

Disaster Risk Reduction and Management: Recalling the Need for Paradigm Shift in Definition

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Abstract

The paper articulates the need for a paradigm shift in defining the basis of what constitutes a disaster. This new framework must be sensitive to the need for a more theoretical approach to inform disaster and hazard management. Central to this is that the resulting approach cannot be muddled in linear rational and procedural doctrines but appreciate the dynamics of complex non-linearity of disaster events. By engaging in thought experiment and critical analysis of existing literature, the paper deconstructs the normative paradigm of defining disaster. The end is to inform disaster management and risk reduction intervention and mitigation programmes. The presented alternative approach is sensitive of the need to equally include; spatial, political, social, parameters. These are appreciated as being equally important as those dealing with ecological and economic. The resulting not only include other elements, but also expands the definition to the complex conditions inherent in the origin of phenomena to the interaction of the phenomena with multiple and complex socio-spatial and demographic dynamics, and then appreciating the complex results of this nonlinear interaction. The need for a more substantive definition of disaster underlines the pre-analysis that is necessary for implementation of mitigation and prevention strategies. That disasters are becoming more complex is synonymous with the complexities inherent in post-war development dynamics.

Keywords

Risk Reduction, Disaster Management, Origin-Interaction-Resultant, Spatial Nonlinear

1. Introduction

The paper has a dichotomous mutually exclusive focus. Firstly, it opines the need

for changes to the epistemic and technical groundings informing the definition of disaster events. Secondly, it presents arguments for elevating the multiple interactions of cultural expressions, socio-spatial dynamics alongside ecological processes, in theory formulation for Disaster Management (DM) and Disaster Risk Reduction (DRR) intervention strategies. These two concerns present arguments for changes to the intellectual language pervading the discipline. Arguments for shift in the basis of how disaster events are defined hinge mainly on reducing, and ultimately eliminating, the dominant and bias “hazard origin” approaches. Under this paradigm, disasters are defined as natural, technological and human based off the hazard’s origin. This single origin bias ignores importance multiple and complex origins and interactions of diverse elements, inherent in the socio-economic, spatial and demographic development dynamics of the receiving place.

DRR and DM strategies are formulated and targeted to avert negative ends, when a hazard and human social conditions interact. This polar linear approach to defining disaster is translated into DRR and DM mitigation and early warning strategies and programmes. The focus is then on trying to make the receiving built environment resilient, based off the hazard’s origin, with little focusing on the fact that there are multiple hazards with multiple and complex origins. The hazard origin definition of disaster represents flaws in the epistemic groundings, while the application of strategies and programmes for DRR and DM are deliberate, linear and planned technical responses to events that are unintentional, complex nonlinear and unplanned. This hazard origin bias in defining disaster partially ignores or relegates cultural, social and spatial factors and ecological elements that have infinite and complex origins. These factors, expressed in human interactions, form the basis for legislation and policy, which in turn inform theory and ultimately influence the substantive content of DM policies, plans and programmes. They are then imperative in determining how disasters and natural phenomenon are perceived and thus ultimately prepared for.

The use of the word natural, as a “prefix” to both hazard and disaster, suggests biases and surrendering to forces out of human control (acts of God) and thus can be construed as admission that no matter the extent of intervention some things cannot be averted. Within the language cultural, this contributes to increasing vulnerability. The labelling of disaster as “natural” affects the relationship of society with the hazards and in turn DM and DRR strategies. An ecological disaster gets far more sympathy from society than does a natural disaster, that cannot be averted. Ecological conjures up images of the interrelationships amongst the different elements (water, land, air and fire, and plants and animals) and the consequences of human actions on biogeochemical processes/cycles. While ecological also include elements of naturalness, it has a softer affinity to the human psychics. On the other hand, a natural event separates humans from the processes and puts the blame for destruction of human systems on God or other spiritual forces, because there is nothing that can be done to avert natural processes.

Ecological processes incorporate a human dimension that is not present or easily identifiable within natural processes, which takes place with or without human involvement. The paper opines that the word natural should be eliminated from the DM and DRR language and literature and be replaced with ecological. Similarly, the hazard origin bias should be replaced with an appreciation of the interaction of multiple and complex elements from multiple origins.

The contribution of hazard, risk and vulnerability as important inputs in the definition of disaster is also significant, given that these three factors are socio-spatially and mutually exclusively determined. The shift in consideration of nonlinear interactions and origins in defining a disaster must take place within an intellectual environment, unaffected by the rational and procedural modes of thoughts that currently dominate the planning discipline and literature. This will ensure that they have little or no influence in informing the formulation and implementation of DRR and DM intervention strategies, policies and plans. The paper also opines that the nonlinearity and complexities of disaster events renders rational (linear) DM policy and plan inappropriate. The multiple objectives of the paper are substantively mutually exclusive. Joining them theoretically will ensure that DM Planning and DRR adopt and target appropriate intervention based on how disaster is defined and how the culture of the language within the discipline is interpreted.

