

# Interactive Role Of Climate Change On Economic Growth

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## ABSTRACT

Climate change is a very uncertain and complex external phenomenon that affects the economic growth. The purpose of this paper is to study the role of climatic changes on economic growth globally as the climate effects are very crucial to evaluate the economic growth. Climate change has significant effects on the economy hence on the economic growth. In order to study the effect of climate change, all the effects of climate change will be discussed followed by the factors of economic growth and their interactive effect will be analyzed.

**Keywords :** Climate change; Economic growth

## 1 INTRODUCTION

THERE exists an intricate connection among climatic change and economic growth. Sudden changes in climate have enough power to de-stabilize the economic growth from its desired level. With the benefits involved in climate change there are hazards and susceptibilities too. The countries should take this aspect of climatic change into the consideration by developing an adaptation towards climate change.

## 2 LITERATURE REVIEW

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### 2.1 Economic Groth and Climatic Changes

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As studied by (David E. BLOOM and Jocelyn E FINLAY 2009), [4] Ingenuousness in the occupation of trade, extraordinary ratio of savings and , human resources growth, and macroeconomic strategy besides other factors donate substantially towards human capital investment also plays a vital role, it includes many factors and education is one of them, like for example as stated by (D.W. Cheek, 2001) education encompasses numerous segments including [7] ,educational institutes from low to high level education, learning system through sub-ordinates, job based training workshops. The efforts done by the organization or state to invest on learned and experienced as well knowledgeable people is positively related to economic growth. In the paper of (Roberto Perotti, 1993), he proposed a model with the basic concept that, fair dissemination of income is encouraging to elevate the growth

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and productivity at different stages of per capita income. The primary and fair forms of distribution of income are related to balanced political environment as a result the level of growth is uplifted. [9] In another model, presented by (Alberto Alesina and Dani Rodrik, 1994) it is advocated [10] with help of proven results that with an increase in The Approach towards investment and production capacity is also influencing factors for economic growth. Taking the production side, like for example agricultural productivity, as studied by (Kiminori Matsuyama, 1992) the agricultural productivity has an affirmative influence on economic growth in case of closed economy rather than in an open economy. [6]

According to the empirical analysis done by (Sajid Anwar and Arusha Cooray, 2012) in the South Asia region, financial development has contributed to an increase in the benefits of foreign direct investment and also improvement in political rights and civil liberties has enhanced the benefits of financial development. [12]

Culture has a powerful influence on the economy's growth. As stated by (J. Haavard and Maridal, 2013) there are two channels through which culture affects economic performance, [13] the first one is cultural behaviors that stimulate individual inspiration and behaviors that improve societal capital in the population".

As far as climate change is concerned, According to (Richard S.J. Toll, 2009) climatic change is a long-term problem and it's a mother of all externalities. In his research on greenhouse effect in 2000, the carbon dioxide emissions alone were 24 billion metric tons. He stated that one cannot have cheap energy without carbon dioxide. [15]

As a result of an increase of greenhouse emissions in terms of gases to the atmosphere, the global climate changes with respect to altering of temperature, rainfall patterns and other weather condition as well. In the book edited by (Joel B. Smith and Dennis Tirpak, 1989) it is stated, as estimated by National academy of sciences due to global warming the concentration

of carbon dioxide doubles which was above preindustrial levels and the increase was 1.5 degree C to 4.5 degree C (1979). According to them greenhouse gasses emissions dominant effects will be observed not until 2050. Although sudden and abrupt variations in oceanic movements can cause extreme changes in the global climate. [16]

### 3 EFFECTS OF CLIMATE CHANGE

The effects of climate change are very powerful as they can alter the balance of life of any region or country depends upon the ratio of their variability. Climatic change can be gradual as well as abrupt. The existence of various plants and animal species is also dependent on climate change. Greenhouse has an effect in terms of emissions of gases.

