

## 1: Economic loss from natural disasters worldwide | Statistic

*The Economics of Natural Disasters: Implications for Federal Policy* (The Free Press, ). Federal Emergency Management Agency. *Indirect Economic Consequences of a Catastrophic Earthquake*, Jerome W. Milliman and Jorge A. Sanguinetti, eds., *National Earthquake Hazards Reduction Program* (July ).

What is the Problem? We know that the cost of damage from natural hazards to governments, businesses, and families is very high. We know that money spent to clean up disasters is money lost to economic development. We know planning, design, and construction techniques that can greatly reduce costs due to natural hazards. We know how to site a structure to minimise the effects of natural hazards. Who are the "we" that know so much? We work in the private sector, government, and non-governmental organisations NGOs. We operate at local, national, regional, and global levels. We have been building structures, training personnel, conducting research, and cleaning up disasters for a long time. We are the hundreds of thousands of Caribbean citizens who have suffered the effects of unbridled natural hazards. We have lost loved ones, homes, businesses, and services because those effects were not reduced as they should have been. Why do governments resist making the small investments that would make buildings and infrastructure safer? Why are individuals unwilling to insist on construction that makes their homes and businesses more hazard-resistant? The purpose of this paper is not to tell governments what actions to take to increase the safety and well-being of their citizens. The purpose is to persuade them to take the actions they already know they should take with respect to natural hazards. The need to pay special attention to natural hazards Severe hurricanes, torrential rains, earthquakes, and landslides will continue to occur. Insurance and reinsurance are cyclical. In the recent past insurance premiums were excessively expensive, and they may become so again. The codes that do exist provide insufficient standards for critical facilities. Furthermore, they do not adequately address the important question of non-structural elements. With appropriate design and construction techniques, facilities can be protected so that they remain in operation after a hazardous event. Protection costs are affordable. The levels of losses in major disasters demonstrate the economic importance of reducing vulnerability. Given the small size of Caribbean states, the impact of a major hurricane or earthquake can affect the entire national community. While losses from individual landslides are small, collectively they cause more casualties and damage than either hurricanes or earthquakes. The situation is probably similar in the Caribbean. As a result of high deductibles and under-insuring, insurance covers less than 50 percent of the losses caused by natural hazards. This proportion to insured losses is expected to become much worse Figure 1. Comparison of Economic and Insured Losses Munich Re 97 The cost of business as usual Natural hazards can damage buildings and infrastructure causing a series of direct and indirect losses. The direct losses, borne by the property owner and partially offset by insurance payments, can be approximated by the cost of repair and reconstruction. The indirect losses arise as a consequence of disruption of production and services and spread through the entire economy. An example of this is what would happen to imports and exports if a seaport were out of service for an extended period. Indirect losses are difficult to estimate and can easily exceed direct losses. A study [2] of infrastructure that failed due to natural hazards finds that: In other words, most damage and disruption can be prevented, and it pays to do so. Insurance The insurance industry has experienced growing disenchantment with the Caribbean over the past two decades, with several insurers and reinsurers withdrawing from the region. Those that remained increased premiums severalfold, reaching peak rates around Subsequently, those high premiums attracted investment funds for reinsurance resulting in a drop in rates, but the active hurricane seasons of and began to reverse that trend, and the high rates of could still return [3]. Climate change Even though global climate change is subject to a great deal of uncertainty, the Intergovernmental Panel on Climate Change IPCC recently concluded that human intervention has a discernible effect on global climate. Global mean surface air temperature has increased between 0. Global sea level has risen by between 10 and 25 cm over the past years and is projected to rise about 50 cm more by What does all this mean for the Caribbean? Small islands and low-lying coastal areas are especially vulnerable to sea level rise. Higher rates of coastal erosion, permanent inundation, and flooding might occur. This is particularly dangerous in a region where

