaufmann & Kraay, 2003). Political rights, freedom of speech and governance are the major factors of 80 percent variation of GNI of different economies (Talbot & Roll, 2003). Good governance and economic growth has a positive correlation which shows governance is a strong factor of economic growth (Khan, 2007). Colonized countries which were rich in 16th century are now poor, the difference cannot be assessed by geographical location but exactly from the economic and political institutions which persist in these countries (Acemoglu et al., 2001).

2.5 Economic Growth and Environment

Environment and economic growth have negative relationship initially. Most of the indicators of environment show negative relationship but as countries enter in next level of income, the environmental indicators also start improving specially sanitation and safe drinking water (Shafik & Bandyopadhyay, 1992).

Using the data of Global Environmental Monitoring system to measure the relationship between water/air quality and GDP through various indicators, the study confirmed the Environmental Kuznets Curve (EKC) for CO_2 smoke and water quality in the urban centers (Grossman & Krueger, 1995).

2.6 Governance and Environment

Environmental problems are often having technical, behavioral and managerial dimensions. Increasing attention has been given on environmental governance to address the complex issue. Increasing interest on environmental governance on local and global context focused on the issues like insufficient resources, allocation and

access, conservation of forests and atmospheric system. Research's suggest that one of the important factors to overcome that environmental management and effective conservation of nature is governance. The purpose of environmental governance is to manage individual and collective actions to secure environment (Armitage, De Loë, & Plummer, 2012; Ostrom, 1999).

2.7 Carbon Dioxide Emission CO_2

Environmental pollution, greenhouse gases and climate change are among the top concern of world community. The alarming increase in CO_2 emission and greenhouse gasses in the air are considered the world's highest environmental threat. CO_2 plays leading role in enhancing greenhouse effect among the greenhouse gasses and contribute more than 60 percent of this effect (Ozturk & Acaravci, 2010). Energy production, consumption, intensity, availability and price plays a significant role in development trends of CO_2 emission (Stern, 2004). Economic literature establishes a relationship among economic development, energy consumption and CO_2 and the results suggest that there is long term relationship between level of pollution and economic growth. Any restriction on energy consumption to reduce CO_2 emission will lower economic growth (Ozturk & Acaravci, 2010; Halicioglu, 2009). United Nations is trying to minimize the impact of climate change and global warming through different international agreements i.e. Kyoto protocol (Halicioglu, 2009). Kyoto Protocol was initiated in 1997 in Japan, in 2001. 191 countries of the world signed the protocol which came into force in February 2005 with certain bindings to reduce the emissions by signing parties. Protocol is considered an important step towards actual global emission reduction regime which is expected to reduce greenhouse emission and provide basic guidelines for any future agreement on climate change for international community (Alkhathlan & Javid, 2013). Basic source of Greenhouse gas emission is

burning of fossil fuels mainly coal oil and gas which releases CO_2 in the air. Other greenhouse gasses like methane, nitrous oxide, hydrofluorocarbons and sulfur hexafluoride are mainly produced from agricultural and industrial processes and consumer goods. Activities relating to reduction of greenhouse gasses have an importance for society and the world economy (Breidenich et al., 1998).

2.8 Particulate Matter $PM_{2.5}$

$PM_{2.5}$ is air Particulate Matter which have dimension of 2.5 micrometer. (The diameter of human hair is 3 micrometer). It is so small than it can only be seen with an electron microscope. Famous as fine particles are also small than their corresponding item PM_{10} which have dimension of 10 dimeter. Their sources include wood burning, agriculture burnings, electric generation plants, automobiles, forest fire and dust storms. Due to their size, they can stay in the air for long time and have higher chances of inhaling by humans and animals. By passing the nose and throat they enter into lungs and circulatory system which causes premature deaths from heart attack, asthma, lungs disease and other respiratory problems (Miettinen, 2019).

$PM_{2.5}$ long-term presence leads to plaque deposits in veins effects vascular and hardening the veins which ultimately leads to heart attack and stroke. Due to the higher quantity of $PM_{2.5}$ in the air, there are higher chances of lung cancer and heart diseases (Pope et al., 2002). American Heart Association has warned about the severity of $PM_{2.5}$. Presence of $PM_{2.5}$ for few hours to weeks can increase cardiovascular diseases related to mortality and non-fatal events, presence for longer period can even higher the risk and reduce life expectancy by a several months to a few years (Brook et al., 2010). Due to its adverse effects $PM_{2.5}$ is closely monitored by health authorities worldwide. The level is measured in air quality index or any air quality standard by any country.

