

Climate Change and Regime Perpetuation in North Korea

ABSTRACT

Climate change is a new variable that may weaken the Kim Jong-il regime by disrupting North Korea's agricultural sector, leading to greater food insecurity and erosion of the state's institutions. North Korea has limited capacity to adapt to climate hazards, which could exacerbate existing stresses and push the regime into terminal decay.

KEYWORDS: North Korea, climate change, regime change, Kim Jong-il, adaptive capacity

THERE IS GROWING ACKNOWLEDGEMENT that climate change has the capacity to accentuate existing frailties within fragile states and thus alter the dynamic of international politics. This paper examines the vulnerability of North Korea's agricultural sector to climate change and assesses the impact of climate change on regime stability. There is a need to expand the extensive literature on regime stability in North Korea to take account of climate change as an important new variable interacting with the existing weaknesses of the country's institutions and political economy. Sustained climate hazards may profoundly influence North Korea's agricultural system and food distribution mechanisms, accelerating the deterioration of the command economy, state ideology, and the regime's totalitarian social controls.

The longevity of the regime has been a topic of conjecture since Kim Jong-il's rise to power in 1994. Many analysts presumed that the primary driver of the regime's collapse would be its economic weakness. A number of factors were cited as indications that regime collapse was imminent. North Korea was

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said to be in “a spiral of economic degradation.” Famine had been rampant, spawned by climatic disasters. There was systemic political inefficiency. Kim Jong-il’s grip on power during the early years of his reign was tenuous, and he was apparently unwilling to embrace economic reform.¹ The Soviet Union had collapsed. However, such predictions proved premature: North Korea, also known as the Democratic People’s Republic of Korea (DPRK), weathered the late-1990s famine period, and Kim Jong-il remains in power.

State collapse results from a complex interplay of local and global economic, political, social, and environmental factors culminating in the implosion of government structures. Security can no longer be provided for by state institutions as law and order dissolve into a Hobbesian state of anarchy. The common collapse thesis bore more resemblance to the theory of *state failure*, which is a functional failure of state institutions from which recovery is possible.² In these cases, the institutions of the state ceased to function and were replaced by new regimes, which reorganized the institutional structures. A failing regime will not necessarily endanger the integrity of the state, though collapse remains a possibility if the new leadership and its reconstituted governing institutions remain weak.

In contrast, Marcus Noland wrote that Kim Jong-il’s regime would “muddle through,” making ad hoc adjustments to fix specific problems in relation to changing circumstances.³ These adjustments have included limited economic reforms in 2002, de facto marketization through the growth of farmers’ markets, and changes in agricultural practices. The regime has defied expectations of its demise to continue functioning in spite of adverse circumstances. In the absence of some kind of hard external pressure—such as crippling economic sanctions, foreign military intervention, or a series of natural disasters—the Kim regime should retain power for some time to come.

Climate change, however, is an exogenous variable that may render that assumption mistaken. The predicted impacts of climate change are now well understood in the scientific community. In its most recent report, the

1. Kim Kyung-won, “No Way Out: North Korea’s Impending Collapse,” *Harvard International Review* 18:2 (Spring 1996), pp. 22–25, 71–72; Nicholas Eberstadt, “Hastening Korean Reunification,” *Foreign Affairs* 76:2 (March/April 1997), p. 81.

2. R. Bates, D. Epstein, J. Goldstone, T. Gurr, B. Harff, C. Kahl, K. Knight, M. Levy, M. Lustik, M. Marshall, T. Parris, J. Ulfelder, and M. Woodward, *Political Instability Task Force Report: Phase IV Findings* (Arlington, Va.: Political Instability Task Force, 2003), p. 9.

3. Marcus Noland, “Why North Korea Will Muddle Through,” *Foreign Affairs* 76:4 (July/August 1997), pp. 105–18.

Intergovernmental Panel on Climate Change (IPCC) identified several climate hazards, including land degradation from forest loss, changes in precipitation cycles and lower crop yields because of changing local temperature regimes, and extreme weather events, which are likely to decrease food security for vulnerable populations. The time frames over which such hazards will take effect are a point of debate, ranging from the present to the end of this century. Climate change may be occurring much faster than originally predicted, in light of evidence that climate indicators have accelerated beyond the high end of the IPCC prediction range because of positive feedback loops in the Earth's climate system.⁴

Climate hazards will cause the greatest harm in combination with existing problems such as overpopulation, demographic imbalance, poor governance, endemic poverty, and lack of infrastructure.⁵ The interaction of climate change with the existing weaknesses of the DPRK state is a field of inquiry ripe for further study. The literature on regime stability in North Korea has yet to include analysis of climate change as a key variable. This paper aims to initiate inquiry to fill this void. The first section uses Hans-Martin Füssel's vulnerability assessment methodology to deduce North Korea's vulnerability to climate change hazards. The second section draws on the work of Mohan Munasinghe and Rob Swart to assess the North's capacity to adapt to these climate impacts. The third section outlines the dangers of climate hazards to North Korea's political economy through the lens of organizational complexity.

NORTH KOREA'S VULNERABILITY TO CLIMATE HAZARDS

The task of conducting a climate vulnerability assessment for North Korea's agricultural sector is hampered by the opacity of the North Korean state. Obtaining data on its social systems is often a deductive task; it is necessary

4. Positive feedback loops occur when a particular process increases the momentum of other related phenomena, which in turn reinforce and accelerate the original process. For example, rising ocean temperature in the Arctic Sea has led to an increase in the melting rate of the summer ice pack. This increased melting exposes a greater area of open ocean to exposure to solar radiation. Because the open sea absorbs more solar radiation than ice, due to different levels of reflectivity, sea temperature increases and thus accelerates the rate of ice pack melt. David Spratt and Philip Sutton, *Climate Code Red: The Case for Emergency Action* (Melbourne: Scribe, 2008), p. 17; James Hansen, "Scientific Reticence and Sea Level Rise," *Environmental Research Letters* 2:024002 (2007), pp. 1–6.

5. Kurt Campbell and Christine Parthemore, "National Security and Climate Change in Perspective," in *Clmatic Cataclysm: The Foreign Policy and National Security Implications of Climate Change*, ed. Kurt Campbell (Washington, D.C.: Brookings Institution Press, 2008), p. 14.

to gather information from a variety of secondary sources to correlate with information compiled by international agencies working within the country and observational evidence gathered by foreign visitors. This obstacle adds an element of imprecision to any climate vulnerability assessment.

