Article

Future Research Directions of Disastronomy in the Climate Crisis Era

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1. Black Swan and Gray Rhino

We can distinguish between emerging disasters that are certain to cause large-scale damage to a community but could not be anticipated in advance, and disasters that have already been fully anticipated and have proven to be highly damaging. We refer to the former as black swans and the latter as grey rhinos. In our daily lives, we see a variety of disasters for which there are warnings of large-scale damage and tangible evidence that they will occur. However, despite the warnings and evidence, we tend not to prepare or take action against them.

Black swans are not the only disasters that we need to plan for and manage. Rather, we should be more concerned and prepared for grey rhinos. This is because grey rhinos can be anticipated and predicted. They don't happen out of the blue, but rather after a series of warnings and tangible evidence.

Black swans and grey rhinos have always happened in any community. What we need to do is to try to prevent them from happening in the first place, or to try to reduce the scale of the damage, or to create a system to prepare for them in advance. Whatever the disaster, the important thing is for individuals, households, organisations, communities and countries to improve their response capabilities. Improving disaster response capabilities requires a well thought-out preparedness system, and doing everything you can to prepare for a disaster in advance will help you be successful in responding to a disaster.

2. Core System Model

In the 1950s and 1960s, systems theory was a new theoretical perspective for understanding and predicting natural and anthropogenic phenomena. General systems theory was a new paradigm for the scientific exploration of wholeness, interrelatedness, and interdependence, and to this day, the systems approach is highly influential in most academic disciplines and professions. The systems models you are familiar with are described using concepts such as inputs, processes, outputs, feedback and feedforward loops, equilibrium, homeostasis, and open and closed systems. A system is made up of many interdependent elements that function as a whole to achieve a purpose.

Suppose there is a core system that drives and operates the entire social system. What is the core system? Why did the government's disaster management system not work to save the lives of passengers in the Sewol ferry disaster in 2014? I answer that it was because there was no core system to run and guide the disaster response system. Someone else points out that the control tower was not working at the time.

What is a core system that keeps the whole system working in the right direction? A core system can be defined as the hub of a complex network that guides and coordinates the entire system in a certain direction. In the system model, between the inputs and outputs is a conversion process called a political system. However, we do not know how the system's conversion process works or what its components are. Strictly speaking, we don't

know what makes the whole system work. We can only describe and understand the framework of a social system, a political system, and an administrative system.

I suggest the components of the core system as follows. First, value. Values are the components that determine the direction of the system's operations in situations such as disasters, public issues, events, etc. Without values and philosophy, the system will be lost and wandering in the forest looking for something. Second, institutions. In order to implement desirable values, we need to create or build institutions that are socially and legally acceptable to members of society. Third, leadership. Leadership is needed to manage the system based on desirable values and legitimate institutions. Fourth, devotion/dedication/commitment. In order for a system to achieve or perform its work, it must have a commitment to the mission that it must achieve. Fifth, expertise. The system must possess the necessary expertise to perform its tasks. Expertise is special knowledge or know-how that can be acquired through practice, study, training, etc.

3. Future Research Directions of Disastronomy

A disaster can be defined as "an event that threatens the viability of a community or causes large-scale loss of life and property among its members". Here, I define Disastronomy as "the study of finding the nature and causes of disasters and the rules and laws for overcoming and managing them, so as to respect and implement the universal values of human society: human life, human dignity, and fundamental rights of human beings."

Nowadays, it is very difficult and challenging to avoid disasters due to various hazards and vulnerabilities in society, so many scholars are focusing on disaster resilience to achieve sustainable communities. Disaster resilience can be defined as a holistic approach that includes the protection and restoration of critical infrastructure and functions with the support and ability of communities and organisations exposed to disasters to effectively resist, absorb, accommodate and recover. Disaster resilience research has emphasized resilience at the organizational level, with the argument that organizations that experience disasters should be the ones that are best prepared and most able to adapt to them, and that there is a need to strengthen the resilience of disaster management organizations that are responsible for local disaster management.

Today, I present research directions in Disastronomy according to the five domains that make up the Core Systems Model: values, institutions, leadership, devotion, and expertise.