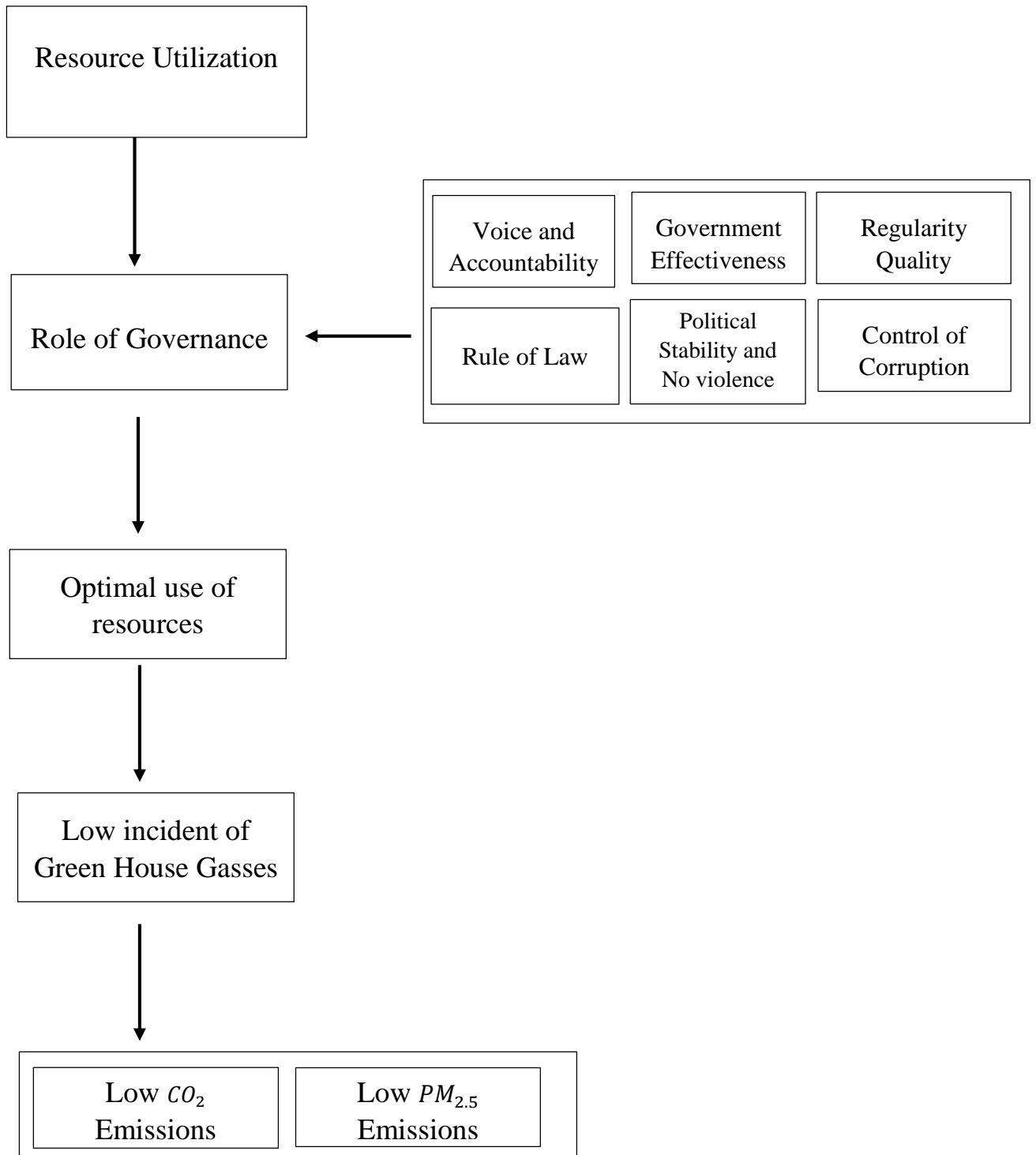
CHAPTER 3

METHODOLOGY

This chapter presents an overview of data, formulation of hypothesis, data sources, model specification and conceptual map of the study. Current study is empirical in nature and based on secondary data. The objective is to empirically validate the prevailing theory that entails good governance at core to mitigate environmental concerns. Therefore, the theory driven by hypothesizing that good governance has positive impact on improving environmental quality, and subsequently follows deductive research approach.

For precise assessment of environmental degradation, the study used ambient $PM_{2.5}$ air pollution and CO_2 emission as dependent variables. Panel data is used for 23 years from 1996-2017 for 160 cross sections. For better understanding, the study also analyzed the data at disaggregate level by economic blocs i.e. high, middle and low income countries for which world bank classification 2018 has been used. As of 1 July 2019, low-income economies are defined as those with a GNI per capita, calculated using the World Bank Atlas method, of \$1,025 or less in 2018; lower middle-income economies are those with a GNI per capita between \$1,026 and \$3,995; upper middle-income economies are those between \$3,996 and \$12,375; high-income economies are those with a GNI per capita of \$12,376 or more.

3.1 Conceptual Framework



Above conceptual map of the study shows the current environmental governance and studies intervention. At the top we have resource utilization which is not efficient due to poor and weak role of governance. The study aimed to incorporate good governance

practices which are rule of law, regulatory quality, government effectiveness, control of corruption, voice and accountability, political stability and no violence. By incorporating good governance practices in resource utilization there will be optimal use of resources that will result in effective environmental governance. Output of this intervention will be low incidents of greenhouse gasses and pollution which will ultimately lead to low incidents of CO_2 and $PM_{2.5}$.

3.2 Hypothesis

Good governance has: -

H1a: - Negative relationship with $PM_{2.5}$

H1b: - Negative relationship with CO_2

3.3 Empirical Model for Ambient $PM_{2.5}$

As it is concluded in preceding chapter, mostly peripheral sides of observed phenomenon are widely discussed while core issue has rarely been explored and that encouraged the extant of current study. By taking deep insights from literature, following equation is specified for which $PM_{2.5}$ is explained and has regional impact in contrast to CO_2 .

$$PM_{2.5\ it} = \beta_0 + \beta_1(Gov)_{it} + \beta_2(GDP)_{it} + \beta_3(GDP^2)_{it} + \beta_4(ENC)_{it} + \beta_5(TRD)_{it} + ERT_{it}$$

Where $PM_{2.5}$ is air pollution measured in terms of microgram per cubic meter and “i” denote country index and “t” for time period. While GOV stands for Governance, GDP is GDP per capita, GDP^2 is Square of GDP per capita, ECO is energy consumption, TRD is trade and ERT is independently distributed error term.

Basing upon Tai et al., (2012), this study used the above independent variables to estimate the the relationship between governance and air pollution due to $PM_{2.5}$.

