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# The Influence of Economic Growth, Population, and Industrial Sectors on Environmental Degradation in Indonesia

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**Abstract:** Growth of the econonomic is the main problem of many developing countries (developing country) such as Indonesia itself, grasp with economic development as his instrument. It is in the form of environmental degradation that occurs as a by product that is not likely to attain many market participants even the Government though. On this simple research will be described in simple and concrete, where we restrict this research on variable environmental degradation in the form of proxy data CO2 emissions in Indonesia, economic growth, population, and industrial sectors. Whenever it is found to be the result of linear regression method with the double the result that environmental degradation occurs which by population growth and economic growth, each effect is positive and significant. However, the industrial sector showed a negative influence and significantly to degradation of the environment itself

**Keywords:** CO2 emissions, Economic Growth, Population, Industrial Sector, Environmental Degradation

## Introduction

Economic development is a challenge for many people in developing countries. One who becomes a way to embody the terms develop an economy is creating and doing development in economics such as industry sectors, agriculture, trade, and more. To achieve that, the required capital and sufficient expertise, in addition to planning and seriousness from the Government. Solow (1993) wrote down in his book, that the economic growth in the long run be influenced significantly by an increase in investment including human capital, knowledge against technology, and industrial plants and equipment. As with Indonesia, the magnitude of capital flows is an opportunity to get financing economic development.

Holdren & Ehrlich (1974) In Indonesia, shifting and expanded farming activities on the grounds that agriculture in the mountain valley can cut forest areas. Philippines shows

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logging and forest clearing. This is caused by a large population, although the percentage is declining. Zero global population growth needed for a prosperous and environmentally friendly civilization.

Undeniable as well with a lot of incoming investment, is certainly the opening of land for infrastructure development needs good roads, dams up to the factory to support the economy. So in the end at a certain point if these circumstances occur outside the control of negative externalities would be destruction of the environment (environmental degradation). In addition, the emerging economy area (area Center) will become a magnet for residents as well as outside the region will strive to be a part of the development. So it can be inferred that degradation of the environment is influenced by economic activities and also demographic events such as urbanization, population and age population (Jorgenson and Clark, 2010).

This leads to misleading conclusions that deny the complex multivariate processes-environmental, political, social, and economic- which are the root causes of environmentally induced migration and/or conflict. When people are faced with severe environmental degradation they have one of three options: (1) stay and adapt to mitigate the effects; (2) stay, do nothing and accept a lower quality of life; or (3) leave the affected area (Warner, Hamza, Oliver-Smith, Renaud, & Julca, 2010). Wang at al (2017) environmental degradation or environmental damage can lower levels of economic development. This can lower the productivity natural resources and cause a variety of problems, be it health issues as well as the comfort of living. An increase in population in recent times result in increased demand for basic needs, these conditions are increasingly causing damage to the environment gets larger. The existence of the damage one of these caused by air pollution such as emissions of CO2 factories in doing production, where high demand from market participants for a goods and services to meet the needs of life and achieve utility never over. Behind these things, environmental degradation also occurs due to a decrease in the number of broad forest (Wang and Zhao, 2015).

In this paper we critically examine the concept of the Environmental Kuznets Curve (EKC). It proposes that there is an inverted U-shape relation between environmental degradation and income per capita, so that, eventually, growth reduces the environmental impact of economic activity. The concept is dependent on a model of the economy in which there is no feedback from the quality of the environment to production possibilities, and in which trade has a neutral effect on environmental degradation (Stern, Common, & Barbier, 1996)

Sterns (2014) a critical history of the Environmental Kuznets Curve (EKC). The EKC proposes that indicators of environmental degradation first rise, and then fall with increasing income per capita. Recent evidence shows however, that developing countries are addressing environmental issues, sometimes adopting developed country standards with a short time lag and sometimes performing better than some wealthy countries, and that the EKC results have a very flimsy statistical foundation. A new generation of decomposition and efficient frontier models can help disentangle the true relations between development and the environment and may lead to the demise of the classic EKC.