population, economic activity, and infrastructure have shifted towards coastal areas and urban settings in recent years. Increased salt-water intrusion of coastal aquifers may also be expected. Given the high dependence of the region on rain for potable water, changes in the rainfall pattern may cause serious problems. Climate change is also projected to exacerbate health problems such as heat-related illness, cholera, and dengue fever. There is some indication that the Caribbean region may be entering a period of increased hurricane activity, after a relatively calm period from the s through the late s. A twofold strategy for reducing vulnerability to natural hazards in the Caribbean The concept of disaster management has expanded significantly. Originally focussed only on immediate pre-disaster preparedness and post-disaster response, the concept now encompasses the longer-term issues of hazard assessment, risk reduction, and rehabilitation. Is a function of hazard characteristics probability, intensity, extent and vulnerability Vulnerability degree of loss to a given element at risk, resulting from the occurrence of a phenomenon of a given magnitude To reduce vulnerability, structures must be located in areas safe from hazards or be able to resist their impacts. This requires changes in public and private approaches to location, design, construction, and maintenance of structures. Setting appropriate standards and making reasonable decisions about "safe" locations, however, requires understanding of the areal distribution, frequency, and magnitude of hazardous events. Since most hazards are shared by all the countries in the region, a coordinated effort to map prevalent hazards and develop regional expertise in risk management can reduce the cost and increase the accuracy of the information necessary for proper decision-making. Action is difficult because the people, not the political leaders or the technicians, must take the initiative. When the people lead, the leaders will follow. Of course, much can also be done to improve the technical and institutional situation surrounding natural hazards. We propose a twofold approach of mutually supporting strategies. Mandates On several occasions during the past decade, Caribbean policy workers have put disaster management on the regional and national agendas. The Programme of Action for the Sustainable Development of Small Island Developing States , adopted in Barbados in during the UNSIDS conference, calls for the integration of natural and environmental disaster policies into national development planning processes, and for the development and implementation of public and private sector pre - and post - disaster recovery plans. Also, the promotion of the inclusion of disaster planning, preparedness, and mitigation in national development plans was incorporated into the Plan of Action. Moreover, the need to establish, as appropriate, regional emergency response teams and regularly test contingency plans; and promote the establishment of appropriate building construction codes that include regulatory and enforcement mechanisms through the sharing of technical information and expertise was recognized. The Plan of Action also committed to cooperate in the development, strengthening and implementation of regional disaster mitigation plans, including contingency and response arrangements. This vulnerability has been compounded by the geographic situation of the region, which makes the Caribbean Sea a transit area for many cargoes of a potentially hazardous nature. The important role of preparedness and mitigation in reducing the vulnerability of Caribbean states to such natural disasters was also recognized. The countries pledged to continue to coordinate their efforts and improve their ability to detect, monitor and respond to natural disasters. Moreover, they affirmed the priority of investment in planning, preparedness and mitigation initiatives, to strengthen the capacity of countries in the region to protect themselves from disasters and to decrease the need for emergency response resources in the future. Involve stakeholders Communities must become more aware of natural hazards and demand that measures be taken to reduce their negative effects. Little action will take place until pressure is felt on the political front from victims of inaction. Precedent exists for mobilising action at the national, state, municipal, and local levels. The process consists of four steps: A FEMA publication describes the process in a series of case studies from around the country and tells of the enormous savings the partnerships have already achieved [11]. On the state and municipal level, the Florida Department of Community Affairs DCA spearheads a state-wide strategy to help cities and counties establish mitigation plans. Although the project is relatively new, it is already bearing fruit [12]. At the local level, the OAS helped organise programs for mitigating the risks of natural hazards in the towns and villages of Grenada and Saint Lucia. Local disaster committees were established, potential risks identified and monitored, mitigation measures instituted, and systems for notification and evacuation put in place. Mobilise action Disaster

mitigation is difficult to sell. Homeowners prefer to invest in the exterior appearances and comfort of their dwellings rather than in improving wind resistance of roofs. Public-sector decision-makers make investments that fail to consider natural hazards, favouring the distribution of benefits to larger numbers of constituents. Major institutional weaknesses persist in the enforcement of land use and code regulations. The technical challenges of disaster mitigation are well understood. What is less understood is how to address the persistent obstacles of public perception, political expedience, and the myth that "Our country is too poor to afford the required standards" [14]. The most difficult part is provoking the interest of the man in the street to back hazard mitigation. Develop a disaster mitigation plan At the national level, each country must incorporate disaster mitigation into all its activities, from the traditional realms of emergency management and development control through economic planning, education, tourism, and infrastructure development. A disaster mitigation plan should be developed as a framework for co-ordinating this national effort. The plan could be developed in five steps: Develop a national disaster mitigation policy. This provides the vision, rationale, and mandate for vulnerability reduction activities. Assess existing hazards and map the hazard risk. Document the location, frequency, severity, and impact of historical hazardous events. Assess existing and future vulnerability to hazards. Identify the areas most at risk by combining information on existing or planned development with maps of areas at risk of hazardous events. Develop a disaster mitigation plan with programs for implementation. Examine public and private activities in vulnerable areas to ensure that these activities do not increase existing vulnerability. This review should include recurrent activities e. The plan should encompass all government activities, such as building codes and regulation of maintenance, education, and land use. It should include instruments that promote the adoption of mitigation behavior in such areas as fiscal and development incentives, cropping systems, and infrastructure development. Implement, monitor, and update the disaster mitigation plan.