3.1. Community disaster resilience

Disaster resilience is both the ability to recover from a disaster and a measure of the speed of recovery. Resilience is the ability to bounce back from a shock. The role of communities, neighbourhoods, and families in building resilience is critical, and disaster resilience is everyone's business and a responsibility shared by citizens, the private sector, and the government sector. Disaster resilience is the ability to absorb the shock or disruption of social functioning from a disaster. Resilience in the natural environment is the return of an area or ecosystem to its original state after being subjected to some hazard or threat. Human systems require progressive development rather than restoration to the past. Resilience can therefore be seen as the ability of both systems and communities exposed to hazards to resist, absorb and recover, including the preservation and restoration of basic structures and functions.

3.2. Disaster management in the age of climate crisis

Climate change can cause irreversible losses of human and physical capital and impoverishment. Two major challenges to sustainable development are addressing both poverty and vulnerability to climate change. Currently, poverty contributes to vulnerability, and vulnerability to climate change often results in perpetuating poverty. In exceptional cases, measures to reduce poverty have in some cases perpetuated or increased

poverty by increasing vulnerability to climate change. However, policies and interventions should focus on the overlap between poverty and vulnerability, i.e. adaptation measures that seek to reduce both poverty and vulnerability to climate change. These can be seen as sustainable adaptation measures. Adaptation is the ability of a system to adapt to climate change to reduce potential damage, take advantage of opportunities, or cope with consequences.

3.3. No Poverty and sustainable disaster management

The concept of poverty can be linked to sustainable livelihoods. Livelihoods are the flow of income, which must be sufficient to avoid the vulnerability of poverty. Vulnerability is closely related to asset ownership. The more assets a person has, the less vulnerable they are, and the greater the erosion of assets, the higher the level of insecurity. These vulnerabilities can be divided into structural and proximate vulnerabilities. The concept of structural vulnerability is related to the concepts of stochastic and chronic poverty. Structurally vulnerable households experience chronic poverty because they are poorer on average, whereas the state of proximate vulnerability can change from year to year.

3.4. Local governance of disaster management

When a disaster strikes, there will be support and involvement from central or regional governments, but most of the actual disaster management process - the prevention, preparedness, response, and recovery phases - is carried out by local governments and voluntary community-based organisations such as local NGOs. Therefore, in order for communities to rebalance and maintain sustainable stability from external shocks, such as disasters, the collective resilience of their political and economic systems needs to be enhanced. Today, the private sector provides much of the country's critical infrastructure, so it is essential to include private sector companies in national disaster management and crisis management systems. In particular, it is necessary to build public-private partnerships in the prevention and mitigation phases.

3.5. Budgeting and investing for disaster management effectiveness

The nature of disasters is such that budgetary rigidity is a problem, despite the unforeseen circumstances that arise. In addition, the lack of cost-benefit analysis in disaster management budgets has been noted. In addition, the lack of coordination between basic local governments and metropolitan local governments, which are the final budget execution units, and the resulting complaints are characteristic of the budgetary system for disaster management in Korea. In recent years, the frequency of large-scale disasters and the scale of damage have continued to increase. Disaster management organisations, including government ministries and local governments, are faced with the problem of where and how much to invest resources and budgets to prevent various types of disasters in advance and to prepare for disasters when they occur. To achieve more effective disaster management with limited resources and budgets, it is necessary to recognise which hazards are present, identify those that are more threatening and more damaging to nearby residents, and prioritise investments to manage them in the medium and long term. The reasons why governments are not proactive in investing in disaster prevention can be traced to incentive structure issues such as externality, moral hazard, and irrationality of disaster management participants, which need to be studied.

3.6. Critical infrastructure disaster management

Critical infrastructure refers to the essential facilities, systems, functions, and values of a political, economic, social, and cultural system. The disruption or collapse of a critical infrastructure poses a serious threat to the viability of a nation and its ability to maintain operations. These critical infrastructure crises can be triggered by a variety of causes. For example, terrorism, mass protests or strikes, riots, and various disasters. These various

causes can disrupt the safety of the public, the vitality and integrity of a nation's economy and society, and key government facilities, functions, and systems. The areas of national critical infrastructure include finance, transport, power, telecommunications, major industrial complexes, energy, nuclear power, dams, public order, public health and medical care, drinking water, government facilities, major national assets, and national symbols. Each of these areas contains functions, facilities, systems, and values of the national society, and if they are not protected, the survival of the nation is seriously threatened. Nevertheless, these areas are very under-researched in Korean disaster management. Therefore, it is necessary for disastronomy to study the measures for the protection of these critical infrastructures and the crises and threats that lead to the paralysis of critical infrastructures.