On the other hand, the great famine of the 1990s provides insight into the likely impact of climate change hazards on North Korea. Agricultural output declined from 1987 as Soviet-subsidized imports of key inputs dropped away. Initially, the regime adapted to the loss by bartering rice in exchange for cheaper grain imported from the Soviet Union while drawing heavily on the national food stockpile and advising the public to consume only two meals a day, in a concerted propaganda campaign. In 1990, the Soviet Union rejected the barter system and requested that North Korea pay for goods in hard currency at international market prices. The North lacked the foreign exchange needed to purchase imports at market prices because of its minimal export income. This prompted a steep decline of total trade volume between North Korea and the Soviet Union from US\$3.2 billion in 1990 to \$360 million in 1991.⁶ By 1993, mortality rates began to climb, a sign that the growing food crisis had descended into famine. In early 1995, the regime was forced to act, negotiating aid agreements with South Korea and Japan. The floods that hit during the summer monsoon were the coup de grâce, a trigger that accelerated the famine.⁷

The floods and drought of 1995–97 overextended this already stretched system beyond the limits of its ability to cope. These events provide a preview of the likely impact of climate hazards on the North Korean state. Climate change hazards are likely to act as stress multipliers, damaging systems that are already weak.⁸ Today, the North's agricultural system continues to function under duress, beset by many of the same root causes that contributed to the famine. A climate vulnerability assessment can thus be carried out with some confidence based on evidence from the recent past.

6. Heather Smith and Huang Yiping, "Achieving Food Security in North Korea," in *Promoting International Scientific, Technological, and Economic Cooperation in the Korean Peninsula: Enhancing Stability and International Dialogue* (Rome: Istituto Diplomatico Mario Toscano and the Italian Ministry of Foreign Affairs, 2000), p. 205.

7. Stephan Haggard and Marcus Noland, *Famine in North Korea: Markets, Aid, and Reform* (New York: Columbia University Press, 2007), pp. 21–24.

8. Alan Dupont, "The Strategic Implications of Climate Change," *Survival* 50:3 (June/July 2008), pp. 46–47.

A Preliminary Vulnerability Assessment

Vulnerability is a measure of a system's exposure to hazard, in relation to the underlying social processes of that system and its capacity to cope with hazards. This paper uses a methodology devised by Hans-Martin Füssel to assess the vulnerability of North Korea's agricultural system to climate change hazards.⁹ It consists of five elements from which a fully qualified vulnerability evaluation can be developed: (1) temporal reference; (2) the vulnerable system; (3) the sphere, which encapsulates the internal properties and external influences on the vulnerable system; (4) the attribute of concern, which is the component of the vulnerable system that is exposed to hazard; and (5) the hazard that will affect the vulnerable system.

Temporal Reference. The *temporal reference* is the time scale over which vulnerability is measured. Defining a time scale is important because the magnitude and nature of the hazard may change over time, as will the characteristics of the vulnerable system. This study uses a temporal reference of 20 years. A longer period of interest would be impractical, as no political system remains static. Because the regime is muddling through on the back of a weak economy, rigid institutions, and a faltering agricultural sector, it would be unwise to project too far into the future. Due to Kim Jong-il's advancing age and apparently declining health, a leadership transition will also occur during this period, the outcome of which remains unclear.

Vulnerable System. The *vulnerable system*—the system of analysis, the core unit that is the focus of the vulnerability assessment—is North Korea's ruling regime, headed by Kim Jong-il. The regime can be divided conceptually into three primary interlinked components: the physical base, the idea of the state, and its institutions.¹⁰ A state's physical base includes the population and resources within its defined territory, including the agricultural sector. The idea of the state is the distinctive idea—the legitimizing paradigm—that lies at the heart of the regime's political identity. The institutions of the state comprise the machinery of government, including the executive, legislative, administrative, and judicial bodies. The institutions maintain dominion over the state's

9. Hans-Martin Füssel, "Vulnerability: A Generally Applicable Conceptual Framework for Climate Change Research," *Global Environmental Change* 17 (2007), pp. 155–67.

10. Barry Buzan, *People, States, and Fear: An Agenda for International Security Studies in the Post-Cold War Era*, 2nd. ed. (Boulder, Colo.: Lynne Rienner Publishers, 1991), p. 90.

population and territory, a control materially subsidized by the physical base and legitimized by an overarching ideational framework. North Korea is a unique case in which the ruling regime has become synonymous with the state itself through the close-knit integration of its constituent dimensions under the personalized leadership of Kim Jong-il. States within which all three components are well developed and interconnected are usually stronger than states in which the three primary components are weak, such as North Korea.

Stress in one interlinked dimension can weaken the others as well. During the North Korean famine, weakness in the physical base—including food and energy shortages—placed enormous stress on the state's institutions and ideational base. The famine period demonstrated that the decay of one attribute of this vulnerable system significantly weakened the system as a whole. However, in the North Korean case, each of its interlinked dimensions needs to be in mutually reinforcing terminal decay for regime collapse to occur.

Sphere. The *sphere* represents the internal factors and external influences on the vulnerable system. The internal factors are endogenous properties of the system such as specific agricultural policies, as well as the totalitarian political architecture of centralized decision-making, large bureaucracy, information controls, and public indoctrination. Key external influences on North Korea are its reliance on external inputs of energy, food, and other aid from foreign sources; isolation from the global economy; and the unstable political environment on the Korean Peninsula.

INTERNAL INFLUENCES: STABILITY AND SOCIAL CONTROL

There are two strands of thought that merit mention in this section. First, the regime opted in the 1960s to pursue agricultural self-sufficiency, despite the impossibility of such a policy given the peninsula's disadvantageous geographic and climatic conditions. Stephan Haggard and Marcus Noland have argued that the food crisis could have been, and still can be, alleviated if the regime were willing to access commercial imports of grain, as do other countries with a comparative disadvantage in agriculture.¹¹ This failure precipitated the North's slide into famine as the food system deteriorated, while

11. Haggard and Noland, *Famine in North Korea*, p. 50.

leaving the country vulnerable to future external shocks that could make the problem worse.