The idea for the paper arose out of an attempt to overcome the challenges of DM and DRR, and the need to respond to these challenges by identifying and highlighting underlying concerns outside of the traditional (normative) procedural and rational modes. An approach is needed, which is capable of accounting for the wide range of multiple interacting factors (demographic, ecological, spatial, social, political and cultural) which result in a nonlinear complex disaster event. The approaches presented also serves more narrowly, to describe the various socio-spatial dynamic, cultural expressions and ecological processes underlying responses to disasters, risk perception and response, without prejudice. According to [Kasperson et al. \(2003\)](#), in particular those processes by which certain hazards and events, that experts assess as relatively low in risk, can become particular focus of socio-political activity within a society (i.e. risk amplification), while other hazards that experts judge more serious receive comparatively less attention from society (i.e. risk attenuation).

As in most sciences, the majority of practitioners within the field of DM and DRR do their work with little explicit reflection on the philosophical knowledge that underlies their research and subsequent planning. More focus is spent on practise and implementation, where processes and methodologies for intervention in DRR are central place, or where best practises are copied wholly or in part, leaving little or no room for theoretical discourse and understanding. According to [Hodgson \(1998\)](#), in so far as Planners make their philosophical positions explicit, claims to adhere to any particular theoretical conviction are upmost. Since DM and DRR are academically and intellectually located within

the wider ambits of the Planning discipline, then they too rest indirectly on one or more of at least four major epistemological foundations (realism, idealism, positivism and rationalism). There are many considerations that need interpretation and examination to be included in theoretical posits as important precursors to the understanding of human socio-spatial settlement behaviour under disaster conditions. Such considerations must rest on intellectual principles, respectful of geo-culture realities and the systems dynamics where implicit and explicit value judgements about the multiple direction and speed of change are understood. This is preferably done within the context of facilitating the formulation and implementation of DM Plans. Such plans have traditionally been informed by biases on technical and demographic data at the expense of ignoring socio-spatial settlement and sense of space behavioural characteristics which are the basis for demographic variables and technical standards. How can the understanding of nonlinear interactions, which result in dislocation and displacement in traditional socio-spatial conditions be interpreted and located within certain theoretical understandings to broaden the DM and planning process?

The necessity for DM to be guided by theory, or at least hydroid versions, or adopt a particular epistemological position is ignored by DM practitioners to their peril. The upsurge in the frequency, severity and intensity in disasters is equally due to the self-responsive changes in ecological processes responding to socio-spatial and demographic dynamics related to increasing pace of urbanisation and its accompanying multiple maladies. Most practitioners in DM and DR were caught with their intellectual guard down, leading to responses that are procedurally biased and piece meal. The result is that up until now there has not been any breathing room for proper theoretical formulation within a substantive DM and planning framework. The paper purports that shifting the basis of how a disaster event is defined, from a single hazard origin bias to a more multiple hazard origin, interaction and resultant focus, as well as changes to the culture of language within the discipline, is a good starting point.

2. Defining Disaster

Definition of events such as, emergency and disaster, vary along legislative and policy lines in different states and cultures. It is the prerogative of each jurisdiction to practically locate and define the tenets of the US-ISDR within their own development priorities, ensuring that the essence of the global interest is not lost in local translation. According to the [UN-ISDR \(2002\)](#), “a disaster is a serious disruption of the functioning of a community or a society, causing widespread human, material, economic or environmental losses which exceed the ability of the affected community/society to cope using only its own resources”. In the United States of America, the [National Research Council \(NRC\) \(2006\)](#) defines a disaster as a singular larger scale event that overwhelms the local capacity to effectively respond to and recover from an event. The definition of a disaster in Jamaica is outlined in the Disaster Preparedness and Management Act of 1993.

Even though this act, the attendant National Disaster Plan and the Draft National Hazard Mitigation Policy are under parliamentary review, they provide the framework guide for DM and planning in Jamaica. Section 2 of the act defines a disaster as “the occurrence or threat of occurrence of an event caused by an act of God or otherwise, which results or threatens to results in loss of property damage, damage to the environment, death or injury of person, on a scale which requires emergency intervention, by the state and results in widespread dislocation of essential services, fire, accident, hurricane, pollution, diseases, earthquakes, droughts and floods, so declared under section 12”. Section 12 contains conditions under which the minister may declare any part or whole of the island a disaster area. Under Section 2 of the act, disaster preparedness means any activity taken in anticipation of a disaster, hazard or other emergency situation, in order to reduce any negative impact. Similarly, a hazard is a natural or manmade phenomenon that may cause physical damage, economic loses or threatened human life and wellbeing, if it occurs in an area of human settlement, agriculture or industrial activity.

The works of [Pelling and Uitto \(2002\)](#) and [Moore \(1995\)](#) like many others fall short in addressing the twin factors, collectively or separately, which is the focus of this paper. Cultural norms, especially those relating to religious beliefs, which have found their way into disaster legislation and education, may also assist in amplifying the exposure of the island to disasters. Certain disaster evens and meteorological and weather phenomenon are seen as acts of God. This belief renders efforts at mitigation and preparation void, since if God is behind an event then no amount of human intervention can avert the effects. Prayer is then the preferred means of mitigation, when changes in social and spatial habits, such as heeding early warning signs and not constructing building in obvious dry river beds and other vulnerable areas, could have averted a disaster event. Close to one million Jamaicans are squatters living in urban areas exposed to multiple hazards ([Bailey, 2014](#)).

