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The Implications of Climate Vulnerability for North Korean Regime Stability

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Abstract: This paper fuses theoretical models of climate vulnerability and adaptive capacity to critically examine the “muddle through” thesis of regime stability in North Korea, put forward by Marcus Noland, in the context of global climate change. Literature on regime stability in North Korea has reached a consensus Kim Jong-il’s regime will maintain power by “muddling through,” making ad hoc adjustments as localised problems arise. Climate change is a new variable effecting regime perpetuation that has not been discussed in the academic literature. Climate hazards are likely to disrupt the North’s agricultural sector and the country’s food security, leading to erosion of the state’s institutions. In the medium term, predicted climate change impacts on North Korea include decreasing crop yield from the agricultural sector, changing precipitation cycles, and increasing incidence of extreme weather events. North Korea has limited capacity to absorb and adapt to climate hazards. The state is already weakened from ten years of famine and economic isolation, and is inhibited by a rigid totalitarian political system, and crumbling infrastructure. Over time, increasing food shortage may lead to greater reliance on external aid, increased corruption, internal displacement of people, refugee exodus into China, rejection of official ideology, erosion of coercive institutions and even withdrawal of elite support for the regime.

Keywords: North Korea, Regime Stability, Climate Vulnerability, Adaptive Capacity

THIS PAPER EXAMINES the vulnerability of North Korea’s agricultural sector to climate change and assesses its possible impact on regime stability through the theoretical lenses of vulnerability and adaptive capacity. 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 will profoundly influence North Korea’s agricultural system and food distribution mechanisms, accelerating the deterioration of the regime’s totalitarian social controls.

Regime longevity has been a topic of conjecture since Kim Jong-il’s rise to power in 1994. Kim Kyung-won and Nicholas Eberstadt, among others, believed that the primary driver of the regime’s collapse would be its economic weakness, an obvious indication that collapse was imminent.¹ Collapse would be caused by the convergence of input limitations—such as food shortages, restricted income streams and energy bottlenecks—along with the rejection of official ideology and the inability of state institutions to carry out their assigned functions.

¹ Kim, K. 1996. No way out: North Korea’s impending collapse. *Harvard International Review* 18 (2):22-5, 71-2.; Eberstadt, N. 1997. Hastening Korean reunification. *Foreign Affairs* 76 (2):77-92. p. 81.

Kim and Eberstadt's collapse predictions proved premature; the Democratic People's Republic of Korea (DPRK) weathered the late-1990s famine period and Kim Jong-il remains in power.²

In contrast, Marcus Noland believed that Kim Jong-il's regime would "muddle through," addressing changing circumstances by making ad hoc adjustments to fix specific problems.³ These adjustments have included limited economic reforms in 2002, *de facto* marketisation through the growth of farmers' markets, and changes to agricultural practices. The regime has defied expectations and continued functioning, in spite of adverse circumstances. In the absence of a hard external pressure—crippling economic sanctions, foreign military intervention or a series of natural disasters—the Kim regime will retain power for some time to come.

Climate change is an exogenous variable that may render that assumption redundant. The predicted impacts of climate change are now well understood in the scientific community. The Intergovernmental Panel on Climate Change (IPCC) identified several climate hazards, including land degradation due to forest loss, changes in precipitation cycles, and lower crop yields due to changing local temperature regimes, and extreme weather events, which are likely to decrease food security for vulnerable populations.⁴ Climate hazards will cause the greatest harm in combination with existing problems such as over-population, demographic imbalance, poor governance, endemic poverty and lack of infrastructure.⁵

² *State collapse* results from a complex interplay of local and global economic, political, social and environmental factors culminating in the implosion of government structures. State failure and collapse transpire when the resource, energy and manpower requirements of governing institutions fall below what is necessary for their continued operation. Security can no longer be provided for by state institutions as law and order dissolves into a Hobbesian state of anarchy. Examples of *state collapse* include Somalia and the Democratic Republic of the Congo during the early 1990s. The collapsist thesis of Eberstadt and Kim bears more resemblance to the theory of *state failure*, which is a functional failure of state institutions from which recovery is possible. In these cases the institutions of the state ceased to function and were replaced by new regimes, which reorganized the institutional structures. Examples of *state failure* include Cuba in 1959 and Iran in 1979. See: Homer-Dixon, Thomas. 2006. *The Upside of Down: Catastrophe, Creativity, and the Renewal of Civilization*. Washington DC: Island Press. p. 41; Bates, R, 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. 2003. Political Instability Task Force Report: Phase IV Findings. Arlington: Political Instability Task Force, George Mason University. p. 9; Milliken, J, and K Krause. 2002. State Failure, State Collapse, and State Reconstruction: Concepts, Lessons and Strategies. *Development and Change* 33 (5):753-774. p. 765; Yannis, A. 2002. State Collapse and its Implications for Peace-Building and Reconstruction. *Development and Change* 33 (5):817-835. p. 822; Tainter, J. 1988. *The Collapse of Complex Societies*. Cambridge: Cambridge University Press. p. 23.

³ Noland, M. 1997. Why North Korea Will Muddle Through. *Foreign Affairs* 76 (4):105-118. p. 105-18.

⁴ The IPCC encompasses the work of thousands of scientists from around the world in many disciplines to compile its reports. See: Working Group III contribution to the Intergovernmental Panel on Climate Change Fourth Assessment Report: Summary for Policymakers. 2007. Paper read at 9th Session of Working Group III of the IPCC, 30 April – 4 May 2007, at Bangkok, Thailand. p. 2-5. The timeframes over which such hazards will take effect are a point of debate, ranging from the present time to the end of this century. Climate change may be occurring much faster than originally predicted, with 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. See: Garnaut, R. 2008. Garnaut Climate Change Review: Interim Report to the Commonwealth, State and Territory Governments of Australia. Melbourne: Garnaut Climate Change Review. p. 21-2; Spratt, David, and Philip Sutton. 2008. *Climate Code Red: The Case for Emergency Action*. Melbourne: Scribe. p. 1; Hansen, J. 2007. Scientific reticence and sea level rise. *Environmental Research Letters* 2 (024002):1-6.

⁵ Campbell, Kurt, and Christine Parthemore. 2008. National Security and Climate Change in Perspective. In *Climatic Cataclysm: The Foreign Policy and National Security Implications of Climate Change*, edited by K. Campbell. Washington DC: Brookings Institution Press. p. 14.

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 of the paper 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 Stewart to assess the North's capacity to adapt to these climate impacts, while the third section outlines the dangers of climate hazards to North Korea's political economy through the lens of organisational complexity.

