**International Journal of Innovation Scientific Research and Review**
*Vol. 04, Issue, 06, pp.2956-2960, June 2022*
*Available online at http://www.journalijisr.com*
*SJIF Impact Factor 4.95*

**Research Article**

**ISSN: 2582-6131**

# IMPACT OF NATURAL DISASTERS ON THE ECONOMY OF AFRICAN COUNTRIES

***Assaad GHAZOUANI**

Lecturer in Economics, LVPNC, FSJEG, University of Jendouba.

**Received 10th April 2022; Accepted 11th May 2022; Published online 29th June 2022**

**ABSTRACT**

The frequency of natural disasters has increased significantly in recent years. In many economically weak countries in Africa, destructive natural events threaten people's lives. Unpredictable disasters such as floods or earthquakes have devastating consequences on the populations and economies of these countries. based on a bayesian spatial model Propensity score matching model we tried to determine the possible impacts of natural disasters on African countries. the results showed a negative and significant impact of natural disasters which led to a decrease (35% of GDP) over the entire period for the affected countries. For countries that did not experience extreme weather conditions, GDP increased by (1.43%).

***Keywords:*** Natural disasters, African countries, BSPSM, Climate change.

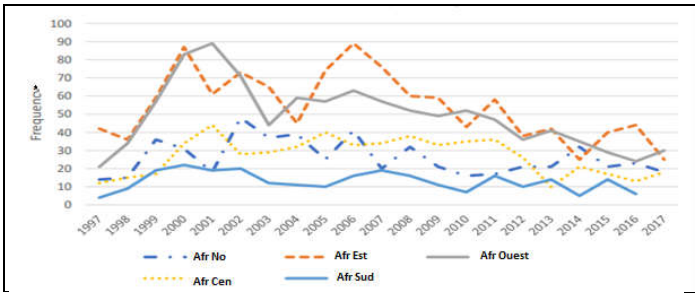
## INTRODUCTION

The African continent has seen its fair share of natural disasters historically and in contemporary times. The effect of natural disasters on economic growth has given rise to useful but inconclusive debates in the literature. Different studies have found positive, negative or not at all significant effects in certain cases of disasters on growth. This makes the question of the impact of natural disasters on the growth of an economy a purely empirical question and more. The occurrence of a natural disaster in any part of the world is disturbing. Individual countries, regional bodies and other groups have become more concerned with the experiences of natural disasters, wherever they occur, and have become more involved in helping to cope with the ramifications of these disasters on people. disaster scene. This is proof of the importance that the world economy attaches to natural disasters. Although the occurrence of natural disasters goes back to history, contemporary times have seen their own share of disasters. Recent experiences of natural disasters around the world include the 2011 earthquake that hit northeastern Japan with a magnitude of 9.0. The confirmed death toll according to the country's reconstruction agency stood at nearly 15,900 people in 2016, with many more missing. The 2010 earthquakes in Haiti and Chile, the 2004 Indian Ocean tsunami and the devastating Hurricane Katrina in 2005 are other examples of disasters that have occurred in recent times. These natural disasters, along with many others, usually result in the loss of human life and property causing economic and social damage to countries that suffer from such disasters. Data from the Emergency Events Database (EM-DAT), for example, suggests that flood-related disasters over the past two decades have resulted in economic losses of around $662 billion worldwide. In Africa, there have also been experiences of natural disasters. In August 2017, three days of heavy rains caused flooding and landslides in Sierra Leone, in which more than a thousand people died and many went missing. The 2011 drought that hit East African countries Kenya, Eritrea, Ethiopia, Somalia and Djibouti has been described as the worst drought ever in these countries in addition to 60 years. A volcanic eruption in Eritrea in 2011 and severe flooding in southern Africa in 2011 are just a few examples of the many natural disasters Africa has recorded in its recent history. While natural disasters in general have been a source of major concern, conclusions about their economic implications at disaster sites are far from definitive. The inconclusive nature of the results on the economic implications of natural disasters is confirmed by Klomp (2016) who postulates that while around 25% of studies on this subject report a negative effect of disasters on real GDP per capita figures, 15% report the opposite. Data from the literature show that natural disasters can impact economic growth through variables such as capital accumulation (Leiter *et al.,* 2009); trade (Gassebner*et al.,* 2010; Oh and Reuveny, 2010) and employment (Umezawa, 2014).Some studies report that natural disasters positively affect economic growth (Albala-Bertrand, 1993; Skidmore and Toya, 2002; Ahlerup, 2013), others report that natural disasters negatively affect economic growth (MacDermott *et al.,* 2014; Klomp, 2016) and others find no effect at all (Guo*et al.,* 2015).The misuse of these results may be well rooted in growth theory. On the one hand, since natural disasters usually result in the loss of human life and property, production inputs, including physical and human capital, are reduced, which reduces the productivity and production capacity and hence , an expected drop in economic growth. On the other hand, attempts to rebuild an economy that has suffered from a natural disaster can lead to better structures and systems as well as the introduction of improved technologies that tend to improve productivity and, for example, improve productivity. subsequently, to increase economic growth. Since both schools of thought are valid, the conclusion of the impact of disasters on a particular economy or region is purely empirical. It is with this in mind that our study attempts to empirically measure the effect of natural disasters in Africa on Africa's economic situation. Previous studies have looked at specific disasters (Shabnam, 2014 [floods]; Cavallo*et al.,* 2013 [earthquakes, floods and windstorms]; Strobl, 2012 [hurricanes] etc.) or have studied together countries in different parts of the globe with different characteristics. Loayza *et al.,* (2012) observed that economic growth in developing economies is more sensitive to disaster shocks with large-scale impacts. The above assertions make a study like this for the one African continent that is mostly made up of developing economies relevant to literature.

