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The Nature of Disasters

Jeremy Bricker

Dicky C. Pelupessy

The dialogue between Jeremy Bricker and Dicky C. Pelupessy explores the fundamental nature of disasters, questioning the balance between natural forces and human influence while exploring themes of responsibility, risk perception, and preparedness. Drawing from Dicky's essay *Earth, Humankind, and the Haze Disaster*, the discussion challenges the idea that the earth itself is vengeful, arguing instead that humans perceive natural events as acts of rage. It highlights humanity's propensity to take risks and the misconception that disasters are purely natural occurrences. Instead, what we call a disaster is often the consequence of one—the result of human choices and vulnerabilities. For instance, as Dicky's essay illustrates, in an earthquake, deaths are not caused by the quake itself but by collapsing structures—a failure to account for seismic risks that exceed a building's capacity.

Curated by guest editor Tara Kanj and chief editor Fransje Hooijmeijer, this transcribed dialogue brings together backgrounds in psychology, engineering, and design. Through cases from the Netherlands, Indonesia, and the United States, it highlights the complex interplay between environmental forces and human decisions that shape them.

DICKY C. PELUPESSY

Dicky is an associate professor at the Faculty of Psychology, Universitas Indonesia. He was coordinator of Master of Applied Psychology program with concentration in Social Intervention. Currently, he is Vice Dean for Education, Research, and Student Affairs. He received his PhD degree in Psychology (Community Psychology) from Victoria University, Melbourne, Australia. He completed his PhD thesis on sense of community, connection to place, and the role of culture by using a constructivist grounded theory approach. He teaches, among others, community psychology for undergraduate and graduate students and is enthusiastic about social ecological analysis, social intervention and action research.

JEREMY BRICKER

Jeremy is a hydraulic and coastal engineer focused on the application of fluid mechanics to engineering design. He holds a BS in Mechanical Engineering and a BA in Physics from Rutgers University, and MS and PhD degrees in Civil Engineering from Stanford University, where he studied wave-current interaction and sediment transport in San Francisco Bay. As an Assistant Professor at Kobe University, he investigated wastewater outfall and river plume dilution in Osaka Bay, and then researched tsunami-induced infragravity waves at the University of Hawaii. He later obtained his Professional Engineering (PE) license while working on the design of hydraulic and coastal structures at URS Corporation in Oakland, California. After the 2011 Japan tsunami, he spent a year at Tokyo Institute of Technology focused on disaster forensics, sleuthing out the mechanisms of bridge and breakwater failure. He was then Associate Professor at Tohoku University, working on problems of structure failure during typhoons and river floods, and investigating the potential for generation of electricity by tides and waves. Following this, he worked at Delft University of Technology in the Netherlands, and is now at the University of Michigan.

PART I —THE NATURE OF DISASTERS

Editors: *Dicky, you have written that disasters happen because we ignore risks and lose balance in our relationship with the Earth. Can you explain what this means in practical terms? How should we rethink disasters like tsunamis or floods through this lens?*

Dicky C. Pelupessy: I think that all natural phenomena can easily be framed using the popular term natural disaster. This suggests that nature is the cause of the disaster, right? That's the common understanding, though I would call it a superficial understanding. The term natural disaster implies that nature itself causes the disaster, but I believe we all understand that there's no such thing as a truly natural disaster. As you pointed out, it's really about how we humans, as social beings, interact with and live in our environment. It's this interaction that transforms a natural phenomenon into an event that disrupts people's lives.

For me, the key issue is how we engage with nature. That's why in my essay I emphasize that it's our connection to and relationship with nature that determines how we are affected when a natural phenomenon occurs. It's about how we live with our ecology, how we manage our lives in relation to our environment. So, that's how I understand and conceive disasters. What I'm essentially saying is that, in the case of tsunamis, for example, the tsunami itself isn't the accident or disaster; rather, the damage it causes is what constitutes the disaster, and that damage is often the result of human-made factors.

