



## **Resilience: Interdisciplinary Perspectives on Science and Humanitarianism** Volume 2, March 2011

Preface .....	i
<i>Stephen Flynn</i>	
Editor's Note .....	iii
<i>Astier M. Almedom</i>	
Postscript: Egypt in Transformation: Unfolding Dynamics of Resilience in a Complex System in Real Time .....	v
<i>Nicholas Cooper</i>	
Resilience and Sustainability of Water Resources in the São Francisco River Basin, Brazil: an Assessment and Plan of Action .....	1
<i>John Parker, Eric Vaughan, and Jeffrey Bate</i>	
Taking the Camel through the Eye of a Needle: Enhancing Pastoral Resilience through Education Policy in Kenya .....	25
<i>Ahmed Idris</i>	
Security and Resilience .....	39
<i>Ola Dahlman</i>	
The North Korean Healthcare System: On the Fine Line Between Resilience and Vulnerability .....	52
<i>Jasmine Barrett</i>	
Reviewing Public Responses to Dr. Kwame McKenzie's Articles on Race and Mental Illness in the UK .....	66
<i>Emily Spooner</i>	
No Recourse Left: The Impact of Poverty on the Resilience of Women from the Migrant-Sending Countries of Central Asia to HIV/AIDS .....	75
<i>Hillary Eason</i>	
Understanding the Cholera Epidemic in Haiti: Comparing Disease-Focused with a Complex Adaptive Systems (CAS) Approach .....	94
<i>Ashraf Elhofy</i>	
Book Reviews .....	107
<i>John Parker</i>	



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## Table of Contents

Preface .....	i
<i>Stephen Flynn</i>	
Editor's Note.....	iii
<i>Astier M. Almedom</i>	
Postscript: Egypt in Transformation: Unfolding Dynamics of Resilience in a Complex System in Real Time .....	v
<i>Nicholas Cooper</i>	
Resilience and Sustainability of Water Resources in the São Francisco River Basin, Brazil: an Assessment and Plan of Action .....	1
<i>John Parker, Eric Vaughan, and Jeffrey Bate</i>	
Taking the Camel through the Eye of a Needle: Enhancing Pastoral Resilience through Education Policy in Kenya .....	25
<i>Ahmed Idris</i>	
Security and Resilience.....	39
<i>Ola Dahlman</i>	
The North Korean Healthcare System: On the Fine Line Between Resilience and Vulnerability .....	52
<i>Jasmine Barrett</i>	
Reviewing Public Responses to Dr. Kwame McKenzie's Articles on Race and Mental Illness in the UK .....	66
<i>Emily Spooner</i>	
No Recourse Left: The Impact of Poverty on the Resilience of Women from the Migrant-Sending Countries of Central Asia to HIV/AIDS .....	75
<i>Hillary Eason</i>	
Understanding the Cholera Epidemic in Haiti: Comparing Disease-Focused with a Complex Adaptive Systems (CAS) Approach .....	94
<i>Ashraf Elhofy</i>	
Book Reviews .....	107
<i>John Parker</i>	



## A National Security Perspective on Resilience

Stephen Flynn<sup>1</sup>

Only resilient communities, companies, and countries will prosper in the 21<sup>st</sup> Century. Terrorism, disease outbreaks, natural disasters exacerbated by climate change, and periodic disruptions of complex and interdependent networks and systems will be perennially in the offing. In a world with no “risk-free zones”, the locales that demonstrate a capacity to withstand, nimbly respond and recover, and adapt to disruptive risk will end up having a comparative advantage over those that do not.

Identifying what it takes to be resilient and acting on that knowledge will be indispensable to achieving growth, safety, and security within the global community. This imperative makes the recent launch of this journal particularly timely and important. While resilience is garnering mounting attention within policy circles, many who are working both inside and out of government are at a loss on how to translate the concept into new strategic guidance and concrete actions. They need help.

Part of the challenge for policy makers is that resilience has been defined by multiple disciplines in differing ways. For those who study ecosystems, resilience represents the capacity of a system to withstand disruptive risks without failing. For those who are interested in organizations and business continuity, resilience is the ability to quickly return to a set of prior conditions or to

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<sup>1</sup> President, Center for National Policy ([www.centerfornationalpolicy.org](http://www.centerfornationalpolicy.org)) and chair of the National Resilience Policy Forum.

restore essential functions after an exogenous shock. For still others, resilience is the ability to transition from one equilibrium state to another, such as moving from war to peace and back, while retaining core values and social cohesion.