Agricultural self-sufficiency is an outgrowth of *juche* (the regime's ever-evolving national ideology emphasizing national self-reliance and the superiority of all things Korean). The core goal of *juche* is maintenance of a thriving self-reliant national economy that operates in a secure environment, guarded by indigenous defense forces.¹² To these ends, *juche* has legitimized the continued operation of the North's centrally planned economy, isolated from the global marketplace, around which a garrison state has developed. This image contrasts starkly with North Korea's present reality: a floundering economy propped up by aid from foreign donors. Perhaps as a result of this, *juche* was superseded in 1998 by the doctrine of *songun* (military-first) politics as the legitimizing paradigm of Kim's ascendancy to power.

Second, the political system itself suffers from an inherent structural and ideological rigidity that impedes effective long-term crisis planning and immediate emergency response. North Korea has the structural characteristics of a totalitarian state. It is ruled by an absolute dictator in Kim Jong-il, with the backing of a vast web of bureaucratic institutions that make up the North Korean state. Kim has consolidated his power by privileging the military over the Korean Workers Party (KWP) through his policy of *songun* politics. Kim rules the country as head of the National Defense Commission (NDC), an institution organized in an effort to sideline the KWP as the paramount body of the bureaucracy in favor of his core constituency in the Korean People's Army (KPA).¹³

Kim has also consolidated control over the KWP by assuming leadership of the Central Committee and thus the Politburo and the Secretariat, the three key organizations within the Party. The KWP penetrates the various social subgroups via guidance committees, which occur at all levels of society and always feature a local cadre as a key member. The committees function as an arm of bureaucratic action and as a mechanism of surveillance to ensure that there is virtually no organized collective unit or activity that is beyond party oversight.¹⁴ Han S. Park describes Kim Jong-il's ascendancy over

12. Han S. Park, *North Korea: The Politics of Unconventional Wisdom* (Boulder: Lynne Rienner Publishers, 2002), pp. 20–27.

13. Kim Il-pyong, "Kim Jong Il's Military-First Politics," in *North Korea: The Politics of Regime Survival*, ed. Kihl Young-whan and Kim Hong-nack (New York: East Gate Books, 2006), pp. 64–67.

14. Park, *North Korea: The Politics of Unconventional Wisdom*, pp. 88–90.

the Party using the metaphor of the human body: Kim is the organism's brain, the Party is its body—the functional arm conveying Kim's will to the public. As mere “body parts,” local nodes of the bureaucracy are dependent on directives from the “brain” and are incapable of autonomous action.¹⁵ Unfortunately, this rigid structure can preclude rapid action when crises occur.

Active social controls are maintained by the internal security services, which report directly to Kim Jong-Il. Internal security comes under the rubric of the Ministry of People's Security, which is responsible for internal surveillance, social control, basic police duties, and border control. Should an individual be arrested for political crimes against the state, his or her entire family may be incarcerated in “re-education” camps to weed out ideological impurity and to deter others from engaging in anti-regime behavior.¹⁶ However, the state increasingly lacks the means to punish some transgressions against official ritual, such that minor offenses go largely unpunished.

The regime maintains a monopoly of communications technologies to ensure that people receive little information about the outside world other than party propaganda, which prevents citizens from forming a basis for comparison with their own society. And although the information blockade appears to be breaking down, the people still lack a public outlet to share their doubts about the system and vent their frustrations. Information sharing remains stifled, reducing the capacity of individuals, communities, and ultimately the state to react appropriately to crises.¹⁷

The effect of socialization pressures, informational controls, and outright coercion has been to sap the intellectual vitality of the wider society, discouraging the propagation of new ideas and development of more-efficient practices in industry and agriculture. This passivity is an obstacle to innovation and to North Korea's capacity to adapt to external shocks. As the economy has crumbled, however, the tentacles of the state have retreated slightly. Marketization of the economy means that those with access to foreign currency are in a strong position to adapt to the food emergency by purchasing what they need on the black market. Those who cannot access the market are most at risk, including urban industrial workers who formerly enjoyed a privileged status—prior to the famine.¹⁸

15. *Ibid.*, p. 88.

16. *World Report 2007* (New York: Human Rights Watch, 2007), p. 297.

17. Park In-ho, *Daily NK*, interview with the author, Seoul, July 28, 2008.

18. *Ibid.*

EXTERNAL INFLUENCES

External influences are exogenous factors affecting the vulnerable system, such as the country's heavy reliance on foreign aid and external energy supplies. Massive injections of foreign aid during the late 1990s were significant in heading off the total failure of state institutions. Kim Kyung-Won has argued that cash payments made by the South Korean Hyundai group to the regime during 1999–2000 amounted to about 20% of its total foreign exchange earnings. This was a timely injection of funds as the regime struggled to overcome the famine.¹⁹ It has been suggested in the South Korean media that food aid is often diverted wholesale for military use, strengthening the position of the KPA as the vanguard institution of the state. The KPA subtracts a portion for its own provisions, then sells the remainder for profit on the black market.²⁰

Reorganization of the Economy: Coping Mechanisms Become Permanent

Regime survival during the famine was a product of coping mechanisms developed outside of state institutions. Restrictions on freedom of movement were circumvented as people foraged for food in surrounding regions. Private home garden plots became a key source of food. Underground farmers' markets sprang up around the country where people could buy and sell food grown in private plots or expropriated from collective farms and aid shipments.

Parallel economies developed that operate outside the official central-planning mechanism, which generates income for the regime and ensures the continuation of important services. The military's is by far the most important parallel economy, accounting for up to 70% of North Korea's domestic economic output. It encompasses all economic activities related to the production, distribution, and consumption of materials within the military sphere.²¹ Contributions from state-sanctioned criminal enterprises represent another income source. The regime has been implicated in a number of illicit activities—including the production and distribution of narcotics, counterfeiting, smuggling, and money laundering—accounting for 35%–40% of the North's total

19. Kim Kyung-won, "Downfall Delayed: Endgames for the North Korean Regime," *Harvard International Review* (Fall 2005), p. 58.