Jeremy Bricker: I agree with what Dicky said. The tsunami itself is technically what we would call the hazard. So, the way the terms are typically used is that the hazard is the physical event that nature throws at us. Exposure is when we put ourselves in the way of the hazard. Vulnerability comes in when, by putting ourselves in the way of the hazard, we don't build structures strong enough to withstand it. The result of those three factors is called risk, and when the damages become too great, we call that a disaster. These terms are well defined in how we usually use them in the discipline. If any one of these factors isn't present—if the hazard isn't there, there's no disaster; if the exposure isn't there, meaning if we don't build in areas exposed to the hazard, there's no disaster; or if vulnerability isn't there, meaning if we build to withstand the hazard, there's no disaster either.

So it requires a natural hazard, but it also requires the human choice to build where there's a hazard and to live in those places. But that being said, if we want to live and work in areas with fertile soil or access to sea routes or trade, we're going to be in vulnerable locations. In the case of the Netherlands, that's the lowlands; in Indonesia, on steep slopes; and in Japan, because most of the country consists of steep slopes, it's prone to flood and landslide hazards. Sometimes it's impossible to account for all the hazards that exist. The Netherlands does a good job at considering storm hazards, for example, but the dikes around the Randstad have a protection return period for storms of one in 10,000 years. However, 8,000 years ago, there was a tsunami in the North Sea caused by a landslide that originated in Norway. That isn't considered in the protection calculation for the dikes in the Netherlands. Even in the Netherlands, where the hazard and vulnerability are quite well known and quantified, those numbers don't take into account all the hazards. They just account for storms, and not for that tsunami or other risks.

Then there's also a very small risk of an earthquake. If that happened, especially before or during a storm, it could cause the dikes to liquefy and slump, which would reduce the protection level. This kind of multi-hazard effect isn't accounted for because the chance of it happening is so low. In Japan, the Netherlands, and Indonesia, many engineers and planners have done a great job of quantifying the hazard and the protection level, or vulnerability. Even then, not everything is included, especially low-probability, high-risk events.

PART II — INHABITING RISKY ENVIRONMENTS

Editors: *What about humans living in risky environments, like the Netherlands or Indonesia, for example? How do we balance this human drive to settle in these vulnerable areas with the reality that this settlement increases disaster risks or hazards, while also acknowledging the human tendency to do so?*

Dicky C. Pelupessy: I think it comes down to what human beings understand about risk and the level of acceptance. I had an interesting finding when I did my research on volcanic eruptions. I visited Central Java after the 2010 eruption of Mount Merapi. In one of my interviews, one of the locals told me that, as a community that has lived there for generations, it wasn't until 2006 that the term "risk" even entered their vocabulary. Before the 2006 eruption, which attracted a lot of attention from the government, scientists, and geologists, people didn't consider the volcano a risk. They had been living harmoniously alongside it for generations. But after the eruption and all the warnings from experts telling them to be aware and ready to evacuate, the concept of risk was introduced to them. This shift really highlights that risk is about our understanding and acceptance of it, and how we manage things we once considered a right. What we do—and what we try to do—really depends on our level of understanding of risk. This also reflects our relationship with the environment. In Indonesia, for example, we know that in some areas, like those prone to earthquakes, our ancestors built certain types of structures in response to the risks they understood at the time. They adapted and adjusted their ways of living. But as we modernize, we may forget, ignore, or fail to pay attention to some aspects of our relationship with the environment. So, that's how I see it.

Jeremy Bricker: So the benefits, or the lack of some risks, outweighed the other risks. It's the same story in the U.S.; it's all historical. Why is New Orleans a city? Because it's at the mouth of a major river that fed the entire continent. This meant it could handle shipping traffic and trading barges all the way up to Canada, which at the time was New France, and back out to the Atlantic along the Saint Lawrence River. So, it connected all the French territories. In colonial days, New Orleans was at the southern edge of the French Empire—New France—which stretched all the way up to the Mississippi, into Canada, and out to the Atlantic. On either side, you had the English. France established the city to protect against the English, and it became a trading hub.

Another area susceptible to storm-induced flooding is Sacramento in California, which is also below sea level. Why is it a city? Because it was the closest seaport to the gold fields during the Gold Rush. And why is San Francisco a city? Despite its earthquake risk, it's the closest deep-water port to the gold fields.