But the very fact that such a diverse group of researchers share an interest in the concept of resilience has an exciting upside. It will take a concerted multidisciplinary effort to better understand and manage global and societal risk. Resilience provides an intellectual center of gravity to inform and support such an effort. And even within individual disciplines, such crosspollination can be helpful in generating new lines of inquiry as well.

It is important to keep in mind that the overall goal of building resilience is not to manage risk as an end unto itself. Indeed, successful resilience is measured by the extent to which there is continuity of the systems, functions, and principles that are most important and valuable to us. In this way, one important benefit of devoting attention to the resilience imperative is that it requires us to step back and identify what we believe to be truly critical and reminds us to not take those things for granted.

The field of security studies in particular can benefit from devoting more attention to the resilience imperative. Since the attacks on New York and Washington on September 11, 2001, U.S. national security efforts have been overwhelming weighted towards combating terrorists by going on the offense. But, an emphasis on resilience highlights the as-yet untapped potential to deter acts of terrorism by denying an adversary the hoped-for consequences of targeting critical infrastructure. For instance, if an attack on the electrical power grid resulted in only a limited and temporary disruption of service, there would be little appeal in undertaking

such an attack. Conversely, if a relatively small investment in sabotage can yield substantial loss of life, destruction of property, and widespread system failure, then terrorist attacks will remain a very appealing weapon of warfare.

A focus on resilience also provides a means to correct the flawed but widely accepted view that there is an inherent tension between bolstering security and preserving civil liberties. When resilience is identified as a strategic security imperative, talk of such tradeoffs is exposed as plainly self-defeating. The measure of success becomes not how many terrorist attacks have been prevented, but how successfully core societal values have been preserved in the face of the ongoing terrorism risk. If policy makers assume that greater levels of protection can only be accomplished by a commensurate sacrifice in civil liberties, then they have confused means with ends. After all, it was at considerable risk to their own personal safety that the Founding Fathers fought a revolution and established a Constitution whose preamble highlights as one of its fundamental purposes, to “secure the Blessings of Liberty to ourselves and our Posterity.”

The emphasis on resilience also has the salutary effect of requiring open and participatory processes that enlist and strengthen civil society. Resilience cannot be imposed from above by security and law enforcement professionals operating behind closed doors. It must be cultivated from below for it takes individuals, communities, and companies, each pursuing efforts within their respective spans of control, to build societal resilience.

Building resilience additionally requires an all-hands effort that extends beyond national jurisdictions and conventional security. Whether it is adapting to climate change, preparing for earthquakes and tsunamis, or developing

contingencies to mitigate and quickly respond to and recover from man-made disasters, the resilience imperative is a universal one. As such, it is an agenda that has the capacity to transcend ideological and cultural differences within and among nations and therefore provides a unifying rationale for greater international cooperation.

In short, the new focus on resilience represents a fertile area of inquiry, ripe with possibility for novel insights and helpful guidance on coping with risk, old and new. Scholars looking back in a half-century’s time may well marvel at this new journal’s trailblazing contribution to the international relations field.



## **Resilient by Design: Towards Securing the Future**

As I write this editorial note, dramatic events in North Africa have ushered in transformative change in Tunisia and Egypt. Their impact continues to reverberate across the region, with mass protests underway in Libya. Was this turn of events anticipated? Yes and no. In the case of Egypt, the problems associated with the nation's neglect of its youth, an important unharnessed national resource and most significant majority, were brought to our readers' attention in this journal last year (see Cooper 2010). The timing of Egypt's turbulent change was not predicted, but it is now clear in hindsight that the revolution was inevitable. It is essential to consider complex system dynamics in general, and the dynamics of resilience in particular: *routine* and *turbulent* change alternate as resilient systems and sub-systems go through the *adaptive cycle* that is inherent in all living systems. Are the Egyptian society and/or systems of government resilient by design? Have Egyptian youth secured their future? Nicholas Cooper's thoughtful Postscript below invites us to re-read his proposal towards a better understanding of resilience, livelihoods and human (national and international) security.