According to (Richard S.J. Toll, 2009) the production of carbon dioxide due to greenhouse affects fossil fuel combustion. [15] In the book edited by (Joel B. Smith and Dennis Tirpak, 1989) 50 studies were conducted to examine the greenhouse potential impacts on the following areas of US (the Great Plains, California, the Great lakes, the Southeast and) because of their hydrological, climatological, and biological diversity. Some of the results showed that the

1. Basic water and food necessities in US could be easily met due to the adaptability.
2. Regions having high economic value can be easily protected from high sea-level rise.
3. The cost and difficulty would increase with the abrupt change and vice versa.
4. High temperature (due to global warming) can cause earlier snowmelts and can completely cover the low lying areas. [16][13]

The water resources depreciation issue is a critical issue, which is no doubt a stressful concern due to the climatic changes. According to (Eric Beinhocker, Ian Davis, and Lenny Mendonca, 2009, pg. 1) in 2030, [1]

1. Global rate of GDP around 40% and
2. Population of world approximately 80%

will be in regions where there will be enough water supplies.

Climate change is a kind of challenge for sustainable economic growth. The countries having low adaptability with the climate change are adversely affected in terms of their economic growth. (Riedo et al., 2000, 2001) stated the results of a particular region taken for the case study and the results showed a decrease (under specific climatic changes) in Timber growth in the forest region and the results were consistent with the studies in past. [21] [22] (Briner et al., 2012, pg. 58) advocated that the production level of crops was initially constrained as the temperature got low and less affected by low levels of moisture in the soil. [23] Also, Upcoming changes in terms of land usage are forecasted to be affected by environmental variations due to climate change associated alterations in prevailing situation of an economy. By evaluating the climate change effects on an eco-system and the goods and chattels as well as services offered by them, it is crucial to understand their dynamic links.

### 4 FACTORS AFFECTING ECONOMIC GROWTH

Economic growth is affected by many factors like economic, political, social, cultural, technological and climatic factors as well. All the major factors effecting growth of an economy will be discussed by considering their sub factors.

Economic factors along with the non-economic factors both contribute towards the growth of an economy.

Infrastructure is the backbone of any country. Networking of communication channels, role of banking sector, ports, stock markets, educational institutes; they all contribute towards infrastructure of a country. If all the components of an infrastructure are well-managed than the infrastructure would be one of the reasons for the economic growth contributing in a positive way.

Government plays a decisive role in the equal distribution of wealth. Distribution of income is one of the parts of government policies in the wealth distribution. The inequality of the distribution of income in the long run ultimately affects the economic growth (Simon Kuznets, 1955). [2]

The development of infrastructure, law and order situation and investment trends greatly depends on the government policies. According to the growth of private sector development is greatly affected by government policies.

If the banks, stock markets and other financial institutions are working well enough then they all will contribute as one of the reasons affecting economic growth positively. In the view of (Ross Levine and Sara Zervos, 1998) in the long run the if the banks, stock markets in terms of liquidity are functioning well, that is a positive sign for the economic growth encourages the rate of high return projects which in turn increase productivity will have positive effects on economic growth. [3] On the other hand financial crisis contributes negatively. According to (Eric Beinhocker, Ian Davis, and Lenny Mendonca, 2009, pg. 1) during the phase of financial crisis there is a sharp rise of prices followed by a sharp decline for example in 2009 there was approximately a decrease of crude oil price from \$140 to \$40 per barrel in six months of time. [1]

Financial crisis highly affects the investment process and the production capacity as well as a result there would be a negative on economic growth. The sustainable growth depends upon many factors. According to (Stanley Fischer, 1993) during the phase of rising prices, major economical shortfalls and biased foreign exchange marketplaces are undesirably associated with the growth of an economy. Additionally, inflation lessens growth by dropping investment and yield growth; financial plans deficits also shrink both, the capital accumulation and productivity growth. [8]

Political instability is a vital factor that can have an impact on the development of an economy. As investigated by (Alberto Alesina, Nouriel Roubini, Sule Özler, Phillip Swagel, 1996) uncertainty of political situations are well-defined as the susceptibility of a government downfall. [10] According to them the political instability and economic growth can be mutually estimated and the countries with an extraordinary government collapse the growth those countries is considerably low. In the paper of (Ari Aisen and Francisco José Veiga, 2013) they empirically showed the effects of politically unpredictable

bility on economic growth by taking

1. Their sample consisted of 169 countries
2. Time period was almost 5 years (1960 to 2004).

Lower growth rates were observed in terms of GDP per capita in those countries where there was high level of political instability. Concerning the networks of broadcast, they found that political uncertainty unpleasantly affects growth by dropping the rates of growth efficiency. [11]