Everything has a historical reason, regardless of whether there are hazards or not. The hazards came second—natural hazards were secondary to the economic, military, or political reasons for these cities being built, like in New Orleans. Once these cities are established, people want to stay. They don't want to move away from their jobs or families. It becomes a lot of effort and money if the government wants to address these risks. In Japan, after 2011, moving entire communities was a really special effort. Now, in Indonesia, they're making similar efforts to move part of the capital.

PART III — TECHNOLOGY AND CULTURAL ADAPTATION

Editors: *From both your engineering and psychological expertise and perspectives, should these efforts be made to relocate, or should we stay where we are and continue advancing our technologies to survive in these increasingly uninhabitable places, which are retaliating in the form of disasters as a consequence of our initial lack of judgment in choosing to live there?*

Dicky C. Pelupessy: Technology plays an important role. We need it in our lives. Technology is part of how we connect with our ecology and our environment. It serves as an intermediary between us as human beings and our environment. As I've emphasized before, it's really about our relationship with nature and our ecology. The first step is our mindset. We need to foster a positive and constructive relationship with our environment. Once we have that, we can create and produce things—based on science and technology—that help strengthen our relationship with nature and protect our lives. So, the key is to start with the right mindset, and then technology comes in to support us. I'm reminded of what the communities I met said. Before 2006, the concept of risk didn't exist for them. The term "risk" was only understood by those who had scientific and technological knowledge, who recognized that living in a

certain space could be risky when an eruption occurred. In our relationship with nature, we create not only technology but also culture. This is why I believe disasters occur when our culture fails us. As I've quoted before, something that resonates deeply with me: the collapse of cultural protection. Making our lives safe and protected is something we build through culture. When a natural phenomenon occurs and causes a disaster, it's often the result of our cultural systems failing us. Technology is a part of that culture, and I want to emphasize that it's really about our mindset—our relationship and connection with nature. Technology acts as a bridge between humans and nature. We should view it as part of our culture, something we create to make our lives easier and more comfortable. But we need to develop a deeper understanding of how technology fits into the larger framework of human culture, including safety and protection.

Jeremy Bricker: I agree with that as well. It's been this way since the beginning of civilization, right? Civilizations have always thrived in arid areas by building dams to irrigate land, which allowed agriculture to develop and, in turn, made cities possible. It's not new that we rely on technology for civilization to exist—this has been the foundation of our development, even in terms of our interactions.

Editors: *So, technology is part of our culture, and within our culture, we also have a relationship with our natural environment, which varies in different places. We use technology to make ourselves comfortable and to protect ourselves. For example, in New Orleans, as we discussed earlier, there was this major flooding. Was the accident that people lived in the wrong place, or was the accident that technology failed?*

Jeremy Bricker: Well, as far as we can say, if the technology had been designed properly and performed as intended, the failure—and the disaster—would not have occurred. The event fell within the design parameters of the system. However, the dikes and walls in this case didn't withstand the water levels they were meant to, due to construction flaws. No, it wasn't an accident. It was due to flaws in construction—partly because of insufficient strength and partly because the foundation wasn't on the type of soil the designers had originally believed.

Editors: *A similar question for you Dicky, but in the context of the 2004 Indian Ocean tsunami. One of the key reasons people struggled to escape was the layout of the streets, which directed them towards the wave rather than away from it. In this case, how do we assess the disaster? Was it an accident, or does it reflect a failure in both the technical and cultural aspects of how the area was structured and how people interacted with their environment?*

Dicky C. Pelupessy: I think it is both. You know, it's an accident in the sense that it's something expected due to the phenomenon of earthquakes and tsunamis. The casualties were caused by collapsed structures—that's an accident, right? But it also shows us the collapse of cultural protection: how we build our houses, how we set up spatial arrangements in neighborhoods. If we understand that an area is prone to earthquakes and tsunamis, then culturally, we need to build and develop spatial arrangements that factor in what might happen. So, I see it as an accident because the structures we built couldn't withstand the tremors; they collapsed, causing casualties and injuries. But it's also telling us that the very notion of culture—culture that can protect us—did not really exist at that time.