The Fletcher School is internationally renowned and widely represented by its outstanding alumni who are currently serving in high level positions of leadership. There is no one who better represents the field of resilience policy and practice as well as the Fletcher School as does Dr. Stephen Flynn, President of the Center for National

Policy. As he has most eloquently and honorably outlined in the Preface to this volume, systems that are resilient by design will secure the future, and it is in everyone's interest to embrace the resilience imperative and actively engage in building community, national, and international resilience to disasters. While it is in itself illuminating and rewarding to study resilience in its multiple dimensions, it is more fulfilling and meaningful to connect the dots and see the big picture. Dr. Flynn's inspiring scholarship coupled with his policy and practice leadership has contributed to the existence of a Resilience Directorate in the White House where other graduates of Tufts University are also serving. This journal promises to continue to provide space and encouragement to diverse researchers and practitioners who want to share their insights or discuss the questions that intrigue them most about resilience.

The articles lined up in this volume include a collaborative effort by three co-authors, *John Parker, Eric Vaughan, and Jeffrey Bate* who have come up with a coherent interdisciplinary assessment and action plan for promoting resilience and sustainability of water resources in the São Francisco River Basin (SFRB) region of Brazil. Based on their review and analysis of a detailed report, the authors identify critical areas of social and ecological vulnerability. Their findings lead them to conclude that it is difficult to implement the Strategic Action Program (SAP) as a first step for Integrated Water Resource Management (IWRM). This work originated in the new IWRM course offered by Tufts University's cross-school graduate certificate training program, Water: Systems, Science and Society.

*Ahmed Idris* draws on his own fieldwork in Kenya (Summer 2010) where he witnessed the launch of the “Nomadic Education Policy” in Garissa. His article examines the extent to which the new policy may enhance rather than undermine the resilience of pastoralist communities, and points to the need for further investigation.

Incorporating discussions held on campus with the Institute for Global Leadership’s EPIIC Colloquium in our resilience panel discussion, senior practitioner and policy maker *Dr. Ola Dahlman* offers his reflections on international security and resilience using the metaphor of the geo-physical layout of a landscape with a “basin of attraction” whose resilience can be measured, at least in theory, using the parameters of “Latitude”, “Resistance” and “Precariousness”.

Building on their research seminar course term papers *Jasmine Barrett*, *Emily Spooner*, *Hillary Eason*, and *Ashraf Elhofy* present cogent essays examining respectively the health care system in North Korea (*Barrett*); the discussion on racism and mental illness sparked by Dr. Kwame McKenzie’s articles in the in the UK (*Spooner*); the impact of poverty on women’s resilience in the migrant-sending countries of Central Asia using the spread of HIV-AIDS as an indicator (*Eason*); and a comparative analysis of the Cholera epidemic in Haiti following using the complex adaptive systems (CAS) approach against the disease-focused approach (*Elhofy*). None of these publications would have been possible without the dedicated review and truly constructive feedback of the editorial

team members: *David Hastings* (our new member from Tufts and the Harvard School of Public Health), *David Henderson*, *Joann Lindenmayer*, *Bill Moomaw*, *Linda Tickle-Degnen*, and *James Tumwine*. The volume concludes with *John Parker’s* most insightful and engaging set of book reviews bringing together two different schools of thought that may in fact be two sides of the same coin when examined under the lens of resilience.

Special thanks to my editorial team members *Henderson*, *Tickle-Degnen*, *Stockton*, and *Tumwine* for donating funds towards book tokens for the best written student papers. I am pleased to announce the following recipients of our book tokens for their work as judged by the reviewers: *Jeffrey Bate*, *Hillary Eason*, *Ahmed Idris*, *John Parker*, *Emily Spooner*, and *Eric Vaughan*. Last, but not least, I am delighted to welcome *John Parker* and his team of Fletcher students and others who will take on the mantle of running this journal, with the continued support of the existing faculty and external editorial team starting with the next volume - *Resilience* (2012).

Astier M. Almedom  
23 February 2011





## **Egypt in Transformation: Unfolding Dynamics of Resilience in a Complex System in Real Time**

Nicholas Cooper<sup>1</sup>

In the first edition of this journal ([Cooper 2010](#)), I argued that the ‘youth bulge’ currently observed in Egypt’s population structure confronted decision-makers with a fork in the road. On the one hand, programmers and policy-makers could invest in young people, utilizing the Sustainable Livelihoods framework to assess, plan for, and fulfill the needs of Egyptian youth by investing in their financial, human, social, physical and natural capital. Choosing this path offered the promise of peace and prosperity as the relative size of the working age population expanded, the dependency ratio decreased, and youth were provided with viable and attractive opportunities that allowed them to pursue resilient livelihood strategies. On the other hand, failure to create an enabling environment for young people’s livelihood strategies raised the specter of unrest. As this large youth cohort becomes dissatisfied with the *status quo*, the absence of attractive and viable livelihood opportunities pushes them to the margins, carrying the possibility that Egyptian youth could turn to unconventional, or even maladaptive, strategies to meet their needs.