## 2: The Impact of Natural Disasters on the Global Economy - The One Brief

*Economic analyses of natural hazard management options are rare for some hazards. Many of the benefits of natural hazard management are intangible (or non-market), such as lives saved, health benefits, environmental benefits, and social values.*

Print "Hazard always arises from the interplay of social and biological and physical systems; disasters are generated as much or more by human actions as by physical events. A natural hazard is an extreme event that occurs naturally and causes harm to humans or to other things that we care about, though usually the focus is on humans which, we might note, is anthropocentric. An extreme event is simply an unusual event; it does not necessarily cause harm. Note that many hazards have both natural and artificial components. Because hazards are threats of harm mainly to human systems, human activities play a large role in how severe a hazard is. Similarly, as we saw in the urban landscapes page of Module 7, many major cities are built in coastal areas. These cities face the threat of rising sea levels, a hazard being caused by global climate change, as discussed in Module 9. In short, the severity of the impacts from a natural hazard depends on both the physical nature of the extreme event and on the details of human development decisions. What makes an event a disaster? This is in many ways an ethical question. A natural hazard escalates into a natural disaster when an extreme event caused harm in significant amounts and overwhelms the capability of people to cope and respond. Then what do we mean by "harm"? This is essentially asking what it is that we ultimately care about. The question of how we define "disaster" is similar to the question of how we define "development," as discussed in Module 5. As with "development," there are definitions of "disaster" that emphasize monetary measures and definitions that emphasize health measures. The severity of a disaster is commonly measured in terms of the dollars of damage it causes or in the number of deaths it causes. All else equal, a disaster that causes more dollars of damage will usually also cause more deaths. However, this is not always the case. Disasters in poorer regions tend to cause more deaths; disasters in richer regions tend to cause more dollars in damages. This is because poorer regions tend to be less capable of protecting their populations and because richer regions tend to have higher-cost development exposed to the extreme event. We saw this on the previous page in comparing Hurricane Katrina to Cyclone Nargis. The difference makes it important for us to pay attention to how "disaster" is defined. Self-check Now that you have read a bit about what natural hazards are, here are a few multiple-choice questions that will test your understanding of the differences between extreme events, hazards, and disasters. These should be very simple questions and the purpose here is to give you some confidence in understanding this material so far. Hurricane Katrina along the U. Gulf Coast was a n: Disaster Click for answer Katrina was certainly also an extreme event, but along the Gulf Coast, its defining feature is the major damage it caused, making it a big disaster. Polar lows are cyclones that occur near the North and South Poles. These are types of: Because these events occur near the poles, they tend to not damage things that we care about. People do not live in the region, and what ecosystems exist there are not substantially disturbed. But polar lows do have unusually high winds, making them extreme events. Common Types of Natural Hazards Natural hazards can be classified into several broad categories: Geological hazards are hazards driven by geological i. This includes earthquakes and volcanic eruptions. In general, geological extreme events are beyond human influence, though humans have a large influence on the impacts of the events. Meteorological hazards are hazards driven by meteorological i. This includes heat waves, cold waves, cyclones, hurricanes, and freezing rain. Cyclones are commonly called hurricanes in the Atlantic and typhoons in the Pacific Ocean. Hydrological hazards are hazards driven by hydrological i. This includes floods, droughts, mudslides, and tsunamis. Floods and droughts can cause extensive damage to agriculture and are among the main contributors to famine. The deadliest natural disaster in world history not counting pandemics was the Central China floods, killing three or four million people. Biological hazards are hazards driven by biological processes. This includes various types of disease, including infectious diseases that spread from person to person, threatening to infect large portions of the human population. Many discussions of natural hazards exclude biological hazards, placing them instead within the realm of medicine and public health. If