Editors: *So, if we redefine disasters as human-caused accidents, what does that mean for our response to them? In your opinion, should the focus be on changing how we build and plan urban environments, or should it be about shifting how we think about nature, as Dicky mentioned regarding cultural change? Or is it a balance between the two? And if so, how do we find that balance?*

Jeremy Bricker: If it's about how we think about nature, I'm not sure it would be beneficial to relocate settlements, like New Orleans or Sacramento, from their current low-lying areas. Moving these large cities would not only mean losing cultural heritage, but it would also have a significant environmental impact. These cities have been developed for centuries, and if we move them to a previously undeveloped area, we would essentially destroy nature on a large scale.

Instead, using technology to strengthen existing settlements, while preserving the natural environment where it is, might be a better approach. In the US, we have a distinction between "greenfields" and "brownfields." Greenfields refer to developing untouched land, while brownfields are areas that have already been developed. Protecting and reinforcing settlements in high-risk areas—like those already in New Orleans or Sacramento—helps preserve the natural greenfields. Looking at the Netherlands, especially, there's an interesting dynamic. By having so many people living in high-risk areas, the need to cooperate became essential. People there work together, even if they don't fully understand why.

In contrast, in the US, where people often live in less hazardous areas and are more widely dispersed, there tends to be less cooperation and more individualism. The necessity of working together in high-risk areas like the Netherlands fosters a spirit of cooperation that might be harder to develop elsewhere.

Dicky C. Pelupessy: For me, the key component of civilization and culture is human beings. Human beings create culture, and everything that follows—technology, infrastructure, and so on—is a part of that culture. But it's important to emphasize that humans must first be ready and prepared to face potential disasters. It's about building a mindset and mentality within communities—people living together in certain natural and spatial settings—so they can protect their lives through a positive and constructive relationship with nature.
Technology comes into play as a tool to make this relationship more balanced and harmonious. It's about how we develop a culture that fosters this connection with our environment. Humans create technology, but the foundation is our relationship with nature, and technology is used to enhance that.

As Jeremy pointed out, the answer isn't to just keep moving until we find the safest place. That's not how civilizations have evolved. It's not about fleeing from danger but building mechanisms of understanding and living with the risks inherent in our surroundings. For example, people in Indonesia can still live near active volcanoes, but we need to build a culture that helps us coexist with such risks. It's about developing a better understanding of nature and fostering a culture that allows us to live side by side with the natural world, even in high-risk areas.

PART IV — PERCEPTION OF NATURE

Editors: *I was reading a book called The Spell of the Sensuous by David Abram, an anthropologist who writes about Indonesia. He talks about how we've lost the right perception of nature. In one part, he describes watching a ritual where people put food outside for spirits, but the ants ate the food. This made him realize that these spirits were somehow connected to the ants. It's as if in honoring the spirits, there was also a way to integrate nature and humans in a mutually beneficial way.*

This struck me because in the Netherlands, we have no real perception of nature. We've been constructing our environment for so long that we no longer recognize what nature truly is. I tell students here that we don't really understand nature. If we want to respond to the "angry Earth," we need to first understand why it's angry. How do you see this perception of nature? I think in Indonesia, this awareness is still stronger than in the Netherlands, for example.

Dicky C. Pelupessy: Yes, Indonesians have a high awareness of nature, and that becomes a challenge when we modernize our lives with technological advancements. I'm not against science and technology—we need it—but we also need to preserve our awareness and sense of nature. In Indonesia, sometimes our drive for development, to improve our lives, causes us to neglect our connection to nature.

It's about finding balance—developing our lives with technology while maintaining a deep understanding of and connection with nature. So, there's a tension between development and keeping that sense of relationship with nature.

Editors: *But that's something we can learn from. Jeremy, what do you think from the American perspective?*

Jeremy Bricker: Even though the Netherlands doesn't have much natural nature, only artificial nature, and the US has tons of natural nature, I don't think Americans are any more aware of nature than the Dutch are. Look at how we treat climate change—we have tons of natural areas, but we don't care much about reducing our carbon footprint. Americans continue driving larger cars, building more roads, and expanding cities, despite the effect it has on nature. In contrast, the Dutch, even without much natural nature, are more conscious of these issues and taking more action to reduce their impact on the environment. So, despite the difference in natural resources, I believe the Dutch are more aware and proactive in preserving the environment than we are.

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