20. Park interview, Seoul, July 28, 2008.

21. Daniel Pinkston, "Domestic Politics and Stakeholders in the North Korean Missile Development Program," *The Nonproliferation Review* 10:2 (Summer 2003), p. 9.

exports and an even larger slice of total earnings.²² The regime's dilemma now is that despite a number of ad hoc adjustments, the country's continued functioning relies on these same adaptive responses that prevented collapse during the famine period. Coping measures are something to fall back on in times of immediate crisis. When they become permanent, there is no further slack in the system to buffer it against exposure to new hazards.

Attribute of Concern. The *attribute of concern* is the component of the vulnerable system threatened by exposure to hazard, which in this case is the country's agricultural sector, the crucial node in the North's political economy. Food production in North Korea is hampered significantly by geography and climate, with only a few regions suitable for large-scale agriculture in view of the mountainous topography and harsh winters. In 2004, the total area of cultivated land in North Korea was estimated at 17%–18% of the overall land area. Average temperatures range from –19°C during winter to 25°C in summer. The large temperature variation between winter and summer limits the length of the growing season. For these reasons, periodic famine has been a feature of life on the Korean Peninsula for many centuries.

A major limit on cultivation in North Korea is its generally poor soil fertility. Soil analyses conducted by the Food and Agriculture Organization (FAO) have discovered that soil pH in cultivated regions of the North is highly acidic. Acidity impedes soil properties such as movement of air and water through the soil, plant nutrient uptake, microbial activity, and breakdown of contaminants, thus producing lower crop yields.²³ The traditional solution has been to use large amounts of fertilizers. After 1991, the DPRK's large indigenous fertilizer industry was decimated when imports of fossil-fuel feed stocks for fertilizer production ceased, resulting in reduced crop yields. By growing crops with significantly fewer fertilizer inputs, North Korea's farms have effectively been mining nutrients from the soil, continually decreasing its fertility.²⁴

22. David Asher, "The North Korean Criminal State, Its Ties to Organized Crime, and the Possibility of WMD Proliferation," *Nautilus Institute for Security and Sustainable Development*, November 15, 2005, <<http://nautilus.org/fora/security/0592Asher.html>>, accessed August 25, 2006.

23. Henri Jossierand, Tom Morrison, John O'Dea, Simon Dradri, Paula Hidalgo Sanchis, and Xie Hongyi, "FAO/WFP Crop and Food Security Assessment Mission to the Democratic People's Republic of Korea" (Rome: FAO/World Food Program [WFP], 2008), pp. 13–15.

24. "Fertilizer Use by Crop in the Democratic People's Republic of Korea" (Rome: FAO of the United Nations, 2003), pp. 2, 5–7.

North Korea's state-run collective farms currently rotate winter, spring, and summer crops. Wheat is the main cereal crop cultivated during the winter, along with a small proportion of winter barley, sown from late September to mid-October. Barley is the primary spring cereal crop, with some spring wheat, sown in March and harvested in June along with the winter wheat crop. A double crop of potatoes is also grown in the spring and again in the summer. The primary summer cereal crops under cultivation are rice and maize. Maize cultivation has decreased in recent years in favor of less moisture-demanding cereal crops. Other crops produced during the summer include sorghum, millet, soybean, and buckwheat; vegetables such as cabbage, spinach, radish, cucumber, eggplant, and tomato; and fruits such as pears, peaches, apricots, and apples.²⁵

The double cropping program puts considerable strain on farm laborers and mechanized farming hardware, because of the short time interval between the winter crop harvest and planting the summer crop. Because of energy shortages, farm machinery must be used sparingly, while electric-powered irrigation systems operate sporadically at the mercy of the intermittent power supply. Most heavy farm labor is done by humans and draught animals, limiting the rate at which harvested land can be turned over for fresh cultivation.²⁶ Heavy and continuous crop rotation also increases the risk of crop losses from pests and diseases. Because of these factors it is likely that double cropping in North Korea has reached its maximum extent.

Small private gardens proved to be the difference between sustenance and starvation for many North Koreans through the famine period and have become an important component of the food system. Each household on the collective farms, of which there are about 1.67 million, is allowed a private garden of approximately 100 square meters. Urban households are also entitled to garden plots, although these are much smaller. Private gardens typically produce an early crop of potatoes and maize, followed by vegetables such as cabbage, radishes, peppers, and garlic. Because private plots are usually well cared for, crop yields have tended to be higher than on the collective farms.²⁷

25. "Second Thematic Roundtable on Agricultural Recovery and Environmental Protection—DPRK" (New York: United Nations Development Program, 2000), pp. 7–13.

26. Kisan Gunjal, Swithun Goodbody, Oshidari Kenro, and Joan Fleuren, "FAO/WFP Crop and Food Supply Assessment Mission to the Democratic People's Republic of Korea (Rome: FAO of the United Nations, 2004), p. 11.

27. Jossierand et al., "FAO/WFP Crop and Food Security Assessment Mission to the Democratic People's Republic of Korea," p. 25.

Climate Hazard. A *climate hazard* is a process or event that has the potential to create loss in human social, economic, and political systems through its transformative effect on the biosphere. Analysis of climate hazards requires definition of the range of potentially damaging events, along with an estimation of the human social and economic tolerance of these events within the system of study. These hazards are transnational in scope. Their influence at the local level will be mediated by geography, as well as by political, economic, and social conditions in human systems. This is not intended as an exhaustive list of climate hazards but will provide a foundation for further investigation of their implications for regime stability.

Rising average temperatures are predicted to depress crop yields. The key imperative is whether crops grown in a given area can tolerate a changing temperature regime for that location. Grain crops are particularly susceptible to climate variations. A 3°–4° Celsius rise in temperature above 1990 levels is predicted to reduce maize and rice production in East Asia by 10%–20% by 2100.²⁸ The direct impact on the temperature tolerance of crops is compounded by changes to precipitation patterns, length of the growing season, the intensity and timing of extreme weather events, and increased exposure to plant pests, weeds, and diseases.