biological hazards are counted, then they include the deadliest disasters in world history, including the Black Death outbreak of bubonic plague in the 14th century, killing millions of people, and the "Spanish" flu pandemic, a global affair the name "Spanish" is due to historical coincidence killing millions of people. While biological hazards are undoubtedly important, they are not discussed in detail in this module. It is possible for an extreme event to fit within more than one of these categories. For example, volcano eruptions a geological event block incoming sunlight, potentially enough to cause cold waves a meteorological event. Volcano eruptions can also cause tsunamis a hydrological event ; some of the largest tsunamis ever occurred when volcanoes along coasts caused large landslides into the water. Earthquakes a geological event that occur under water can also trigger tsunamis a hydrological event , such as the Japan Earthquake and Tsunami. Systems of Hazards One extreme event can often be hazardous in several ways. For instance, an earthquake may destroy buildings, cause landslides, and rupture sewer and water lines. The ruptured lines may, in turn, contaminate water, causing water-borne diseases such as cholera. Indeed, a cholera outbreak happened after the Haiti earthquake because of disruptions to clean water supplies. Likewise, a single natural hazard can have many impacts. For instance, hurricanes involve high winds, torrential rain, flooding, and storm surges. The winds may remove roofs and topple power lines. The floods may inundate roads, homes and schools. Ecosystems can be damaged, threatening wildlife. Some impacts can even be beneficial. A hurricane churns up ocean water, cooling surface water and thus reducing the risk of another hurricane in the same area. Keeping track of these systems of hazards and impacts is an important part of the study of hazards. Who Studies Natural Hazards? Contemporary research on natural hazard is interdisciplinary. Natural scientists study the nature of the extreme events involved in hazards. Social scientists study the human dimensions of the impacts and responses. Policy researchers, engineers, and ethicists study what can and should be done to prepare for hazards and to respond to them when they occur. Some specific fields active in natural hazards research include geography, medicine and public health, psychology, economics, engineering, and sociology. Cartography and geographic information science are increasingly important because these fields help analyze important spatial information about hazards. Later in the module, we will see some examples of how cutting-edge information technology is being used to revolutionize disaster response. Career Options For better or worse, natural disasters occur frequently and cause much damage, creating the need for dedicated natural hazards professionals. Hazards professionals are employed in government, in private for-profit and non-profit organizations, and in universities and research institutes. People work in characterizing hazards, preparing communities for hazards, providing emergency services after disasters strike, helping communities rebuild, documenting disasters, and raising awareness. People work as project managers, database analysts, operations analysts, environmental experts, and psychiatric consultants. Many people in these and other organizations focus exclusively on natural hazards projects. Others combine work on natural hazards with work on other issues, which is appropriate given how tightly connected natural hazards are to so many other issues.

## 3: The Benefits of Natural Disasters: Floods, Volcanoes, and Hurricanes | Owlcation

*Natural disasters such as earthquakes, floods, typhoons, and hurricanes inflict serious damage and so seem to be bad for the economy. For firms, natural disasters destroy tangible assets such as buildings and equipment - as well as human capital - and thereby deteriorate their production.*

Contact Author Natural disasters refer to environmental phenomenon that are destructive and occur naturally. Natural disasters include floods, volcanic activity, hurricanes, droughts, and earthquakes. While some of these disasters can be predicted and prepared for, they cannot be completely avoided and may result in damage. Some disasters can be so devastating that it wipes out human life in some areas. Whatever the disaster may be, it affects societies both negatively and positively. What Is A Flood? A flood is as a large body of water in areas where it becomes destructive and impedes the natural cycle of living organisms. A flood may be the result of long periods of heavy rain, or rivers or lakes that have overflowed their banks. High temperatures can also cause flooding when it causes ice caps and snow to melt quickly. Heavy floods can be so disastrous that infrastructure is washed away, people and animals drown, and people can be stranded for long periods. Disadvantages of a Flood The society and economy of a country suffers in many ways after a flood. The loss of lives, vegetation, and infrastructure means there will be fewer people on the labor force, less agriculture available for locals and exportation, and less businesses to contribute to the economy of the country. There will be mass dislocation of people, many of whom may be left homeless and jobless. In order to fill this gap the government will have to spend a little more. The country may seek assistance from foreign countries to supply food and materials to clean and replace infrastructure. While some countries will assist freely, some will charge for its efforts, putting the country in debt and at an economic loss. Benefits of a Flood There are benefits of flooding despite its immediate ill effects. For farmers and those in the agricultural sector, it helps them in the long run by providing nutrients to the soil that were lacking. This makes the soil more fertile and increases agricultural production. Nutrients are also added to rivers and lakes, improving the health of fishes that can be consumed. There may be relocation of fishes and organisms living in water bodies. This may improve the ecosystem. New predators and prey are introduced to areas, balancing the aquatic population. Volcanoes While there are a few benefits to floods, there are a few more for volcanoes. A volcanic eruption is the emission of hot magma, ash, and lava from a volcano. Volcanoes can result in other natural disasters such as earthquakes, tsunamis, and floods. An erupting volcano Source Benefits of Volcanoes After a volcanic eruption, the soil becomes rich due to the nutrients from the volcano. Some valuable emissions from volcanoes are pumice, opal, gold, mercury, and metals. It also releases good chemicals into the atmosphere. Chemicals such as carbon dioxide and hydrogen that contributes to the water cycle. Disadvantages of Volcanoes In the event of a volcanic eruption, the people and animals in the area are threatened and they must be evacuated. The evacuation of these individuals will require the efforts of the government and social groups to see to it that the individuals receive shelter. This places a dent in the socioeconomic factors of a country as families may be separated, and buildings used as shelters will not be available for their regular use. The eruption of a volcano releases large amounts of smoke and dust that may form dust clouds. Dust clouds will restrict the amount of light available to plants and animals, resulting in less food and more lives being lost. Hurricanes Many lives are lost every year in the Caribbean due to hurricanes. Hurricanes are a type of cyclone that consists of heavy rain and very strong winds. Disadvantages of Hurricanes Hurricanes result in the destruction to infrastructure and loss of lives, vegetation, and livestock. Many hurricanes cause floods, which can wash away homes and people. The strong winds can destroy large trees and buildings, or use objects as missiles that can cause great damage. The loss of life resulting from hurricanes mean the labor force will be lessened. The destruction of vegetation and livestock means countries will have to source more of their food from other countries. Benefits of Hurricanes The winds from a hurricane can also contribute to the agricultural sector in the long run. The wind will cause the topsoil to be distributed to areas in which it was lacking. Through the redevelopment of infrastructure, the property value and living conditions in some areas will improve. Hurricanes help to bring people together as they help each other in the aftermath. It helps to build up the

