Carbon Dioxide Emissions Reduction Efficiency and Growth Potential (A Case of Pakistan and China)

哈尔滨工程大学经济和管理学院

学生：DANIAL(丹尼尔)　　导师：ALINA

目录
CATALOG

Chapter 01

➢ Introduction

- China's industrial sector is essential to the country's announced carbon-reduction targets and global warming mitigation efforts. Since entering the World Trade Organization in 2001, China's industrial sector has expanded at a breakneck pace, causing significant increases in carbon emissions. Climate change has become a global concern because of greenhouse gases (GHGs) .

- Most GHGs are produced by burning fossil fuels, which account for 58% of total emissions. The energy and farm-livestock industries are the principal producers of greenhouse gas (GHG) emissions in Pakistan and China. Green Finance is an idea that is evolving. The theoretical examination of the system's design and structure enhanced the green finance (G.F.) practices in China and Pakistan, and it was the subject of early research. In addition, environmental insurance may be a beneficial way of mitigating environmental risk problems.

- Since the 1980s, China has experienced rapid financial expansion and has become the world's largest manufacturer.China has the world's biggest producer of more than 220 modern items among 500 everyday things (The State Council, The People's Republic of China, 2017). First: the general energy utilization in the business addresses approximately 70% (62.0 percent), while clean energy utilization, like water, wind power, atomic force, and flammable gas, represents around 19.7 percent (112%) of complete energy utilization (National Bureau of Statistics, The People Republic of China).

- Considering financial advancement assets and natural limitations, the global-local area and China search for a green street (green economy) to break the ecological and assets constraints. Coal has committed to reducing ozone-depleting pollutants, notably CO2 outflows. China has shut down the world's largest coal-fired power plant (CFPP) and is transitioning to clean energy sources. To decrease CO2 emanations by half to 80%, the CPEC (Pakistan) was one of the world's significant framework projects with a 13% to 15% limit development higher than China, India, and the USA.

- This study is more important because these two countries have invested a lot of money in various projects to boost their economies. Both countries are attempting to improve the living standards of their people by providing good health services and trying to eliminate harmful factors that harm people's health. One of the most significant benefits of lowering carbon emissions is that it would reduce the number of fatalities caused by air pollution and help relieve pressure on healthcare systems.

- To ensure a more sustainable and thriving economy, both countries must achieve this separation and cut carbon emissions.The other primary purpose of this research is to assess green finance methods in terms of energy, economic, population, environmental, and ecological issues and their impact on CO2 emissions. As a result, it is more significant because this research examines numerous variables that directly or indirectly impact CO2 emissions. We will discuss how green financing strategies improve the economic potential in Pakistan and China.

Chapter 02

- **Literature Review**

Green Economy and Green Finance Policies in China

- Economic and policy-centered issues have become worldwide worries, awkward environmental nature, asset weariness, and contamination since they have a solid association with social advancement and people's endurance (Carayannis, E. G., & Campbell, D. F. 2019). The green e-economy (G.E.), with low energy utilization, low contamination, and low outflow levels, has turned into an important decision and heading for Chinese monetary turn of events and a course for supporting feasible improvement in emerging nations (Lewis, J.I. 2015).

- China is one of the major CO2 emitter countries and the world's chief energy consumer among industrialized and unindustrialized countries, which can be observed by a recent tendency towards continuous exponential growth. The CO2 emissions have grown from 671.1 Million Metric tons (MMT) to 2247 (MMT) from 1990–2010, portraying 7.66% of the annual growth rate. In addition, the energy consumption convinced an increase in CO2 emissions from 1448 (MMT) to 8320 (MMT) from 1990–to 2010, conforming to a 6.7% annual average growth rate (Chang 2010). In addition, coal use is more carbon-intensive than oil and gas, but it remains a significant driver of economic growth and the world's second-largest driver of CO2 emissions (Jinke and Dianming 2008; Wolde 2010).

- The main reason for climate change is the combustion of principal energy sources in the economic maneuvers of the economy. Due to primary energy ingesting, there is a far-reaching increase in GHG emanations in which CO_2 emission is on top, leading to an unembellished threat of climate change in the Asian region. However, because of its demographic position, Pakistan is one of Asia's most affected climate change countries (Cheema et al. 2006). Pakistan's average temperature increased significantly because of its demographical location compared to the temperature of the rest of the world. Due to weather changes, Pakistan faces severe natural disaster threats. Pakistan placed at 16th rank in the Susceptibility Index among the 170 countries, meaningfully decreasing from 29 to 16 after 2010 (Maplecroft 2010a). Pakistan stood at 8th among 180 countries in the global climate risk index of the German Watch (Hamering 2012). According to Commission Planning (2007), Pakistan surfaces a thoughtful threat of a scarcity of safe drinking water, which significantly reduces from 5600 to 1200 cubic meters over the period 1951–2003. In the Maplecroft Food Security Table, Pakistan hierarchical 30th in 163 countries, Maplecroft (2010b) quantified that Pakistan has no stable food security situation.