North Korea's Vulnerability to Climate Change Impacts

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 hazard.⁶ The methodology for vulnerability assessment employed here consists of a number of elements from which a fully qualified evaluation can be developed: temporal reference, the vulnerable system, the sphere, which encapsulates the internal properties and external influences on the vulnerable system, the attribute of concern, which is the component of the vulnerable system that is exposed to hazard, and the hazard that will affect the vulnerable system.⁷

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

The North Korean famine of the 1990s provides an insight into the likely consequences of climate hazards. The regime teetered on the brink as a confluence of natural disasters, withdrawal of support from the Soviet Union and crippling energy shortages contributed to the famine and led the state to the edge of failure. A climate vulnerability assessment can thus be carried out with some confidence, based on evidence from the recent past.

The 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.⁸ The regime can be divided conceptually into three primary interlinked components: the physical base, the idea of the state, and its institutions. A state's physical base includes the population and resources within its defined territory, including the agricultural sector. The idea of the state

⁶ Smith, D, and J Vivekanandar. 2007. *A Climate of Conflict: The links between climate change, peace and war*. London: International Alert. p. 10; Han, WJ, SE Ahn, and EA Lee. 2005. *Climate Change Impact Assessment and Development of Adaptation Strategies in Korea*. Seoul: Korea Environment Institute. p. 175; DPR Korea: *Common Country Assessment 2002*. 2003. New York: United Nations. p. 13.

⁷ This paper uses a methodology devised by Hans-Martin Füssel to assess the vulnerability of North Korea's agricultural system to climate change hazards. Füssel's methodology contains a sixth element—knowledge domain—which refers to the body of knowledge from which the vulnerability statement derives its assessment. In this case study on North Korea will integrate data on biophysical processes with sources describing socio-economic conditions within the country. See: Füssel, H. 2007. *Vulnerability: A generally applicable conceptual framework for climate change research*. *Global Environmental Change* 17:155–167.

⁸ Füssel, H. 2007. *Vulnerability: A generally applicable conceptual framework for climate change research*. *Global Environmental Change* 17:155–167. p. 157.

is the distinctive idea—the legitimising 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.⁹ States within which all three components are well developed and inter-connected are usually stronger than states—such as North Korea—in which the three primary components are weak.¹⁰ During the famine, weakness in the physical base—food and energy shortages—stressed the state’s institutions and ideational base. The famine period demonstrates that the decay of one attribute of a vulnerable system can bring that system to the brink of collapse when mutually reinforcing decay takes place.

The *temporal reference* is the timescale over which vulnerability is measured. Defining a timescale is important because the magnitude and nature of the hazard may change over time, as will the characteristics of the vulnerable system.¹¹ This study uses a temporal reference of twenty years. 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, a leadership transition will also occur during this period, the outcome of which remains unclear. Given recent warnings about the accelerated rate of global climatic change, it is quite possible that changes to the regional and local climate regimes in and around the DPRK will occur within the twenty-year timeframe.¹²

The *sphere* represents the internal factors and external influences on the vulnerable system. The internal factors are endogenous properties of the system, such as the totalitarian political architecture of centralised 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

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

⁹ The institutions maintain dominion over its population and territory, a control materially subsidised by the physical base and legitimised by an overarching ideational framework. See: Buzan, B. 1991. *People, States and Fear: An Agenda For International Security Studies in the Post-Cold War Era*. 2nd ed. Boulder: Lynne Rienner Publishers. p. 70-90.

¹⁰ 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 personalised leadership of Kim Jong-il. See: Armstrong, C. 2001. The Nature, Origins, and Development of the North Korean State. In *The North Korean System in the Post Cold War Era*, edited by S. Kim. New York: Palgrave. p. 57; Holsti, K. 1996. *The state, war, and the state of war*. Cambridge: Cambridge University Press. p. 84.

¹¹ Tol, F, T Downing, O Kuik, and J Smith. 2004. Distributional aspects of climate change impacts. *Global Environmental Change* 14:259–272. p. 266-7.

¹² Christopher Field, a member of the IPCC and founding director of the Carnegie Institution’s Department of Global Ecology at Stanford University, stated at the annual meeting of the American Association for the Advancement of Science that “We are basically looking now at a future climate that’s beyond anything we’ve considered seriously in climate model simulations.” See: Lydersen, K. *Scientists: Pace of Climate Change Exceeds Estimates*. Washington Post, 15/02/2009. Available from <<http://www.washingtonpost.com/wp-dyn/content/article/2009/02/14/AR2009021401757.html?hpid=topnews>>.

up the North Korean state. As trusted deputies, the leadership core gets to share in the spoils of totalitarian rule and thus has a vested interest in regime perpetuation.¹³

Kim Jong-Il has consolidated his power over the entire public sphere through what Han S. Park describes as a “natural organismic” authority structure. Kim Jong-il is the organism’s brain, whilst the Party is its body, the functional arm conveying Kim’s will to the public.¹⁴ As mere “body parts,” local nodes of the bureaucracy are dependent on directives from the “brain” and are incapable of autonomous action. This rigid structure precludes rapid action when crises occur, such as the flooding events of August 2007.¹⁵

The regime maintained a monopoly of communications technologies to ensure that the people received little information about the outside world other than party propaganda.¹⁶ People may have doubts about the system, but have no public outlet to vent their frustrations. Information sharing was stifled, reducing the capacity of individuals, communities and ultimately the state to react appropriately to crisis situations. However, the information blockade is no longer effective. For a decade since the famine, knowledge of the outside world has penetrated the country through repatriated defectors, short-term travellers to China, diplomats, and exchange students to other nations.¹⁷ Diplomats and travellers have given credibility to the seemingly fantastic depictions of life in South Korea featured on smuggled CD’s, DVD’s and short-wave radio transmissions, as well as the stories of returned defectors.¹⁸

Active social controls are maintained by the internal security services, which are responsible for internal surveillance, social control, basic police duties, and border control.¹⁹ Should an individual be arrested for political crimes against the state, their entire family may be incar-

¹³ Friedrich, C, and Z Brzezinski. 1966. *Totalitarian Dictatorship & Autocracy*. 2nd ed. New York: Frederick A. Praeger Publishers. p. 35-7.

¹⁴ Park, H. 2002. *North Korea: The Politics of Unconventional Wisdom*. Boulder: Lynne Rienner. p. 88.

¹⁵ *DPRK Hit by Unceasing Torrential Rain 2007*. Korean Central News Agency, 13/08/2007. Available from <<http://www.kcna.co.jp/item/2007/200708/news08/14.htm#11>>.

¹⁶ Cognitive dissonance occurs where a person encounters new information about a given topic that cannot be rationalised away by currently held belief and ideas, causing psychological discomfort. This discomfort leads the person to seek or develop new paradigms for interpreting that topic. See: Festinger, L. 1962. *A Theory of Cognitive Dissonance*. Stanford: Tavistock Publications. p. 2. See also: Oh, K, and R Hassig. 2000. *North Korea: Through the Looking Glass*. Washington DC: Brookings Institution Press. p. 37; Snyder, S. 2000. North Korea’s Challenge of Regime Survival: Internal Problems and Implications for the Future. *Pacific Review* 73 (4):517-533. p. 527-8; Kang, C, and P Rigoulot. 2001. *The Aquariums of Pyongyang: Ten Years in a North Korean Gulag*. New York: Basic Books. p. 141.