coastal areas of islands, making the island wider. In all instances of natural disasters, the social and economic aspects of a country will be negatively affected. The redistribution of population will affect the country negatively as overcrowding may become an issue. It may lead to increased illnesses and social problems. Families will be separated, disrupting the socialization of many. Jobs will be lost and the economy will take a hit. Countries will receive loans from various international institutions. This money should not only be used to repair damages caused by the disaster, it should also be invested in something that can produce great returns.

## 4: Economic Analysis of Natural Hazards - Oxford Research Encyclopedia of Natural Hazard Science

*Economic and financial impacts. Major natural disasters can and do have severe negative short-run economic impacts. Disasters also appear to have adverse longer-term consequences for economic growth, development and poverty reduction.*

Friday, November 2, Economics and Natural Disasters In the aftermath of Hurricane Sandy, many teachers and students of economics will find themselves searching for background materials that provide some background in the economics of natural disasters. Here are a few examples from the last few years. David Stromberg laid out the economic arguments about natural disasters in "Natural Disasters, Economic Development, and Humanitarian Aid," appearing in the Summer issue of my own Journal of Economic Perspectives. This article, like all JEP articles back to the start of the journal, is freely available to all courtesy of the American Economic Association. Stromberg makes the fundamental point that the economic analysis of natural disasters is built on three factors: In fact, Stromberg traces this distinction back to letters between Voltaire and Rousseau in the aftermath of the great Lisbon earthquake of 1755. Voltaire had written a poem on how terrible the earthquake was; Rousseau had responded by pointing out that it was not the quake, but the interaction between human society and the quake, which was at issue. At the first quake, fissures five meters wide appeared in the city center. The waves of the subsequent tsunami engulfed the harbor and downtown. Fires raged for days in areas unaffected by the tsunami. An estimated 60,000 people were killed, out of a Lisbon population of 250,000. In a letter to Voltaire dated August 18, 1756, Jean-Jacques Rousseau notes that while the earthquake was an act of nature, previous acts of men, like housing construction and urban residence patterns, set the stage for the high death toll. Thus, the WHO Collaborating Centre for Research on the Epidemiology of Disasters CRED maintains an Emergency Events Database Center that collects data on natural disasters, where a disaster is defined as 10 or more people reported killed, or more people reported affected, a declaration of a state of emergency, or a call for international assistance. Here are some of their figures showing global trends in natural disasters from 1980 through 2010. The first graph shows the number of such disasters over time: The second and third graph show the number of people killed, and the number of people affected by such disasters. The trendline for number of people killed has been dropping over time, with occasional spikes: However, the number of people affected by natural disasters is rising over time, which one would expect as a result of growing population levels, if nothing else. Finally, the fourth graph shows monetary losses from natural disasters. Of course, this graph is driven by whether the disasters hit high-income or middle-income countries, where the measured economic costs of damage are higher than in low-income countries. The best way of dealing with natural disasters is often before they occur: For a nice overview of such efforts around the world, I recommend the report on "Natural Hazards, UnNatural Disasters: Every disaster is unique, but each exposes actions" by individuals and governments at different levels that, had they been different, would have resulted in fewer deaths and less damage. Prevention is possible, and this report examines what it takes to do this cost-effectively. Not many storms will pack the wallop of Hurricane Sandy, but New York City is a huge agglomeration of people living on a coastline who will inevitably be susceptible to storm and flood damage. Two other quick references: First, the National Flood Insurance Program will almost certainly not have the money to pay for the damage from Hurricane Sandy. For background on that program and how it works, and why its inability to fund these damages was completely predictable, Erwann O. Michel-Kerjan, lays it out in "Catastrophe Economics: I blogged about the article here. He points out that 31 states have such laws, and that the completely predictable problems with such laws are that they discourage bringing supplies into disaster areas, they discourage conserving on key resources, they concentrate economic losses on local merchants, and they worsen the economic losses in the disaster area.