3.7. Disaster management leadership

Disaster management is essentially a collaborative activity in which two or more organisations work together to create a better public good in the community. As different organisations may have different perceptions of collaboration, the joint activities that need to be undertaken are aimed at communication, coordination, building partnerships, and eliminating wastage of resources and efforts. Collaborative networks in disaster management are a fundamental component of any disaster response. Effective disaster management collaboration also requires cultural sensitivity and a common language, while successful disaster managers must be able to communicate effectively with other officials. For disaster management to be an integral part of sustainable development, it is desirable for disaster managers to engage with all political and social institutions in the community.

3.8. Building inclusive community capacity for disaster management

All disasters are localised. Everyone can and should be involved in disaster management planning: local governments, community associations, business councils, voluntary organisations, faith-based organisations, etc. In fact, disasters are very unfair. Vulnerable people, such as the poor, elderly, racial and ethnic minorities, and the mobility impaired, can suffer more from disasters. By involving the entire community in the disaster management planning process, we can identify and anticipate those at higher risk and empower citizens to act on their behalf, strengthening the resilience of vulnerable populations and reducing the burden on disaster managers. In particular, modern societies face a wide range of hazards and disasters, making it imperative that all institutions and organisations, both formal and informal, are involved in disaster management. Community responses such as employment generation, asset transfer and construction, seed introduction, education and skills development, microfinance support, and more orderly migration are preferably carried out by local governments. Research should be conducted to strengthen these disaster management capacities.

3.9. Disaster management collaboration and preparedness

Building the collaborative networks needed to manage disaster management and emergencies should be based on trust and commitment to the ultimate goal, not hierarchical order. Within the collaboration process itself, commitment, shared interests, trust building, leadership, and face-to-face communication are factors that influence the success of collaboration. Preparing for contingencies in emergency situations requires flexibility and adaptability, as creative and innovative approaches are needed to anticipate the unexpected and deal flexibly with chaos in emergency situations. Disaster preparedness is a key concept and the most important activity in disaster management. Disaster preparedness refers to the activities that individuals, families, organisations and communities undertake to improve their response capabilities, usually before a disaster strikes.

3.10. Disaster relief to build the resilience of disaster victims

Disaster victims may have been living a basic life without any problems before the disaster, but now they are facing a disaster that they are not responsible for, which has broken up their families, killed or injured family members, and left them socially and economically vulnerable. Therefore, it is necessary to increase the resilience of disaster victims so that they can return to their normal life before the disaster. Research is needed on how to increase the resilience of disaster victims, whether in poor or rich countries.

3.11. Disaster management expertise

In disaster management, it is important to have experts with expertise. The importance of experts in disaster management can be seen in terms of creativity, application, and reliability. First, experts are creative, unlike skilled workers who have been working in a field for a long time and have gained experience. Each disaster presents a different set of problems, and creativity is required to solve them. Secondly, experts are specialised in a particular field and have expertise in the details of the problem. Therefore, they can apply and adapt their knowledge, information, and methodologies to other problems, disasters, and crises. Third, experts are constantly learning about professional ethics and transparency during the process of developing their expertise and being educated and trained in their knowledge and methods. Therefore, experts have a stronger sense of ethics, transparency, and integrity than other members of the general public. Therefore, disaster management requires expert decision-making and implementation.

3.12. Advanced Technology in the Age of the Fourth Industrial Revolution

The importance of science and technology related to disaster safety is growing as the characteristics of disasters and safety accidents are changing and their ripple effects are increasing. Therefore, it is necessary to support R&D that can secure the safety of the public through technological innovation for disaster safety based on the technology of the Fourth Industrial Revolution. In particular, it is necessary to strengthen R&D support for the development of diagnostics, vaccines, and therapeutics in response to new and variant infectious diseases such as COVID-19 through pan-ministerial R&D cooperation. At the same time, it is necessary to develop the necessary technologies to respond to emerging zoonotic diseases step by step and establish a system for international collaborative research.

Profile: He received his B.A., M.A., Ph.D. from Yonsei University, Korea in 2000. He is a Director of National Crisisonomy Institute and a Professor of Department of Public Administration at Chungbuk National University, in which he has taught since 2000. His interesting subject and area of research and education is crisisonomy, disastronomy, emergency management, policy implementation. He has published 222 articles in journals and written 16 books, including 14 co-author books.