¹⁷ It is estimated that up to 200,000 escapees have been returned to North Korea from China. See: Park, IH. 2008. Interview with the author. Seoul, 28 July 2008.

¹⁸ It is now generally well-known that South Koreans are more prosperous and enjoy a better standard of living. North Koreans also know that their country is lacking in the rule of law and that other countries have free elections. See: Ibid.

¹⁹ Internal surveillance takes place through the penetration of various social subgroups via guidance committees, which occur at all levels of society and always feature a local cadre as a key member. The Party representative, referred to as the secretary, is responsible for transmitting policy directives from the Party, evaluating the job performance of bureaucrats, and reporting back to the Party. The committees function as an arm of bureaucratic action and as a mechanism of surveillance to ensure that there is virtually no organised collective unit or activity that is beyond party oversight. See: *North Korea: Human Rights Concerns 2007*. Amnesty International, 24/11/2006. Available from

<<http://news.amnesty.org/index/ENGASA240022006>>; World Report 2007. 2007. New York: Human Rights Watch. p. 297; Country Profile: North Korea. 2007. Washington DC: US Library of Congress. p. 19-20; Park, H. 2002. *North Korea: The Politics of Unconventional Wisdom*. Boulder: Lynne Rienner. p. 88-90; *Country Study - North Korea*. US Library of Congress, 1993. Available from <<http://lcweb2.loc.gov/frd/cs/kptoc.html>>.

cerated in “re-education” camps to weed out ideological impurity and to deter others from engaging in anti-regime behaviour.²⁰ However, the state is increasingly lacking the means to punish some transgressions against official ritual, such that minor offences go largely unpunished.²¹

Over time, the effect of socialisation pressures, information controls and outright coercion have sapped the intellectual vitality of the wider society, discouraging new ideas and stifling development of efficient practices in industry and agriculture. This passivity is a direct obstacle to the country’s capacity to adapt to external shocks. As the economy has crumbled, however, the tentacles of the state have retreated. Marketisation of the economy means that those with access to foreign currency are in a strong position to adapt to crisis conditions by buying what they need on the black market. Those who are unable to pay are most at-risk, including urban industrial workers who formerly enjoyed a privileged status prior to the famine.²²

External Influences

External influences are exogenous factors affecting the vulnerable system. The DPRK had become dependent on Soviet food and energy subsidies and for some time prior to 1991 was unable to fully feed its population due to declining returns on agricultural production, caused by scarcity of key agricultural inputs, grinding inefficiencies and technological decrepitude throughout the economy.²³ The situation has become acute since the cessation of subsidies provided by the Soviet Union. Despite efforts to increase crop yields, shortfall in agricultural output remains a problem.

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 Hyundai group to the regime during 1999-2000 amounted to approximately twenty percent of its total foreign exchange earnings, a timely injection of funds as the regime struggled to overcome the famine period.²⁴ Food aid is diverted wholesale for military use, strengthening

²⁰ Lankov, A. 2007. *Koreaia: vchera i segodnia (The Repressive System and Political Control in North Korea)*. Vostochnaia literature 1995. Available from <http://www.fortunecity.com/meltingpot/champion/65/control_lankov.htm>. For an eyewitness account of North Korea’s gulag system and collective punishment, see: Kang, C, and P Rigoulot. 2001. *The Aquariums of Pyongyang: Ten Years in a North Korean Gulag*. New York: Basic Books.

²¹ Lankov, A. 2007. *North of the DMZ: Essays on Daily Life in North Korea*. Jefferson, NC: McFarland & Company. p. 314.

²² Park, IH. 2008. Interview with the author. Seoul, 28 July 2008.

²³ Smith, H, and Y Huang. 2000. Achieving Food Security in North Korea. In *Promoting International Scientific, Technological and Economic Cooperation in the Korean Peninsula: Enhancing Stability and International Dialogue*. Rome, Italy: Istituto Diplomatico Mario Toscano and the Italian Ministry of Foreign Affairs. p. 201-5; Lankov, A. 2007. *North Korea hungry for control*. Asia Times Online, 10/09/2005. Available from <<http://www.atimes.com/atimes/Korea/G110Dg01.html>>.

²⁴ Kim, K. 2005. *Downfall Delayed: Endgames for the North Korean Regime*. Harvard International Review: 56-59. p. 58; Rigoulot, P. 1999. *Crimes, Terror, and Secrecy in North Korea*. In *The Black Book of Communism: Crimes, Terror, Repression*, edited by S. Courtois, N. Werth, J. Panne, A. Paczkowski, K. Bartosek and J. Margolin. London: Harvard University Press. p. 563. The World Food Program has budgeted for 149, 998 metric tons of food aid, at a cost of US\$70.96 million. South Korea sent over US\$3.2 billion in aid and cash payments to the DPRK between 1995 and 2004, with the United States contributing US\$1.1 billion over the same period. China is likely to continue its annual cereal concession of 250,000 metric tons. Yet despite these efforts, almost 6.5 million North Koreans are still reliant on food aid to survive. See: Beck, Peter. 2005. *North Korea: Can the Iron Fist Accept the*

the position of the Korean Peoples' Army (KPA) as the vanguard institution of the state. The KPA subtracts a portion for its own provisions, then on-sells the remainder for profit on the black market.²⁵

Reorganisation of the Economy: Coping Mechanisms Become Permanent

Regime perpetuation 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 sprung up around the country, where people could buy and sell food grown in private plots or expropriated from collective farms and aid shipments.²⁶

Parallel economies developed that operate outside the official central planning mechanism, which generated income for the regime and ensured the continuation of important services. The military economy is by far the most important parallel economy, encompassing all economic activities related to the production, distribution and consumption of materials within the military sphere.²⁷ Contributions from state-sanctioned criminal enterprises represent another income source.²⁸ 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 against exposure to new hazards.

Invisible Hand? Brussels: International Crisis Group. p. 4; *Protracted Relief and Recovery Operation—Democratic People's Republic of Korea*. 2006. Rome: World Food Program. p. 16; Pollack, J. 2005. *The Strategic Futures and Military Capabilities of the Two Koreas*. In *Strategic Asia 2005-06: Military Modernization in an Era of Uncertainty*, edited by A. Tellis and M. Wills. Seattle & Washington DC: National Bureau of Asian Research. p. 147-8.

²⁵ Park, IH. 2008. Interview with the author. Seoul, 28 July 2008.

²⁶ Small farmers' markets were initially established in the mid-1950s as an outlet for the sale of surplus produce from the collectivised farms. In the early-1980s they became more common and since 1991 have mushroomed into busy bazaars where all manner of goods, legal and illegal, can be bought, sold and bartered. See: Scobell, A. 2006. *Kim Jong Il and North Korea: The Leader and the System*: Strategic Studies Institute. p. 35; Snyder, S. 2000. *North Korea's Challenge of Regime Survival: Internal Problems and Implications for the Future*. *Pacific Review* 73 (4):517-533; Oh, K., and R Hassig. 2000. *North Korea: Through the Looking Glass*. Washington DC: Brookings Institution Press. p. 67.