## 5: Natural Hazards and Economic Development: Policy Considerations

*Note: Citations are based on reference standards. However, formatting rules can vary widely between applications and fields of interest or study. The specific requirements or preferences of your reviewing publisher, classroom teacher, institution or organization should be applied.*

**Economic and Financial Impacts of Natural Disasters:** Disasters also appear to have adverse longer-term consequences for economic growth, development and poverty reduction. But, negative impacts are not inevitable. Vulnerability is shifting quickly, especially in countries experiencing economic transformation - rapid growth, urbanization and related technical and social changes. In the Caribbean and Bangladesh there is evidence of both declining sensitivity to tropical storms and floods and increased resilience resulting from both economic transformation and public actions for disaster reduction. The largest concentration of high risk countries, increasingly vulnerable to climatic hazards, is in Sub-Saharan Africa. Risks emanating from geophysical hazards need to be better recognized in highly exposed urban areas across the world because their potential costs are rising exponentially with economic development. Natural disasters cause significant budgetary pressures, with both narrowly fiscal short-term impacts and wider long-term development implications. Reallocation is the primary fiscal response to disaster. Disasters have little impact on trends in total aid flows. Governments need appropriate risk management strategies for future disasters that include medium-term financial planning for 8 – 10 years. The basis of funding has to be broadened, applying a combination of mechanisms at different layers of loss coverage to help overcome the obstacles to increased coverage of insurance and capital market tools. Natural hazard risk management should be integrated into longer-term national investment policies and development strategies and appropriately reflected in the allocation of financial resources. Quality, reliable scientific information is a necessary condition for effective disaster risk management. The international community should support global and regional research and information systems on risks. It should also ensure that there are adequate complementary monitoring and dissemination programs at the national level. Priorities include climatic variability, regional and national flood forecasting and geophysical hazards. Economic research on natural disasters

Vulnerability to natural hazards is determined by a complex, dynamic set of influences, such as economic structure, stage of development and prevailing economic and policy conditions. To understand and assess the economic consequences of natural hazards and the implications for policy, it is necessary to consider the pathways through which different types of hydro-meteorological climate-related and geophysical hazard impact on an economy, the different risks posed and the ways in which societies and economies adapt to or ignore these potential threats. The eclectic approach adopted in this study, employing largely qualitative methods, is particularly useful in exploring the many complex and dynamic pathways through which extreme hazardous events influence an economy and its financial system and also for identifying areas and issues where further investigation including quantification would be worthwhile.

### 6: Japan GDP: Natural disasters hit economic growth - BBC News

*Economics and Natural Disasters* In the aftermath of Hurricane Sandy, many teachers and students of economics will find themselves searching for background materials that provide some background in the economics of natural disasters.