Egyptian President Hosni Mubarak has now resigned following popular protests that lasted for 18 days, catalyzed by similar events in neighboring Tunisia that led to the

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fall of President Zine El Abidine Ben Ali, ending a presidency that began before the majority of the current Egyptian population was born.

By all accounts, the popular movement was a youth movement cutting across religious and socio-economic lines. The sequence of events seen in Tahrir Square (Cairo) and elsewhere (including Alexandria) exposed highly complex systems and sub-systems with cultural, political, social and economic layers threatening to peel off very quickly. Motivated by longstanding frustrations over high unemployment, persistent poverty, and government corruption, Egyptian youth had faced a dearth of opportunities for the development of resilient, sustainable livelihoods. As highlighted in my proposal to promote their resilience it was clear that young people’s access to social capital was mixed. While “bonding” social capital, between youth and their friends and family, may be high, “bridging” social capital between young people and the larger community and state seemed to fall short.

The 18 days of protests preceding the President’s resignation revealed the disconnect between the Egyptian state and its people, particularly its youth. It is the responsibility of the state, through its institutions, policies and processes, to create an enabling and supporting environment for the lives of its people. Widespread corruption is but one example of this disconnect, as those who have been empowered by the system perpetuated that system and their own self-interest, rather than the interests of the Egyptian people.

The Sustainable Livelihoods model I had proposed last year highlighted the relationships between these factors. Poverty is both a cause and consequence of non-sustainable and non-resilient livelihoods.

With little access to financial and other forms of capital, Egyptian youth had few attractive, viable and resilient livelihood strategies they could pursue. As a result, the outcomes of available livelihood strategies did not meet young people's needs, perpetuating the cycle of lack of opportunities, and increasing the vulnerability of their livelihood strategies to external shocks and challenges.

The timing and form of Egypt's recent upheaval were impossible to predict. However, application of the Sustainable Livelihoods framework highlighted the inadequacy of the *status quo* prior to President Mubarak's departure, and its potential effects on peace and security. Rather than providing viable and attractive opportunities for its young population, the state failed to embrace the opportunity provided by its population structure to drive development and provide young people with the tools and the environment to fulfill their livelihood goals. President Mubarak's downfall came about by the strength of organization demonstrated by young people in particular, as they turned to unconventional strategies to meet their needs. Many of them have asserted their ownership of the process of change their movement has ushered in. However, the challenges and opportunities confronting Egypt remain the same. In this new era, with the implications of failure at the forefront, Egypt will have to redefine its approach to young people, reaping the developmental dividends of young people's potential. It remains to be seen to what extent the military and state apparatus allow youth participation to remain the signature of transformation - Egypt's "new era".





## **Resilience and Sustainability of Water Resources in the São Francisco River Basin, Brazil: an Assessment and Plan of Action**

John Parker<sup>1</sup>, Eric Vaughan<sup>2</sup>, Jeffrey Bate<sup>3</sup>

### ***Summary***

In 2003, a Strategic Action Program (SAP) was developed to guide integrated water resources management (IWRM) in the São Francisco River Basin (SFRB) of northeastern Brazil with the input of over 12,000 people and 400 institutions. This paper assesses the ability of the SAP to effectively implement IWRM in the SFRB by carrying out a multi-faceted analysis under the framework of resilience and sustainability. Three analyses – an Institutional Network Analysis, Water Use Analysis and Environmental Impact Analysis – identified critical areas of social and ecological vulnerability in the SFRB, including fragile basin-level institutions; rapidly increasing water use; high levels of inequality; and inadequate consideration of ecological health criteria. These areas of vulnerability are hindering the effective implementation of IWRM in the SFRB. With the goal of informing donor agencies, policy-makers and civil society organizations in the SFRB, four principal areas of policies and investments are recommended. These include: (1) build the capacity of the São Francisco River Basin Committee and basin-level institutions to improve shared governance and meaningful stakeholder participation; (2) reduce socioeconomic inequality in the Lower Basin; (3) improve water use efficiency among water users, particularly in the agricultural and industrial sectors; and (4) improve the decision-making and coordination of reservoir operations. The implementation of these recommendations will help build sustainable and resilient social-ecological systems that are able to better withstand unexpected shocks and meet the demands of current and future generations.