***Corresponding Author: Assaad GHAZOUANI,**
Lecturer in Economics, LVPNC, FSJEG, University of Jendouba.

Current data from the International Monetary Fund (IMF) shows that the African region has an average GDP per capita at current prices of US $1,990, with most of these countries in the region being developing countries. It is estimated that over 90% of disasters occur in low-income countries (Klomp, 2016) and that they are more affected by these natural disasters in terms of economic losses as a larger share of their GDP is affected compared to developed countries; whose economic losses, even though they may be enormous in absolute terms, may represent a relatively smaller share of their total output. Another important contribution of this study is the different ways in which we look at the natural disaster variable. Among other measures, we also examine the intensity of the disaster.

**Figure 1. Disasters in Africa by region**




**Source:** EM-DAT

Figure 1 shows the trend of disaster occurrences in Africa by sub-region over the past two decades. From the figure, it can be seen that on average, the Southern African region recorded the fewest disaster occurrences over the period, followed by countries in the North African region. With the exception of 2000, 2004, 2010 and 2014, the East African region appears to have recorded the highest number of disasters over the period. It should be noted, however, that the East Africa region has the highest number of countries in its membership, while the Southern Africa region has the fewest countries in its membership. This could possibly be responsible for the differences in the total number of occurrences in the sub-regions. Despite this, the figure reveals that the entire African continent has seen its fair share of disasters. These disasters include droughts, floods, fires, the spread of bacterial and viral diseases, tsunamis, explosions, cyclones, among others.

## LITERATURE REVIEW

Skidmore and Toya (2002) examined the relationship between disasters, capital accumulation, total factor productivity, and economic growth in a multi-country study. They noted that climatic events had a positive relationship with economic growth while geological events had a negative relationship with growth. Overall, they found a positive relationship between natural disasters and growth. Guo*et al.,* (2015) conducted a study to examine the impact of disasters recorded in 30 provinces of China on economic growth. Although the meteorological category of disasters has been found to promote growth through human capital, disasters have not had a significant overall impact on economic growth. The two studies by Skidmore and Toya (2002) and Guo*et al.,* (2015) suggest that, thanks to human capital, natural disasters can have a positive impact on economic growth. The first study further emphasizes total factor productivity as a channel through which increased economic growth can result from natural disasters. However, this latest study reveals that, overall, disasters do not have a significant effect on growth. This is in agreement with the study by Cavallo *et al.,* (2013) discussed below.