More on the agenda Natural disasters such as earthquakes, floods, typhoons, and hurricanes inflict serious damage and so seem to be bad for the economy. For firms, natural disasters destroy tangible assets such as buildings and equipment as well as human capital and thereby deteriorate their production capacity. These adverse impacts may sometimes be fatal to the firms and result in them being forced to close down. But the academic evidence on the economic impact of natural disasters is mixed. As reviewed in surveys such as Noy and Vu and Loayza et al. But because these studies use aggregate data, they cannot answer why and how corporate productivity improves due to natural disasters. Natural disasters and corporate productivity: This mechanism is often called creative destruction. There is some evidence for this hypothesis, although mixed. De Mel et al find that the firms that suffered more damage to their assets because of the devastating tsunami in Sri Lanka in exhibited smaller profits, sales, and capital stock. These findings are inconsistent with creative destruction. On the other hand, Hosono et al. Also consistent with this hypothesis, Leiter et al find that European firms located in regions affected by a major flood in had higher asset and employment growth as compared with non-affected firms, although they also find that the firms in the affected regions exhibited smaller value-added. However, to the extent that efficient firms are also forced to exit, or an unnatural selection is at work, then the overall impact is unclear. In the subsequent sections, we report our findings from this study. Empirical approach on firm bankruptcy after the Tohoku Earthquake In Uchida et al a we use a sample of firms located in the Tohoku area of Japan that we obtain from the database of Teikoku Databank Ltd. The TDB is a leading private credit bureau in Japan that covers a sufficient fraction of the firms in Japan. We focus on bankruptcy as the type of firm exit, which is one of the most commonly observed types. Evidence for natural selection Table 1. Bankruptcy probability and firm score: Regression results Excerpt Note: Uchida et al a Figure 1. Damaged versus undamaged firms Source: The black and the gray lines respectively indicate the results for firms inside and outside the affected areas. These findings suggests that natural selection is at work both inside and outside the affected areas. Second, the estimated marginal effects in Table 1 are comparable between the firms in damaged Column A and undamaged Column B areas, and the curvatures of the two lines in Figure 1 are comparable although the levels of the two lines differ, which will be discussed below. This finding means that the Tohoku Earthquake neither promotes nor demotes the natural selection of firms. In reality, it is evident that the firms in the affected area do suffer substantial damage, especially from tsunamis or the serious accident at the nuclear plant in Fukushima. Hence, the finding of a smaller probability of bankruptcy in the affected area is seemingly counterintuitive. However, there is one potential reason for the lower probability in the affected area the enormous amount of public aid to firms. These firms may have voluntarily closed down. This story is convincing because the Tohoku area is the epitome of a shrinking Japan due to its aging population. Therefore, the firms in this area would have sooner or later faced long-run problems such as difficulty in business succession and a decline in the local economy. Indeed, we have little evidence to support these conjectures, and there remain many empirical questions to resolve. As the above discussion suggests, the exit of firms or more generally their dynamics and the recovery of the local economy after natural disasters is closely intertwined with the policy measures taken and the underlying economic conditions. Thus we should have a broader and long-run perspective in examining their economic impact and the policy measures needed to deal with them beyond just focusing on the direct and devastating damage that attracts much of our attention. For the mechanism through which the market eliminates inefficient firms during the recession period, see e. Using very detailed plant-level information for the amount of damage, this study finds that plants with more damage are more likely to exit. Ono et al examine the relocations of firms after the Tohoku Earthquake and find that damage by the earthquake increased the likelihood of relocations. Using this budget, the government has implemented a variety of

measures, such as different forms of subsidies, public credit guarantees by credit guarantee corporations, and loans by public financial institutions. Saito et al inspect from an economics viewpoint the policy-making process behind this huge budget and conclude that the budget was excessive. This article is published in collaboration with VoxEU. Publication does not imply endorsement of views by the World Economic Forum. To keep up with Agenda subscribe to our weekly newsletter.

## 7: CONVERSABLE ECONOMIST: Economics and Natural Disasters

*In the 10 years since Hurricane Katrina, the world has seen an annual average of major natural disasters, with average annual economic losses of US\$ billion, insured losses of US\$63 billion, and 76, lives lost, according to Aon's latest annual Global Climate Catastrophe Report.*