3.4 Empirical Model for CO_2 Emission

As delineated in section 3.2, CO_2 has worldwide impact on environmental degradation in contrast to $PM_{2.5}$. In the light of literature, following equation is specified to as CO_2 dependent variable.

$$CO2_{it} = \beta_0 + \beta_1(Gov)_{it} + \beta_2(GDP)_{it} + \beta_3(GDP^2)_{it} + \beta_4(ENC)_{it} + \beta_5(TRD)_{it} + ERT_{it}$$

Where CO_2 is air pollution measured in terms kiloton and “i” denote country index and “t” for time period. While GOV stands for Governance, GDP is GDP per capita, GDP^2 is Square of GDP per capita, ECO is energy consumption, TRD is trade and ERT is independently distributed error term.

We have extended the model by Alkathlan & Javid, (2013) and Nasir & Rehman, (2011) to measure the relation between carbon dioxide and governance by adding GDP its Square, energy consumption and trade as independent variables

3.5 Data

This study uses panel data for estimation. Panel data contains observations of two dimension. Cross sectional and time series dimensions. In cross section, we conflate different cross section in one period of time while in time series, we collect data of one cross section for different time periods. Availability of data, modeling capacity for complex human behaviors and challenging methodology are the factors that contribute to the growth of panel data studies. Panel data helps to overcome the heterogeneity of cross sectional observations like countries and businesses over time. The effect of independent variable on dependent variable can be predicted and measured better in panel data as compared to time series and cross sectional data.

Additionally, “Panel data give more informative data, more variability, less collinearity among the variables, more degree of freedom and more efficiency”. It is also better

estimation method to study the duration of economic states and the “dynamics of change” over time (Baltagi, 2001). It is an effective method to measure complex human behavior. The functional form (a log-linear model) of the equation is used so that the slope coefficients give the percentage change in the dependent variable.

3.6 Estimation Technique

Use of OLS is legitimate when there is no heterogeneity, and there is upward bias FEM or REM is preferable to various estimators in following ways. As it is already discussed we have employed panel data that is often characterized by heterogeneity. To capture the effect of heterogeneity, mostly FEM or REM model is recommended. In case of FE that is usually downward bias but biasness can be overcome by taking large time interval.

3.7 Hausman Test

Hausman test is standard technique used in empirical panel data to verify the use of fixed effect or random effect model. The test suggests the use the best model for estimation. Current study employed panel data and Hausman’s test statistic suggest the use of fixed effect model.

3.8 Fixed Effect Model

It is specified in the fixed effect model that each observational unit has its own intercept which creates heterogeneity in the sample due to separate intercept for each observation. The unit intercepts are time invariant in fixed effect model which do not vary over time even if they might be different among cross section units. Hence, fixed effect model considers intercept of independent variable which do not vary across time and cross section.

3.9 Empirical Quantification

A wide-range data set not only offers improved coverage across countries and time but also preclude inexact comparison among diverse economic blocs. It has the capacity to execute unbalanced panels, missing observations, nonstationarity in extensive panel and persistent differences in states development level, governance, infrastructure and preferences. Moreover, panel data is useful when carrying out policy analysis because it counts for unobserved individual country effect. Furthermore, Results of country specific studies cannot be generalized make panel study a choice.

CHAPTER 4

DATA SOURCES AND DESCRIPTION

This chapter presents an overview of data sources, descriptions, definitions and rationale for use of the variables for the study. The chapter also covers the descriptive statistics summary of the data set.

4.1 Good Governance

For governance, world governance indicators data have been used which is collected by World Bank. Following Six themes (as given at table 4.1) are measured on 48 indicators on the scale -2.5 (Weak) to +2.5 (Strong).

Table 4.1: Governance Indicators

Sr. No	Variable	Description
1.	Voice and Accountability	Participation of citizens in electing government, Freedom of speech, association and media.
2.	Political Stability and No Violence	Political violence, terrorism and instability of political affairs
3.	Government Effectiveness	Effectiveness of public service delivery, civil service independence and quality, policy processes and implementation and government credibility,
4.	Regularity Quality	Formulation and implementation of government policies.
5.	Rule of Law	Civil society confidence on laws and abidance. Specially on judicial system, criminal laws, property rights and enforcement of contracts.
6.	Control of corruption	Use of official power for personal interests including unimportant and grand arrangements of corruption. Elite capture for personal gains.

Source: - World Governance Indicators, World Bank.

The study has used an index by combing the score assigned against each variable for selected countries of the study. The same index has been used to measure the impact of good governance on different variables by Jindra & Vaz, (2019) and Ahmad & Saleem, (2014) for measuring the impact of good governance on multidimensional poverty and human development respectively. Data is available from 1996-2017.

Table 4.2: List of Independent variables

Variable	Unit	Definition	Rationale
Governance (GOV)	-2.5-+2.5	Estimate gives the country's score on the aggregate indicator, in units of a standard normal distribution, i.e. ranging from approximately -2.5 to 2.5.	Governance: - Governance is our main variable of attention. Governance index is measured by World Bank based on six indicators i.e. Control of Corruption, Government effectiveness, Regulatory Quality, Rule of Law, Voice and Accountability and Political Stability and absence of violence by giving estimated average score ranging from -2.5 as worst and +2.5 as highest to each indicator. We have developed an index by giving equal weight to all six indicators and used for the study. Good governance is considered a key factor for improvement in all aspects of human management. We are expecting significant and negative relationship with environment.
Gross Domestic Production	GDP per capita (constant 2010 US\$)	GDP per capita is gross domestic product divided by midyear population. Data are in constant 2010 U.S. dollars.	GDP per capita: - is used to measure the development level of a country. At the initial stage of development countries focus on development and are least interested in environmental issues. It is expected to have positive and significant impact of GDP on environmental indicators.
Gross Domestic Production Square	Squared	It is the Square of GDP in Constant 2010 U.S. dollar	GDP per capita Square: - As economies grow they care more sensitive about environment. They spent relatively high to protect environment. It is expected to have significant and negative impact on environmental indicators.
Energy Consumption (ECO)	kg of oil equivalent per capita)	Energy use refers to use of primary energy before transformation to other end-use fuels, which is equal to indigenous production plus imports and stock changes, minus exports and fuels supplied to ships and aircraft engaged in international transport.	Energy Consumption: - Developing economies often use cheap methods of energy production ignoring the environmental cost. As economies produce more energy from coal it has positive and significant impact on environmental degradation We are expecting the same relationship.
Trade (TRD)	% of GDP)	Trade is the sum of exports and imports of goods and services measured as a share of gross domestic product.	Trade is directly linked with environment. As economies grow they tend to import relatively cheaper technology (which not is environment friendly) and produce quantities greater than their need to have exportable surplus. Hence, they ignore the environment focusing on development. So, we are expecting the same significant and positive relationship.

