Fast and Slow Thinking
in the Face of Catastrophic Risk

Howard Kunreuther
The Wharton School
University of Pennsylvania

Paul Slovic
University of Oregon

Kimberly Giusti Olson
Independent Scholar,
Eugene, Oregon

August 2014
Working Paper # 2014-06
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Howard Kunreuther, Paul Slovic, and Kimberly Giusti Olson

Abstract

Studies of behavior in the face of natural disasters and mass atrocities provide common lessons about managing catastrophic threats. We cannot assume that the massive destructiveness of an event will lead us to appreciate and appropriately respond to the risk. The potential consequences, whether in billions of dollars or millions of endangered lives, often fail to convey the emotional meaning necessary to motivate effective protective actions. Rather than trusting our desensitized feelings as our moral compass, we must employ slow and careful thinking, coupled with short-term incentives, to create policies, procedures, laws, and institutions that will nudge or even require us to behave in ways that accord with our considered values for protecting human lives and property.
Catastrophic risk is not new to the 21st century. Natural disasters, famines, and pandemic disease have long been with us. Economic development coupled with climate change is increasing the frequency of losses and fatalities from natural disasters and their destructiveness to the environment.¹ Wars continue to rage accompanied by new forms of equally virulent attacks on non-combatants in the form of genocides and mass atrocities.²

As human behavior is implicated in both the causes and consequences of many of these problems, this paper reviews new insights about thinking and decision-making that provide guidelines for reducing these daunting threats. We shall do this with regard to two hazards noted above, natural disasters and mass atrocities. Apart from their catastrophic nature, these are very different risks. But they both induce similar ways of thinking and deciding that exacerbate their harmful consequences. Policies to mitigate their harm thus need to be informed by knowledge gleaned from behavioral research on decisions under risk and uncertainty.

Our analysis builds on the distinction between intuitive and deliberative thought processes characterized by Kahneman³ as fast and slow thinking, respectively. We will describe some pitfalls of intuitions arising from fast thinking that cause problems in the management of disasters and mass atrocities. Insights from this behavior point to the need for slow and more deliberative thinking when creating policies, laws, and institutions to better control these catastrophic risks. With these insights in mind, we provide policy prescriptions for better managing each of these hazards.

Intuitive and Deliberative Thinking

A large body of cognitive psychology and empirical research during the past 30 years has revealed that individuals, small groups, and organizations often make decisions by employing a blend of intuitive and deliberative thought processes. In his thought-provoking book, Thinking,
Fast and Slow, Nobel Laureate Daniel Kahneman characterized these two modes of thinking as System 1 and System 2, building on a large body of cognitive psychology and behavioral decision research as depicted in Table 1.

System 1 thinking tends to be fast and effortless. System 2 thinking requires more time and attention. Intuitive thinking works well for routine decisions but can be problematic for low-probability high-consequence events when there is limited opportunity to learn from personal experience and when the consequences are likely to occur far into the future. With respect to floods and hurricanes, individuals are likely to discount the impact climate change will have on sea level rise and future damage. With respect to genocide, the atrocities involve large numbers of faceless people in distant places, whose actual or predicted deaths fail to spark the feelings and emotions necessary to motivate protective action.

This paper documents how fast intuitive thinking causes underreaction to natural disasters and mass atrocities. Informed by these descriptive insights, we then argue for prescriptive measures that reflect trade-offs informed by slow and deliberative thinking.

Natural Disasters

Scope of the Problem

Thirty years ago, large-scale natural disasters were considered rare events. Between 1970 and the mid-1980s, annual insured losses from natural disasters worldwide (including forest fires) were only in the $3 billion to $4 billion range. In fact, Hurricane Hugo, which struck in 1989, was the first natural disaster in the United States to inflict more than $1 billion of insured losses.