Cavallo *et al.,* (2013) used data from 196 countries to examine the impact of what they called "catastrophic" natural disasters on economic growth. They found that when controlling political changes, even extremely large disasters did not have a significant effect on economic growth. In the absence of such controls, they found that only extremely important events had a negative effect on growth.In a study by MacDermott *et al.,* (2014), they show that natural disasters negatively affect economic growth, especially in low-income countries. Indeed, these poor countries tend to have poor financial sector development, making it difficult to secure the large investments needed to replace physical capital and infrastructure lost as a result of extreme disasters. In the case of rich countries, however, they argue that there may be a temporary decline in output in the aftermath of the disaster, but that access to credit and increased investment will put these economies back on track. long-term growth unlike poor countries. Shabnam (2014) find that the number of people affected by floods has a negative effect on economic growth while death rates do not have a significant effect on growth. The study found that for 0.1% of the population affected by the floods, there is a decrease in GDP per capita of 0.005% and this was attributed to the fact that the most obvious effect of the floods is destruction livelihoods of those affected. Klomp (2016) examined the effects of natural disasters on economic development using nighttime light intensity as a measure of economic development, and found a negative relationship between these variables. He further found that climatic and hydrological disasters are more important determinants of development in developing countries, while for advanced economies the most important determinants were disasters of the geophysical and meteorological class. He considered that the degree of financial development of a country as well as the quality of political institutions were relevant in partially explaining the impact of disasters. MacDermott *et al.,* (2014) point out that the level of financial sector development is a determining factor in the effect that disasters could have on economic growth. This highlights that when examining the effects of disasters on economies, it is important to study economies with similar characteristics together rather than grouping together economies with different economic characteristics in a single study. Strobl (2012) examined the effects of hurricanes on the growth of developing economies in the regions of Central America and the Caribbean. The paper argues against investigating the impacts of disasters without paying special attention to the region within which disasters occur due to the fact that different geographic regions suffer from different probabilities of experiencing a disaster for which it only focuses. on the geographic region used for its study. After taking into account the specific economic conditions of each country and the time of the disaster, the author finds that on average, a hurricane took a loss of 0.84 percentage point in the growth of production in the area d 'study. Felbermayr and Groschl (2014) also showed in their study of over 100 countries that natural disasters have unequivocal negative effects on growth. They find that a disaster in the first percentile of the disaster index results in a reduction in GDP per capita of almost 7% at a minimum, resulting in a reduction of 0.46% in GDP per capita. They argue, however, that factors such as stronger institutions, greater trade openness and greater financial openness help reduce the negative effects of disasters on growth by accelerating the process of economic recovery.

## METHODOLOGY

### model

We estimate the following empirical specification :

$$Y_{it} = \alpha + ID_{it} + AP_{it} + X_{it} + \gamma_i + \varepsilon_{it}$$

Where :

- $\boldsymbol{Y_{it}}$is GDP, which is used as an indicator of economic growth.
- $\boldsymbol{ID_{it}}$: the intensity of disasters, We use all types of disasters, including droughts and floods.
- $\boldsymbol{AP_{it}}$: the number of people affected
- $\boldsymbol{X_{it}}$ : Control variables such as trade openness, population and capital investments
- $\boldsymbol{\gamma_i}$: country-specific effects, regulating unverified heterogeneity between countries.
- $\boldsymbol{\varepsilon_{it}}$ : error term

**Description of the data**

Most studies on the effects of natural disasters on growth (Loayza *et al.,* 2012; Felbermayr and Groschl, 2014; Dell *et al.,* 2012) have used the Emergency Events Database (EM-DAT) provided by the Center for Research on the Epidemiology of Disasters. (CRED).This study also uses this data for our disaster variables. EM-DAT is compiled from a variety of sources including UN agencies, non-governmental organizations, national governments, insurance companies, research institutes and news agencies. There are over 22,000 disasters in EM-DAT, ranging from natural disasters to technological disasters. For an event to be classified as a disaster in the EM-DAT, it must meet one of the following criteria: 10 or more people would have been killed, 100 people or more would have been affected, the state of emergency has been declared or international assistance has been called for. We also include some control variables used in related papers by Loayza *et al.,* (2012) and Felbermayr and Groschl (2014). These authors use a set of structural and domestic policy variables. Structural factors include variables such as total population (variable of the size of the economy), and trade openness (defined as imports plus exports divided by GDP). Capital investment (defined as gross fixed capital formation) is used as an indicator of a country's domestic policy. Data on control variables such as population, trade openness and private equity are taken from World Bank indicators. The study uses unbalanced panel data covering 54 African countries. Data cover the period 2006-2017.