- Economic and policy-centered issues have become worldwide worries, awkward environmental nature, asset weariness, and contamination since they have a solid association with social advancement and people's endurance (Carayannis, E. G., & Campbell, D. F. 2019). The green e-economy (G.E.), with low energy utilization, low contamination, and low outflow levels, has turned into an important decision and heading for Chinese monetary turn of events and a course for supporting feasible improvement in emerging nations (Lewis, J.I. 2015).

- China is one of the major CO2 emitter countries and the world's chief energy consumer among industrialized and unindustrialized countries, which can be observed by a recent tendency towards continuous exponential growth. The CO2 emissions have grown from 671.1 Million Metric tons (MMT) to 2247 (MMT) from 1990–2010, portraying 7.66% of the annual growth rate. In addition, the energy consumption convinced an increase in CO2 emissions from 1448 (MMT) to 8320 (MMT) from 1990–to 2010, conforming to a 6.7% annual average growth rate (Chang 2010). In addition, coal use is more carbon-intensive than oil and gas, but it remains a significant driver of economic growth and the world's second-largest driver of CO2 emissions (Jinke and Dianming 2008; Wolde 2010).

Green Economy and Green Finance Policies in Pakistan

- The green economy is the way to work on personal satisfaction, kill poverty, and build a practical turn of events. There have been various indications of a broad social and monetary justification for moving towards a green economy (Richomme-Huet & de Freyman, 2014). The organization has been recognized before as a functioning organization that can prompt the recuperation of a good society (Rahman et al. 2014). The present review intended to concentrate on the tendency of Pakistan's more youthful populace towards green business ventures. That could accomplish reactant work in supportability (Parrish & Foxon 2009).

- Green Finance is an essential component of green growth, where companies raise funding to study and adopt green technology in their businesses. The financial sector must build new financial solutions to attain Green Finance and target industries and technology to obtain funding. Financing mechanisms are therefore needed to promote the country's climate finance. A preliminary study looked at per-capita carbon emissions, revenue, energy consumption, and foreign trade between 1972 and 2008 in Pakistan.

- This study looked into the effects of energy use, economic concerns, and environmental variables on CO2 emissions. This study provides information on CO2 emissions in China and Pakistan by utilizing economic, energy, environmental, and ecological indices. This study is unique in that it looked at how energy use, economic variables, and environmental factors affect CO2 emissions in both Pakistan and China. This research will aid in determining how population, GDP per capita, GPI, HDI, and other economic and environmental factors influence CO2 emissions via carbon, as well as how these factors negatively affect CO2 emissions. There has been a lot of studies done on CO2 emissions in China, but little research has been done on CO2 emissions in Pakistan. As we all know, Pakistan is one of the top ten countries in the world when it comes to dealing with environmental issues such as global warming and greenhouse gas emissions. The majority of businesses in Pakistan have taken no steps to limit CO2 emissions by filtering hazardous smoke that has resulted from increased CO2 emissions. Numerous more variables contribute to CO2 emissions, including population, ecological impact, and the use of oil and gas in energy-generating facilities and automobiles as smoke. Therefore, our work is exceptional in that it is the first to measure CO2 emissions in both Pakistan and China.