### ***Background***

Serving as the lifeblood of northeastern Brazil, the SFRB encompasses 636,920 square kilometers and flows through six states, from the heavily populated and water-rich south through the more arid and sparsely populated regions in the north before turning east and emptying into the Atlantic Ocean. It is a river basin of tremendous ecological, political, and socioeconomic diversity.

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The Strategic Action Program (SAP) in the SFRB was developed with the objectives of: (1) promoting sustainable development of the SFRB and its coastal zone; and (2) addressing the physical, biological, chemical, and institutional root causes of progressive degradation affecting the basin (ANA et al., 2004). The SAP also aims to reduce the incidence and severity of water disputes within the region. While the SAP is an important step towards an integrated water resources management strategy, it provides incomplete plans for water use allocation and environmental rehabilitation (Braga & Lotufo, 2008), raising questions about its ability to foster sustainable development and reduce social and ecological vulnerability. This is of particular concern in the context of water use trends in the basin that may soon place too much stress on ecosystems leading to undesirable social and ecological outcomes.

As of 2003, over thirteen million people live in the SFRB with 74% of the population inhabiting urban areas located predominantly in the southern headwaters of the basin. The basin's upper physiographic region covers only 15.6% of the basin's area but accounts for 48.8% of the basin's population. Population densities range from 8 people per square kilometer in the middle physiographic region to over 60 in the upper and lower regions (ANA et al., 2004). As the basin's population grows, the percentage of people living in urban areas continues to increase. As of 2003, there were 14 municipalities with populations over 100,000 (ANA et al., 2004). Socioeconomic disparity also characterizes the region, with 21% of its inhabitants living in poverty as defined by Brazilian standards (CPWF, 2006). Livelihood activities encompass a range of sectors, including agriculture (smallholder and industrial), mining, manufacturing, and fishing.

Development in the SFRB significantly impacts water resources availability and ecological health. As of 2003, nearly 6.4 billion cubic meters of water are used annually to support agricultural and industrial activities. Hydropower and agriculture have the largest influence on the rapidly growing use of water resources. Hydropower in the basin accounts for 17% of national hydropower production (Braga & Lotufo, 2008). There is an installed capacity of 10,300 MW (OAS, 2005), mostly shared between five dams. The potential capacity has been estimated at 26,300 MW (OAS, 2005), and significant basin-wide hydropower expansion efforts are currently underway. The Sobradinho Reservoir exemplifies large-scale infrastructure in the basin; it has a surface area of 10,943 square kilometers and a capacity of 34,100 million cubic meters (CWPF, 2010).

Irrigation in the agricultural sector accounts for 68% of water withdrawals (ANA et al., 2004). Industrial agriculture is mostly focused upstream and near the large cities. Bio-fuel crops are increasingly cultivated on a large scale. As the agribusiness industry grows in the SFRB, the agricultural sector is becoming increasingly dependent upon water and international crop prices, both of which can be highly variable. Water for agriculture also exemplifies the basin's unequal distribution of resources as smallholder agriculture is predominantly dependent on rainfall and small-scale runoff. Traditional crops in the basin include soy, corn, banana, bean, mango, rice and onion.

Hydropower and agricultural interests have historically driven Brazil's water resource decisions (Global Water Partnership, 2004), and this is clearly evident in the SFRB. Urban domestic water use is also beginning to play a more central role due to increasing urbanization. The effects of urban development have been borne by the environment in the forms of water pollution, excess sediment flux, and ecological degradation; these issues have been identified as focal points for remediation within the SAP (ANA et al., 2004).

In light of these complex and interrelated human and environmental pressures, integrated water resources management (IWRM) is essential in order to reduce social and ecological vulnerability and foster sustainability in the SFRB. To determine whether the SAP can effectively guide IWRM in the SFRB, a multi-faceted evaluation is performed under the framework of integrated resilience and sustainability. We examine resilience in the context of interconnected social-ecological systems by linking social resilience with ecological resilience. We define social-ecological resilience as a measure of the capacity of social and ecological systems to anticipate and withstand disturbances without fundamental loss of identity or structure (Holling, 1973; Gunderson, 2000, Almedom, 2009). We define sustainability as balance or equilibrium between ecological health and human needs in which there are no long-term negative impacts on either. This implies the basin will indefinitely remain a resource for human livelihoods and well-being.