Extreme weather events are increasing in frequency and intensity around the world. Agricultural systems are particularly at risk to extreme weather events during certain stages of the crop cycle.²⁹ North Korea is susceptible to torrential rain and flooding, typhoons, drought, and acute cold weather. Since 1991, large-scale floods have occurred in 1995, 1996, 2001–02, and 2004–07, punctuated by drought years in 1997 and 2000. The IPCC has predicted that higher ocean surface temperatures caused by climate change will increase the incidence of typhoons, leading to heavy precipitation and storm surges affecting coastal areas.³⁰ In the longer term, sea level rise will

28. R. V. Cruz, H. Harasawa, M. Lal, S. Wu, Y. Anokhin, B. Punsalmaa, Y. Honda, M. Jafari, C. Li, and N. Huu Ninh, "Asia," in M. L. Parry, O. F. Canziani, J. P. Palutikof, P. J. van der Linden, and C. E. Hanson, eds., *Climate Change 2007: Impacts, Adaptation, and Vulnerability, Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change* (Cambridge: Intergovernmental Panel on Climate Change, 2007), p. 483.

29. R. N. Warren, N. Arnell, R. Nicholls, P. Levy, and J. Price, *Understanding the Regional Impacts of Climate Change* (Norwich: Tyndall Center for Climate Change Research, 2006), pp. 35–36.

30. Alexandre Mansourov, *Disaster Management and Institutional Change in the DPRK: Trends in the Songun Era* (Washington, D.C.: Korea Economic Institute, 2007), pp. 4–8; Cruz et al., "Asia," pp. 476–79.

also threaten coastal areas in North Korea, which will jeopardize the agricultural viability of land reclaimed from the sea.

Changing precipitation patterns have altered the influence of the East Asian monsoon on the Korean Peninsula. Approximately 85% of the North's rainfall occurs during the spring and summer months, concentrated primarily between June and September. Typhoons also occur during this period at an average of one per year. However, in recent years, variability in rainfall patterns has been recorded across East Asia. Annual precipitation on the Korean Peninsula has increased; the characteristics of summer monsoon rains have changed. The usual four to six weeks of steady and prolonged monsoonal rains have given way to sporadic episodes of concentrated heavy showers and scattered storms, particularly in July and August. And although regular flooding is not a new phenomenon, the magnitude of flooding appears to be worsening. The North's water system can handle long periods of consistent steady rain, but it cannot cope with bursts of heavy precipitation, which overwhelm inadequate flood defenses.³¹

Increasing annual temperatures caused by climate change are having an impact on rates of *deforestation*. The rate of change of average temperatures is becoming faster than the speed at which forests grow. Because climate is a driver of the flora that grows in a specific location, the geographic shift of climate zones toward the poles is changing local climate conditions and altering the species composition of forests.³² The changing temperature regime is likely to weaken established forests in North Korea.

Deforestation there is being accelerated by land clearing for cultivation and greater collection of forest wood to meet energy demand in lieu of scarce alternative sources. These denuded landscapes have only a limited capacity to absorb water when it rains heavily, exacerbating flooding and leading to soil erosion of both marginal and arable land. With a limited growing season and continued food shortfall, North Korea can ill afford to have cropland decimated by flooding. If such events occur annually, the food shortfall is liable to increase.

31. Chung Yong-seung, Yoon Ma-byung, and Kim Hak-sung, "On Climate Variations and Changes Observed in South Korea," *Climatic Change* 66 (2004), p. 155; "DPR KOREA: State of the Environment 2003" (Pathumthani: United Nations Environment Program, 2003), pp. 11–13.

32. J. M. Hansen, M. Sato, P. Kharecha, D. Beerling, R. Berner, V. Masson-Delmotte, M. Pagani, M. Raymo, D. L. Royer, and J. C. Zachos, "Target Atmospheric CO₂: Where Should Humanity Aim?" *arXiv:0804.1126v2* [physics.ao-ph] (2008), p. 12.

FINAL HAZARD ASSESSMENT: RISK OF GREATER FOOD INSECURITY

Climate hazards will cause the greatest harm in combination with existing problems such as overpopulation, demographic imbalance, poor governance, endemic poverty, and lack of infrastructure.³³ In the North Korean case, the direct consequence of climate hazards accentuating existing socioeconomic and political weaknesses will be declining food security. Food insecurity exists when people lack secure access to enough safe, nutritious food for normal sustenance and growth. This can be caused by inadequate access to food as well as by insufficient and uncertain supplies. Large segments of the North Korean population are already at risk because the regime continues the misguided pursuit of agricultural self-sufficiency and because certain social strata enjoy privileged access to existing food supplies at the expense of more-vulnerable segments of the society. Those people experiencing food insecurity thus must develop coping mechanisms to secure subsistence, or face malnutrition and death.

North Korea's Adaptive Capacity

The exposure of the North's agricultural system to hazard does not automatically translate into institutional failure and chaotic social breakdown. The level of harm suffered by the vulnerable system depends on its adaptive capacity, which is the ability of the vulnerable system to reduce exposure to hazards, moderate potential damage, recover from losses incurred, and cope with the consequences of the new environment. Mohan Munasinghe and Rob Swart have outlined six key determinants of a vulnerable system's adaptive capacity: (1) economic resources, (2) access to appropriate technology, (3) availability of information and skills, (4) infrastructure, (5) adequate institutions, and (6) equitable access to resources.³⁴ A system in which the key determinants are strongly positive will have a much higher adaptive capacity than one where the key determinants are weak.

Economic Resources. North Korea's economy remains in a decrepit state. The regime does not currently have the means to provide equitable food distribution

33. Campbell and Parthemore, "National Security and Climate Change in Perspective," p. 14; Dan Smith and Janani Vivekanandar, *A Climate of Conflict: The Links between Climate Change, Peace, and War* (London: International Alert, 2007), pp. 21–22.

34. Mohan Munasinghe and Rob Swart, *Primer on Climate Change and Sustainable Development: Facts, Policy Analysis, and Applications* (Cambridge: Cambridge University Press, 2005), p. 187.

and is reliant on foreign aid to make up the shortfall. The North is unable to generate funds by producing goods for export to access new agricultural technologies from abroad. What income it does derive comes from the export of mining commodities, from illicit sources such as drug running, and from weapons sales.³⁵ Investment in the Kaesong industrial precinct generates income for the regime through direct payments from investors and the appropriation of a portion of its workers' wages. For instance, Hyundai-Asan is estimated to have made direct payments to the DPRK government of up to \$800 million between 2000 and 2005.³⁶ This crisis originated in the 1970s when the North defaulted on its foreign debts after a period of excessive borrowing. Since this time, the regime has been unable to access credit from foreign donors.³⁷ The situation became dire in 1991 when the collapse of the Soviet bloc closed off markets for the North's substandard manufactured goods. Cessation of Soviet energy subsidies was a further blow leading to the North's deindustrialization. To fund adaptation measures, the regime must reallocate scarce capital from other projects or obtain assistance from international organizations.