Paraphrasing the definition of disaster; a disaster is an abrupt departure from traditional modes of functioning of a human system. The departure is caused by energies endemic or foreign to the system, and a return to normalcy can only be achieved by injecting energies from an external source. As the multiple responses to human settlement concerns progress, there is usually deliberate or willful unawareness that at any time normative behaviours and processes within the settlement system can be abruptly compromised, to the extent that the intrinsic values of the system are temporarily voided. At this juncture the system requires the intervention from extraneous energies to re-establish the traditional normative processes restoring values. The intention, though not always achieved, is also geared towards ensuring that the element of surprise is reduced or eliminated when the disruption resurges. A disaster compromises both the absorptive capacity of the human system and the extent to which it can further support “disruptions” from normalcy. Disaster response, as a covert cry for help (inter-

national aid), is the greatest admission of the failure of traditional normative system and the inability to interpret the new emerging norm. A reformulation of Merton (1996), reference to deviance as a human psychological disorder inadvertently set the tone for interpretation of regular disruption of systems by disasters. The increase in frequency of disasters is exhausting the novelty of the occurrence and is partially responsible, ironically, for the levels of lethargy and unpreparedness of which some communities suffer. If disasters become a norm they can spread and become a relatively permanent part of social and structural systems. This is the rationalisation of irrationality or the ordering of chaos, which occurs within a self-regulating social and structural system. The time it takes to return to traditional normative process depends to a large extent on the resilience of the system. The longer this period the more susceptible the social and structural system is to accepting the disruption as the norm etc. The strain, chaos, anti-social behaviour and collapse that constitute a disaster are determinants of the theoretical foundations used to interpret and understand the disaster.

Inherent in the definition of disaster are two variables, which can best be defined as having multiple complex origin and nonlinear expression. One is the hazard and the other the social (human settlement) system. Both are governed by different laws, requiring different space resources for expression and both variable has multiple and complex origin. What happens when these two stubborn variables meet is what constitutes a disaster? The disaster is then the combined conditions of the phenomena and the human settlement system and should be equally attributed to both. Alexander and Davis (2012) have outlined some essential elements of the human system in the context of disaster and the inbound difficulties to resolving inherent problems. Additionally, they assert that in the event that underlying risk factors are not recognised and confronted, then alternative solutions must be identified outside of the traditional government-funded bodies such as the UNISDR, if we wish to see the problems resolved. Similarly, Eiser et al. (2012) defined human system in the context of risk perception and how actions are chosen in regards to risk interpretation. Clearly, risk perception is intimately linked to how humans position their settlement conditions, through spatial planning or not. The phenomena can be best described as a hazard and can have ecological, social and technological origin. Human actions can and do have consequences on ecological processes as much as ecological processes have consequences on human settlement systems. These interactions and their consequences are continually controlled by the normal and abnormal interplay of energies and are infinitely expressed within both systems. The UN-ISDR (2004) identified Climate Change, inter alia, as an important component of the natural system in as much as it is a product of the human system. However, volumes of literature are dedicated to the study and explanation of natural systems and their association with various components of natural hazards; see for example, Sørensen et al. (2006); McEntire (2004). The hazard is part of different ecological

processes, which behave differently and results in different products. These hazards provide an outlet for energy to ecological processes and interrelationships. The responsibility of the hazard to the system and its processes is important for the ecology to continually support itself and the human conditions and demands continually placed upon it. Fulfilling these demands not only places tremendous pressure on ecological processes and products, but they are often times damaging to the said processes. This nonlinear inter-relationship involving ecological processes and human systems can best be described paradoxically.

In accordance with Alexander and Davis (2012), it is the meeting of the human system and the ecological processes that defines what constitutes a disaster. Human actions have consequences on the natural and normal interplay of energies within ecological processes. The severity and intensify of disaster events are largely attributed to the social and spatial conditions of the human settlement, while the frequency of the hazards is determined by the nature of ecological processes, which facilitate their formation and give them energy. Given this, combination of ecological and human systems, the disaster may have a comprehensive impact in a localized manner, while the hazard has multiple localized origins and a comprehensive impact. DM must then be an extension of human and ecological systems, where, clearly the options for the management of the latter are more feasible than for the former. Tampering with ecological system can further infuriate negative conditions of the human systems and their ability to exercise resilience against or complementarity with ecological systems. It is this correlation that will form the basis for formulation of DM theories. However, while theories of human spatial systems are riddled in rational and comprehensive modes of planning, DM theories, where they exist are superficially, procedural.