In the process of achievement of the economy, and major economic activities, must use fossil fuels in its production activities. However, the use of fossil energy, or energy that can not be updated generally give a negative impact to the environment. Fossil fuel dependence towards growth is also reinforced by Zhou et al (2011) stating that due to the policy of the Government in suppressing levels of emissions with the emissions tax increase would

impact economic growth , where the emission reduction ranges on numeric 4.52-12.26 percent and resulted in a decline in GDP in the range 0.11 to 0.30 percent. Linkages can be seen from the influence of the use of fossil energy in economic growth, the emission reduction policies proven to decrease CO2 emissions reached number 34 – 47 per cent, but the undeniable result of this policy will lower the economic growth rate in the range of 2.96 percent to 8.23 per cent (Yi and Le-le, 2014).

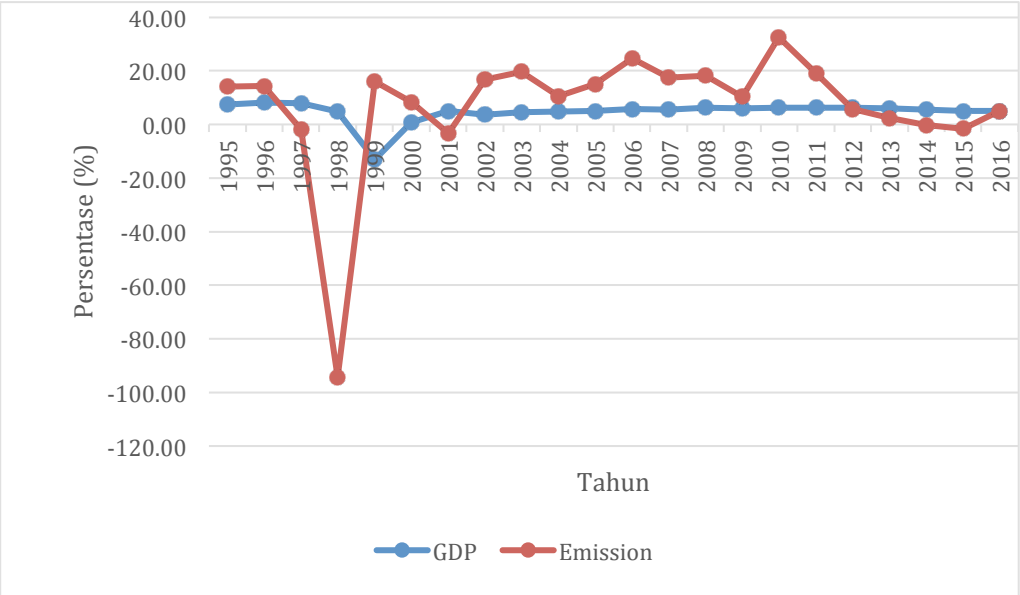
Xiumei and Ming (2011) concludes that the influential economic growth significantly to an increase in carbon emissions in industrial areas of China. Those results reinforced by studies Wang et al (2016) about the relationship of CO2 with energy consumption in several provinces in China, where economic growth is positively correlated with CO2. In the long run there is on other research, Shahbaz at al (2016) examines CO2 emissions and economic growth in Algeria, which shows the results of emissions is influenced by the energy to electricity and imports, reciprocal relationship between economic growth with CO2 emissions.

On the research of Yang et al (2017) shows as soaring economic growth by affected by the use of a fuel or energy is sourced from fossil faster than energy use of non fossil. Along with the increasing growth of energy, increase CO2 emissions. In contrast to the results in may by Ito (2017) stating that the use of renewable energy is not that in fact generate more emissions, the negative effect against economic growth.

Countries are encouraged to identify drivers of deforestation and forest degradation in the development of national strategies and action plans for REDD+. In this letter we provide an assessment of proximate drivers of deforestation and forest degradation by synthesizing empirical data reported by countries as part of their REDD+ readiness activities, CIFOR country profiles, UNFCCC national communications and scientific literature. Commercial agriculture is the most important driver of deforestation, followed by subsistence agriculture. Timber extraction and logging drives most of the degradation, followed by fuelwood collection and charcoal production, uncontrolled fire and livestock grazing. The results reflect the most up to date and comprehensive overview of current national-level data availability on drivers, which is expected to improve over time within the frame of the UNFCCC REDD+ process.