Access to Appropriate Technology. The adaptive capacity of the agricultural sector is dependent upon the technology at hand to buffer against crop-yield losses. North Korea's economic problems have not helped in this regard. At present, farming is dependent on human and animal labor to compensate for aging and dilapidated mechanized farm equipment, which cannot be repaired or replaced because of economic sanctions and the regime's inability to import new equipment and spare parts. Energy shortages compound the problem; even if the country's farm machinery was in optimal condition, there would not be enough fuel to power its tractor fleet. Thus, when extreme events do occur, it takes a great deal of time and human labor to restore farmland to full production.

35. Sheena Chestnut, "Illicit Activity and Proliferation: North Korean Smuggling Networks," *International Security* 32:1 (Summer 2007), pp. 80–111; Peter Beck, *North Korea: Can the Iron Fist Accept the Invisible Hand?* (Brussels: International Crisis Group, 2005), p. 4.

36. Stephan Haggard and Marcus Noland, *North Korea's External Economic Relations* (Washington, D.C.: Peterson Institute for International Economics, 2007), p. 14; Marcus Noland, "How North Korea Funds Its Regime," April 25, 2006, *Peterson Institute for International Economics*, <<http://www.iie.com/publications/papers/paper.cfm?ResearchID=629>>, accessed March 18, 2007.

37. "Country Profile: North Korea," July 2007 (Washington, D.C.: U.S. Library of Congress, 2007), p. 11, <http://lcweb2.loc.gov/frd/cs/profiles/North_Korea.pdf>, accessed September 1, 2007.

Availability of Information and Skills. Planning for adaptation requires information about local vulnerability and options for increasing the resilience of the system. Indeed, adaptation is enhanced by good education and the provision of easy access to climate change-related information to at-risk groups.³⁸ North Korea is hamstrung in this regard because the intelligentsia has been continually purged since the 1950s. Intellectuals lost their high social status and were turned into working-class functionaries, practitioners of *juche*, which devalued intellectual activity and stifled scientific innovation.³⁹ The bureaucracy has become highly resistant to new ideas, capable only of applying rigid dogma to a raft of complex practical problems. This does not bode well for the timely identification of vulnerable sectors and the development of appropriate adaptation strategies.

Infrastructure. Adaptive capacity is also dependent on the relative strength of the physical infrastructure of the vulnerable system. With no indigenous petroleum reserves, North Korea continues to be a net energy importer, with 90% of its oil coming from China and a smaller fraction from Russia.⁴⁰ A large portion of farm irrigation is powered by electric pumps, which are vulnerable to blackouts. There are, however, projects underway to reduce reliance on electrified systems by realigning irrigation canals to harness gravity to pump water.⁴¹ The North's transportation infrastructure is heavily dependent on fuel supplies that are intermittent, reflecting shortages of fuel acquired from China. This presents a critical problem for the distribution of food: even in a year of good harvests, food may not reach certain parts of the country because of difficulties with transportation.

Adequate Institutions. Strong and well-organized institutions are a key pillar of successful climate adaptation. In North Korea, food distribution has traditionally been carried out through a rationing mechanism called the Public

38. Smith and Vivekanandar, *A Climate of Conflict*, p. 33.

39. Kim Sung-chull, "Dynamism of Politics and Status of Intellectuals in North Korea," *Development and Society* 31:1 (June 2002), pp. 95–96.

40. William Brown, "Changes in the North Korean Economy and Implications for the Energy Sector: Is North Korea Really Short of Energy?" presented at the DPRK Energy Experts Working Group Meeting, June 26–27, 2006, San Francisco, *Nautilus Institute for Security and Sustainable Development*, <<http://nautilus.org/DPRKEnergyMeeting/papers/Brown.html>>, accessed November 2, 2006.

41. Jossierand et al., "FAO/WFP Crop and Food Security Assessment Mission to the Democratic People's Republic of Korea," p. 15.

Distribution System (PDS). The PDS was established in 1957 to centralize the distribution of cereals, later encompassing a wider variety of foods and consumables. The government was forced to decide how to distribute scarce commodities because the fixed prices of goods distorted the balance of supply and demand. This was useful for social control, as the population became dependent on the state for nearly all daily necessities.⁴² This system worked reasonably well during times of stability but was ineffectual during the famine. Clearly dysfunctional, it was officially abandoned in 2002. What little food was available was distributed preferentially to elite members of the party and the military, while some regions and social groups were excluded altogether. It was these groups that were most exposed to starvation and malnutrition during the famine.

The PDS was partially and temporarily revived in some areas in October 2005, offering a daily ration of 500 grams of cereal. Distribution delays stemming from transportation deficiencies and administrative inertia have prevented PDS rations from becoming available in all counties. The revived PDS led to brief short-term improvements before the initiative was again withdrawn, with rations reverting to pre-revival levels. Those living in or near the larger cities on the west coast have the greatest chance of accessing the PDS ration of 150 grams per day as it exists currently, while those in other areas continue to rely on adaptive strategies developed during the famine.⁴³

Equitable Access to Resources. Adaptive capacity is a function not only of the availability of resources but also equitable access to those resources. North Korea has a three-tiered social stratification that influences individuals' access to food. The country is divided into a "central" class, which forms the core of society and from which the regime elite derives; an "uncertain" class of the families of former small business persons and landholders; and a "hostile" class of officially designated enemies of the state, which includes approximately one-quarter of the North Korean population. Stratification influences many aspects of daily life: access to good jobs and higher education; being allowed to live in Pyongyang and other major cities (and hence, one's standard of living

42. Andrew Scobell, *Kim Jong Il and North Korea: The Leader and the System* (Carlisle Barracks, Penn.: U.S. Army War College, 2006), pp. 34–35.