²⁷ Daniel Pinkston has estimated that the military economy may account for up to seventy percent of North Korea's domestic economic output, far outstripping the contribution of the civilian economy. See: Pinkston, D. 2003. Domestic Politics and Stakeholders in the North Korean Missile Development Program. *The Nonproliferation Review* 10 (2):1-15. p. 9.

²⁸ Economic weakness has left the regime dependent on other sources of income. The regime has been implicated in a number of illicit activities, including the production and distribution of narcotics, counterfeiting, smuggling, and money laundering. David Asher suggests that illicit exports may account for 35-40 percent of the North's total exports, contributing to an even larger slice of total earnings. Profit margins on illegal activities are far beyond those earned by conventional trade, often as high as five hundred percent, which is one of the reasons why criminal activity is so lucrative and has become an important prop for the regime. See: Asher, D. 2006. *The North Korean Criminal State, Its Ties to Organized Crime, and the Possibility of WMD Proliferation*. The Nautilus Institute for Security and Sustainable Development, 15/11/2005. Available from <<http://nautilus.org/fora/security/0592Asher.html>>. See also: Chestnut, S. 2007. Illicit Activity and Proliferation: North Korean Smuggling Networks. *International Security* 32 (1):80-111; Chestnut, S. 2005. *The "Sopranos State?" North Korean Involvement in Criminal Activity and Implications for International Security*: Stanford University: Center for International Security and Cooperation.

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.²⁹ Food production in North Korea is hampered significantly by geography and climate, with only a few regions suitable for large-scale agriculture due to mountainous topography and harsh winters.³⁰ The large temperature variation between winter and summer limits the length of the growing season.³¹ For these reasons periodic famine has been a feature of life on the Korean peninsula for many centuries.³²

A major limit on cultivation in North Korea is its generally poor soil fertility. Soil analyses conducted by the Food and Agriculture Organisation (FAO) have discovered that soil pH in cultivated regions of the North are highly acidic.³³ The traditional solution has been to use large amounts of fertilisers. However after 1991, the DPRK's large indigenous fertiliser industry was decimated imports of fossil fuel feed stocks for fertiliser production ceased, resulting in reduced crop yields. By growing crops with minimal fertilisation, North Korea's

²⁹ Füssel, H. 2007. Vulnerability: A generally applicable conceptual framework for climate change research. *Global Environmental Change* 17:155–167. p. 157.

³⁰ Gunjal, K, S Goodbody, K Oshidari, and J Fleuren. 2004. *FAO/WFP Crop and Food Supply Assessment Mission to the Democratic People's Republic of Korea*. Rome: Food and Agriculture Organization of the United Nations. p. 6. In 2004 the total area of cultivated land in North Korea was estimated at 17-18 percent of the total land area. See: Pinkston, D, and P Saunders. 2003. Seeing North Korea Clearly. *Survival* 45 (3):79-100. p. 84-5; Walters, K, and K Traxler. 1994. *North Korea—A Climatological Study*: USAF Environmental Technical Applications Center. p. 1.2.

³¹ Average temperatures range from -19oC during winter to 25oC in summer. See: Gunjal, K, S Goodbody, K Oshidari, and J Fleuren. 2004. *FAO/WFP Crop and Food Supply Assessment Mission to the Democratic People's Republic of Korea*. Rome: Food and Agriculture Organization of the United Nations. p. 5.

³² Kim Il-Sung attempted to address the problem of periodic food shortages through the 1954 Chollima movement, a "grand plan to remake nature" featuring an enormous land reclamation campaign to increase the stock of arable land and foster agricultural self-sufficiency. Mountain sides were terraced, land was reclaimed from the sea, and over forty thousand kilometres of irrigation canals were cut to augment the stock of available land. Terraces were cut into mountains too steep to support them, contributing to soil erosion that denuded the hills and severely reduced their water catchment capacity, leading to increased intensity of flooding events in the land below. Land reclaimed from the sea suffered from high salinity and would not support food crops, despite the massive use of chemical fertilisers. In February 1964 Kim Il-Sung announced a new framework, the Chongsan-ri method, to increase crop yields based on four principles: mechanisation, chemicalisation, irrigation, and electrification. Mechanisation turned the country's farms into collectives more akin to factories, staffed by a salaried proletariat with no property ties to the land and thus no bourgeois sympathies. Over time the industrial scale mechanisation and use of chemicals in agriculture have yielded declining returns as soils became exhausted and agricultural machinery fell into decrepitude. Declining energy supplies resulted in power cuts that prevented the pumping of water for irrigation and curtailed the production of fertilisers, pesticides and herbicides. See: Natsios, A. 2001. *The Great North Korean Famine*. Washington DC: United States Institute of Peace Press. p. 12; Martin, B. 2004. *Under the Loving Care of the Fatherly Leader: North Korea and Kim Dynasty*. New York: St. Martin's Press. p. 161.

³³ The pH of soils in North Korea range between pH 4.5-5.5. Acidic soils tend to influence soil properties such as movement of air and water through the soil, plant nutrient uptake, microbial activity, and breakdown of soil contaminants, and thus produce lower crop yields. At a pH of less than 5.0, many of the thirteen nutrients essential to healthy plant growth become unavailable. See: Gunjal, K, S Goodbody, K Oshidari, and J Fleuren. 2004. *FAO/WFP Crop and Food Supply Assessment Mission to the Democratic People's Republic of Korea*. Rome: Food and Agriculture Organization of the United Nations. p. 10; Ramankutty, N, J Foley, J Norman, and K McSweeney. 2002. The global distribution of cultivable lands: current patterns and sensitivity to possible climate change. *Global Ecology & Biogeography* 11:377–392. p. 378, 382.

farms have effectively been mining nutrients from the soil, continually decreasing the fertility of those soils.³⁴

North Korea's state-run collective farms currently run a rotation of winter, spring and summer crops. Wheat is the main cereal crop cultivated during the winter, along with a small proportion of winter barley, which are sown from late-September to mid-October.³⁵ Barley is the primary spring cereal crop, with some spring wheat, which is sown in March and harvested in June along with the winter wheat crop. A double-crop of potato is also grown in the spring and again in the summer.³⁶ The primary summer cereal crops under cultivation are rice and maize.³⁷ Maize cultivation has decreased in recent years in favour of less moisture-demanding cereal crops. Other crops produced during the summer include sorghum, millet, soybean, buckwheat, vegetables such as cabbage, spinach, radish, cucumber, eggplant, tomato, and fruits such as pears, peaches, apricots and apples.³⁸

The double cropping program puts considerable strain on farm labourers and mechanised farming hardware, due to the short time interval between the winter crop harvest and planting of the summer crop. Due to 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 labour is done by humans and draught animals, limiting the rate at which harvested land can be turned over for fresh cultivation.³⁹ Heavy and continuous crop rotation also increases the risk of losses from pests and diseases.⁴⁰ It is thus 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 metres. Urban households

³⁴ *Fertilizer use by crop in the Democratic People's Republic of Korea*. 2003. Rome: Food and Agriculture Organisation of the United Nations. p. 2, 5-7.