The paper deliberately and temporarily ignores the strong anthropocentric scope of current and accepted definitions. However, it asserts that the viability of human systems is inextricably linked to the health of nonhuman systems. Thus humans and nature/ecology are one and inseparable. The fact cannot be ignored that humans are natural beings, given into social expressions, and thus all their expressions, then must also be a result of socio-ecological interrelationships. Human actions are normally referred to as “un-natural” not only due to their negative impact on ecological environment, but more so that the constituents of human production are far removed from their ecological origin and takes extremely long times to return to this origin. A product is considered “green” because unlike “brown” products its constituents are not as far removed from natural origin and can be easily broken down, over a relatively short time, into its original and separate ecological constituents.

3. Determinisms of Disaster

Settlement characterisations (spatial, aspatial, form and function) are the strongest direct determinants in defining a disaster in the context of the impacting (potential) hazard. Given peculiar sets of settlement conditions coupled with the

nature of the hazard then the disaster can be determined. Settlement is defined in the context of its location, and the particular sets of environmental or geographic conditions peculiar to that location. A history (Diamond, 1999; Harman, 2008; Hart, 2007) of the first civilisation (Southern Mesopotamia—Egypt—in the Indus Valley, Yellow River—China, Mexico Valley, Guatemala jungle, Honduras jungle and Coast-lands and highlands of Peru), shows their locations in “vulnerable areas”. These areas were also labelled the most fertile places of earth. It was this fact (food security through the development of permanent domestic food supply), that attracted nomadic humans to these fertile alluvial plains. Although this fact (inter alia) may no longer be valid in contemporary context, the physical location conditions still exists and thus the potential for disasters. This is especially true in contemporary setting, since the dominant agricultural focus has been replaced by massive urbanisation. All-be-it a history of civilisation shows that distinct cultural, social and ethnic characteristics are heavily influenced by physical design and layout, which too is influenced by the physical geography (location, climate, weather, soils, vegetation, topography, relief, faun and cultural patrimony) of the locale. These geographic determinisms of the myriad of settlement concerns by extension refer also to the vulnerabilities inherent in the geography and geology of location.

That the environment is responsible for the development of particular culture and behaviour, is important in integrating environmental determinisms in defining development plans (inclusive of DM plans), for a particular area. Moreover, the cultural and socio-economic spatial expressions may disguise the ecological relationships that are naturally occurring in an area. For example, land reclamation may disguise important underlying topographical and drainage characteristics that are important in defining the impacts of heavy rains on the flood vulnerability of the area. This is normally the case with settlements which are the recipient of imported inhabitants, who are not indigenous to the area and are thus not knowledgeable with its geo-physical characteristics. Disasters prone conditions are normally prevalent in areas where there is strong people environment disconnect. Housing developments are inherently different than communities and villages, planned or unplanned! Intrinsic in environment and geography determinisms are issues of education, poverty, politics and governance, community cohesiveness, investment in infrastructural support services, health conditions, communication networks, and all the things that are of concern of a settlement.

4. Deconstruction of the Disaster Definition

So far definitions of disaster evade identification of hazard origin and the result of interactions or allude to only a single origin. Other definitions place the origin (cause) as act of God. Still definitions avert the limitation of identifying the causes of the disruption and begin with accepting that there is disruption. While there have been notable shifts in the basis for defining disaster in academic and research literature, the legislative (Chen, 2011) and institutional (UN-ISDR, 2005)

changes has not been keeping pace with such trends. Emergency Management Australia asserts that recently the focus of concern with emergencies and disasters has moved towards consideration of the situation created by such phenomena rather than simply of the origin, nature, size, speed of onset and other physical attributes of the hazard, which results in the event itself (Emergency Management Australia, 2004). Other research (e.g. Mileti et al., 1995; Sørensen et al., 2006; Cuny, 1994; McAllister, 1993; Chen, 2011; Stenchion, 1997) has made similar assertions. The definition of what constitutes a disaster goes beyond relativism and is deliberate and certain. These elements of forethought or deliberation are due mainly to the localized nature of the impact and the interaction between the geo-aspatial characteristics and the hazard.

The geographical characteristics encapsulate all ecological factors inherent in location and subsequently climate, while the aspatial factors are socially defined and consider all settlement concerns. The geo-scientific nature of a hazard and its location in nature makes it one of the most complex systems to interpret, since it is difficult to model. Such a model would have to be an exact replica of the original. Geographic, atmospheric, seismic, wildfire, hydrological and volcanic induced hazards, are however predictable given specific geographic, chemical, hydrographic and temperature variables, properly integrated in a relevant “computerized” GIS environment.

The notion of DM is itself entangled in some sort of deliberate action which too indicates theory guidance. For all intent this is muddled in rationalism and rationalistic behaviour. Some critics of rationalism in planning posit that this approach is procedurally over biased at the expense of substance. Here more emphasis is placed in realizing an approach or completing a “process” rather than a higher level substantive understanding of the concern being addressed. Most evacuation plans are so infatuated with successfully realizing the “evacuation process”, that proponents of the plan are not sensitive to the reasons why people firstly locate in vulnerable areas and why they do not want to be “forced” to leave. These and other substantive questions must be asked and answered prior to the operationalisation of the evacuation plan, long before the disaster event is imminent. Additionally, since evacuation and relocation can have such important modifications to the residence of political power, especially in developing countries, such as Jamaica (Buchanan, 1986) and sense of place (Stedman, 2003), then questions and their answers regarding politics and social inclusion, must also help to inform the content and implementation of the Disaster Plan.