Table 4.3: List of dependent variables

Variable	Unit	Definition	Rationale
Particulate Matters _{2.5} ($PM_{2.5}$)	Population-weighted exposure to ambient $PM_{2.5}$ pollution is defined as the average level of exposure of a nation's population to concentrations of suspended particles measuring less than 2.5 microns in aerodynamic diameter, which are capable of penetrating deep into the respiratory tract and causing severe health damage. Exposure is calculated by weighting mean annual concentrations of $PM_{2.5}$ by population in both urban and rural areas.	Population-weighted exposure to ambient $PM_{2.5}$ pollution is defined as the average level of exposure of a nation's population to concentrations of suspended particles measuring less than 2.5 microns in aerodynamic diameter, which are capable of penetrating deep into the respiratory tract and causing severe health damage. Exposure is calculated by weighting mean annual concentrations of $PM_{2.5}$ by population in both urban and rural areas.	$PM_{2.5}$ is fine form of PM_{10} which cause air pollution and has negative impact on human health. It decreases metrological visibility which caused road accident. Irritation in eyes, nose throat, coughing, shortness of breath, Asthma, Heart diseases, Lung Cancer are major diseases due to $PM_{2.5}$. Due to these sever impacts on human health, the study used this variable
Carbon Dioxide (CO_2)	CO_2 emissions kiloton	Carbon dioxide emissions are those stemming from the burning of fossil fuels and the manufacture of cement. They include carbon dioxide produced during consumption of solid, liquid, and gas fuels and gas flaring.	CO_2 emission and greenhouse gasses considered the highest threat to environment.it is the main source that is affecting plant growth, development and functions hence caused global environmental change. It almost contributes 60 % in enhancement of greenhouse gasses. Due to its highest contribution for environmental degradation we have used the indicator for the study.

Source: - World Development Indicators and World Governance Indicators, 2019.

4.2 Descriptive Statistics

The data set comprises the information of 160 countries. This is an unbalanced dataset containing missing values in the series for many variables, especially $PM_{2.5}$ (dependent variable) and energy consumption. Table 4.4 provides complete descriptive statistics of the independent and dependent variables for aggregated sample used in the study.

Table 4.4: Descriptive Statistics for Overall Sample

Variable Name & Sign	Mean	Std.Dev.	Min	Max	Observations
Governance					
GOV	-0.022	0.904	-2.449	1.970	N = 3876
between		0.888	-2.163	1.850	N = 204
within		0.182	-1.428	0.880	T = 19
Gross Domestic Production (Log)					
GDP	8.527	1.526	5.157	12.174	N = 4697
between		1.533	5.443	11.931	N = 205
within		0.226	6.141	9.420	T = 22.912
Gross Domestic Production Square (Log)					
GDP2	75.034	26.222	26.593	148.214	N = 4697
between		26.479	29.625	142.374	N = 205
within		3.698	36.284	89.882	T = 22.912
Energy Consumption (Log)					
ENC	7.236	1.112	2.256	10.004	N = 2943
between		1.233	2.489	9.799	N = 172
within		0.138	6.107	7.858	T = 17.110
Trade (Log)					
TRD	4.344	0.617	-3.863	6.758	N = 4350
between		0.560	0.448	5.883	N = 200
within		0.294	-3.373	7.766	T = 21.750
Particulate Matters 2.5 (log)					
$PM_{2.5}$	3.164	0.583	1.768	4.613	N = 2134
between		0.579	1.891	4.566	N = 194
within		0.079	2.344	3.386	T = 11
Carbon Dioxide (Log)					
CO_2	8.963	2.607	1.993	16.147	N = 4023
between		2.595	2.195	15.525	N = 206
Within		0.290	6.119	10.637	T = 19.529

Source: Author's calculations.

Descriptive statistics table shows the mean value, standard deviation, minimum value, maximum value, total observations number of countries and time period for each variable in the table. For the governance variable the study has 3876 observations, 204 countries and 19 years data. For Gross Domestic Production and its square the study have 4697 observations for 205 countries with 23 years data. For energy consumption, there are 2943 observations for 172 countries having 17 years data. For trade the study used 4350 observations for 200 countries with 22 years data. For PM2.5 the study has 2134 observations for 194 countries having 11 years data and lastly CO2 which have 4023 observations for 206 countries having 19 years data.