(Hosonuma et al., 2012). National and international economic policy has usually ignored the environment. (Arrow et al., 1996). Inequality in population growth can affect the uncertainty of food availability, and adversely affect the level of nutrition of the community. growing imbalance between world population and resources that support human life; The importance of water for plants; Use of fossil energy in food production (Pimentel, Huang, Cordova, & Pimentel, 1997).

Figure 1.1 **Percentage economic growth and CO2 emissions In Indonesia The year 1995 Until 2016**




Source : World bank (2017)

In Figure 1.1 visible fluctuation of percentage of economic growth and CO2 emissions in Indonesia from year 1995 up to 2015. Seen from the image of fluctuating movements of economic growth and CO2 emissions, which look like grooves that were formed from the second variable. Economic growth affect the level CO2 emissions in Indonesia. As for the rise in the growth of the economy then the CO2 emissions will directly follow the growth rate, as the impact of the activities during the process of the economy takes place. This is in accordance with the research Ashfaq et al (2016) in Journal of research write down consumption and energy (total energy, gas, oil, and coal) in the economy associated positively towards carbon emissions of CO2.

Based on the above, then the background of the formulation of the problem in this research is how to influence economic growth, population growth, and the growth of the industrial sector towards environmental degradation in Indonesia?

The purpose of this study, namely, to know the influence of economic growth, population growth, and the growth of the industrial sector towards environmental degradation in Indonesia. Inglesi & Lotz (2016) Internationally, the importance of renewable energy in the energy mix has been increasingly appreciated. The advantages of the renewable energy usage for the world's energy security and the environment are indisputable and much discussed in the literature. However, its effects on the economic welfare of the countries are yet to be examined fully and described quantitatively. The purpose of this paper is to estimate the impact of the renewable energy consumption to economic welfare by employing panel data techniques. The results show that the influence of renewable energy consumption or its share to the total energy mix to economic growth is positive and statistically significant. From a policy point of view, promoting renewable energies bears benefits not only for the environment but also for the economic conditions of the countries.

Newman (2006) This research is a case study in Sydney where urban population growth is higher compared to rural areas which has an impact on the sustainability of the ecological environment. There needs to be a study and policy about that.

## Literature Review

Development problems make many parties participate in the it, so that achieving community welfare will result in economic growth going up on its own, where economic growth is positively related to the level of community welfare in a country. It is also inevitable that which to achieve prosperity can result in other sectors or there are costs sacrificed in the form of opportunity costs, especially the environment as a result of the process of achieving economic development from a country. This is a negative externality of the environment from the productivity and development activities and economic growth itself.

According to Todaro and Smith (2011) change in land use in developing countries currently produce contribution in the global concentration of greenhouse gases (greenhouse gases), it is estimated that when deforestation can be contribute to the top 20 percent of emissions of carbon dioxide (CO2) around the world. Environmental degradation can be a result of the process of exploitation of nature such as that occurred in the process of forest encroachment, an fungsian land, drying of peat and fossil energy use, etc.

(Ying, Chang, & Lee, 2014) I. Introduction In June of 2002, President Bush announced a doubling of funds for the African Education Initiative. Total U.S. spending on basic education in Africa will total $630 Million over the next five years.

Motivation for such an increase lies in the belief that the education of children in developing countries "is key to future economic growth and lasting democracy, leading to greater stability and improved standards of living."1 Many growth models include education and offer predictions as to the implications of education policy changes on macroeconomic performance. Some empirical analyses of the growth rate of real per capita GDP in the U.S. suggest that years of secondary and higher schooling contribute positively toward economic growth.2 Such research is of particular importance as developed nations continue taking a more active role in the development of third-world nations, as growth models offer predictions useful in aiding policy decisions. II. Objective The goal of this paper is to survey the literature on education and its effects on economic growth. Over the last several decades, there have been a number of new developments and findings on this subject in both the micro and macro literature. Several recent models with policy implications are discussed. Where possible, we link the policy implications to growth-related issues faced by developing countries. Throughout this survey of the literature, we present mathematical concepts in a way that is accessible to less technical readers.

(Alberti, 1996) Developing new signals of urban performance is a crucial step to help cities maintain Earth's natural capital in the long term. Conventional measures of economic performance and urban quality of life are inadequate to capture the interdependence between urban society, economic development, and the environment. Furthermore, although cities affect and are affected by natural systems beyond their physical boundaries, the interdependence between urban systems and the regional and global environment is not reflected in urban decision-making. No signals on the state of natural re- sources and on the sustainability of their current uses are typically provided to urban communities.