The natural origin of the hazard is also a favoured approach in defining disaster events. This is done at the expense of relegating significant human (socio-spatial) factors, to discussions within the realm of risk and vulnerability. Most theories and research (Eakin & Luers, 2006; Cutter et al., 2009; White & Hass, 1975; Turner et al., 2003; Walton et al., 2008; Blaikie et al., 1994) associated with disasters adopt this bias even though both the natural phenomenon and the socio-spatial settlement conditions are equally responsible. Other research (Cutter et al., 2009;

Pelling & Uitto, 2002) goes as far as dissecting the definition into natural, technological and social/human disasters. This practise implies that these are more and not less responsible, for what constitute a disaster, based off the origin. Albeit not every ecological phenomenon translates into a disaster, since they are all not in contact with socio-spatial elements. Still a disaster has no single origin, but begins when ecological phenomenon, e.g. hurricane, tropical storm, drought, earthquake and flood waters, meets peculiar sets of socio-spatial settlement conditions, e.g. squatter communities/settlements and marginalised urban lands deprived of socio and physical infrastructural investment, at a particular time. The relationship of this to other factors has been identified and critically analysed by Bailey (2014) in reference to Jamaica and the Kingston Metropolitan Area. While Cutter et al. (2009) and Eiser et al. (2012), argue that this natural event exposure-based approach prevailed for three decades until researchers began to question the validity of such a natural event centric focus. They make reference to the seminal paper of O'Keefe et al.'s (1976) which argues for "taking the naturalness out of natural disasters" and refocusing attention on the human drivers of vulnerability. While the work of these and other researchers (Bryant & Bailey, 1997) have argued against the nature bias in determining risk and vulnerability the same has not been so for defining disasters.

Disasters attributed to ecological phenomenon are more frequent and popular than those associated with social/civic and technological causes (oil spills, industrial fires and crime). A more substantive definition of what constitutes a disaster considers not only origin, more so a single origin, but also the interaction and end results of the interactions of all elements. Similarly, a shift in this direction calls for a renewed focus and consideration of the vulnerability and risk components as precursors to the definition, since they are normally presented as adjunct. These factors are dominantly socially determined. Consequently, there should be a shift of the blame for disasters from the ecological phenomenon. Current disaster literature attribute more of the definition to ecological phenomenon, than those dealing with vulnerability and risk as socio-economic associations. By attributing the blame more to the ecological phenomenon, humans and society feel that the onus, for reducing vulnerability and mitigating against disasters, is not on them, and that no matter what they do to increase resilience; these "acts of God" will render all their efforts meaningless. This is exasperated in SIDS, such as Jamaica, and poor countries of Sub-Sahara Africa and Asia, where religious and spiritual beliefs, cultural and social habits are still at the heart of vulnerability, risk and disaster perception.

Disaster conditions, upon manifestation and expression, are the result of the continual combined bombardment and interaction of three key elements, which themselves are complex; ecological processes (weather, climate and micro-climate, geological, atmospheric, hydrological, floral and faunal), social/human (psychological, perception, political, demographic, spatial, physical, cultural, economic, ethnic, religious and spiritual) and planetary (oceanic, solar, lunar and ultra-at-

mospheric). Disasters then when defined, must encapsulate all of these three elements in different proportions. Within a disaster event it is difficult to accurately assign blame to any one of these element. No accurate mathematical algorithms or quantitative method or theory exists to; assign origin of the disaster conditions to the natural, social or planetary element. For one, the degree of displacement and dislocation within a human system resulting from the interaction of these elements in different proportions is evidence of the high degree of contradiction between the human system and the other two. Human systems are the most vulnerable to dislocation and displacement. They may recover and return to a state of normalcy over a shorter time, than the natural and planetary. However, the long term readjustments of the ecological and planetary systems do have a greater impact on social systems in the long run.

One of the main reasons why DM activities are lacking in theoretical foundation and that the definition of disaster is skewed towards its perceived natural origins is due to the proportional rate of occurrence or manifestation of human activities versus the occurrence of a disaster. While disasters are abruptly expressed, socio-spatial activities are proportionally less abrupt. Consider that in Africa and Asia the urban population will double between 2000 and 2030. That is, the accumulated urban growth of these two regions during the whole span of history will be duplicated in a single generation (UN, 2007). It is not difficult to appreciate the effects of this on global ecological resources. That this, and other, gradual socio-demographic dynamics will contribute significantly to disaster cannot be discounted. However, it is easier to see a tropical storm in Jamaica than it is to see the consequences of this unprecedented growth in urban demographics. Proportionate analysis may reveal that the accumulated impact of these socio-demographic trends may well have a more devastating impact than the sudden occurrence of a single disastrous event, such as a tropical storm. Within such an environment, the disaster will no doubt take centre stage, while the growth in population and its attendant impacts fade in the background, in comparison. Just as geographic determinism (Peet, 2007) dictates the effects of environmental conditions on human behaviour, over time and gradual, so too do the human actions, over time, contribute to the changes in the ecological cycles.