Through this lens, we pose the following questions about the SFRB and the SAP:

1. Is the current institutional framework capable of building sustainable and resilient social-ecological systems in the SFRB?
2. How do current trends in water use affect the future availability of water? Is there sufficient water to satisfy human and environmental needs?

3. How has economic and infrastructure development affected ecological resilience within the basin? How can development goals be met without increasing ecological vulnerability?
4. Is the approach taken by the SAP sufficiently integrated? Can better integration increase basin-wide social-ecological resilience?

These questions provide the foundation for the analyses in this report, with the ultimate goal of providing meaningful insights for policy-makers, donor agencies and civil society organizations in order to improve water resources management in the SFRB.

### ***Project structure***

To assess the effectiveness of the SAP, we explore three distinct but interrelated components of water management in the basin: (1) the institutional network governing water resource policy and decision-making; (2) the distribution and trends in water use; and (3) the environmental impact of water use and infrastructure. These analyses provide the most comprehensive insights into the basin's socioeconomic, institutional and environmental characteristics and vulnerabilities. The project is capped by a synthesized analysis that provides policy and investment recommendations for strengthening the resilience and sustainability of the basin's social-ecological systems.

The Institutional Network Analysis section examines the complexities of water governance that arise from the basin's large and diverse network of federal-, state- and basin-level actors. It identifies the roles and responsibilities of, and relationships between, different stakeholders and analyzes how they influence decision-making outcomes. It then determines the extent to which processes that strengthen institutional resilience are being realized, including shared governance, decentralization, public participation and coordination.

The scenario-based Water Use Analysis evaluates basin-wide trends in water use. Changes in supply and water uses are simulated over a 23-year planning period using the Water Evaluation and Planning (WEAP) Model (Yates et al., 2005a; Yates et al., 2005b). The ability for variable and finite supply to meet growing water use is evaluated with implications for the system's storage capabilities and support of stakeholder-driven development.

The Environmental Impact Analysis examines the impact of water resource development on the aquatic and riparian ecosystems of the São Francisco River Basin. It discusses the SAP's ability to address environmental degradation and analyzes the effects of regulating infrastructure,

in-stream water requirements and extractive water uses on the SFRB's hydrologic regime. This analysis provides insight into the system's current and future state of ecological health.

The final section is a synthesis of the three analyses. Institutional and water management improvements are identified and specific policies and investments are recommended for improving the integrated resilience and sustainability of the SFRB to address current and future water needs for all stakeholders.

### ***Institutional Network Analysis***

Water resource decisions in the SFRB are determined by complex processes and interactions between diverse groups of actors at the federal-, state- and basin-levels. This section analyzes the SFRB's institutional framework to better understand the relationships between stakeholders and their influence on decision-making outcomes.