Times have changed and we now need to manage risks in a new era of catastrophes. As shown in Figure 1, economic and insured losses from earthquakes, hurricanes and floods have
increased significantly in recent years primarily due to a higher degree of urbanization and an increase in the value of property at risk. In hazard-prone areas, this urbanization and increase in population translates into greater concentration of exposure and hence a higher likelihood of catastrophic losses from future disasters. Sea-level rise, storm surge, and an increase in hurricane intensity partly due to global warming have also had an impact on damage.\(^4,5\)

The upward trend in losses has had an impact on post-disaster relief to the affected communities for rebuilding destroyed infrastructure and providing temporary housing to displaced victims. In the United States, federal and state governments have played an increasingly significant role in providing such relief. A look at the number of U.S. presidential disaster declarations from 1953–2011 depicted in Figure 2 reveals a sharp upward trend with peaks in Presidential election years.

**Why Do Individuals Ignore the Perils of Natural Disasters?**

By relying on gut feelings and simplified heuristics that induce systematic biases, many individuals do not pay adequate attention to the consequences of natural disasters when deciding where to live and what protective measures to undertake. It is not uncommon for those whose risk perceptions are based on feelings and intuition to underestimate the likelihood and consequences of a low probability event that they have not yet experienced.\(^6\) The problem is compounded by people’s inability to distinguish between low likelihoods that differ by one or even two orders of magnitude (e.g., between 1 in 100 and 1 in 10,000) when evaluating safety concerns.\(^7,8\)

People’s intuitive assessments of the likelihood of an uncertain event are often based upon the ease with which instances of its occurrence can be recalled or imagined. This *availability bias*\(^9\) is strongly influenced by recent personal experience and can lead to an
underestimation of low probability disasters before they occur, and their overestimation afterwards.

The availability bias helps explain why many individuals first purchase insurance following a disaster and cancel their policies after several loss-free years because they consider their policy to have been a poor investment. It is difficult to convince insured individuals that the best return on an insurance policy is no return at all. They should celebrate not having suffered a loss and still maintain their current coverage.10

Psychological research has documented the role of specific feelings such as worry or anxiety along with more general affective processes in guiding the intuitive assessment of risk.8,11,12 Prior to a disaster people often feel no need to invest in protection because they are not worried about the event occurring. The high anxiety felt after a disaster makes it easy to justify undertaking protective measures because the experience of suffering damage is deeply etched in one’s recent memory.

The reluctance to incur the upfront costs of protective measures until after a disaster occurs is reinforced by a tendency to focus on short-term goals reinforced by budget constraints. Few homeowners residing in hazard-prone areas invest in measures that reduce future losses, even when deliberative thinking would reveal them to be cost-effective.13

**Encouraging Protective Measures Prior to a Disaster**

Recognizing the pitfalls of fast intuitive thinking in dealing with extreme events, we offer guiding principles to encourage long-term deliberative thinking. We then show how insurance coupled with other policy tools can provide short-term incentives for homeowners to invest in protective measures prior to a disaster.
Guiding principles.

**Principle 1: Recognize the long-term impact of disasters on a region’s or nation’s politics, culture, and society.** The public and private sectors need to appreciate these long-term impacts when developing strategies for undertaking loss-reduction measures prior to an event and implementing a well-designed recovery program following an event.

**Principle 2: Consider inequalities in the distribution and effects of disasters.** Natural disasters often bring disproportionate hardships to middle and low-income households. Such vulnerability should be considered in developing risk management strategies.

**Principle 3: Understand people’s heuristics, biases, and other misperceptions when developing risk management strategies.** Appreciating the limitations of fast intuitive thinking is an important input in creating remedies and building cultures to manage catastrophic risk more effectively.

For insurance to play a key role in managing catastrophic risks, we propose two additional principles:

**Principle 4: Insurance Premiums Should Reflect Risk.** Risk-based premiums signal the type and magnitude of hazards individuals face and encourage investment in cost-effective loss reduction measures through a reduction in insurance costs.

**Principle 5: Address Equity and Affordability Issues.** Any financial assistance given to residents currently residing in hazard-prone areas (e.g., low-income homeowners) should come from general public funding and not through insurance premium subsidies.

