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**EXPOSURE TO CLIMATE CHANGE RISKS: CROP INSURANCE**

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**ABSTRACT**

*This paper analyses the broadly used concepts of risk and exposure as they relate to climate and weather threats, re-conceptualizes these terms in the context of climate change and explains this development using crop insurance as example. Government subsidization of insurance against risks related with contrary climatic situations and weather events, such as flood impairment and crop loss, may lead to discrete decisions that really raise the exposure of people, property and economic events to those risks. The methods that give rise to this phenomenon are important in accepting the exposure of social populations to climate change. In many areas, existing conditions that give rise to flooding or crop failure are likely to be intensified by climate change over coming eras. In the climate change field, susceptibility has been abstracted as a function of disclosure to risk and as a skill to adapt to the effects. In this context, crop insurance is possible adaptive measures. This treatment of exposure compares with similar ideas in insurance and risk management whereby actions that cause damage are known as threats, and physical conditions, such as climate change, that increase the outlook of a threat occurring, are known as physical threats.*

**KEYWORDS**

climate change, susceptibility, physical hazards, adaptive response.

**1. INTRODUCTION**

It is widely accepted that growths of carbon dioxide and other greenhouse gases, in huge part, are an effect of social activity and are causing substantial changes to the Earth's climate, especially rises in average temperatures. However, the most recent report of the Intergovernmental Panel on Climate Change (IPCC) also summarizes changes in the occurrence, spatial dissemination and degree of a number of climatic conditions, extremes and weather events possible to occur in coming decades. Many of these variations, if revealed, pose significant risks to social well-being. The panel notes that much social disbursement can be expected to face an amplified potential of flooding because of heavy rain events and sea-level rise. Higher temperatures and more hot days are expected to occur over closely all land areas, and increased summer continental drying and allied risk of summer drought is likely to occur over mid-latitude interior areas. Such variations in climatic conditions may be expected to pose distresses for areas of agricultural production. Many social settlements in such environments have long been open to the risks of flooding or drought. Such indexes of climate change can therefore be defined as existing risks to which such societies are already unprotected. In other words, the climatic conditions recorded above represent impending increases in frequency, degree or magnitude of existing climatic or weather correlated risks. Because the likely signs of climate change comprise of hazards for which insurance may be available, use of insurance can be considered as one the many promising options for climate change. The objectives of this paper are; first, we set forth the ideas of risk and susceptibility from the research literature, which have become central to evaluating the potential effects of climate change on social populations. Second, we expose that though coverage and adaptive capability are often treated separately, in climate change works, they are not equally independent variables and that they are consistently unified, and we thus propose a re-conceptualized model of climate-related risk to exemplify more closely these connections. This model is relevant to those seeking to reduce social exposure to climate change risks, because actions taken to reduce disclosure may cause changes in adaptive capacity- or vice versa. Third, we demonstrate these ideas with examples of insurance for crop- and flood-related risks. In many western countries, governments aids such insurance, which serves to make the assurance more widely available; thus, more people who experience these types of victims are compensated.

**2. SOCIAL VULNERABILITY TO CLIMATE VARIATION**

Many descriptions have been offered to describe social vulnerability to natural conditions that may have contrary consequences. Most describe susceptibility as the potential to experience harm or loss from some event or condition, and this prospective is related to factors that distress the prospect of the incident or situation occurring and the capacity to cope with or adjust to the effects of the event, and when it occurs. Social vulnerability to the broad range of risks related with climate change can be denoted with the model (1)

$$V, i = / (Ejllt1Csltt) \quad (1)$$

Where V = susceptibility, E = disclosure, AC = volume, s = a given structure or community, 1 = a given locality, i = a given climatic inducement and t = a given period of time. This model recognizes that the liability of a given community or system to climate change is specific to particular pressures or stimuli at particular

locations and periods of time. There are two major elements of liability notable in the model. E refers to the possibility or occurrence of hazardous conditions relative to the presence of socials at a particular location at a particular time. AC refers to the capability of those exposed to cope with the potential risky conditions to which it is exposed. No particular scale is quantified in this model, allowing for vulnerability to be characterized at levels from individual families to communities, regions and beyond.