³⁵ These were the two cereals introduced in a double cropping program instituted in 1996 as a partnership between the North Korean government and the FAO. See: *Second Thematic Roundtable on Agricultural Recovery & Environmental Protection – DPRK*. 2000. New York: United Nations Development Program. p. 7.

³⁶ Potato was introduced in the late-1990s in an attempt to boost carbohydrate production in all major agricultural areas. See: *Fertilizer use by crop in the Democratic People's Republic of Korea*. 2003. Rome: Food and Agriculture Organisation of the United Nations. p. 13.

³⁷ The average annual yields for all cereal crops cultivated in North Korea during the period 2002-04 fell well below expected yield potentials for those crops under normal weather conditions. Expected potential yield for winter wheat is 3 tons per hectare, 3 tons/hectare for spring barley and 6.5 tons/hectare for rice. North Korea achieved yields of 1.02-1.85 tons/hectare for winter wheat, 0.59-1.63 tons/hectare for spring barley, and 3.2 tons/hectare for rice respectively over the 2002-04 period. See: *Ibid.* p. 13.

³⁸ Gunjal, K, S Goodbody, K Oshidari, and J Fleuren. 2004. *FAO/WFP Crop and Food Supply Assessment Mission to the Democratic People's Republic of Korea*. Rome: Food and Agriculture Organization of the United Nations. p. 6-8, 13-19.

³⁹ In 2003, North Korea had an inventory of 64,062 tractors, of which 36,836 (57.5%) were operational. See: *Ibid.* p. 11; *Fertilizer use by crop in the Democratic People's Republic of Korea*. 2003. Rome: Food and Agriculture Organisation of the United Nations. p. 4; *Second Thematic Roundtable on Agricultural Recovery & Environmental Protection – DPRK*. 2000. New York: United Nations Development Program. p. 7.

⁴⁰ These include threats to wheat and barley fields from armyworm infestation and the endangering of the potato crop to blight. See: *Fertilizer use by crop in the Democratic People's Republic of Korea*. 2003. Rome: Food and Agriculture Organisation of the United Nations. p. 23-24.

are also entitled to garden plots, though these are much smaller. As private plots are usually well cared for, crop yields have tended to be higher than on the collective farms.⁴¹

Hazard: Climate Change Impacts on Agriculture

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.⁴² 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.⁴³ Four specific climate impacts—rising mean temperature, extreme weather events, changing precipitation patterns, and climate-induced deforestation—have been selected for analysis. Their likely impact on agricultural systems in East Asia has been well documented elsewhere and will not be elaborated on here.⁴⁴ Their influence on human systems is a function of their interaction with political, economic and social conditions.

Final Hazard Assessment: Risk of Greater Food Insecurity

Climate hazards will cause the greatest harm in combination with existing problems such as over-population, demographic imbalance, poor governance, endemic poverty and lack of infrastructure.⁴⁵ In the North Korean case, the direct consequence will be declining food security. Food insecurity exists when people lack secure access to sufficient amounts of safe and nutritious food for normal growth, development and sustenance. It can be caused by inadequate access to food as well as insufficient and uncertain supply.⁴⁶ Large segments of the North Korean population are already at-risk because the country does not produce enough

⁴¹ Urban household plots range in size from 59-73 square metres and typically produce an early crop of potatoes and maize, followed by vegetables such as cabbage, radish, peppers and garlic. See: Gunjal, K, S Goodbody, K Oshidari, and J Fleuren. 2004. *FAO/WFP Crop and Food Supply Assessment Mission to the Democratic People's Republic of Korea*. Rome: Food and Agriculture Organization of the United Nations. p. 8.

⁴² Füssel, H. 2007. Vulnerability: A generally applicable conceptual framework for climate change research. *Global Environmental Change* 17:155–167. p. 157-8; Smith, K. 1996. *Environmental Hazards: Assessing risk and reducing disaster*. 2nd ed. London: Routledge. p. 5; Blaikie, P, T Cannon, I Davis, and B Wisner. 1994. *At Risk: Natural hazards, people's vulnerability, and disasters*. London: Routledge. p. 21.

⁴³ Smith, K. 1996. *Environmental Hazards: Assessing risk and reducing disaster*. 2nd ed. London: Routledge. p. 12.

⁴⁴ This is not intended as an exhaustive list, but will provide a foundation for further investigation of their implications for regime stability. See: Han, Wha-jin. 2008. Interview with the author. Seoul, 11 July 2008; Parry, ML, OF Canziani, JP Palutikof, PJ van der Linden, and CE Hanson, eds. 2007. *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. p. 472-5; Warren, R, N Arnell, R Nicholls, P Levy, and J Price. 2006. *Understanding the regional impacts of climate change*. Norwich: Tyndall Centre for Climate Change Research. p. 30; Chung, YS, MB Yoon, and HS Kim. 2004. On Climate Variations and Changes Observed in South Korea. *Climatic Change* 66:151–161. p. 155; Gunjal, K, S Goodbody, K Oshidari, and J Fleuren. 2004. *FAO/WFP Crop and Food Supply Assessment Mission to the Democratic People's Republic of Korea*. Rome: Food and Agriculture Organization of the United Nations. p. 3-4; *DPR Korea: Common Country Assessment 2002*. 2003. New York: United Nations. p. 9

⁴⁵ Campbell, Kurt, and Christine Parthemore. 2008. National Security and Climate Change in Perspective. In *Climatic Cataclysm: The Foreign Policy and National Security Implications of Climate Change*, edited by K. Campbell. Washington DC: Brookings Institution Press. p. 14.

⁴⁶ Smith, D, and J Vivekanandar. 2007. *A Climate of Conflict: The links between climate change, peace and war*. London: International Alert., p. 21-2; *DPR Korea: Common Country Assessment 2002*. 2003. New York: United Nations. p. 13.

food to feed itself and because certain social strata enjoy privileged access to existing food supplies. Those people experiencing food insecurity thus must develop coping mechanisms to secure subsistence or face malnutrition and starvation.

North Korea's Adaptive Capacity

North Korea's vulnerability to climate hazards depends on its adaptive capacity, its ability to reduce exposure to hazards, moderate potential damages, recover from losses incurred, and cope with the consequences of the new environment.⁴⁷ Mohan Munasinghe and Rob Stewart 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.⁴⁸ A system in which the key determinants are strongly positive will have stronger adaptive capacity than one where the key determinants are weak.