Within mainstream literature the disaster is referred to as natural, when the foreign energy is of an ecological origin. In Cutter et al. (2009) three types of origins of hazards and disasters are identified as having society as their common denominator. The first hazard involves the interaction between society and natural systems (e.g. hurricane). The second is caused by interaction between society and technology (e.g. chemical spill). The final occurs between society and itself (e.g. financial breakdowns, Stroup & Zissimos, 2013). It is clear that the last two origins of hazards involve the interaction of society with itself. This separation of hazard and origin brings to fore another important element in the definition of disaster; that of time. Definitions of disaster rely on the “abrupt” occurrence of change, ignoring the fact that ecological systems and social systems, to

an extent, normally respond progressively over a long time to pressures and threats. Natural adaptation is long term and the geological implication for soil and rock formations are beyond the temporal window of social and political planning. Conversely, some social investments, such as education (social engineering) as a long term response to crime and violence can be frustrating to politicians, who are more bent on realising rewards and returns within the three to five years voting cycle. However, investment in physical infrastructure (World Bank, 2011; Tuck et al., 2009; Njoh, 1999; Chen et al., 1998; Bailey, 2014) can have positive effects in improving community's resilience.

Without discounting or discrediting the focus on hazards, vulnerability and risk as a starting point to defining disaster, their origin can lead to errors in analysis and ultimately in devising intervention strategies. Disasters are actual events, while vulnerability and risk are measures of potential. No amount of vulnerability estimation can adequately prepare a society for its interaction with ecological phenomenon. This is not to take away from the successes (Sørensen et al., 2006) of mitigation programmes in countries such as Cuba, Jamaica, Costa Rica and Canada. Consequently, the definition of what is a disaster should not begin and end with its origin since there is no single origin or end. As such the definition should begin from the point of interaction of the ecological phenomenon with the socio-spatial settlement conditions at a particular time, until the results of the interaction are known. Further critical analysis will reveal that this point is within a nonlinear continuum and inadvertently shows the nonlinear relationship of all the elements (social, spatial and ecological). This origin-interaction-result approach to defining a disaster is what this paper promulgates, in favour for a definition that begins and ends at a single point of origin of any one factor.

Alexander and Davis (2012) identified five novel factors, which are far from being natural, that place citizens at risk, in contemporary societies. These are; 1) the human right to hazard information, 2) explosive population growth, 3) corruption, 4) how people are placed at risk by the deliberate actions of governments also known as “*social murder*”, and 5) gender discrimination. This is by no means an exhausted list. They called for the need for explicit recognition of the negative side of disaster risk, or in other words the factors that block DRR. These include the role of the black economy, “proxy wars” and the deliberate creation of inequality by marginalising communities. Clearly, these and other similar concerns are far from being ecological; they are of multiple origin. It is easy to identify equal sets of social and ecological factors as active determinants in the cause effect interrelationship of what constitutes a disaster. Smith (2011) identified climate change (along with globalisation, demographic dynamics and increasing resources use) as one of four most important forces shaping civilization's northern future. This he did while attempting a “thought” experiment of the World in 2050. While the paper calls for equal consideration of all factors in forging a definition, it argues in favour of the multiple origins, interaction, and

results in the definition than the linear natural origin that presently obtains. The fact is that it is far easier to change human actions, making them aligned with ecological dynamics, than to achieve the reverse.

5. An Alternative Basis for Defining Disaster Event

The Origin-Interaction-Resultant (OIR) approach is based off multiple origins, nonlinearity, complex interactions and results from the interconnectedness of various factors. This new basis for the definition of disaster can be built on the current and subtle versions presented antecedent. In this spirit the paper offers the Origin-Interaction-Resultant approach. Under this approach, the multiple-origins of the phenomena [ecological (e.g. tropical storm and torrential rain), human (e.g. H1N1, COVID-19, Ebola, outbreak and Civil Unrest) and (technological e.g. industrial fire and oil spill)] are identified and equally considered for any given event. The definition then proceeds to identify the interaction of these phenomena with settlement conditions, at a particular time and space, especially, since there are vast arrays of settlement types. Finally, the results of the interactions of the phenomena with settlement conditions and ecological processes are determined. This interaction must inevitably result in some sort of dislocation, damage and/or displacement of ecological elements (e.g. destruction of a mangrove or a forest), human settlement (damage to houses and water supply infrastructure) conditions or humans and society (e.g. state of emergency due to prolong civil unrest). At the extreme case all three factors may be equally displaced or a combination of any possibilities based off the laws of probability. However, it is more likely that any one factor may exhibit a greater level of displacement than the other two. This alternative basis for defining a disaster does not begin at the origin of the hazard but at the end upon estimation on where the greatest amount of dislocation, damage and displacement takes place. Upon this basis disasters are reclassified accordingly.

1) Natural Disaster: when the results of the multiple interactions are such that the majority of the damage is borne by the ecological system (e.g. an oil spill in a wetland or the sea).