The exact form of the relationship {f} is not specified, as it would vary by s, 1, i and t; however, the general form as it is set forth denotes that E is completely related to V, while AC is adversely or inversely related to V. This model offers a very broad conceptualization of liability. It does not specify the particular interconnections. It is anticipated that these relationships are likely to be system-, place- and time-specific, and will vary with the explicit types of climate change-related hazards and potential ways of adjusting to such risks. We next reformulate this general liability model to reveal how risk is assumed in the fields of insurance and risk management. Doing so will provide perceptions into how insurance may influence adaptive capacity and may inform strategy regarding promoted insurance in particular applications.

### 3. RISK AND HAZARD AS DEFINED IN THE INSURANCE INDUSTRY

The following portrayals of risk and hazard as they are used in the fields of insurance and risk management are derived from Trieschmann et al. and are reliable with those in standard insurer's. In the field of insurance, risk is identical with ambiguity about the existence of a given outcome, and an event that is the index of a given risk is known as a threat. Risk may be classified as follows:

#### Pure risk vs. Hypothetical Risk

A pure risk is one where, if the threat arises, the only probable outcome is a loss to the person facing it. For example, a house fire is suspect to result in any benefit to the owner of the house. A hypothetical risk is one where, if the threat occurs, the chance of experiencing either a loss or a benefit exists. Note that the risk itself is not the source of speculation, but the nature of the impact of its occurrence is. A gamble placed on a racehorse is an example of a hypothetical risk.

#### Static risk vs. Dynamic Risk

A static risk occurs in an atmosphere that is in a steady state. For example, the probability of death is 100 percent and unlikely to change. A dynamic risk is one where the environment may be substance to change. Starting a new business in a unpredictable economic environment is an example of dynamic risk.

#### Subjective risk vs. Objective Risk

A subjective risk is one where an individual forms a view regarding the possibility of a threat occurring. An objective risk is one where the probabilities of a threat occurring can be enumerated. For example, distress of flying is a subjective risk; the frequency of airplane crashes as restrained per number of airplane flights is an objective risk. Using these accounts of risk, liability as it is generally labeled in climate change literature becomes pure, dynamic risk using the language of the insurance industry. The climatic provocations that give rise to such risk become climatic threats. Whether the dangers are objective or subjective in the context of climate change is in large part associated to the view of the observer; Slovic et al. have shown how observation of what creates risk of harm from environmental threats is subjective by a range of factors and may differ considerably among individuals and institutions.

For the purposes of this paper, it is adequate to identify the prominence of perception in the formation of risk. The reality of crop and flood insurance implies that such risks are generally observed to exist in the controls where insurance is made accessible; whether an individual chooses to contribute in such insurance plans may certainly be subjective by the awareness of those conditions that increase the possibility of a given threat occurring or that increase the severity of the loss when a threat occurs are known in the insurance industry as hazards. Hazards can be categorized as follows:

#### Physical Hazards

A physical hazard is a substantial condition that increases the chances of a threat occurring, or, in our case, a geophysical, biophysical, atmospheric or hydrological condition. For example, a sudden and passionate burst of rain is a physical hazard in a floodplain, because it raises the possibility that a channel may runoff its banks, thereby increasing the likelihood of property damage occurring.

#### Morale Hazards

The action of a discrete disregards or is careless of a given threat is a morale hazard. An example of this is a specific who builds a house in an area that is normally flooded and does so with the hypothesis that a third party will reimburse him or her for any losses he or she might experience. It will be shown that sustained insurance can cause this form of hazard to occur.