### **National Policy and Institutional Framework**

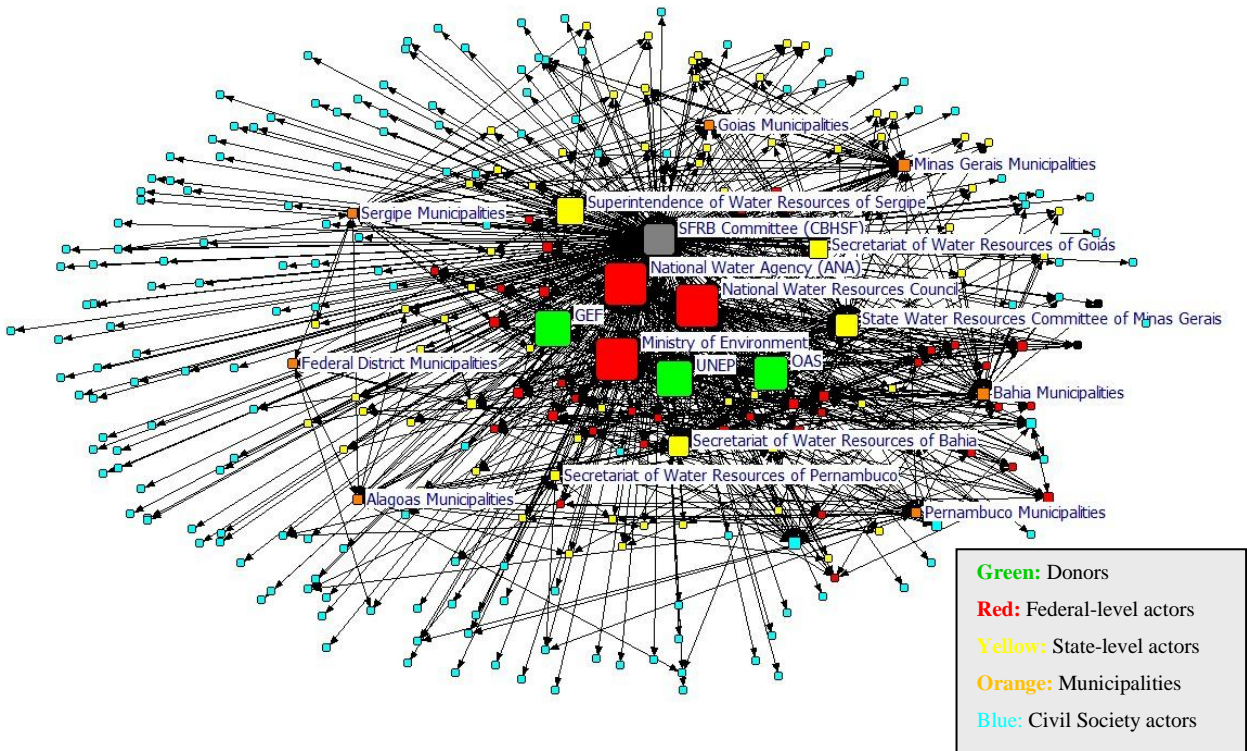
In 1997, Brazil introduced a new regulatory framework to guide national water resources management and planning. This framework replaced a previous top-down, single-sector water management system in which water resources were governed principally at the federal-level (ANA et al., 2004). Central to Brazil's water reform efforts was the introduction of a new water resources law that created the National Water Resources Management System (NWRMS). The establishment of the NWRMS aimed to decentralize water resources decision-making responsibilities from federal bodies to a coordinated group of actors at the federal-, state-, and basin-levels with the intention of enabling shared governance, enhancing public participation and improving cross-sectoral integration (Porto, 1998; Tortajada, 2001; ANA et al., 2004). Guiding these reform efforts are the principles that water is a finite public good with economic value and that the watershed is the most appropriate spatial unit for water resources planning and management (Porto, 1998; Tortajada, 2001; ANA et al., 2004). The institutional mechanisms through which the NWRMS aims to implement these activities are River Basin Committees, which are composed of a group of public, private and civil society actors responsible for enabling active stakeholder participation in water resources decision-making.

## **The Institutional Framework in the São Francisco River Basin**

The SFRB covers six states and 503 municipalities. Hundreds of governmental, private sector and civil society actors influence how water resources are allocated, used and managed. The governance of water resources in the SFRB is composed of a group of federal-, state-, and basin-level institutions. At the federal level, the National Water Resources Council (CNRH) is responsible for overseeing the planning of water resources policies among national, regional, state and municipal governments and water user organizations. The Secretariat of Water Resources (CRH) helps formulate the national water resources policy and supports the CNRH in monitoring, implementing and approving the National Water Resources Plan. The National Water Agency (ANA) is an autonomous institution affiliated with the Ministry of Environment, responsible for implementing the NWRMS. At the state level, the State Water Resources Council (CERH) is the main water resources legislative body, holding state responsibilities equivalent to those of CNRH at the federal-level.

At the basin level, the recently established São Francisco River Basin Committee (CBHSF) is responsible for coordinating the activities of other agencies in the river basin and for creating a forum in which stakeholders can discuss and negotiate water resources issues. The CBHSF is composed of an equal number of representatives from federal, state and municipal government bodies, civil society and water user organizations. The executive secretariat of the CBHSF is the River Basin Agency, which is responsible for administration and financial resources, including the collection of water tariffs. Water user and civil society organizations, encompassing NGOs, the private sector, community associations, universities and agricultural cooperatives, form the diverse group of civil society actors at the basin level. Based on an analysis of the SAP and relevant background literature on institutions and water governance in the SFRB (Brannstrom, 2004; Lemos & de Oliveira, 2004; ANA et al, 2004), Figure 2 demonstrates the decision-making power and relative importance of stakeholders within the SFRB using Network Analysis software UCINET and NetDraw. The size of the node demonstrates the level of decision-making power within the network (the larger the node, the greater decision-making power) while the location of the node within the network denotes the actor's relative importance (the more central the node is to the network, the greater its relative importance). Given the early stages of reforms and decentralization efforts, the current network structure depicts federal agencies, donors and state agencies as having the greatest decision-making powers and highest levels of network centrality. Meanwhile, because municipalities are

just recently being integrated into decision-making processes, they are ‘outliers’ in the network, meaning that they have the smallest number of ties with other actors in the network and the least amount of decision-making power. The size, diversity and complexity of this network make shared governance, coordination, and public participation critically important for enabling integrated water resources management; however, all the more challenging to actually achieve.