43. Jossierand et al., "FAO/WFP Crop and Food Security Assessment Mission to the Democratic People's Republic of Korea," p. 22.

and access to food rations).⁴⁴ Increasingly, food distribution is being determined by one's position in the emerging market economy.⁴⁵

WHITHER THE STATE: THE ADAPTIVE CAPACITY OF INDIVIDUALS

The actions of individuals and social groups within a vulnerable system can play a large part in fortifying the system's adaptive capacity. In North Korea, informal coping mechanisms have played an important role in sustaining vulnerable people through the famine period and through food shortages up to the present day. First, many non-agrarian households maintain small kitchen-garden plots where they cultivate vegetables. Second, individuals have been able to sell crops siphoned from collective farms, as well as surplus from kitchen gardens and expropriated food aid, in informal private farmers' markets. Third, households unable to provision their own food often receive support, mostly in the form of cereals and vegetables, from relatives in rural households. Finally, where no other choice exists, people have been forced to forage for wild food. Foraging typically occurs in spring and autumn. Although wild foods have always been an important component of the Korean diet, their contribution to daily nutrient intake increased and became more important during food crises.⁴⁶

These informal coping mechanisms could not prevent widespread mortality during the famine. A generally accepted figure suggests that 600,000 to one million people perished in 1994–98, approximately 3%–5% of the pre-famine population.⁴⁷ Those who perished, for the most part, were unable to grow their own food or produce goods or services to barter for food. These strategies remain today as standard food procurement practices, leaving only minimal buffering in the system to absorb future shocks.

DANGERS TO THE VULNERABLE SYSTEM

State failure and collapse transpire when the resource, energy, and manpower requirements of governing institutions fall below what is necessary for their continued operation. Institutions evolve specific capacities to fulfill certain

44. Haggard and Noland, *Famine in North Korea*, p. 55; Andrei Lankov, *North of the DMZ: Essays on Daily Life in North Korea* (Jefferson: McFarland and Co., 2007), pp. 66–69.

45. Park interview, Seoul, July 28, 2008.

46. Jossierand et al., "FAO/WFP Crop and Food Security Assessment Mission to the Democratic People's Republic of Korea," pp. 23–26.

47. Daniel Goodkind and Loraine West, "The North Korean Famine and Its Demographic Impacts," *Population and Development Review* 27:2 (June 2001), p. 199.

needs; each operational program requires nodes of institutional organization for its execution and maintenance. Institutions must be staffed and new recruits trained, bureaucrats need to be paid, the military must be provisioned, rules must be policed, and information recorded. Consequently, increased sociopolitical complexity requires greater inputs of energy and resources, incurring growing maintenance costs.⁴⁸ To maintain a complex sociopolitical system, its leadership must have access to an adequate energy, resource, and manpower base. If any of these is inadequate, the system cannot be preserved at the desired level of complexity. Institutional breakdown is likely, leading to failure or collapse.

Totalitarianism is a complex form of social organization, mobilizing people within vast institutions orchestrated from the center. Totalitarianism attempts to atomize the individual, to strip away all social bonds save for dependency on the state. Complete devotion should be given to the dictator, the party, and the movement. Greater resources are required for maintaining total control than in less centralized, disaggregated forms of governance. The totalitarian dictator's control is underpinned by an elaborate ideology, an extensive vanguard mass party, monopolistic control over information and the use of force, as well as central planning of all economic activity, and the threat and use of physical and psychological terror.⁴⁹

Maintaining structures of this scale requires an enormous resource base. When this is diminished, the complexity of the system must be reduced. Total political control can no longer be maintained, and huge centralized institutions must disaggregate into smaller units. This may occur in one of three ways: (1) disaggregation of the state into smaller discrete political units, as in the "Balkanization" of the former Yugoslavia and the collapse of the former Soviet Union; (2) via social triage, where sections of the population are cut off from the resource pool so that system can be maintained (this regime survival strategy was maintained during the famine); and (3) through systemic reform, where the state consciously alters its political system to a more efficient mode of organization. In the case of North Korea, this would include official marketization of the economy, greater political and social

48. Thomas Homer-Dixon, *The Upside of Down: Catastrophe, Creativity, and the Renewal of Civilization* (Washington, D.C.: Island Press, 2006), p. 41; Joseph Tainter, *The Collapse of Complex Societies* (Cambridge: Cambridge University Press, 1988), p. 23.

49. Carl Friedrich and Zbigniew Brzezinski, *Totalitarian Dictatorship and Autocracy* (New York: Frederick A. Praeger Publishers, 1966), pp. 21–22.

freedoms requiring less policing, and smaller and fewer government institutions.

North Korea's rigid political system is not equipped to deal with stress from food shortfalls, a weak economy, and energy shortages. Climate change hazards of increasing intensity and frequency may increase pressure on this system by further exacerbating the country's food insecurity.⁵⁰ Many of the political consequences of food insecurity were witnessed in North Korea during the famine. The regime was able to muddle through and survive by consciously decreasing the complexity of its totalitarian system via social triage. However, the consequences of climate stress could disrupt the political economy of the state to a degree that further, uncontrollable reductions in systemic complexity cannot be avoided.

Displacement and Migration

Migration will be the best available adaptation option when governing institutions prove unresponsive to climate-induced crises and household capital endowments preclude other measures.⁵¹ For many North Koreans during the famine, victims of social triage, migration was their only option for survival. It is today, and is likely to remain so in the future, for people with minimal access to foreign currency and limited access to the black market. Migration has the further consequence of inviting official corruption. Low-level officials can take advantage of vulnerable displaced people. Bribery can be solicited or unsolicited, driven by both the illegality of unauthorized travel and the necessity of journeying to find food. North Koreans are subject to strict travel controls that keep them isolated and make surveillance and social control easier for the coercive organizations. However, during the famine the regime was powerless to enforce travel restrictions because corrupt low-level officials took bribes to facilitate the movement of illegal travelers. Many were able to escape the country by bribing border guards and travel inspectors to reach and cross the Chinese border. Illegal travellers are also an easy extortion target for unscrupulous officials who demand payment in exchange for

50. Nathan Hultman and Alexander Bozmoski, "The Changing Face of Normal Disaster: Risk, Resilience, and Natural Security in a Changing Climate," *Journal of International Affairs* 59:2 (Spring 2006), p. 26.