Chapter 03

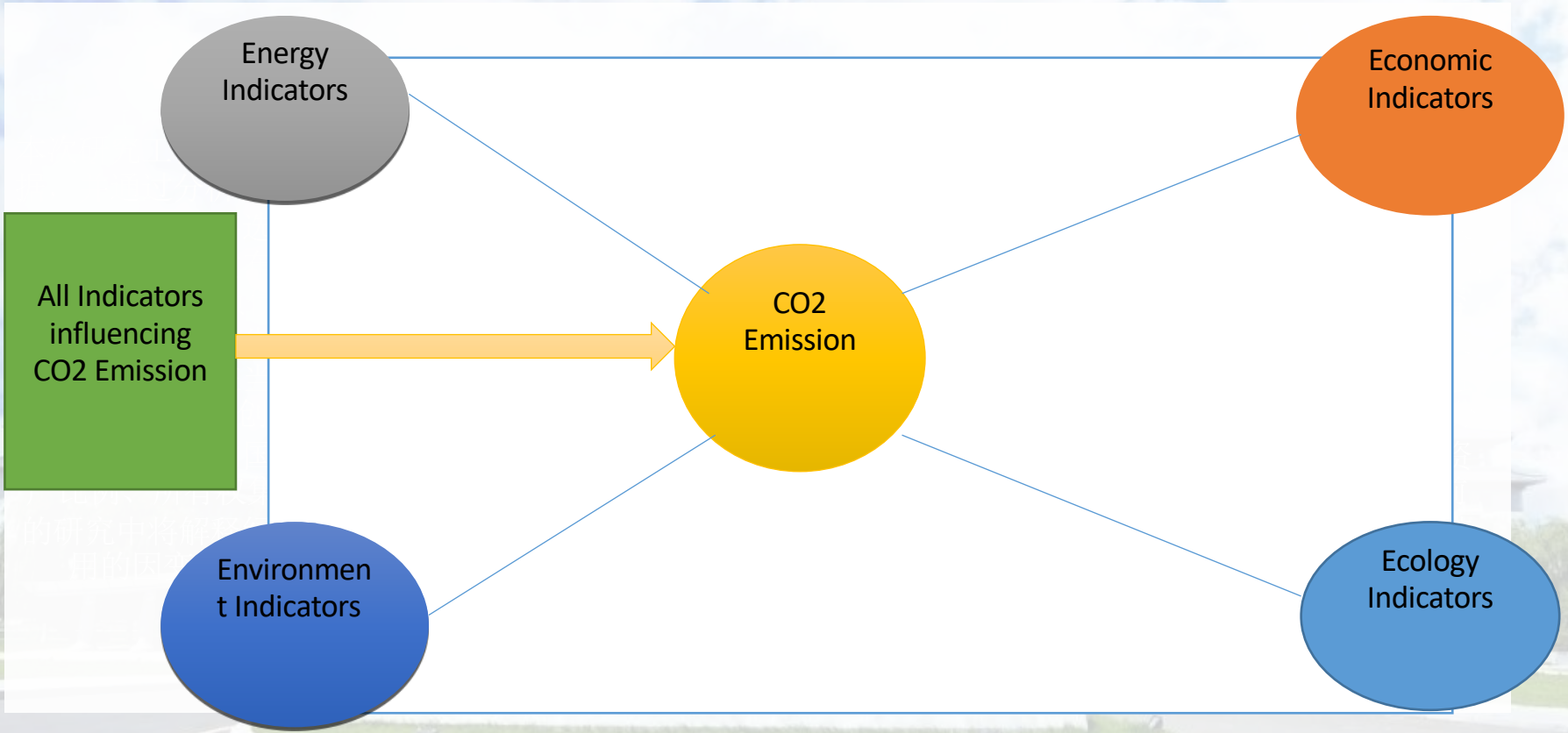
- **Research Methodology**

Methodological Base

- The ongoing study is empirically interpretative and quantitative. To test the hypothesis, partial least square structural equation modeling was employed using Stata _14 software for analysis. The PLS-SEM technique has been utilized because Hair et al. (2010) claimed that this approach is more appropriate for the explanatory nature of current research. The current study sought to investigate the impact of energy consumption, economic variables, and ecological factors on CO2 emissions. As a result, the quantitative data for this study came from World Development Indicators (WDI), a credible and authoritative World Bank source database. Furthermore, the data was collected from 1980 to 2020 and anticipated for 2030. As a result, the study's time frame was 1980-2030. The current study undertakes CO2_emission as the dependent variable while energy consumption, economy, and ecological factors are independent variables. Therefore, the study determines the impact of individual factors on the CO2 emissions in population presence as a mediating factor. A brief description of each factor is as below.