Economic Resources

North Korea's economy remains in a decrepit state. 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.⁴⁹ Whilst investment into North Korea is growing in its three special economic zones, these operations are run by foreign companies and do not produce direct export revenue.⁵⁰ The collapse of the Soviet Bloc closed off markets for the North's sub-standard manufactured goods and ended energy subsidies to the North, leading to its deindustrialisation. To fund further adaptation measures, the regime must

⁴⁷ Adger, W, and K Vincent. 2005. Uncertainty in adaptive capacity. *Comptes Rendus Geoscience* 337:399–410. p. 400; Munasinghe, M, and R Swart. 2005. *Primer on Climate Change and Sustainable Development: Facts, Policy Analysis, and Applications*. Cambridge: Cambridge University Press. p. 175; Tol, F, T Downing, O Kuik, and J Smith. 2004. Distributional aspects of climate change impacts. *Global Environmental Change* 14:259–272. p. 266.

⁴⁸ Munasinghe, M, and R Swart. 2005. *Primer on Climate Change and Sustainable Development: Facts, Policy Analysis, and Applications*. Cambridge: Cambridge University Press. p. 187.

⁴⁹ Chestnut, S. 2007. Illicit Activity and Proliferation: North Korean Smuggling Networks. *International Security* 32 (1):80–111.; Lintner, B. 2007. *North Korea's golden path to security*. Asia Times Online, 18/01/2007. Available from <<http://www.atimes.com/atimes/Korea/IA18Dg01.html>>; *The Estimate of North Korea's Foreign Trade in 2005* (May 15, 2006). 2006. edited by R. M. o. Unification: ROK Ministry of Unification; Pinkston, D. 2003. Domestic Politics and Stakeholders in the North Korean Missile Development Program. *The Nonproliferation Review* 10 (2):1-15. p. 9.

⁵⁰ There are three special economic zones in North Korea: Kaesong, in the south near the DMZ, in which many South Korean companies have set up manufacturing plants; Sinuiju, on the Yalu River border with China; and Rajin-Sonbong, in the northern coast near the Russian border. The revenue 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. See: *Country Profile: North Korea*. 2007. Washington DC: US Library of Congress. p. 11; Armstrong, C. 1998. 'A Socialism of Our Style': North Korean Ideology in a Post-Communist Era. In *North Korean Foreign Relations in the Post-Cold War Era*, edited by S. Kim. Oxford: Oxford University Press. p. 39; Chung, J. 1986. Foreign Trade of North Korea: Performance, Policy, and Prospects. In *North Korea in a Regional and Global Context*, edited by R. Scalapino and H. Lee. Berkeley: Center for Korean Studies, University of California-Berkeley. p. 81.

reallocate scarce capital from other projects or undertake substantial systemic reform to obtain assistance from international organisations.⁵¹

Access to Appropriate Technology

The adaptive capacity of the agricultural sector could be enhanced by technologies to buffer against crop loss. North Korea's economic problems have not helped in this regard. At present, farming is dependent on human and animal labour to compensate for aging and dilapidated mechanised farm equipment, which cannot be repaired or replaced. 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.⁵² Thus when extreme events do occur, it takes a great deal of time and human labour to restore farmland to full production.

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.⁵³ 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, stifling scientific innovation.⁵⁴ The stock response of a bureaucracy resistant to new ideas is to apply rigid dogma to complex practical problems. This bodes ill for the timely 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 percent of its oil coming from China and a smaller fraction from Russia.⁵⁵ A large portion of farm irrigation is powered by electric pumps, which are

⁵¹ The Food and Agriculture Organization is engaged in a number of agriculture and water project in North Korea. See: *FAO Technical Cooperation Department Field Programme Activities 2008*. Food and Agriculture Organization, 2008 2008 [cited 28 March 2008 2008]. Available from <<https://extranet.fao.org/fpmis/FPMISReportServlet.jsp?APD=&countryId=KP&div=&fundG=&type=countryprofileopen&lng=EN&qfirs=&UF=N&typeUF=&colorder=2345&pwb=&sorttype=1>>.

⁵² French, P. 2005. *North Korea: The Paranoid Peninsula - A Modern History*. London: Zed Books. p. 100-1.

⁵³ Parry, ML, OF Canziani, JP Palutikof, PJ van der Linden, and CE Hanson, eds. 2007. *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. p. 490; Smith, D, and J Vivekanandar. 2007. *A Climate of Conflict: The links between climate change, peace and war*. London: International Alert. p. 33; Munasinghe, M, and R Swart. 2005. *Primer on Climate Change and Sustainable Development: Facts, Policy Analysis, and Applications*. Cambridge: Cambridge University Press. p. 187.

⁵⁴ SC Kim, SC. 2002. Dynamism of Politics and Status of Intellectuals in North Korea. *Development and Society* 31 (1):79-106. p. 6.

⁵⁵ French, P. 2005. *North Korea: The Paranoid Peninsula - A Modern History*. London: Zed Books. p. 100-1; Brown, W. 2006. Changes in the North Korean Economy and Implications for the Energy Sector: Is North Korea Really Short of Energy? In *DPRK Energy Experts Working Group Meeting*. San Francisco: The Nautilus Institute for Security and Sustainable Development; Li, D. 2006. *DPRK's Reform and Sino-DPRK Economic Cooperation*.

vulnerable to blackouts.⁵⁶ The North's transportation infrastructure is heavily dependent on intermittent fuel supplies, caused by 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.⁵⁷

Adequate Institutions

Strong and well-organised 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 Distribution System (PDS).⁵⁸ This system worked reasonably well during times of stability, but was ineffectual during the famine. 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.⁵⁹ Clearly dysfunctional, it was officially abandoned in 2002.

The PDS was revived piecemeal in October 2005 offering a daily ration of 500 grams of cereal.⁶⁰ Distribution delays due to transportation deficiencies and administrative inertia have prevented PDS rations from becoming available in all counties.⁶¹ Those living in or near the larger cities on the west coast have the greatest chance of accessing rations, while those in other areas continue to rely on adaptive strategies developed during the famine.⁶²

Equitable Access to Resources

Adaptive capacity is a function not only of the availability of resources, also equitable access to those resources. North Korea has a three-tiered social stratification which influences the access of individuals to food. The country is divided into a "central" class, which forms the core of society and from which the regime elite derive; an "uncertain" class of the families

The Nautilus Institute for Security and Sustainable Development, 23/08/2006. Available from <<http://www.nautilus.org/fora/security/0670Li.html>>.

⁵⁶ Natsios, A. 2001. *The Great North Korean Famine*. Washington DC: United States Institute of Peace Press. p. 14; Beck, Peter. 2005. *North Korea: Can the Iron Fist Accept the Invisible Hand?* Brussels: International Crisis Group. p. 3.

⁵⁷ *Protracted Relief and Recovery Operation—Democratic People's Republic of Korea*. 2006. Rome: World Food Program. p. 5-6.