They will not be considered to any great extent in this course, but include: Insect infestations Disease epidemics Wildfires Natural Hazards can also be divided into catastrophic hazards, which have devastating consequences to huge numbers of people, or have a worldwide effect, such as impacts with large space objects, huge volcanic eruptions, world-wide disease epidemics, and world-wide droughts. Such catastrophic hazards only have a small chance of occurring, but can have devastating results if they do occur. Natural Hazards can also be divided into rapid onset hazards, such as Volcanic Eruptions, Earthquakes, Flash floods, Landslides, Severe Thunderstorms, Lightning, and wildfires, which develop with little warning and strike rapidly. Slow onset hazards, like drought, insect infestations, and disease epidemics take years to develop. Anthropogenic Hazards These are hazards that occur as a result of human interaction with the environment. They include Technological Hazards, which occur due to exposure to hazardous substances, such as radon, mercury, asbestos fibers, and coal dust. They also include other hazards that have formed only through human interaction, such as acid rain, and contamination of the atmosphere or surface waters with harmful substances, as well as the potential for human destruction of the ozone layer and potential global warming. Effects of Hazards Hazardous process of all types can have primary, secondary, and tertiary effects. Primary Effects occur as a result of the process itself. For example water damage during a flood or collapse of buildings during an earthquake, landslide, or hurricane. Secondary Effects occur only because a primary effect has caused them. For example, fires ignited as a result of earthquakes, disruption of electrical power and water service as a result of an earthquake, flood, or hurricane, or flooding caused by a landslide into a lake or river. Tertiary Effects are long-term effects that are set off as a result of a primary event. These include things like loss of habitat caused by a flood, permanent changes in the position of river channel caused by flood, crop failure caused by a volcanic eruption etc. Vulnerability to Hazards and Disasters Vulnerability refers the way a hazard or disaster will affect human life and property Vulnerability to a given hazard depends on: Proximity to a possible hazardous event Population density in the area proximal to the event Scientific understanding of the hazard Public education and awareness of the hazard Existence or non-existence of early-warning systems and lines of communication Availability and readiness of emergency infrastructure Construction styles and building codes Cultural factors that influence public response to warnings In general, less developed countries are more vulnerable to natural hazards than are industrialized countries because of lack of understanding, education, infrastructure, building codes, etc. Poverty also plays a role - since poverty leads to poor building structure, increased population density, and lack of communication and infrastructure. Human intervention in natural processes can also increase vulnerability by Development and habitation of lands susceptible to hazards, For example, building on floodplains subject to floods, sea cliffs subject to landslides, coastlines subject to hurricanes and floods, or volcanic slopes subject to volcanic eruptions. Increasing the severity or frequency of a natural disaster. Affluence can also play a role, since affluence often controls where habitation takes place, for example along coastlines, or on volcanic slopes. Hazard Assessment consists of determining the following when and where hazardous processes have occurred in the past. Risk Assessment involves not only the assessment of hazards from a scientific point of view, but also the socio-economic impacts of a hazardous event. Risk is a statement of probability that an event will cause x amount of damage, or a statement of the economic impact in monetary terms that an event will cause. Risk assessment involves hazard assessment, as above, location of buildings, highways, and other infrastructure in the areas subject to hazards potential exposure to the physical effects of a hazardous situation the vulnerability of the community when subjected to the physical effects of the event. Risk assessment aids decision makers and scientists to compare and evaluate potential hazards, set priorities on what kinds of mitigation are possible, and set priorities on where to focus resources and further study. Prediction and Warning Risk and vulnerability can sometimes be

reduced if there is an adequate means of predicting a hazardous event. Prediction A statement of probability that an event will occur based on scientific observation Such observation usually involves monitoring of the process in order to identify some kind of precursor event s - an anomalous small physical change that may be known to lead to a more devastating event. Hurricanes are known to pass through several stages of development: Once a tropical depression is identified, monitoring allows meteorologists to predict how long the development will take and the eventual path of the storm. Volcanic eruptions are usually preceded by a sudden increase in the number of earthquakes immediately below the volcano and changes in the chemical composition of the gases emitted from a volcanic vent. If these are closely monitored, volcanic eruptions can be often be predicted with reasonable accuracy. Forecasting Sometimes the word "forecast" is used synonymously with prediction and other times it is not. In the prediction of floods, hurricanes, and other weather related phenomena the word forecast refers to short-term prediction in terms of the magnitude, location, date, and time of an event. Most of us are familiar with weather forecasts. In the prediction of earthquakes, the word forecast is used in a much less precise way - referring to a long-term probability that is not specific in terms of the exact time that the event will occur. Early Warning A warning is a statement that a high probability of a hazardous event will occur, based on a prediction or forecast. If a warning is issued, it should be taken as a statement that "normal routines of life should be altered to deal with the danger imposed by the imminent event". The effectiveness of a warning depends on: The timeliness of the warning Effective communications and public information systems to inform the public of the imminent danger. The credibility of the sources from which the warning came. If warnings are issued too late, or if there is no means of disseminating the information, then there will not be time enough or responsiveness to the warning. If warnings are issued irresponsibly without credible data or sources, then they will likely be ignored. Thus, the people responsible for taking action in the event of a potential disaster will not respond. Frequency of Natural Disasters Again, it is important to understand that natural disasters result from natural processes that affect humans adversely. First - Size Matters For example: Humans coexist with rivers all the time and benefit from them as a source of water and transportation. Only when the volume of water in the river becomes greater than the capacity of the stream channel is there a resulting disaster. Small earthquakes occur all of the time with no adverse effects. Only large earthquakes cause disasters. Second " Location, location, location.

### 8: Adam Rose - USC Price

*This statistic displays the annual economic loss caused by natural disaster events worldwide from to In , some million U.S. dollars were lost due to natural disasters. The.*

### 9: Natural Disasters & Assessing Hazards and Risk

*Natural Hazards and Natural Disasters. A natural hazard is a threat of a naturally occurring event will have a negative effect on humans. This negative effect is what we call a natural disaster.*

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