**Strategies for encouraging slow deliberative thinking.** We propose two complementary programs for encouraging long-term thinking (Principle 1) and addressing
affordability issues (Principle 2), recognizing the heuristics, systematic biases and other misperceptions associated with fast intuitive thinking (Principle 3).

**Program 1: Multi-year insurance (MYI) coupled with home improvement loans tied to the property.** A multi-year insurance (MYI) policy coupled with home improvement loans to pay for loss reduction measures could be attractive to property owners. Annual premiums would be stable over a fixed period of time (e.g., five years) after which they would be reviewed by a credible scientific body to determine whether the risk has changed due to external factors (e.g., sea level rise). For MYI to be marketable by the private sector, insurers need to be able to charge premiums that reflect risks (Principle 4).\(^{14}\)

A MYI contract tied to the property would decrease the likelihood that either homeowners or insurers cancel their insurance policy. Home improvement loans for investments in risk reduction measures spread the upfront costs of mitigation measures over time. If insurance rates are risk-based, then the annual premium reduction from adopting a risk-reduction measure is likely to be greater than the annual loan cost. In other words, the short-run benefits are positive and there is an economic incentive to invest in these measures for individuals who engage in short-term thinking.

To illustrate, suppose it costs $1,200 to mitigate one’s property and by doing so the annual insurance premium would be reduced by $400 to reflect lower losses from a disaster. Short-run thinking may lead the homeowner to not undertake the measure because the upfront cost is three times greater than next year’s premium reduction. Now consider that the homeowner gets a five-year home improvement loan at a 7.5% interest rate, costing $290 per year. When coupled with a five-year insurance policy tied to the property the family would save $110 each year making this package financially attractive.
Program 2: Insurance vouchers to address affordability issues. There is often tension between setting insurance premiums that reflect risk (Principle 4) and dealing with equity/affordability issues (Principle 5). For example, the National Flood Insurance Program (NFIP) in the United States recently moved toward risk-based insurance pricing through the passage of the Biggert-Waters Act in July 2012. However, the elimination of certain premium discounts raised issues with respect to the affordability of coverage for homeowners in flood-prone areas. In March 2014 Congress reversed course and reinstated subsidized rates for certain classes of policyholders.

To address affordability concerns of low- and middle-income homeowners, Kousky and Kunreuther\textsuperscript{15} proposed using vouchers (like food stamps), rather than relying on premium discounts. More specifically they proposed coupling these vouchers with hazard mitigation requirements financed with low-interest loans. Such a voucher program has two key aspects. First, it operates in parallel with risk-based premiums essential for communicating information about flood risk to communities, developers, and residents. Second, vouchers (based on the household’s income) would be used not only to cover a portion of the increase of the insurance premium from the current subsidized rate, but also to cover the costs of the loan for mitigating damage to the residential property. If the vouchers were contingent on the homeowner’s mitigating their property, the household would then have a short-term economic incentive that could overcome their reluctance to think ahead in preparing for disasters.

Genocide and Mass Atrocities

Scope of the Problem

Over the past century the world has been shocked to learn of many horrific incidents of mass collective violence. The Holocaust of World War II stands out and, in recent years,
atrocities in Rwanda, the Balkans, and Darfur have gained the world’s attention. Today, humanitarian catastrophes in Syria and the Middle East are in the news.

Yet, these memorable cases are only a small part of the problem, as shown in Table 2. Mass atrocities, defined as the intended death of at least 1000 non-combatants from a distinct group in a period of sustained violence, are not rare. Since 1900, 201 distinct cases resulted in an estimated 84 million fatalities, an average of about 470,000 each! The atrocities death toll is comparable to interstate wars and vastly greater than that from terrorism.

In addition to the stunning frequency and scale of mass atrocities, what stands out in historical accounts of these abuses is the inaction of bystanders. In her prizewinning book *A Problem from Hell: America and the Age of Genocide*, Samantha Power documented the inadequacy of the U.S. government’s response to numerous genocides dating back to 1915. She concluded: “No U.S. president has ever made genocide a priority and no U.S. president has ever suffered politically for his indifference to its occurrence. It is thus no coincidence that genocide rages on.”