⁵⁸ The PDS was established in 1957 to centralise 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. To claim the PDS, a representative of each family unit would present identification and rationing coupons on the 15th day of each month in return for a ration of rice and a number of different grains. See: Scobell, A. 2006. *Kim Jong Il and North Korea: The Leader and the System*: Strategic Studies Institute. p. 34-5; Lankov, A. 2007. *North Korea's antique food rationing*. Asia Times Online, 15/01/2005. Available from <<http://www.atimes.com/atimes/Korea/GA15Dg01.html>>; *Starved of Rights: Human Rights and the Food Crisis in the Democratic People's Republic of Korea* (North Korea). 2004. London: Amnesty International. p. 8-9.

⁵⁹ Woo, M. 2005. North Korea in 2005: Maximising Profit to Save Socialism. *Asian Survey* 46 (1):49-55. p. 5.

⁶⁰ *Protracted Relief and Recovery Operation—Democratic People's Republic of Korea*. 2006. Rome: World Food Program. p. 5.

⁶¹ Lankov, A. 2007. *North Korea hungry for control*. Asia Times Online, 10/09/2005. Available from <<http://www.atimes.com/atimes/Korea/GI10Dg01.html>>.

⁶² *Protracted Relief and Recovery Operation—Democratic People's Republic of Korea*. 2006. Rome: World Food Program. p. 6.

of former small businessmen and landholders, and a “hostile” class of officially designated enemies of the state, which includes approximately one-quarter of the North Korean population.⁶³ It influences their access to good jobs and higher education, of being allowed to live in Pyongyang and other major cities, and, hence, their standard of living and access to food rations.⁶⁴ Increasingly however, food distribution is being determined by one’s position in the emerging market economy.⁶⁵

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.⁶⁶ 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, cultivating common vegetable varieties. 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 that are 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.⁶⁷

These informal coping mechanisms could not prevent widespread mortality during the famine. Andrew Natsios has estimated that 2-3 million people succumbed to malnutrition and associated health complications during 1994-98.⁶⁸ Those who perished were largely those who 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 minimal buffering in the system to absorb future shocks.

⁶³ Lankov, A. 2007. *Koreaia: vchera i segodnia (The Repressive System and Political Control in North Korea)*. Vostochnaia literature 1995. Available from <http://www.fortunecity.com/meltingpot/champion/65/control_lankov.htm>.

⁶⁴ Amartya Sen has observed that uneven distribution of food among social strata in an affected area is a common feature of famines. See: Sen, A. 1981. *Poverty and Famine: An essay on entitlement and deprivation*. Oxford: Clarendon Press. See also: Lankov, A. 2007. *North of the DMZ: Essays on Daily Life in North Korea*. Jefferson, NC: McFarland & Company. p. 66-9. For a description of differential food distribution in North Korea during the great famine, see: *The Invisible Exodus: North Koreans in the People’s Republic of China*. 2002. Washington DC: Human Rights Watch. p. 19-20; Rigoulot, P. 1999. Crimes, Terror, and Secrecy in North Korea. In *The Black Book of Communism: Crimes, Terror, Repression*, edited by S. Courtois, N. Werth, J. Panne, A. Paczkowski, K. Bartosek and J. Margolin. London: Harvard University Press. p. 560.

⁶⁵ Park, IH. 2008. Interview with the author. Seoul, 28 July 2008.

⁶⁶ Adger, W. 2003. Social Capital, Collective Action, and Adaptation to Climate Change. *Economic Geography* 79 (4):387-404. p. 15-6.

⁶⁷ It has been estimated that 60-80 percent of citizens have supplemented their meagre rations with wild foods. See: Scobell, A. 2006. *Kim Jong Il and North Korea: The Leader and the System*: Strategic Studies Institute. p. 35; Gunjal, K, S Goodbody, K Oshidari, and J Fleuren. 2004. *FAO/WFP Crop and Food Supply Assessment Mission to the Democratic People’s Republic of Korea*. Rome: Food and Agriculture Organization of the United Nations. p. 20-1.

⁶⁸ Natsios, A. 1999. *The Politics of Famine in North Korea*. Washington DC: United States Institute of Peace. p. 1.

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 fulfil certain needs; each operational program requires nodes of institutional organisation 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, with maintenance costs growing with each organisational node.⁶⁹ To maintain complex socio-political system, its leadership must have access to an adequate energy, resource and manpower base. If either of these is inadequate, the system cannot be preserved at the desired level of complexity; institutional breakdown is likely, leading to failure or collapse.⁷⁰

Totalitarianism is a complex form of social organisation, mobilising people within vast institutions orchestrated from the centre. Greater resources are required for maintaining total control than are required in less centralised, 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.⁷¹

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 centralised institutions must disaggregate into smaller units. This may occur in one of three ways: (1) disaggregation of the state into smaller discrete political units, such as occurred in the "Balkanisation" of the former Yugoslavia, and the collapse of Soviet Union; (2) via social triage, a strategy employed during the famine, where sections of the population are cut off from the resource pool so that system can be maintained; and (3), through systemic reform, where the state consciously alters its political system to a more efficient mode of organisation. In North Korea, this would require complete marketisation of economy, greater political freedom requiring less policing, and smaller and fewer government institutions.

North Korea's rigid political system is not well equipped to deal with stress. Climate change hazards of increasing intensity and frequency may add to pressure on this system by further exacerbating the country's food insecurity.⁷² The political consequences of food insecurity starkly illustrated during the famine period. The regime was able to muddle through and survive by consciously decreasing the complexity of its totalitarian system via social triage; however, the flow-on consequences of climate stress could disrupt the political eco-

⁶⁹ Homer-Dixon, Thomas. 2006. *The Upside of Down: Catastrophe, Creativity, and the Renewal of Civilization*. Washington DC: Island Press. p. 41; Tainter, J. 1988. *The Collapse of Complex Societies*. Cambridge: Cambridge University Press. p. 23.

⁷⁰ Tainter, J. 1988. *The Collapse of Complex Societies*. Cambridge: Cambridge University Press. p. 91.

⁷¹ Totalitarianism attempts to atomise 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. See: Arendt, H. 1958. *The Origins of Totalitarianism*. 2 ed. London: George Allen and Unwin; Friedrich, C, and Z Brzezinski. 1966. *Totalitarian Dictatorship & Autocracy*. 2nd ed. New York: Frederick A. Praeger Publishers; Scobell, A. 2006. *Kim Jong Il and North Korea: The Leader and the System*. Strategic Studies Institute.

⁷² Hultman, N, and A Bozmoski. 2006. The Changing Face of Normal Disaster: Risk, Resilience and Natural Security in a Changing Climate. *Journal of International Affairs* 59 (2):25-41. p. 26.

nomy of the state such that further, uncontrollable reductions in systemic complexity become inescapable.