### 4. RE-CONCEPTUALIZING THE SUSCEPTIBILITY MODEL

On the basis of the influences presented so far in this paper, the abstract model of liability introduced above may be reformulated as follows:

$$R_{s1pt} = f(H_{s1pt}, A_{s1pt}) \quad (2)$$

Where R = pure, dynamic risk, H = hazard, A = adaptive response, s = a given community, 1 = a given location, p = a given threat and t = a given period of time In this reformulation (2), liability of a given system or community to a given climatic incentive occurring at a given place and time has been exchanged by the risk of loss in a given community, in a dynamic environment, due to a given climatic threat occurring at a given place and time. In doing so, we move from a general conceptualization of the potential for loss or harm due to climate change to a conceptualization that, although still generic in nature, describes the outcomes of particular adaptive measures taken in the context of specific climate- or weather-related events or conditions. The terms exposure (E) and adaptive capacity (AC) have been replaced by H and A, respectively. A, in this model, defines the influence of a particular response or set of actions, such as insurance, against a particular threat (p) and is therefore more measure-specific than adaptive capacity.

The term threat (p), which defines the physical display of the risk (R) in question, is significantly narrower than the term climatic stimulus (i) that it has swapped. In other words, the re-conceptualized model seeks to relate specific types or forms of adaptation to specific types of climate- or weather-related risks. The term hazard includes physical, morale and moral hazards as described above, and its use in this reformulation makes clear what is implied in the term exposure used in the more general susceptibility model: that both environmental and social progressions influence the level of risk. For instance, different types of threat might increase the prospect of flood-related threats in a given location. Climate change, should it lead to more common extreme precipitation events, would present a physical hazard. Where the resident of a building situated in a floodplain uses the basement to store valuable items, not recognizing that the building has been flooded in the past, this presents a morale hazard. A builder, who intentionally constructs for re-sale, to an unsuspecting buyer, a non-flood-proof building on a piece of land known to be drowned regularly, creates a moral hazard.

### 5. EXPERIMENTAL APPLICATIONS

This conceptualization may be used to help structure other empirical inquiries or analyses of the susceptibility of a range of social systems to climate change, as well as prevailing climate-related risks. For example, Bryant et al. define the adaptation of farmers to climatic inconsistency and change as involving "resolute positive or reactive response[s] to variations or risks". This depiction is similar to that of adaptive responses (A) in the conceptualization of risk described above. The authors go on to show that the capacity of agricultural systems to adjust to climatic risks is subjective by a range of social procedures, such as government policies, economic situations and consumer preferences operating at larger scales, and farm size, crop varieties and family financial well-being at the specific farm level. A task in estimating the size to adapt to future climatic conditions is thus in the analysis of how such processes limit or enhance the adoption of adaptive responses. An empirical study of the relationship between opinions and actions might seek to interpret these in the framework of physical, morale and moral hazards using the abstract model introduced here.

This conceptualization of risk has helped guide the progress of an empirical study of social migration performance in rural areas in the period of repetitive crop failures in the mid-1930s caused by irregular years of scarcities and floods. The model was useful in distinguishing that migration could be abstracted as one of a range of potential adaptive responses to hostile climate conditions or weather events and not simply as a threats faced by farmers and the social practices that placed them in differential positions of disclosure, leading to particular groups of farmers using migration as an adaptive response.

**6. CONCLUSION**

Although susceptibility is presented as being a purpose of exposure and adaptive capacity, the courses that form exposure and adaptive capacity do not act in segregation from one another. They are not independent variables. Both reflect the fundamental social, political, economic, cultural and institutional situations that guide the nature of social tenure and resource use. Furthermore, programs that are proposed to improve people's ability to cope with environmental risks—that is, to improve adaptive capacity—may result in behavior that raises disclosure to those very same risks. Exposure to climate change is not simply a measure of the possibility of changes in biophysical conditions of a given location over time. Rather, both biophysical and social procedures regulate exposure. This paper has abstracted how social behavior, with respect to procedures that might be taken to condense climate change-related risks, may worsen both exposure and adaptive capacity, using example of existing adaptive measures, such as crop insurance, developed in response to existing exposures to climatic conditions. Understanding these relationships as they presently reveal with respect to climate conditions and weather-related events may progress our capability to develop alternative measures that more properly support adaptive capacity in coping with future indexes of climate change. Care must be taken when evolving adaptation policies to prevent unplanned significances increasing exposure to the very risks they are planned to avoid.

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