**A Psychological Account of Underreaction to Mass Atrocities**

There is no simple answer as to why citizens and their governments repeatedly fail to take action with respect to genocide and other mass atrocities. Every episode of mass murder raises unique social, economic, military, and political obstacles to intervention, but these atrocities are consistently ignored by powerful governments, and the general public without apparent regard for their scale.

One fundamental psychological mechanism that plays a role involves affect, the positive and negative feelings associated with fast intuitive thinking that has been shown to be a strong motivator of behavior. Research described below shows that the statistics of atrocities and
genocides, no matter how large the numbers, often fail to spark affect or emotion and thus fail to motivate action. Beyond describing the problem, we shall examine ways that we might make these abuses “feel real” and motivate appropriate interventions.

**Affect and the Value of Human Lives**

If we are to take steps to address problems of genocide, a crucial question is: How should we value the saving of human lives? An analytic answer would look to fundamental values such as the compelling moral principle that every human life is inherently of equal value, in which case the value of saving $N$ lives should be $N$ times the value of saving one life, as represented by the linear function in Figure 3a. In fact, the value of saving $N$ lives could even be disproportionately more important as $N$ increases if it threatens the social fabric and viability of a group or community (see Figure 3b).

How do we actually value human lives? Two descriptive models link affect and intuitive thinking and reflect values for lifesaving profoundly different from those depicted in the normative models shown in Figures 3a and 3b. Both of these descriptive models reflect an insensitivity to large losses of human life that likely contributes to apathy toward genocide and mass atrocities.

**Psychophysical numbing.** We all recognize the powerful impulse to help a single individual in distress, a phenomenon demonstrated in the research laboratory and labeled “the singularity effect.” When it comes to valuing lives, we often value two lives as less than twice the value of one. More generally, if we allow our feelings to be our guide (System 1), the value we place on saving human lives follows the same sort of “psychophysical function” that characterizes our diminished sensitivity to changes in a wide range of perceptual and cognitive phenomena—brightness, loudness, heaviness, and wealth—so that increases in magnitude
typically evoke smaller and smaller changes in response.\(^2\) The function in Figure 3c, termed *psychophysical numbing*, represents a value structure in which the importance of saving one life is great when it is the first or only life saved but diminishes as the total number of lives at risk increases. Thus we may not “feel” much difference, nor value the difference, between saving 87 lives or saving 88.

**Compassion fade.** Psychophysical numbing can explain why we would not feel differently upon learning that the death toll in Darfur is closer to 400,000 than to 200,000. What it does not fully explain, however, is our apathy toward genocide, inasmuch as it implies that the response to an initial loss of life will be strong and maintained, albeit with diminished sensitivity, as the losses increase. Research has identified a second descriptive model, *compassion fade*, that shows that affective feelings and response toward two victims are not only less than twice those for one, they may actually be less than those toward one.\(^22\) In the hybrid model depicted in Figure 3d, the value function for lives increases at first, but then decreases, possibly to the point of collapse, as the number of lives at risk grows larger.

The natural and easy way to deal with moral issues is to rely on our intuitive feelings. We can also apply reasoned deliberation to guide us but, as Haidt\(^23\) has demonstrated, intuition usually comes first in morally charged circumstances and dominates reasoned judgment unless we make an effort to critique and, if necessary, override our feelings. Thus, left to its own devices, intuition will likely succumb to compassion fade, favoring individual victims and underreacting to catastrophic threats.

**Prescriptive Implications for Law, Institutions, and Policy**

Behavioral research sends a strong and important message: Our intuitions, reflecting fast thinking, often fail us. Fortunately, we can address catastrophic threats with thoughtful
deliberation by designing more responsive legal and political structures. The United Nations Security Council, designed to create peace and security in a post-WWII world, is ill-equipped in its current form to deal with mass atrocities. Some permanent member states, fearful of setting a precedent for future intervention in their own internal affairs, continue to block preventive interventions. These failures at the institutional level, combined with our numbed intuitive responses, create a cycle of willful inaction.