Economic growth is a condition of the State sector in the economy that is experiencing an improvement towards better, expressed in a certain period. Economic growth can also be defined as the process of increase in production capacity of an economy that is manifested in the form of rising national income and improvement in standard of living of the people. The existence of economic growth is an indication of the success of economic development (Ministry of Finance of the Republic of Indonesia, 2013).

GDP (Gross Domestic Product) is a tool to calculate the most economy note because it is considered as the best single measure on the level of social welfare (Mankiw, 2009). Under the laws of Republic of Indonesia No. 10 years 1992, residents are people as yourself, family members, community members, citizens, and the set quantity which resides somewhere within the wiliyah State at a particular time. Hauser, et al. (in spells, 2003) describes the demographics i.e. include the amount, distribution, territory, and the composition of the population as well as the changes were and the factors that led to the change, which usually arises because the natalitas, mortality, migration, and social mobility. McLeman (2010) This article describes and analyzes the impacts of population and demographic change on the vulnerability of communities to climate change and variability. It begins with a review of existing literature on the effects of population change on anthropogenic greenhouse gas emissions, the exposure of settlements to climate risks, and on the capacity to adapt to climate change.

According to the Central Bureau of statistics, the industry is a unit or unity of effort doing economic activities, aims to produce goods or services, is located at a specific location or building, and has its own administrative records concerning production and cost structure and there are one or more responsible for such business.

Borhan and Hitam (2012) researching on the influence of economic growth in the ASEAN countries towards CO2 emissions, the results show that in the long run economic growth to rising pollution. In addition, Wang (2012) researching on the influence of economic growth against CO2 emissions, the result of economic growth positively and significantly to berpengah gas CO2 emissions in China. Mitchell & Popham, (2008) In a subsequent study of population growth, a case study in the United Kingdom looked at the relationship between population levels and the availability of green open spaces. The results show a positive relationship and have an impact on the level of health and income.

Meanwhile Cherni and Jouini (2017) last about the relationship between CO2 emissions, renewable energy, and economic growth in Tunisia using ARDL model, they find that there is a trade-off between economic growth and CO2 emissions. Mirza and Kanwal (2017) last about the relationship between economic growth, energy consumption and CO2 emissions in Pakistan. The results show that in the short term there is a relationship of causality between economic growth, energy consumption and CO2 emissions while in the long run, there is a relationship between economic growth, energy consumption and CO2 emissions.

Liverman & Vilas (2006) This review examines how neoliberal policies that include free trade and less government have altered environmental management of industry, forests, water, agricultural land, and fisheries in Latin America. We examine theories and case studies about the privatization and pricing of environmental services and common property resources, the environmental impacts of free trade, and the transfer of environmental management to local or nongovernmental institutions. We conclude that neoliberalism has had some profound influences on the environment and on environmental management in Latin America and that the implementation and impacts of

neoliberal policies on local environments have varied greatly by nation and by place as a result of different political, institutional, economic, environmental, and social conditions. Although many studies of neoliberalism and environment paint a negative picture, there are places and people that have adapted well to and benefited from neoliberal policies. Unfortunately, judgments on the success of neoliberal policies are limited by data and by the lack of detailed and balanced case studies.

In the study Choong & McKay (2014) see a growing world population that is related to the increasing demand for palm oil. In 2010 palm oil accounted for 36.5 percent of the world's vegetable oil products. The impact of this activity is an increase in carbon through a carbon footprint that continues to increase under the monitoring of the Standards and Industrial Research Institute of Malaysia (SIRIM).

Research conducted by the Agung, et al (2017) use the panel data with Stochastic impacts by regression methods on population, affluence, and technology (STIRPAT) and showed the results of research that urbanization and consumption of fuel oil and the total consumption of energy, have a significant relationship against oil and fuel consumption total energy consumption, but the urbanized may no impact against electricity consumption and CO2 emissions. The population has a significant relationship towards the consumption of fuel oil, electricity consumption, and total energy consumption as well as CO2 emissions, while economic growth had a significant relationship towards the consumption of fuel oil, electricity consumption, and CO2 emissions.