Table 4.5: Descriptive Statistics for High Income Countries

Variable Name & Sign	Mean	Std.Dev.	Min	Max	Observations
Governance					
GOV	0.945	0.560	-0.491	1.970	N = 1292
between		0.538	-0.345	1.850	N = 68
within		0.169	0.075	1.709	T = 19
Gross Domestic Production (Log)					
GDP	10.213	0.715	8.025	12.174	N = 1610
between		0.713	8.298	11.931	N = 72
within		0.171	9.541	10.853	T = 22.4
Gross Domestic Production Square (Log)					
GDP2	104.813	14.475	64.404	148.214	N = 1610
between		14.557	68.894	142.374	N = 72
within		3.388	91.726	118.554	T = 22.4
Energy Consumption (Log)					
ENC	8.274	0.656	6.592	10.004	N = 1112
between		0.663	6.795	9.799	N = 58
within		0.119	7.535	8.716	T = 19.2
Trade (Log)					
TRD	4.544	0.569	2.814	6.758	N= 1503
between		0.562	3.247	5.883	N = 69
within		0.167	3.524	5.523	T = 21.8
Particulate Matters 2.5 (Log)					
PM25	2.768	0.598	1.768	4.579	N = 671
between		0.597	1.891	4.463	N = 61
within		0.080	2.584	2.938	T = 11
Carbon Dioxide (Log)					
CO2	2.110	0.657	0.086	4.249	N= 1394
between		0.680	0.369	3.967	N = 72
within		0.151	1.178	2.585	T = 19.4

Source: Author's calculations.

Table 4.6: Descriptive Statistics for Middle Income Countries

Variable Name & Sign	Mean	Std.Dev.	Min	Max	Observations
Governance					
GOV	-0.363	0.562	-1.896	1.054	N = 938
between		0.541	-1.577	0.752	N = 102
within		0.162	-1.215	0.540	T = 19
Gross Domestic Production (Log)					
GDP	8.041	0.768	5.490	9.929	N = 2377
between		0.730	6.459	9.465	N = 102
within		0.265	5.654	8.933	T = 23.30
Gross Domestic Production Square (Log)					
GDP2	65.240	12.219	30.144	98.581	N = 2377
between		11.625	41.884	89.598	N = 102
within		4.189	26.490	80.088	T = 2330
Energy Consumption (Log)					
ENC	6.759	0.781	2.256	8.550	N = 1506
between		0.921	2.489	8.418	N = 94
within		0.153	5.630	7.380	T = 16.021
Trade (Log)					
TRD	4.299		-3.863	5.513	N = 2170
between		0.575	0.448	5.220	N = 99
within		0.368	-3.418	7.721	T = 21.91
Particulate Matters 2.5 (Log)					
PM25	3.266	0.470	2.054	4.581	N = 1089
between		0.464	2.328	4.499	N = 99
within		0.083	2.446	3.488	T = 11
Carbon Dioxide (Log)					
CO2	0.396	1.055	-2.633	2.750	N = 1969
between		1.036	-1.686	2.427	N = 100
within		0.254	-2.087	1.596	T = 19.690

Source: Author's calculations.

Table 4.7: Descriptive Statistics for Low Income Countries

Variable Name & Sign	Mean	Std.Dev.	Min	Max	Observations
Governance					
GOV	-0.937	0.527	-2.449	0.051	N = 646
between		0.470	-2.163	-0.179	N = 34
within		0.252	-2.342	-0.151	T = 19
Gross Domestic Production (Log)					
GDP	6.331	0.462	5.157	7.411	N = 710
between		0.430	5.443	7.167	N = 31
within		0.191	5.606	7.017	T = 22.90
Gross Domestic Production Square (Log)					
GDP2	40.295	5.875	26.593	54.923	N = 710
between		5.492	29.625	51.369	N = 31
within		2.395	32.188	48.386	T = 22.90
Energy Consumption (Log)					
ENC	5.893	0.592	4.042	7.038	N = 325
between		0.840	4.127	6.827	N = 20
within		0.131	5.332	6.369	T = 16.25
Trade (Log)					
TRD	4.045	0.393	3.043	5.741	N = 677
between		0.318	3.450	4.887	N = 32
within		0.245	3.242	4.899	T = 21.15
Particulate Matters 2.5					
PM25	3.577	0.415	2.704	4.613	N = 374
between		0.416	2.807	4.566	N = 34
within		0.065	3.335	3.775	T = 11
Carbon Oxide					
CO2	-1.864	1.124	-4.	1.207	N = 657
between		1.101	-3.	1.008	N = 34
within		0.285	-2.	-0.392	T = 19.32

Source: Author's calculations.

CHAPTER 5

RESULTS AND DISCUSSION

After discussing the methodology and defining the data sources, the study estimates and presents the regression results in this chapter. Table 5.1 shows aggregate and disaggregated results for $PM_{2.5}$ for the sample.

Table 5.1: Regression Results of $PM_{2.5}$

Variable Name	Sign	(1) Over all Countries	(2) High Income	(3) Middle Income	(4) Low Income
Governance	GOV	-0.196*** (0.032)	-0.477*** (0.062)	-0.096** (0.040)	-0.025 (0.080)
Gross Domestic Pro.	GDP	0.775*** (0.043)	0.168* (0.090)	0.957*** (0.053)	2.110*** (0.241)
GDP Square	GDP^2	-0.052*** (0.003)	-0.016*** (0.006)	-0.063*** (0.004)	-0.168*** (0.026)
Energy Consumption	ENC	0.076** (0.034)	0.328*** (0.063)	-0.016 (0.039)	-0.486*** (0.119)
Trade	TRD	0.004 (0.013)	0.142*** (0.052)	-0.013 (0.013)	-0.051 (0.063)
_cons		-0.152*** (0.009)	-0.218*** (0.017)	-0.118*** (0.012)	0.068*** (0.024)
Observations		809	319	417	73
Countries		132	48	70	14
R-sq		0.9750	0.9708	0.9828	0.9820
F test that all u_i		0.000	0.000	0.000	0.000

Standard errors are in parenthesis

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. All values are in log form except Governance variable.

5.1 Results and Discussion

Our first table represents the regression results for $PM_{2.5}$. The results are for 132 countries. First column shows the results for sample of 132 countries having 809 observations in the panel. Then we further disaggregate the analyses in high Income, middle income and low-income countries. Column two consists the results of 48 high income countries with 319 observations. Third Column is for middle income countries with 70 countries and 417 observations while last column is for 14 low income countries with 73 observations. For all the regression F-test estimates, the results are statistically significant.