**bayesian spatial Propensity score matching model**

The BS-PSM technique is used to measure the impacts of natural disasters. In this model (t) represents a binary vector (nx1) which reflects the presence or absence of a climatic phenomenon (in our case drought) in the 54 African countries. A spatial error model (SEM) is used to determine the spatial dependence between countries. This matrix captures the spatial shocks auto correlated with the error term$\varepsilon$.

Let the binary vector t:

$$\begin{cases} \mathrm{t} = \mathrm{X}\beta + \varepsilon \\ \varepsilon = \rho\mathrm{W}\varepsilon + \upsilon, \upsilon \sim \mathrm{N}(,\sigma_{\upsilon}^{2}\mathrm{I_n}) \end{cases} \quad (2)$$

With X represents a matrix (n × k) with k the control variables for the n countries. W is a stochastic square matrix of (n x n) countries and $\rho$ the spatial correlation coefficient,

$$\mathrm{X} = \begin{bmatrix} \mathrm{x_{11}} & \cdots & \mathrm{x_{1p}} \\ \vdots & \ddots & \vdots \\ \mathrm{x_{n1}} & \ldots. & \mathrm{x_{np}} \end{bmatrix} \quad (3)$$

a likelihood function for an SEM model is,

$$\mathcal{L}(\mathrm{t}, \mathrm{W}|\beta, \rho, \sigma_{\upsilon}^{2}) = \frac{1}{2\pi\sigma_{\upsilon}^{2n/2}} \mid \mathrm{I_n} - \rho\mathrm{W}|\exp\left\{-\frac{1}{2\sigma_{\upsilon}^{2}}\varepsilon^{'}\varepsilon\right\} \quad (4)$$

with $\varepsilon = (\mathrm{I_n} - \rho\mathrm{W})(\mathrm{t} - \mathrm{X}\beta)$.

On the basis of the matching estimators resulting from the probabilities calculated by the spatial error model (SEM) we compared the regions affected by a natural disaster with the unaffected regions.

The estimated probabilities of the spatial probit model are represented by $\hat{\mathrm{p}} \coloneqq \mathbb{P}(\mathrm{t_i} = 1) = \mathrm{f}(\hat{\rho}\mathrm{W}\varepsilon, \mathrm{X}\beta)$. The nearest neighbor matching estimator between treated and untreated regions is represented by:

$$\mathrm{C_{nn}}\widehat{\mathrm{P}} = \min_{\mathrm{j}}||\widehat{\mathrm{P}_{\mathrm{i}}} - \widehat{\mathrm{P}_{\mathrm{j}}}|| \qquad \mathrm{with} j \in \mathrm{n_0} \quad (5)$$

where$n_0$is the group of untreated (unaffected). In this pairing we will compare the score of an affected region (i) to the scores of other unaffected regions (j) with the objective of finding a treated region with a similar score to untreated regions.

The method for estimating the spatial mean effect of treatment (SATE) is as follows:

$$\mathrm{SATE} = \partial_{\mathrm{u}} = \boldsymbol{\mathcal{M}}\ (\mathbf{t}, \mathbf{W}, \mathbf{X}, \mathbf{y}, \boldsymbol{\Theta})$$

$$\mathrm{E_{W,\ \Theta}}\{(\mathrm{y_i}|\mathrm{t_i} = 1, \mathrm{X_{1i}} =, \ldots\ldots, \mathrm{X_{pi}} = \mathrm{x_p}) - (\mathrm{y_i}|\mathrm{t_i} = 0, \mathrm{X_{1i}} =, \ldots\ldots, \mathrm{X_{pi}} = \mathrm{x_p})\} \quad (6)$$