With the United Nations reform process at a standstill, there is an urgent need for new laws and institutional arrangements that will force us to combat or better yet prevent mass atrocities. The recommendations below seek to integrate behavioral research findings into the decision-making process. Reform should be grounded in an understanding that cognitive deficiencies can prevent actors from taking steps to stop mass atrocities, even when doing so would serve their overall values and interests.

**Recommendation 1: Create mechanisms that require deliberation to justify action/inaction.** Even when moral intuitions are distorted, human cognition can be based on deliberative thinking. Rather than focusing only on obligations to act, international and domestic law could require policy-makers to participate in a formal process of deliberation to construct a defensible policy response to mass atrocities via a series of specific questions and scenarios. Experience from other decision contexts that require policy-makers to balance a range of costs and benefits suggests this simple act of engaging in structured dialogue may help overcome both affective and cognitive obstacles to intervention.

Research has shown that, when faced with multi-dimensional choices that include disparate values (e.g., health vs. cost) and ethical principles, people often resort to lexicographic choice patterns, focusing on a single value objective, to the neglect of other important
considerations. Thus, for policy-makers, protecting national security may overwhelm lifesaving objectives, no matter how many lives are at stake. Structured decision-making exercises can make explicit the conflict between humanitarian and security objectives and attempt to ensure that neglect of the former is not in violation of held values.

**Recommendation 2: Establish and implement pre-commitment mechanisms.** To overcome cognitive limitations, countries could draft international conventions or pass domestic legislation to “pre-commit” themselves to certain courses of action in the event of mass atrocities. Using the African Union’s (AU) Constitutive Act as an example, member states could agree to grant a multilateral organization the right to intervene in their affairs in circumstances involving war crimes, genocide, or crimes against humanity. These agreements would still fall under the United Nations Security Council’s purview for authorizing the use of force, and would provide a pretext for action.

Domestic legislation could be modelled after the U.S. “Foreign Assistance Act” which states that foreign assistance will be suspended if an elected head of government is deposed by military coup or decree. In a similar manner new legislation might trigger automatic economic or military sanctions against a country suffering mass atrocities or increase foreign aid in the event of a humanitarian catastrophe.

Pre-commitment, as described above, facilitates early intervention. The difficulty of avoiding psychic numbing after the death toll has mounted highlights the importance of early response when warning signs appear. More vigorous international monitoring in situations threatening to escalate to wide-scale atrocities (e.g., independence movements, civil wars, military coups, etc.) would play a key role in the development of early intervention strategies. There are several examples of these kinds of monitoring efforts preventing violence, including
the dispatch of international peacekeepers to Macedonia in 1992 and East Timor in 2001 to prevent the destabilization of the newly independent states. In both cases, the military intervention, matched by diplomatic action and civil society initiatives, prevented violent conflict that could have easily led to civil war and ethnic cleansing.

**Recommendation 3: Change the method, content, and delivery of reporting.** Efforts by international organizations (IO) to document mass atrocities typically focus on the widespread nature of violations rather than narratives about the affected individuals. Statistics prevail over stories. Strict page limitations for IO or NGO reports force authors to condense information into compact pieces of data, dehumanizing the individuals and losing their ability to connect with sympathizers on a human level.

The increased availability of mixed media may help in this regard. Digital content, including photography, videography, and voice recordings of individual narratives may cause audiences to exhibit responses which had been masked by psychophysical numbing and compassion fade. Traditional IO and NGO reporting suffers from a limited readership; however, if these organizations partnered with media outlets to produce mixed media reports, the reach would increase exponentially. Within these partnerships, IOs and NGOs should press for stories to be reported in their entirety, as a means to overcome cognitive limitations and press for action.