2) Technological disaster: when the results of the multiple interactions are such that the majority of the damage is borne by the technological system (e.g. damage to an electrical power plant due to severe flood or hurricane).

3) Human/social disaster: when the result of the multiple interaction is such that the majority of the damage is borne by the social systems or humans (e.g. an outbreak of H1N1 or COVID-19 affecting residents in a particular urban community or overwhelming the country's health system).

The OIR model to defining and classifying disaster event ensures that a continuum is maintained with the multiple origins, their interactions and the result of their interactions. DRR and DM must then target the resultant which will simultaneously affect both the interaction and the origins. Clearly, these approaches are appreciative of the actual disaster conditions upon manifestation and not

before. The use of the Origin-Interaction-Result approach ensures that the multiple origins of the causes and their complex interaction are accounted for within the actual disaster event. This information is then used to formulate and guide DM and DRR intervention strategies and programmes and plans. By predicting the manner in which the three elements identified earlier will interact and the possible results of their interaction DM Plans and intervention (early warning) strategies can be fashioned. Inherent in this prediction is the fact that there are (will be) many unknowns in all three considerations and thus no amount of prediction can avert the disaster. However, what the prediction does is estimate the most likely outcomes of the interaction based off multiple outcome priority modelling. The predicted outcome then is a cornerstone in devising mitigation interventions. Additionally, analysis of patterns and trends of different outcomes overtime can be used to inform medium to long term DM Plans and DRR strategies.

6. Implications for Disaster Risk Reduction and Disaster Management

Hazards, vulnerability and risk are three of the most important factors in defining disaster and informing DM. They are then fundamental in twinning both the definition of the basis for disaster and formulating theory on DM. Disaster events classified as natural also have their associated hazard classified as natural. Ecological disasters then have ecological hazards as their origin, even though other social, technological and planetary hazards are present in forming the disaster conditions, once they interact. Actually, the concept of an ecological hazard is fallacious, since these are known conditions and precede the presence of social and human conditions. Disaster is a realisation of the potential that is inherent in vulnerability, risk and hazard. This realisation is valued as a socio-economic displacer. While engineering and planning standards may render the potential for risk and hazard estimable on the social human side, the same cannot be achieved for an ecological phenomenon. There is no correct instrument to ascertain the nature of a hurricane, earthquake and drought before it happens. Standards then are applied to the spatial and physical settlement systems in anticipation of likely impacts and displacement. Hazards, vulnerability and risk are socially constructed, while an ecological phenomenon is natural.

A theory of DM should then be au fait with natural and social constructions related to vulnerability, hazard, risk and disaster, in order to inform interventions. After all, the aim of DM should be to develop appropriate and effective physical (hard), social and ecological/green (soft) intervention methods to manage the adverse interaction of the multiple elements in a disaster event occurring in a nonlinear manner. It is misleading to identify the disaster event as having a natural origin (natural disaster) and by extension identifying the disaster as natural, then target non-natural elements in DM. In any event all DM efforts will inevitably target non-natural elements, with the understanding that they will in

the long and short run affect the nonlinear process of disaster. For DM to be effective it should identify and accept the multiplicity of disaster, its multiple origins, and multiple cumulative cause and effect. These classifications all define the basis of disaster events on an ecological origin, ignoring important social, demographic, spatial, political and cultural elements. Accepting the non-linearity of disaster events also means accepting the multiple origin and cause and effect interrelationships of multiple factors working simultaneously.

DM must then also be guided by multiple objective prioritisation principles. Research (Chandramouli et al., 2009) in urban and regional planning are now shifting into this direction of multiple analysis approach to resolving urbanisation concerns. This is especially true at the spatial level where multiple objective prioritisation is both a necessity and an imperative in; accommodating the multiple demands on spatial resources. Brennan (1999); examining the critical linkages among urbanization, public health and habitat, ecology, population growth, and international security in the context of large cities in developing countries. The research highlighted the trends in urban growth, particularly in the developing world, and their potential to affect the international community. Similarly, Davis (2004) examined the relationship between slums, urban involution and the informal proletariat, in the context of developing countries. Bailey (2014), critically analysed the considerations for redefining and realising Comprehensive Urban Management within the Kingston Metropolitan Region (KMR) of Jamaica, by targeting four interrelated factors; increasing poor urban population, informal settlements on marginal lands, urban infrastructure and increases in the frequency, intensity and severity of hazards. Still other studies and literature, such as Manderscheid and Richardson (2011) and Davis (2004), etc. all in some form or another drew upon correlating several factors in trying to understand various conditions and concerns of urbanisation. Similar multi-objective correlational research is needed in DRR and DM.