with y represents a dependent variable, $\boldsymbol{\mathcal{M}}\ (.)$ is a matching function and $(\beta, \rho, \sigma_{\upsilon}^{2}) \in \Theta$is a vector of parameters of the spatial model. The formula for calculating the SATE model estimate is as follows$\{\hat{\mathrm{p}}^{(1)}, \hat{\mathrm{p}}^{(2)}, \ldots\ldots, \hat{\mathrm{p}}^{(\mathrm{g})}\}$ using a (g) sample of $\mathbb{P}(\beta^{(\mathrm{g})}, \rho, \sigma_{\upsilon}^{2})$ and $\mathbb{P}(\rho^{(\mathrm{g})}|\beta, \sigma_{\upsilon}^{2})$ of the spatial probit model; therefore:

$$\mathrm{C_{cs}}(\hat{\mathrm{p}}^{(\mathrm{g})}, \mathrm{W}) = \min_{\mathrm{j}}||\hat{\mathrm{p}}^{(\mathrm{g})} - \delta_{\mathrm{j}}\hat{\mathrm{p}}_{\mathrm{j}}^{(\mathrm{g})}|| \quad (7)$$

and the density of the SATE is g = 1…G , -runs of the MCMC sampler:

$$\{\mathcal{M}\ (\mathrm{t}, \mathrm{W}, \mathrm{X}, \mathrm{y}, \Theta^{(\mathrm{g})})\}_{\mathrm{g}=1}^{\mathrm{G}} \quad (8)$$

The standard error of the mean treatment effect should be adjusted in order to remedy the uncertainty problem at the level of the first stage of the score estimation (Gelman and Hill, 2007). Using Bayesian methods results in positive standard errors. in small data samples, maximum likelihood produces biased estimators. This problem is corrected by using a Bayesian estimate with informative priors.

## RESULTS AND INTERPRETATION

**descriptive statistics**

We define our first disaster variable as a dummy variable indicating the occurrence or non-occurrence of a disaster. We take the value of a disaster that has occurred at least once a year in a country. The variable number of deaths is defined as the number of deaths and missing persons. The number of people injured, affected and left homeless as a result of the disaster is indicated by the variable, people affected. On average, around 250,000 people are affected by a disaster in Africa, of which around 449 people die or go missing. We also construct a variable called disaster intensity to measure the intensity of a disaster. This variable is defined as the ratio of the number of people affected and left homeless (affected people) to the population of a country.

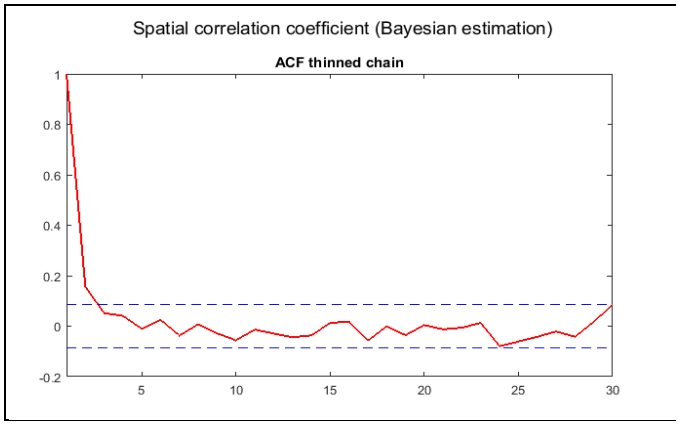
**Tableau 1.descriptive statistics**

| Variable | unité | Obs | Mean | Std. Dev. | Min | Max |
|---|---|---|---|---|---|---|
| GDP | USD | 597 | 4.17e+10 | 2.17e+10 | 1.00e+10 | 9.11e+10 |
| POP | 1000 | 597 | 1.68e+07 | 1.49e+07 | 1465603 | 4.34e+07 |
| TO | % | 597 | .000051 | .0000107 | .0000244 | .0000773 |
| GFCF | USD | 597 | 6.66e+09 | 1.81e+09 | 1.35e+09 | 9.93e+09 |
| ID | Ratio | 597 | .1960101 | 3.558724 | .001 | 87 |
| AP | 1000 | 597 | 814759.4 | 1935905 | 3 | 2.30e+07 |
| T | binary | 533 | 0.5254 | 1 | 0 | 1 |

### Autocorrelation test

The dotted horizontal line on the graph resulting from the "ACF" function indicates the critical threshold beyond which the correlation is considered significant. Indeed, under the assumption of independence, the cross-correlation of the series (of the same size n, and of the same mean and standard deviation) will in 95% of cases be included in the interval. Figure 1 shows the lack of a correlation relationship between the variables.