Factors	Variable Name	Variable Description
Dependent Variable	CO2_Emission	CO2 emissions
Ecological Factors	EC_C	Energy consumption
	E.P.	Energy production GWH
	EI	Energy intensity (index or dataset), Triple Index
Economic Factors	GDP	GDP Bil. USD $
	GDP gr	GDP Growth Rate %
	GDPPC	GDP PER CAPITA Bil. $
	GPI	GPI
	HDI	HDI
	UR	Unemployment Rate
	GINI	GINI
Environmental Factors	TOE	Total Investment in Environment
	E.F.	Ecological footprint per person
	EPE	Ecological protection expences
	ENDE	Elimination of natural disasters costs
Mediator	P	Population

Research Scheme



- The above table shows that CO2 emissions are the dependent variable, while energy consumption, economic factors, and ecological aspects are considered independent variables. The populations of both countries, i.e., China and Pakistan, have been taken as mediating variables. The energy consumption comprises energy consumption of gas measured in (mm cft), the energy consumption of oil/petroleum (tons), the energy consumption of electricity (GWH), energy production (GWH), and energy intensity (triple index). Simultaneously, economic factors include Gross Domestic Product (GDP), GDP Growth, GDP per capita, GPI, Human Development Index (HDI), GINI coefficient, and unemployment rate. The ecological factors in the study are a total investment in the environment, environmental footprint per person, annual wastes, bio-capacity per person (GHA), elimination of natural disaster costs, and ecological protection expenses.

Chapter 04

- **Empirical Results**

- The descriptive statistics features of variables by Pakistan and China are provided in table 2.The value of mean CO2 emission for Pakistan between 1980 and 2030 was 137.01 metric tons, with an average standard deviation of 70.51 metric tons, indicating that the possible variation from the mean value is smaller than the actual mean value. As a result, China is attempting to minimize CO2 emissions as much as possible through green policies. When we look at Pakistan and China's CO2 emission rates from 1980 to 2020, we can see that both countries attempt to keep CO2 levels as low as possible, particularly during the 2008 financial crisis and the pandemic Covid condition.

- The trend pattern of GDP growth in Pakistan and China suggests that both nations were significantly impacted by the 2007-08 global financial crisis. The Covid-19 epidemic greatly affected China's GDP growth in 19 and 020, although China has since been expected to have an annual GDP growth rate of roughly 8%. The study includes CO2 emission as the primary dependent variable, with energy consumption (log form), energy production, and energy intensity index as critical energy consumption factors.

- Regression analysis reveals that CO2 emissions in Pakistan and China increase by 1349.29 units for every one percent increase in GDP, explaining approximately 68.57 percent of the variation in CO2 emissions. The coefficient value is statistically significant at 1%. With GDP growth included as an economic component, the overall variation in CO2 emission due to GDP and GDP growth increased to 73.57 percent. The coefficient value suggests that GDP has a positive effect on CO2 emissions. However, GDP growth has a significant negative impact on CO2 emissions. According to the discoveries, the unemployment rate, GDP, GDP growth, GDP per capita, GPI, and HDI, account for approximately 93.95 percent of the variation in CO2 emissions. In the presence of population as a mediating factor, economic factors such as GDP growth, GPI, and the GINI coefficient had an insignificant connection with CO2 emission. In contrast, per capita GDP and HDI demonstrated a significant negative association with CO2 emission. Similarly, the population coefficient in the overall effects has a substantial negative sign, indicating that population mediates the relationship between economic factors and CO2 emissions negatively.

- This study investigated the impact of energy use, economic considerations, and environmental factors on CO2 emissions. The quantitative data for this study were acquired using World Development Indicators (WDI), a reliable World Bank source database. The study evaluated the association between independent and dependent variables by running linear regression on each instance and including a factor in the analysis. The study assessed the association between independent and dependent variables by running linear regression on each model and having a factor in the analysis.

Chapter 05

- Discussion & Conclusion

- As a result, Green Finance is a critical component of green growth, as it allows businesses to raise funds to investigate and use green technology in their operations to reduce CO2 emissions and thereby limit global warming and greenhouse gas effects. To gain finance for these environmental concerns, the financial sector must develop new financial solutions and target industries to reduce CO2 emissions with the help of green technology. Pakistan's government is concerned about reducing environmental change effects because the country is one of the most sensitive to the effects of climate change. As per the discoveries, populace and GDP per capita are the essential factors emphatically affecting the expansion in CO2 discharges, though carbon power is adverse ly impacting the increment in CO2 emanations. The impacts of expanded energy force and the replacement of petroleum products are blended. Over time, the positive advantages of GDP per capita and populace offset the adverse consequences of carbon power and the combined impacts of energy force and primary/petroleum derivative replacement. The proficiency of carbon power in lessening discharges requires executing a carbon charge, which is an effective technique of diminishing future energy-related CO2 emanations in Pakistan. Rather than energy structure change, energy protection ought to be the essential method for bringing down energy power.

Thank you for your attention

哈尔滨工程大学