While many research has been dedicated to the study of urbanisation and economic development in developing countries (particularly those countries of Asia, Africa and Latin America), the relationship between population concentration in large cities and economic and social wellbeing of municipal population remains unexamined (Brennan & Bockerhoff, 1998), even though these are areas which are most vulnerable. DM is now stuck and subsumed within the technical and scientific narrative of climate change and has evaded the necessity for theoretical groundings. Urban and regional planning has managed to retain its theoretical focus while tackling issues such as urbanisation (Manwaring, 2007; Manderscheid & Richardson, 2011; Overman & Venables, 2005; Preston, 1979; UN-Habitat, 2003; UN-Habitat, 2012; UN, 1996 and Brueckner & Selod, 2008), placemaking and land use (Brueckner & Selod, 2008), traffic and transportation, housing/shelter (Jenkins et al., 2007) and urban governance (UN-Habitat, 2008). Theoretical constructions (Campbell & Fainstein, 2003) in all areas have flourished despite the technical and practical expansion of the discipline across sec-

tors.

Under the multiple analysis approach, DM and hazard risk reduction should be concerned about the management (response and reaction; path defining, path sustaining and path dependent) of the multidimensional changes that define a vulnerable society exposed to hazards and risks. Planning under the ambits of DRR should by extension be concerned about the management of the resource distribution process to avert and reduce the realisation and actualization of hazards and risks to disaster. This brings a further dilemma where the demands on these products are increasingly many and intense and the existence of scarcity and disparity makes resources and products difficult to appropriate. Lösch (1994) explains that the ability to achieve this is political art. Any profession involved in the “creation” and distribution of financial, economic, social and physical products, especially under the stress of a disaster situation and the capitalist political economy and liberal democratic system; is bound to come under tremendous pressure, from a multitude of agents, to satisfy all the competing demands for these products. Against this background the five factors identified by Alexander and Davis (referred to earlier) can be interpreted and examined. Theirs is a contribution to changing the traditional language and focus of hazard and risk understanding, within contemporary urbanising societies.

The aim of a theory is to eliminate or at least reduce the element of surprise. This aim is more important within the application of DM and DRR. To reduce or eliminate surprise there must at least be consistent repetition of a pattern or trend. The repeated occurrences of disaster events in the same locale should not be surprising, especially if little or no social and physical mitigation intervention strategies are done to reduce the occurrence. One of the most important theoretical conclusions within the discipline of DM and hazard mitigation states, “disasters will happen, disasters do happen”. This simple statement summarises centuries of experiences of the historical patterns and trends in hazards and their interaction with human settlement conditions, causing disasters. This has been mainly due to the inability of the physical and social nature of settlements to accommodate the hazard conditions. The degree of failure of support structures and systems can help to define the extent of the damage resulting from the disaster as well as begin the process towards theory formulation.

The nonchalant view of the value of theory in informing DM activities at all stages is the reason why most mitigation strategies fail or are not sustainable. Unsustainable DM efforts are evident in the resurgence and reoccurrences of disasters in the same locale, but with increased frequency, ferocity, intensity and severity. According to the UN-ISDR (2005), “human activities can increase the frequency, intensity and severity of natural hazards, similarly, human intervention may also cause natural hazards where none existed before and human intervention can reduce the mitigating effects of natural systems”. The human factor is common in all instances of defining a disaster and then must be an indispensable part of theory formation for disaster planning.

Human actions are best understood within the ambits of theory. Place space relationships inherent in environmental determinism are important in exploring the relationship between human society and natural environment. Similarly, chaos (Kiel, 1995) and structural strains (Merton, 1996) theories also speak to this relationship, but places more emphasis on the consequences side of the equation and less on the why. Theoretical construct which explore the nature of the interactions of hazards (in particular ecological hazards) with human systems must be important in informing DM activities.

7. Conclusion

Two important conclusions can be drawn from the paper; firstly, about the proposition that the transition from disaster management planning and disaster risk reduction to actual mitigation actions to avert disaster involves important problems and secondly, whether current epistemic and technical methods of defining disasters and the language of disaster management has failed and should be discarded as having been invalidated by contemporary socio-demographic and intellectual developments. Thus the paper is not empirical but methodological or philosophical and need not be falsified.

While there can be no universal definition of disaster, there can still be a common plane of reference involving the fact that; all areas of the globe are subjected to similar biogeochemical processes and cycles and that human settlements in all areas exhibit the same sorts of pressures on these processes and thus are likely to have similar result when they interact. The differences in the interaction are governed by cultural, economic and political conditions within which resources are appropriated and values are defined. It is these differences that influence not only the formation of disasters, but also the nature of the responses. All these represent a complex web of multiple factors and elements, eliminating the focus on any one element. The traditional practice of simply referring to the origin of one hazard, for being solely responsible for a disaster event, does gross injustice to the complex nonlinear processes, which all interrelated elements form as part of producing disaster conditions. The OIR approach to defining disaster comes closest to incorporating all the various multiple interacting factors; their multiple origins, interrelated interactions and diverse results.

Formulating theoretical positions to inform the formulation of DM Plans and DRR Strategies involves biases that are the consequences of the culture of language within the discipline as well as the overly procedural bias of DM DRR. The sooner disaster management practitioners and theorists can limit the biases inherent in language and the focus on realising processes at the expense of substantive understanding then the sooner DM and DRR can begin to properly operate with the contemporary political economic and socio-demographic conditions.

Conflicts of Interest

The author declares no conflicts of interest regarding the publication of this paper.

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