According to the regression result, there is negative and statistically significant relationship between governance and $PM_{2.5}$ in our overall as well disaggregated sample. One percentage improvement in level of governance will decrease the $PM_{2.5}$ by 0.196 (with p value 0.01). The disaggregated analysis makes it clear that governance yield highest return in high income countries where it has negative and significant impact on $PM_{2.5}$ (0.477). Following that for middle income countries, it is 0.096 with p value 0.05 while for the low income countries, though the relationship is negative with value 0.025 but it is statistically not significant. Our results are in line with the hypothesis that better governance will have negative effect on $PM_{2.5}$. Hence in high income countries, its effect is very high and in middle income countries impact of governance is low but statistically significant while in low income countries it has negative relationship but statistically not significant. In brief as the governance is improved in high income countries, which is impacting the $PM_{2.5}$ level negatively similarly in middle income group. While state of governance in low income countries is not satisfactory which is confirmed by our results.

Having discussed the variable of interest, now we will discuss the rest of the explanatory variables to exhibit that the results are stable and logical. Our second measure is GDP per capita. Results suggest there is positive association between GDP per capita and $PM_{2.5}$. This indicates that one percent growth in GDP per capita in overall sample will lead to increase $PM_{2.5}$ by 0.775 percent in the atmosphere. The relationship is statistically significant with P value less than 0.01. The results imply that while achieving high economic growth, countries still compromise on environmental quality. The study further analyses the results according to different economic blocs of countries. For high income countries, one percent increase in GDP will lead to 0.168 percent increase in $PM_{2.5}$ with p-value 0.1 and in Middle income countries 0.957 with p value 0.01 while for low income countries the relationship is 2.110 with p value 0.01. Our results for this variable indicate that economic growth in a country is positively linked with the growth of $PM_{2.5}$. The results are in line with the theory. At the initial stage of development countries have more focused on development while ignoring the environment. Hence, the coefficient of the three disaggregated sub-samples (according to the income level) confirms the hypothesis.

The results further confirmed that the relationship between GDP Square and $PM_{2.5}$ is nonlinear as GDP square turns statistically significant. Results have not only negative relationship but also statistically significant in all groups. Policy implication of GDP Square coefficient indicates the existence of environmental kuznets curve Hypothesis in selected countries. Which means at the initial level of development there is positive relationship between $PM_{2.5}$ and economic growth. Economies focus on development while ignoring the environment. But as economies grow and enter in next level of development they are more conscious about

environment and invest more on environmental causes using environment friendly technologies and tools for development.

Our fourth measure is energy consumption. This variable has positive and significant relationship with $PM_{2.5}$ for our overall sample. One percent increase in energy use will increase $PM_{2.5}$ level by 0.076 percent. The results are statistically significant at 5 percent level of significance for all the regression except the middle income countries. For the high-income countries this value is 0.328 with positive sign. While for the middle- and low-income countries the coefficients are negative.

Our last independent variable is trade which is statistically significant for high income countries only, where coefficient is 0.142 with p value 0.01. For middle- and low-income countries coefficients are not statistically significant which indicates that their trade is either not in the volume or in such processed form which could lead to increased level of $PM_{2.5}$. This results also dominates in the total sample.

Based on the studies empirical model for CO_2 , table 5.3 presents the regression results for aggregated and disaggregated sample.

Table 5.2: Regression Results of CO_2

Variable Name	Sign	(1) Overall Countries	(2) High_ Income	(3) Middle Income	(4) Low Income
Governance	GOV	0.017 (0.031)	-0.015 (0.046)	0.043 (0.040)	-0.108 (0.122)
Gross Domestic Prod. GDP		0.764*** (0.063)	0.892*** (0.101)	0.805*** (0.082)	-1.197*** (0.350)
GDP Square	GDP^2	-0.034*** (0.005)	-0.042*** (0.008)	-0.037*** (0.006)	0.177*** (0.035)
Energy Consumption	ENC	0.828*** (0.039)	0.749*** (0.055)	0.897*** (0.052)	1.053*** (0.185)
Trade	TRD	-0.003 (0.013)	0.018 (0.043)	-0.023* (0.014)	0.191*** (0.067)
_cons		0.313*** (0.016)	0.020 (0.020)	0.211*** (0.023)	1.371*** (0.074)
Observations		2014	745	1081	188
Countries		160	54	89	17
R-sq		0.8578	0.9040	0.8716	0.7403
F test that all u_i		0.000	0.000	0.000	0.000

Standard errors are in parenthesis

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. All values are in log form except Governance variable.

Following the same methodology, we have run the regression for CO_2 emission for our sample. All results are significant as per our hypothesis as in the case of $PM_{2.5}$ except our variable of concern which is governance. Maybe it is because CO_2 is global issue. Local governance may not be effective to control this issue. Which asks for the need of global governance. It can be noticed that for our overall sample, governance is insignificant. Similarly, for disaggregated sample, despite having positive coefficient for middle income countries and negative but not statistically significant for high and low income countries results are statistically insignificant. The results of the coefficient are according to expectation. We further analyse the situation and try to find the reason behind the results here.

Kyoto protocol is global agreement on climate change to reduce the emission under the umbrella of United Nations which binds nations to reduce the emissions to a certain level. Identifying that developed countries are primarily responsible for global climate issues due to heavy industrialization, the protocol was adopted in 1997 in Japan. The detail rules of implementation started were given in COP 7 in Marrakesh, Morocco² in 2001. Its first commitment period started from 2008 in which the parties/countries signed and adopted the protocol to reduce the emissions at certain level.