## Methods

### *Types and Source of Data*

The data used in this research is secondary data, namely data on carbon emissions, economic growth, population growth, and the industrial sector in Indonesia are taken from the official website of the World Bank.

### *Technique of Analysis*

In this research to see the influence of economic growth, population growth, and industry sector against environmental degradation. It is assumed that environmental degradation is a function of economic growth, population growth, and industry sectors, then the research model as follows:

$$\mathbf{EDt = \beta 0 + \beta 1Et + \beta 2Pt + \beta 3ISt + et}$$

Remarks formula :

**ED** : Environmental Degradation, **E** : Economic Growth, **P** : Population, **IS** : industrial sector, $\beta$ 1, $\beta$ 2,$\beta$ 3, : Coefficient Estimation, et : Error Term

The dependent variable in this study is the "ED" illustrating environmental degradation. This variable was measured using data the amount of carbon emissions are calculated in units of millions of U.s. dollars annually. "EG" is a gross domestic Product growth from year to year in Indonesia, which is calculated in units of percent. P is the population growth in Indonesia which is expressed in units of million. While, "IS" is the percentage of the contribution of the industrial sector to GDP calculated in units of Indonesia percent.

## Findings

Estimates of the direct influence of the results of economic growth, population growth, and industry sectors on environmental degradation are briefly presented in the the following table.

Tabel 1. **The results of the analysis of the estimation of the influence of economic growth, the percentage of the population, the percentage of the industrial sector towards environmental degradation.**

| Variabel | Coefficient Estimation | Standart Error | t-ratio | Probability |
|---|---|---|---|---|
| C | -72.44730 | 11.53573 | -6.280250 | 0.0000 |
| EG | 0.029166 | 0.012440 | 2.344598 | 0.0307 |
| LOG(P) | 5.001207 | 0.597881 | 8.364893 | 0.0000 |
| IS | -0.054765 | 0.023739 | -2.306989 | 0.0332 |
| **$R^2$ = 0.8283** | | **$F_{tabel}$ = 3.52** | **$t_{tabel}$ = 1.720** | |
| ***Adj.*$R^2$ = 0.7997** | | **$F_{Statistik}$ = 28.95** | **n = 22** | |

Source: Data output Eviews 9, 2017

$$ED = -72.44730 + 0.029166EG + 5.001207P - 0.054765IS$$

Based on table 1 using the OLS model can be explained that :

1. If the variable economic growth, population growth and the growth of the industrial sector is considered constant then the environmental degradation will be declined by 72.44730 million Dollar.
2. The value of the coefficient of 0.029166 economic growth, which means that if economic growth increased by 1 percent then the environmental degradation will rise 0.0291 million dollar assumes other variables fixed (cateris paribus).
3. The value of the coefficient of 5.001207, population growth means that if population growth is increasing by 1 person then environmental degradation will ride the 5.00 million dollars it is assumed other variables fixed (cateris paribus).
4. Industrial sector growth coefficient value of -0.054765, meaning that the contribution of the growth of the industrial sector increased by 1 percent then the environmental degradation will be declined by 0.0547 Million Dollars if other variables considered fixed (cateris paribus).

### Conclusion

1. Environmental degradation is affected by economic growth, population growth and the growth of the industrial sector of 20.03 percent, while 79.97 percent affected by variables outside the study.

2. variable in the study of economic growth and the number of influential positive population growth and significantly to environmental degradation in Indonesia.

3. While the growth of the industrial sector has a negative influence and significant to environmental degradation in Indonesia.

1. Economic Growth

From the results of the above regression, then retrieved the results of economic growth have a positive and significant relationship against environmental degradation, the results of this research with the same Shuai et al (2018), Cherni and Journi (2017), Adu and Denkyirah (2018), ( Liverman & Vilas, 2006) that look and identify economic growth against environmental degradation. Which they conclude in the existence of the research and significant positive relationship between economic growth and environmental degradation in the form of CO2 emissions

2. Population

From the results of this research, also found that population growth has a positive influence and significant environmental degradation resulting in a CO2 rise. These results are in accordance with research of Wang and Zhao (2018), Yu et al (2017) who is researching about the relationship and linkages between population with CO2 emissions, from the results of research they concluded that population is positive and significant effect against an increase in CO2 emissions.