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 adaptation measures.⁷³ For the victims of social triage, people with minimal access to foreign currency and the black market, this was indeed their only survival option and is likely to remain so in the future. Migration has the further consequence of inviting official corruption. Government officials can demand bribes from vulnerable displaced people who violate travel restrictions, driven by both the illegality of unauthorised travel and the necessity of journeying to find food. During the famine enforcement of travel restrictions broke down because corrupt officials took bribes to facilitate the movement of illegal travellers.⁷⁴

Domestic surveillance weakened because people could move around more freely and were not rooted in one place. Intensification of food shortages will place tremendous pressure on the regime to again tolerate unrestricted travel, leading to deligitimised 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 behavioural motivators.⁷⁵ This suggests 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* marketisation of the North Korean economy seems to be an irreversible trend.⁷⁶ Private farmers' markets weakened the primacy of the command economy, demonstrating that central planning, embodied in the PDS, was an inefficient mechanism for distributing food. People stopped looking to the

⁷³ McLeman, R, and B Smit. 2006. Migration as an Adaptation to Climate Change. *Climatic Change* 76:31-53. p. 41.

⁷⁴ Many were able to escape the country by bribing border guards and travel inspectors to reach and cross the Chinese border. North Korean defector Ji Hae-nam recounts her use of bribes to escape the country: "I brought 200 won worth of food on top of 200 won in cash to a guard from National Border Patrol in Musan telling him that I will give him more when I come back from China after selling my merchandise. He believed me and let me pass and I arrived in China after crossing the Tuman River at 3:30 p.m. Even the soldiers are starving in North Korea that they would do anything for money and their goal is to accrue 500,000 won by the time they are dismissed from the military service." See: *A Matter of Survival: The North Korean Government's Control of Food and the Risk of Hunger*. 2006. New York: Human Rights Watch. p. 29; Ji, HN. 2003. *Testimony of Mrs. Hae-Nam Ji, North Korean defector*. Washington DC: Senate Foreign Relations Committee Subcommittee on East Asian and Pacific Affairs; Hwang, J. 2007. *Hwang Jangyop Holds Press Conference To Explain Why He Defected from North Korea*. Federation of American Scientists, 21/07/1997. Available from <<http://www.fas.org/news/dprk/1997/bg152.html>>.

⁷⁵ Lankov, A. 2008. *North Korea dragged back to the past*. Asia Times Online, 24 January 2008. Available from <<http://www.atimes.com/atimes/Korea/JA24Dg01.html>>.

⁷⁶ Woo, M. 2005. North Korea in 2005: Maximising Profit to Save Socialism. *Asian Survey* 46 (1):49-55. p. 54; Li, D. 2006. *DPRK's Reform and Sino-DPRK Economic Cooperation*. The Nautilus Institute for Security and Sustainable Development, 23/08/2006. Available from <<http://www.nautilus.org/fora/security/0670Li.html>>.

state to provide for them and instead learnt to take care of themselves; no longer could the regime be viewed by ordinary people as a paternal provider.⁷⁷ Marketisation, by contrast, requires minimal state intervention to function efficiently. Again, this is a sign that the system cannot be maintained at the level of complexity required for totalitarian control.

Members of the elite live in a cloistered bubble of privilege, safely sequestered from the pervasive suffering of lower social strata.⁷⁸ 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 what minimum level of resource procurement is necessary to sustain the elite and at what point of erosion an organised backlash may occur.⁷⁹ Recent reports suggest that high-ranking residents of Pyongyang have had their ration substantially reduced.⁸⁰ The tipping point may come when mid- and high-ranking officials are confronted with severely reduced access to food, leading key figures to see support for the status quo as a losing gambit. It seems likely that political disaggregation would follow at this point.

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.⁸¹ The regime holds a strong suit having adopted *Songun* (military-first) politics as its legitimising paradigm. The military remains strong, having co-opted as much as 75 percent of the national economy for itself. This portion operates largely on market principles and provides the KPA with a generous revenue stream through the on-sale of diverted goods on the black market.⁸² Decreases in the food available locally will affect this revenue stream, but to constitute chronic revenue impairment, food shortages would have

⁷⁷ 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 price of goods in the farmers markets. This was an attempt by the regime to adjust to the changed economic landscape once change had already occurred. See: Lankov, A. 2008. *North Korea dragged back to the past*. Asia Times Online, 24 January 2008. Available from <<http://www.atimes.com/atimes/Korea/JA24Dg01.html>>.

⁷⁸ Even rations for even high-level officials fell slightly during the famine. Mr. Lim, who was a soldier at the time of his escape in March 2005, told Human Rights Watch that common soldiers also had faced hunger. His unit, which was assigned to work at a power plant in Hwanghae City, had a serious shortage of food. They received proper rations only on major holidays such as Kim Il Sung's and Kim Jong Il's birthdays. On other days, he received about "three spoonfuls" of grain per meal. See: *A Matter of Survival: The North Korean Government's Control of Food and the Risk of Hunger*. 2006. New York: Human Rights Watch. p. 11; Lankov, A. 2007. *North of the DMZ: Essays on Daily Life in North Korea*. Jefferson, NC: McFarland & Company. p. 314.

⁷⁹ Snyder, S. 2000. North Korea's Challenge of Regime Survival: Internal Problems and Implications for the Future. *Pacific Review* 73 (4):517-533. p. 527-8.

⁸⁰ *N. Korea's food situation hopelessly bad: aid group* 2008. The Hankyoreh, 03 April 2008. Available from <http://english.hani.co.kr/arti/english_edition/e_northkorea/279706.html>.

⁸¹ Barry Buzan states that the ideas and the institutions of the state are inseparably intertwined; thus the ideational pillars are useless without the institutions to put them into practice, just as the institutions are pointless and even impossible without these ideas to give them definition and purpose. See: Buzan, B. 1991. *People, States and Fear: An Agenda For International Security Studies in the Post-Cold War Era*. 2nd ed. Boulder: Lynne Rienner Publishers. p. 86.

⁸² Park, IH. 2008. Interview with the author. Seoul, 28 July 2008.

to coincide with donor fatigue from international sources such that overall food inputs decrease.⁸³

Conclusion

Making predictions about the future is inevitably a risky and imprecise venture. The scenario presented here speculating about the influence of climate change on political stability in the DPRK seems the most likely one, given the evidence at hand. This is not to say that other trajectories may not play out; significant ambiguity exists in both the climate predictions and the political analysis of the North Korean state for one to approach these findings with caution. On the whole, however, the findings of this paper represent the best bet possible given the available information.

The famine period saw a decrease in the level of economic and institutional complexity in North Korea. The regime accommodated 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 reorganisation, something which the totalitarian system is unlikely to survive.

The “muddle through” paradigm has allowed the development 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 climate-related decreases in food security while simultaneously weakened by mutually reinforcing trends of energy shortage, economic malaise, limited horizontal access to information, and political rigidity. Culmination of these crises may force North Korea into systemic reform, or push the regime into collapse as the totalitarian order slides into disrepair.

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⁸³ Given that the international community is confronting a global food availability crisis, this scenario may not be so far-fetched.

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