Other than the factors discussed above, globalization also has an impact on economic growth, as stated by (Henryk Gurgul and Łukasz Lach, 2014, pg. 106) high levels of GDP and increase in globalization are positively related to each other, other significant research issues concerned with globalization have already been profoundly observed, and researchers are still working to get more evidence to link globalization with economic growth. [20]

## 5 ROLE OF CLIMATE CHANGE ON ECONOMIC GROWTH

The economic influence of climate variation or change is mostly defined as the degree to which the social well-being is affected by the climate change. (Samuel Fankhauser and Richard S.J. Tol, 2005, pg. 1). [24]

Climate change is a very critical and complex environmental change. It affects many factors of economic growth. Climatic change is complex and uncertain due to its diverse consequences.

Economic analysis with respect to climate change is an important issue to be focused nowadays. The continuous emissions of gases is causing the temperature of the earth to get warm but as we all know that climate never stay stable and the abrupt changes makes it more complex, as a result the effects can be seen on the economy. As stated by (Robert S. Pindyck, 2012) on the basis of theoretical and empirical grounds that global warming can have a permanent impact on future GDP. According to him certain effects of global warming can be everlasting like annihilation of ecosystems from erosion and overflowing of water, widespread eradication of species of different kinds, and mortality rate due to extreme weather conditions. There is a speculative backing for a growth rate effect. The need of the availability of the resources to overcome the influence of warming will decrease those accessible for other expenditures therefore will have an effect on growth by reducing it considerably. There is an empirical support for a growth rate effect. [18] [19]

By using past records on temperatures and rainfall, for the time frame of 50 years including 136 countries, (M. Dell and B.F. Jones (2008) have shown that GDP growth rate can be get lower with the increase in temperature but the overall level of GDP will not be affected. The calculated effect was decline of 1.1% points of progress or growth for each 1°C rise in temperature (substantial mostly for the countries already having low growth rates). [18] [19]

In addition to the direct contributions of transnational corporations to greenhouse emissions, as mentioned above, globalization may also exacerbate climate change by fostering more rapid development and consequently higher levels of

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fuel consumption by consumers throughout the world. Conversely, policies intended to control greenhouse emissions may indirectly promote globalization, as industries shift location to avoid enforcement of new emissions standards in certain countries (Karen L. O'Brien and Robin M. Leichenko, 2000). [25] [23]

According to the study conducted by (Torben K. Mideksa, 2010, pg. 278) the progress and development of an economy is more tougher due to the changing patterns of climate as the farmed output could be low, in agricultural regions for example it happened in the case of Ethiopia, by lowering its gross domestic product with the ratio of 10 percent as compared to its equilibrium level and with the increase in the ratio of income inequality by almost 20% which will cause economic growth to decrease. [27]

## 6 ADAPTATION TO CLIMATE CHANGE

For the adaptation with the climate change only an inspiration is not enough. Countries should keep them equipped with all the measures of adaptation, which has benefits in the short and long run as well.

An inclination of adaptation towards climate change should be the integral part of the strategies used for economic growth, as stated by (W. Neil Adger, Nigel W. Arnell and Emma L. Tompkins, 2005) to get facilitation and support in case of terrible effects of climate change, the nation should overall develop the capability of adaptation. The scope of adaptation can be executed in provision for or in reaction to the effects caused by a climate change. [26]

## 7 CONCLUSION

The economic growth in a particular country or a region is greatly affected by many factors as discussed above but apart from other factors the climate change also significantly influences the economic growth negatively or positively. The climate change contributes to develop an environment which combined with other factors shall play a substantial role by deviating the graph of an economic growth. The effects of climate change, specifically natural disasters, tend to disturb the smooth functioning of chain contributing towards the economic activity. In order to cope with the climate change so that it will not affect the growth of an economy substantially, the countries should follow the guidelines given by environmental agencies and should be fully equipped to handle natural calamities to avoid vulnerabilities.

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