On the basis of above discussion and observation, we divided our sample into two groups to examine the impact of Kyoto protocol's bindings in reducing the CO_2 emission. Total sample of our study was therefore divided into Pre Kyoto Protocol binding period which is from 1995-2007 and post period which is from 2008-2017. Regression results for these two sub periods for overall countries are given in Table no, 5.4

² (https://unfccc.int/kyoto_protocol)

Table 5.3: Aggregate Regression Results of Pre and Post Kyoto Protocol Bindings

Variable Name	Sign	(1)	(2)
		Pre 1995-2007	Post 2008-2017
Governance	GOV	0.009 (0.040)	-0.123** (0.057)
Gross Domestic Prod.	GDP	0.895*** (0.094)	4.969*** (0.526)
GDP Square	GDP^2	-0.042*** (0.006)	-0.266*** (0.030)
Energy Consumption	ENC	0.722*** (0.060)	0.892*** (0.061)
Trade	TRD	0.005 (0.020)	-0.026 (0.016)
_cons		0.064*** (0.021)	-18.544*** (1.190)
Observations		1097	785
Countries		158	134

Standard errors are in parenthesis
 *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Impact of Kyoto protocol is clearly positive and significant in the case of governance. The parties who signed the agreements, their implementation is seen in the regression results.

In the pre Kyoto binding period, the governance is positively but statistically insignificant for CO_2 . Which mean local governance at country level cannot be contributing in reducing emission. On the contrary, in the post Kyoto binding, the sign is not only negative but statistically significant. On the basis of above findings and discussion, disaggregated and overall results for the Post Kyoto protocol period are given and discussed in the Table no, 5.5.

Table 5.4: Regression Results of CO₂ After Kyoto Protocol Bindings 2008

Variable Name	Sign	(1) Overall Countries	(2) High Income	(3) Middle Income	(4) Low Income
Governance	GOV	-0.123** (0.057)	-0.058 (0.073)	-0.116* (0.069)	-0.120 (0.304)
Gross Domestic Prod	GDP	4.969*** (0.526)	0.844 (1.623)	4.219*** (0.827)	15.116** (6.884)
GDP Square	GDP^2	-0.266*** (0.030)	-0.051 (0.082)	-0.229*** (0.048)	-0.955* (0.525)
Energy Consumption	ENC	0.892*** (0.061)	0.986*** (0.073)	0.910*** (0.076)	0.425 (0.431)
Trade	TRD	-0.026 (0.016)	0.108** (0.048)	-0.037** (0.016)	0.024 (0.170)
_cons		-18.544*** (1.190)	-0.754 (4.695)	-14.760*** (2.000)	-52.155*** (12.466)
Observations		785	294	418	73
Countries		134	49	71	14
R-sq		0.4190	0.4454	0.4712	0.5014
F test that all u _i		0.000	0.000	0.000	0.000

Standard errors are in parenthesis

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. All values are in log form except Governance variable.

5.2 Results and Discussion for CO_2

The table presents the results for CO_2 in post Kyoto Protocol scenario. In the first column results are for overall sample of 134 countries having 785 observations. The second column is for 49 high income countries with 294 observations while third column is for 71 middle income with 418 observations and fourth is for 14 low income countries with 73 observations. For all the results F test is 0.000 while R-sq within is above 0.42, 0.46, 0.47 and 0.50 for our overall panel, high income, middle income and low income countries, respectively.

Our regression result shows that there is negative and significant relationship between CO_2 and governance. For our panel of overall countries one percent estimated average improvement in governance will lead to decrease CO_2 by 0.123 (with p value 0.05). For this regression, the results are not only negative but statistically significant. For high income countries the result shows the negative relationship but is not statically significant. The reason may be some high income countries do not follow the guideline and standards set by the international community for protection of environment and some countries are not even signing the international environment accords like Kyoto Protocol While for the middle income countries the results are negative and statistically significant. One percent average improvement in governance will decrease the CO_2 by 0.116 with p value 0.1. Similarly, results for low income countries shows negative relationship with CO_2 . Results for this variable show negative relationship in all sub economic blocs and significant with middle income and over all countries panel. Which means as countries will have more bindings from international community in terms of following environment friendly technologies to reduce emissions, the more it has positive impact on environment.

Our second measure for the CO_2 is GDP. This variable has positive and statistically significant relationship with CO_2 . For our overall sample one percent increase in GDP will lead to increase the CO_2 by 4.969 with p value 0.01 which is highly significant. Which shows as economies will progress it will produce more emissions. For high income countries one percent increase in GDP will lead to increase CO_2 by 0.844 percent. Similarly, for middle income countries one percent increase in GDP will lead to increase CO_2 emission by 4.219 with p value 0.01. while for the low income countries one percent increase in GDP will lead to increase CO_2 by 15.116 with p value 0.05. Our results conform the standard theory as economies grow they will pollute the environment more.

Our third measure is GDP Square. The result shows negative and statistically significant relationship with CO_2 . For our overall group of countries one percent increase in GDP Square will lead to decrease the CO_2 by 0.266 with p value 0.01. For high income countries, one percent increase in GDP Square will lead to decrease CO_2 by 0.051. Similarly, for middle income countries this relationship is -0.229 with p value 0.01. while for low income countries this relationship is -0.955 with p value -0.1. The results show as economies enter new stage of development they are more conscious about environment and spent more for environment cause. The variables GDP and GDP square again validate the Environmental Kutznet Curve in the case of CO_2 .

Our fourth measure is energy consumption. This variable has positive and significant relationship with CO_2 . For our overall sample one percent increase in energy consumption will lead to increase the CO_2 by 0.892 percent with p value 0.01. while for high income countries this relationship is 0.986 with p value 0.01. Similarly, for

middle income countries the relationship is 0.910 with p value 0.01 and for low income countries the relationship is 0.425.