**From Natural Disasters to Mass Atrocities: Common Lessons**

Natural disasters and mass atrocities, though different in many respects, share similar features for understanding behavior and its implications for preventing catastrophic losses. For both these risks, intuition may mislead us. Specifically, we cannot assume that the massive destructiveness of a future event will lead us to appreciate and appropriately respond to the threat. The low probability of natural disasters at any one place or time leads us to treat the event
as below our threshold level of concern much as the geographical remoteness of atrocities does. The potential consequences, whether in billions of dollars or millions of endangered lives, fail to convey the emotional meaning necessary to motivate effective protective actions.

Fortunately, the modern brain is able to deliberate, to think slowly and analytically when appropriately motivated, and thus recognize the enormity of these catastrophic events and the importance of taking immediate steps to prevent or reduce the consequences of future catastrophes. Rather than trusting our desensitized feelings or simplistic heuristics, we must employ slow and careful thinking coupled with short-term incentives to create policies, procedures, laws, and institutions that will nudge or even require us to behave in ways that accord with our considered values for protecting human lives and property.

**Acknowledgments**

Support for this paper comes from the National Science Foundation under Grant No. SES-1427414, the Center for Risk and Economic Analysis of Terrorism Events (CREATE) at the University of Southern California; the Center for Research on Environmental Decisions (CRED; NSF Cooperative Agreement SES-0345840 to Columbia University) and the Wharton Risk Management and Decision Processes Center. We gratefully acknowledge the assistance of Leisha Wharfield and Carol Heller in the preparation of the manuscript.
Table 1

*Characteristics of Intuitive and Deliberative Thinking*

<table>
<thead>
<tr>
<th>Intuitive Thinking (System 1)</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Operates automatically and quickly, with little or no effort and no conscious voluntary control.</td>
</tr>
<tr>
<td>- Uses simple and concrete associations, including emotional reactions or simple rules of conduct acquired by personal experience with events and their consequences.</td>
</tr>
<tr>
<td>- Shows diminishing sensitivity to quantity.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Deliberative Thinking (System 2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Initiates and executes effortful and intentional abstract cognitive operations when needed.</td>
</tr>
<tr>
<td>- Includes cognitive operations such as computations and explicit reasoning.</td>
</tr>
</tbody>
</table>
Table 2
Comparative measures of Seriousness for State-Sponsored Mass Atrocities (Genocides and Mass Killings), Intrastate and Interstate Wars, and Terrorism

<table>
<thead>
<tr>
<th>Conflict Type</th>
<th>Number of Distinct Cases</th>
<th>Time Period</th>
<th>Total Estimated Fatalities for the Cases</th>
<th>Estimated Fatalities per Case</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mass atrocities</td>
<td>201</td>
<td>1900–2012</td>
<td>84,183,410</td>
<td>470,298</td>
</tr>
<tr>
<td>Interstate wars</td>
<td>66</td>
<td>1900–2007</td>
<td>30,698,060</td>
<td>465,122</td>
</tr>
<tr>
<td>Interstate wars</td>
<td>64</td>
<td>1900–2007</td>
<td>5,485,122</td>
<td>85,705</td>
</tr>
<tr>
<td>Excluding WW I and WW II</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intrastate wars</td>
<td>228</td>
<td>1900–2007</td>
<td>5,469,738</td>
<td>28,1922</td>
</tr>
<tr>
<td>Terrorism (domestic and international)</td>
<td>113,113</td>
<td>1970–2012</td>
<td>241,480</td>
<td>2</td>
</tr>
</tbody>
</table>

Source: Anderton.²⁸
Figure 1. Natural catastrophes worldwide 1980–2013 overall and insured losses ($ billion).

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Source: Munich Re.  

Source: Munich Re.  

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Figure 2. U.S. disaster presidential declarations per year, 1953–2011.
Figure 3. Normative models where (a) every life is of equal value and (b) large losses threaten group or societal viability and descriptive models of (c) psychophysical numbing and (d) compassion fade.
Notes


29 Munich Re. (2014). Topics Geo *Natural catastrophies 2013: Analyses, assessments, positions* Retrieved from