**Figure 2. Autocorrelation test**




### BS-PSM quasi-expérimental algorithme

The results of this study first of all show that in the short and long term, GFCF, the affected population and the intensity of disasters have a negative and significant impact on GDP. Poor countries have suffered significantly from the negative effects of natural disasters. The BSPSM methodology used for matching (Figure 2) showed a negative and significant impact of disasters which led to a decrease (35%) over the entire period for affected countries. For countries that did not experience extreme weather conditions, GDP increased by (1.43%).These results are approved by the panel regression which gave similar coefficients. Table 1 of the estimate shows a negative and significant impact of GFCF, the affected population and the intensity of the disasters. An increase in disasters leads to a drop in GDP of 30%, the number of people affected also reduces GDP by 4%.

**Figure 2: average effect of disasters on GDP**

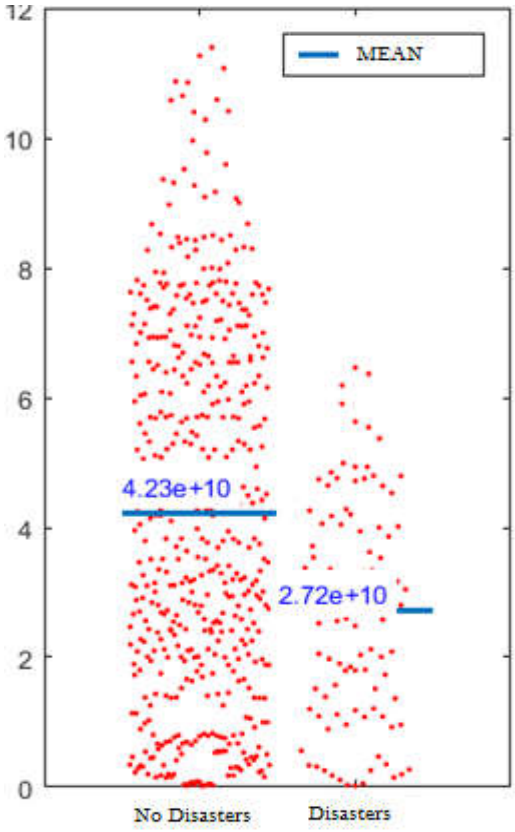



**Table: SPM estimate**

| Covariate | Posterior mean | 95% credible interval | |
|---|---|---|---|
| C | -1.100170 | -2.899575, | 0.5481 |
| POP | 0.11827 | 0.03625, | 0.0200 |
| TO | 0.08268 | 0.000003, | 0.167 |
| GFCF | -0.002914 | -0.028779, | 0.0272 |
| ID | -0.30521 | -0.024728, | 0.37 |
| AP | -0.04042 | -0.015866, | 0.071 |
| $R^2$ | 21.59% | | |

Figure 2 shows the range of the impact of variables on GDP. Disasters have an impact that varies between (-0.024728) and (0.37). The impact of the affected populations varies from (-0.015866,) and (0.071).

**Figure 2. Range of impacts on GDP**

## DISCUSSION

Over the past decades, researchers have attempted to better understand the effects of disasters on economic growth. This is the case due to the steady increase in disasters over the past decades. The purpose of our brief is to establish the real effects of the growth of disasters to help inform decision-makers about the benefits of disaster risk reduction and mitigation. New interests in this area have led to inconclusive results regarding the effects of disasters on growth. So bringing us new evidence on the effects of natural disasters on growth in the case of Africa. We have used different measures of disasters to better understand the effects of disasters on different types of growth in Africa. The regression results show a significant negative effect of natural disasters on economic growth. We also find that the growth effects of disasters are broadly robust for different disaster measures such as disaster intensity and death toll. Our results also show that the catastrophe effect appears and persists in periods after one year. Although our results suggest that immediate and proactive responses were taken to reduce the long-term impacts of disasters on growth in most African countries, judging by the magnitude of the coefficients of the variables, we recommend a more robust to mitigate the effects of disasters, especially in the agricultural sector. Agriculture is the largest economic sector in Africa employing over 60% of the workforce. Therefore, any major catastrophic shock without an immediate policy response in the sector will have major impacts not only on the agricultural sector, but on the economies of African countries as a whole. In the future, the agricultural sector should be modernized in order to resist the effects of natural disasters on the growth of agricultural value added and economic growth as a whole.