Our last measure is trade. This variable not shows the results as expected. It has positive and significant relationship in high income countries and positive in low income countries. while our overall panel and middle-income countries shows negative relationships, which were not expected.

CHAPTER 6

CONCLUSION AND RECOMMENDATIONS

The objective of the study was to investigate the impact of good governance on environmental quality. To achieve this objective, CO_2 emission and $PM_{2.5}$ were taken as proxies for environmental quality (as dependent variable) using data of 160 countries. While governance, gross domestic production, gross domestic production square, energy consumption and trade were taken as independent variables. The study explained important relationships and suggests number of policy recommendations. Results refer for governance reforms to overcome the global climate challenges.

Empirical evidences suggest; First, governance has a direct relationship in the case of $PM_{2.5}$ for the whole sample. Sample disaggregation in high, middle and low income countries gives us even a clearer picture about the state of governance and its impact. As we move from high to middle and low income countries, the impact of governance is decreasing. In the low income countries, the relationship is negative but not significant. In the case of CO_2 the, study concludes that governance of any country will only be effective if there is any binding from international community to reduce CO_2 . As we analyze the pre and post Kyoto Protocol bindings, results clearly indicate that after 2008 bindings from international community there is significant decrease in CO_2 emissions. Global governance is translating to local governance after binding by international community.

These findings suggest that governance reforms are important tools in the low as well as middle-income countries to address environmental issues. There may be a minimum level of governance that countries need to maintain to address the

environment issue. Compliance to international accords like Kyoto Protocol is the driving force behind institutional changes related to environmental issues. Achieving effective governance not only takes time but also needs financial and human resources. Middle and low income countries at the stage of initial development cannot divert resources towards improved governance and hence cannot enjoy the benefits and outcomes. Due to financial constraints, developing countries cannot invest in governance reforms and cannot get benefits. (Jindra and VAZ, 2018; Sachs et al., 2004). To improve the governance in any country there is need of structural reforms to reap the benefits which middle and low-income countries are still lacking (Khan, 2009). A further empirical research is needed which may identify and pinpoint the structural reforms exactly which are needed to be done.

One finding indicate that good governance strategies of economies lead to better control of environmental issues. Effective governance strategies mean better performance in all indicators of governance which includes rule of law, government effectiveness, regulatory quality, control of corruption, voice and accountability and political stability and no violence. If a country performs well in all of the above indicators that will improve the governance which will be translated to ameliorate environmental concerns. Furthermore, our study also suggests that good governance can play an important role in reducing emissions and deal with environmental issues which is the focus of the international community. Especially, low and middle-income countries will have to focus more on structural reforms which are necessary and prerequisite for good governance. Without this, good governance may not produce desired results and hence status quo will sustain. Last but not the least, the

developing countries should adhere to international protocols and play their leading role in achieving the sustainable development.

6.1 Policy Recommendations

- ❑ There is need to improve governance specially in middle and low income countries to address environmental issues like $PM_{2.5}$.
- ❑ CO_2 is global issue. Local/county level governance may not be effective to control this problem. International community/Institutions like UN, World bank, WHO must have to play leading role to overcome this issue.
- ❑ There is need to strengthen international accords like Kyoto Protocol to overcome global environmental problems.
- ❑ Developing countries should adhere to international protocols and play their leading role in achieving the global environmental targets.

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APPENDIX-1

Good Governance

Good governance is a process of public administration to gain maximum benefits for masses. One of the characteristics is collaboration between state institutions and civil society to work closer and together for the maximum welfare of the society. By covering all aspects, following six characteristics are essential for good governance.

1. Legitimacy: - The state in which authority must be accepted without any pressure and freely. It has no relevance to law and regulation, something legal may not be legitimate. Good governance and legitimacy have strong positive correlation. The core to achieve legitimacy is consensus on all political and social affairs and maximum consent on administrative issues.
- 2:- Transparency:- Information should be available publicly on all state political affairs, state policies, legislation, budgets, policy making, expenditures etc. Information should be provided to all citizens through available medium of communications, so they can take part in policy making and other administrative tasks for fruitful outcomes of policies. As the transparency will be high as the good governance level will be high.
- 3:- Accountability:- refers that everyone should be responsible for his/her behavior. In public administration, while holding any position one should be responsible to his/her duties or institution. Accountability means one should fulfill assigned duties while holding any position.
- 4:- Rule of Law:- Law should be the supreme principle. All citizens, officials should be treated equally in all public and political administration processes. The immediate objective of law is regulation, management of social affairs and sustain social order while long term objective is to secure citizens' democratic rights,

liberty and impartiality. Rule of law is fundamental prerequisite for good governance which can only be built on effective legal system. 5:- Responsiveness:- a form of accountability which means individuals and institutions should response proactively and in responsible way on citizens demand. 6:- Effectiveness:- Programs and procedures designed and implemented by state institutions to produce good results should satisfy the needs of citizens. Competitiveness, capacity building of institutions, training of staff are basic requirements to achieve quality output (Keping, 2018).

APPENDIX-2

PM_{2.5} and CO₂

	PM _{2.5}	CO ₂
Characteristics	Particulate Matters, solid and liquid particles in the air, fine & ultrafine, diameter of 2.5-10, 25-100 time thinner than human hair, PM _{2.5} diameter 2.5 micrometer 100 times thinner than human hair	Carbon dioxide emissions are those stemming from the burning of fossil fuels and the manufacture of cement. They include carbon dioxide produced during consumption of solid, liquid, and gas fuels and gas flaring.
Examples	Dust, smog	Dry ice, fossil fuels
Effects	Irritation in eyes, nose throat, coughing, shortness of breath, Asthma, Heart diseases, Lung Cancer	Global warming, climate change