Over the next decades mankind will demand more food from fewer land and water resources. This study quantifies the food production impacts of four alternative development scenarios from the Millennium Ecosystem Assessment and the Special Report on Emission Scenarios. Partially and jointly considered are land and water supply impacts from population growth, and technical change, as well as forest and agricultural commodity demand shifts from population growth and economic development. The income impacts on food demand are computed with dynamic elasticities. Simulations with a global, partial equilibrium model of the agricultural and forest sectors show that per capita food levels increase in all examined development scenarios with minor impacts on food prices. Global agricultural land increases by up to 14% between 2010 and 2030.

Deforestation restrictions strongly impact the price of land and water resources but have little consequences for the global level of food production and food prices. While projected income changes have the highest partial impact on per capita food consumption levels, population growth leads to the highest increase in total food production. The impact of technical change is amplified or mitigated by adaptations of land management intensities (Schneider et al., 2011). Research on economic growth in developing and low-income countries. The results of the study show that quantity and quality can affect the level of economic growth. Indirect government spending can also affect the quality of education. (Woolhouse & Cramphorn 1999).

3. Industrial Sector

While the growth of the industrial sector has a negative influence and significantly to environmental degradation in Indonesia. However, the results obtained by different from Du Lin (2018), Yu et al (2017), (Horvath, 2004), (Uqaili & Harijan, 2012) see about the problems caused by industrial emissions in China, where they discover the positive effects of emissions and significantly to environmental degradation in China. The development of a new law on collecting, recycling and disposing of industrial waste in China Waste Electrical and Electronic Equipment (WEEE) faces many problems regarding electronic waste caused by large production activities.

As in the study Hicks, Dietmar, & Eugster, (2005) which examines the need for developing laws that regulate the recycling and disposal of electronic waste. The results show the influence of industrial electronic waste on environmental and health characteristics. When

seen from the growth of the industrial sector itself, is one of the 17 sectors driving economic growth in Indonesia, such as policy in the form of a tax on carbon emissions in existing industries in Indonesia as well as the use of technology used in the production of goods and services, making the decline in emissions in Indonesia.

This caused the existence of government intervention in the form of the application of environment-friendly policies in order to achieve a level of development that emissions are lower, as stated in REGULATION (presidential Regulation) No. 61 Year 2011: about action plans The national decline in Greenhouse Gas emissions (RAN-GRK) in which there is an eco-friendly material in every aspect of development, ranging from planning, implementation, and evaluation.

The national development planning Board (BAPPENAS) also implemented measures to face the challenge of lowering the level of carbon emissions in Indonesia, namely the launch of system monitoring, evaluation, and reporting Online (PEP), this intended to strengthen the capacity of parties involved in climate change mitigation in Indonesia through the provision of data, information, and systems support accurate decision making to achieve low emissions.

The existence of encouragement in the form of a memorandum of understanding at the Conference organized by the countries that put into KTT talk about the problem of carbon emissions in the world is housed in Paris also makes it easier for Indonesia to lose emission levels after gains in the past year.From some of the rules above, the industrial sector is a significant research as well as its influence negative environmental degradation in Indonesia.

Olajire (2012) Seeing the impact of the beer industry that has an impact on the environment, such as energy consumption, water consumption, wastewater, solid waste and by-products and emissions to the air remains the main environmental challenges in the brewing industry. The conclusions from his research show the need to be aware of the impact of beer production on the environment and from, practices to reduce environmental impacts.

Although it is not yet successful in determining the overall development with low CO2 emissions, but has begun to lead to such a thing. If more and more industry-friendly environment in the growth sector in Indonesia who produce goods and services as well as support from the Government in the form of a policy of environmental sustainability, such as the use of renewable energy and technology friendly the environment, sustainable economic development activities that will be accomplished, as well as its own environmental degradation that can be pressed. Manchester Business School (2006).

(Khatun, Reza, Moniruzzaman, & Yaakob, 2017) High demand for palm oil increases the activity of oil palm companies, this impacts the environment and ecosystem. The results of this study indicate the existence of deforestation, habitat loss, forest fragmentation, biodiversity, climate and environmental change, conversion of land and arable land, and increased greenhouse gas (GHG) emissions, which produce annual fires. Increase security against natural disasters, and increase floods and flood qualifications.

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