## CONCLUSION

The effects of climate change, mainly sea level rise, severe weather phenomena, floods and droughts are likely to lead to the deterioration of natural resources (most of the inhabitants of poor or developing regions derive their means from them. subsistence), an upsurge in vector-borne diseases, food shortages and damage to infrastructure. People and poor countries will be negatively affected differently by climate change. The evolution of greenhouse gas emissions and the capacity to adapt are influenced by the development choices made today. As climate change is itself impacted by the various development choices, it constitutes a threat to development objectives. Traditional development may in some cases unintentionally increase global vulnerability. For example, the construction of new roads and highways resistant to various extreme climatic events, and taking into account its future evolution, could favor the expansion of existing cities even if they are aware of the scale of the threat or the implantation. new human settlements in various areas extremely exposed to devastating climatic effects, mainly in coastal areas threatened by rising sea water, it is a bad adaptation. In order to avoid this maladaptive trap, it is essential that most countries integrate appropriate adaptation measures into development projects, plans and policies, and systematically assess their degree of vulnerability and risks. climatic. Unfortunately many development projects, plans and policies do not take into account climate variability and change.

## REFERENCES


1. Ahlerup, P. (2013). Are natural disasters good for economic growth? Working papers in Economics No 553. University of Gothenburg. ISSN 1403-2465
2. Albala-Bertrand, J. M. (1993). Natural disaster situations and growth: A macroeconomic model for sudden disaster impacts. World Development 21 (9): 1417-1434
3. Cavallo, E., Galiani, S., Noy, I. and Pantano J. (2013). Catastrophic natural disasters and economic growth. The Review of Economics and Statistics, 95(5): 1549-1561
4. Dell, M., Jones, F.B., and Olken, A. B. (2012). Temperature shocks and economic growth: evidence from the last half century. America Economic Journal: Macroeconomics, 4(3): 66-95.
5. Felbermayr, G., and Groschl, J. (2014). Naturally negative: The growth effects of natural disasters. Journal of Development Economics, 111: 92-106.
6. Gassebner, M., Keck, A. and Teh, R. (2010).
7. Shaken, not stirred: The impact of disasters on international trade. Review of International Economics 18(2): 351-368.
8. Guo, J., Liu, H., Wu, X., Gu, J., Song, S. and Tang, Y. (2015). Natural disasters, economic growth and sustainable development in China—An empiricalstudy using provincial panel data. Sustainability 2015 (7): 16783–16800
9. Klomp, J. (2016). Economic development and natural disasters: A satellite data analysis. Global Environmental Change 36: 67-88
10. Leiter, A. M., Oberhofer, H. and Raschky, P. A. (2009). Creative disasters? Flooding effects on capital, labour and productivity within European firms. Environmental Resource Economics 43: 333-350.
11. Loayza, N., Olaberria, E., Rigolini, J., and Christiaensen, L. (2012). Natural disasters and growth: Going beyond averages. World Development 40 (7): 1317-133614
12. McDermott, T., Barry, F., and Tol, R. (2014). Disasters and development: natural disasters, credit constraints, and economic growth. Oxford Economic Papers 66 (2014), 750-773. Oxford University Press
13. Oh, C. H., and Reuveny, R. (2010). Climatic natural disasters, political risk, and international trade. Global Environmental Change 20(2010) 243-254
14. Shabnam, N. (2014). Natural disasters and economic growth: A review. International Journal of Disaster Risk Science 5: 157-163.
15. Skidmore, M. and Toya, H. (2002). Do natural disasters promote long run growth? Economic Inquiry 40(4): 664-687 15
16. Strobl, E. (2012). The economic growth impact of natural disasters in developing countries: Evidence from hurricane strikes in the Central American and Caribbean regions. Journal of Development Economics 97: 130-141
17. Umezawa, S. (2014). The great East Japan earthquake: Its damages, impacts on the labour economy and restoration measures of the government. Labour Market Impacts of Natural and Environmental Disasters. Japan Institute for Labour Policy and Training, 2014 No. 13


*********