51. R. McLeman and B. Smit, "Migration as an Adaptation to Climate Change," *Climatic Change* 76 (2006), p. 41.

free passage. Travel restrictions and border controls have since been reinforced. People caught attempting to cross the Chinese border, or even traveling outside of their residential district, are punished severely.⁵²

The proliferation of internally displaced persons destabilized the strict system of travel restrictions that kept people rooted in one place. Domestic surveillance weakened because people were able to move around more freely. Intensification of food shortages will place tremendous pressure on the regime to again tolerate unrestricted travel, leading to delegitimized social controls and additional growth in official corruption. Once systematic corruption becomes the norm, it is exceedingly difficult for reformist leaders to dismantle it. Money and self-enrichment have replaced career advancement and fear of the coercive apparatus as behavioral motivators. This is clear evidence that this component of the totalitarian order has broken down, a signpost of the decreased complexity of the system.

Undermining of State Institutions

Faced with systemic breakdown that social triage is unable to stem, the regime may be forced into a corner where systemic reform is unavoidable. The de facto marketization of the North Korean economy seems to be an irreversible trend. In 2002, state-owned enterprises began paying market prices for goods through their supply chains, while the price of merchandise in state-owned stores was adjusted to reflect the cost of goods in farmers' markets.⁵³ Private farmers' markets weakened the primacy of the command economy. In effect, this was a back-handed admission that central planning, embodied in the PDS, was an inefficient mechanism for distributing food. People stopped looking to the state to provide for them and instead learned to take care of themselves: no longer could the regime be viewed by ordinary people as a paternal provider. Marketization requires minimal state intervention to function efficiently, in stark contrast to the level of intervention necessary for the proper functioning of the command economy. Again, this is a sign that the system cannot be maintained at the level of complexity required for totalitarian control.

52. "A Matter of Survival: The North Korean Government's Control of Food and the Risk of Hunger" (New York: Human Rights Watch, 2006), p. 29.

53. Meredith Jung-en Woo, "North Korea in 2005: Maximizing Profit to Save Socialism," *Asian Survey* 46:1 (February 2005), p. 54.

Members of the elite live in a cloistered bubble of privilege, safely sequestered from the pervasive malnourishment afflicting the lower social strata. Kim Jong-Il may confront a scenario in which the agricultural and industrial capacity servicing the military and party elite—already weak, as evidenced by the annual food shortfall—is further undermined by climate hazards or by international donor fatigue. It is not clear, however, what minimum level of resource procurement is necessary to sustain the elite and at what point of erosion a backlash against the leadership may occur. Recent reports suggest that high-ranking residents of Pyongyang have had their ration substantially reduced.⁵⁴ The tipping point may come when mid- and high-ranking officials are confronted with severely reduced access to food. Should this tipping point be reached, key figures may begin to see support for the status quo as a losing gambit. This will be the coup de grâce for the totalitarian order; social triage is not possible if the protected portion of the population begins to crumble from within. This is the point where political disaggregation will take place.

Contradiction of State Ideology

The integrity of the totalitarian ideology will follow the trajectory of decreasing political complexity. If total control does not exist, totalitarian ideology is an empty shell, an idea without a purpose. Barry Buzan states that the ideas and institutions of the state are inseparably intertwined. Thus, the ideational pillars are useless without the institutions to put the ideas into practice, just as the institutions are pointless and even impossible without these ideas to give them definition and purpose.⁵⁵ Without *juche* as a practical guide, the institutions of the North Korean state will lose their *raison d'être*; the officials within, their motivation to carry out their duties; and the citizenry, the non-coercive stimulus for compliance.

The regime holds a strong suit, having adopted *songun* politics as its legitimizing paradigm. The military remains strong, having coopted the national economy for itself. It is estimated that the military component now occupies up to 75% of all economic activity in North Korea. This portion operates by

54. "N. Korea's Food Situation Hopelessly Bad: Aid Group," April 3, 2008, *The Hankyoreh* [One Nation], <http://english.hani.co.kr/arti/english_edition/e_northkorea/279706.html>, accessed April 3, 2008.

55. Buzan, *People, States, and Fear*, p. 86.

and large on market principles and provides the KPA with a generous revenue stream through reselling diverted goods on the black market.⁵⁶ Decreases in the food available locally will affect this revenue stream, but in order to constitute chronic revenue impairment, food shortages would have to coincide with donor fatigue from international sources such that overall food inputs decrease.

The regime views aid from Western donors as a poisoned chalice. Foreign nationals representing international donor organizations are a possible conduit for information about the outside world, increasing the chance of ideological pollution and the leakage of dangerous information. Social discord could result if the flagging monopoly on information is shattered, and the North Korean public can fully compare the bounty touted by official propaganda with the harsh reality of everyday life. On the other hand, Peter Beck reports that representatives of foreign donor organizations are chaperoned away from contact with the wider society by party handlers, specially selected for their loyalty to the regime.⁵⁷ Climate hazards thus raise the risk that increasing flows of information could unleash the mass mobilization of previously isolated individuals.

CONCLUSION

The famine period saw a decrease in the level of economic and institutional complexity in North Korea. The totalitarian system was able to accommodate this reduced complexity through strategic retreat in certain sectors of the system, creating a new equilibrium where a weakened totalitarian architecture survived at a lower level of complexity. Exposure to climate hazards may exacerbate existing stresses, necessitating further strategic retreat and systemic reorganization. The totalitarian system of North Korea cannot survive another such reorganization. The muddling-through paradigm has allowed the development of a false sense that the Kim regime can perpetuate itself indefinitely in the face of extreme obstacles. The advent of climate change has altered that equation. North Korea does not have the adaptive capacity to buffer against greater food insecurity caused by exposure to climate hazards while it is simultaneously weakened by energy shortages, economic limpness,

56. Park In-ho interview, Seoul, July 28, 2008.

57. Peter Beck, interview with the author, Seoul, July 22, 2008.

limited horizontal access to information, and its own rigid political system. These trends are mutually reinforcing and can function as positive feedback loops. If the degradation of the state damages the privileged position of the elite, high-ranking officials may see the leadership as a liability and withdraw their support for the status quo. Such crises may force North Korea into systemic reform, or push the regime into collapse as the totalitarian order slides into disrepair.