**Figure 2: Institutional Network of Decision-Making for the SFRB (derived from the authors' analysis of the SAP and background literature on institutions and water governance in the SFRB)**

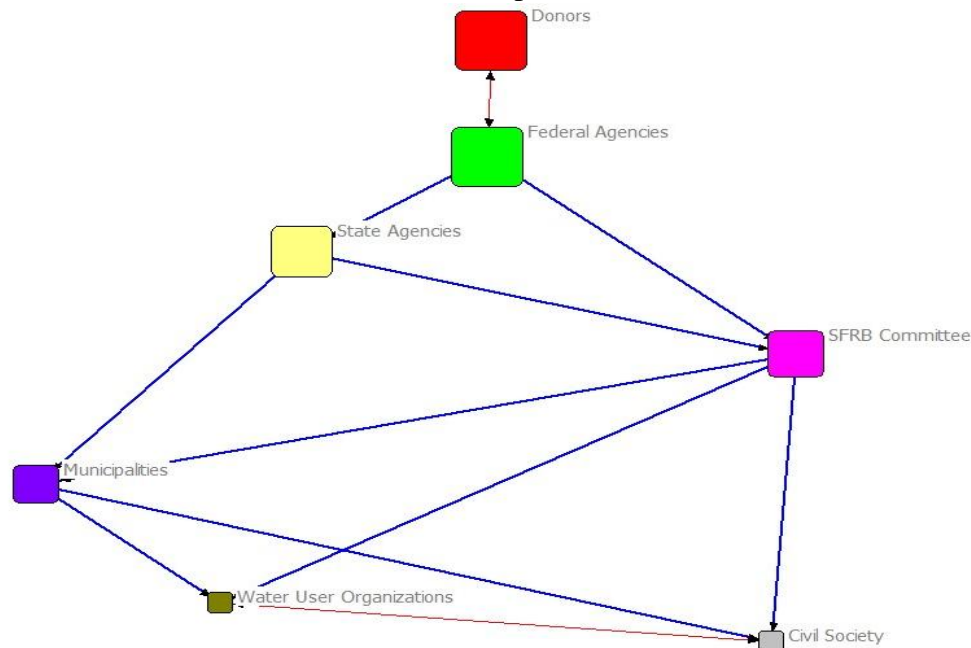
### Analysis of Institutional Resilience in the SFRB

Brazil's national water resources reform and the development of the SAP are important steps forward for developing an institutional framework that enables IWRM in the SFRB. However, much is still required to strengthen the resilience of this framework to fully achieve mechanisms of shared governance, meaningful public participation, and multi-stakeholder coordination. Shifting from a legacy of top-down, one-sector decision-making to participatory democratic decentralization cannot be expected to occur immediately; however, certain actions can accelerate this process and help to ensure that reforms are sustainable and plans are implemented.



The development of the SAP placed strong emphasis on active stakeholder participation; however, the process has been largely driven by external donors and federal-level decision-making. While this may not be harmful over the short-term, there is a risk that without enabling basin-level ownership and sustainability, reforms and plans will remain on paper without being fully implemented. Because reform efforts are in their early stages, the mechanisms for empowering basin-level decision-makers and ensuring stakeholder participation are still very fragile. As depicted by the current institutional network in Figure 3, basin-level institutions, including the CBHSF and municipalities, remain upwardly accountable to higher levels of government as opposed to downwardly accountable to civil society and water user organizations. The blue lines in the network demonstrate non-reciprocal ties between federal-, state-, and basin-level institutions, signifying that decisions are made unilaterally at one institutional level and then passed on to the other.

At present, the institutional network is vulnerable to unilateral decision-making in which federal and state priorities are placed higher than those at the basin level. This increases the likelihood of high-priority federal and state projects being approved, such as the proposed agricultural expansion project or water transfer scheme, without healthy negotiation and debate amongst all parties and sufficient consideration of impacts on all stakeholders. Without empowering and legitimizing basin-level institutions, the current decision-making structure may lead to increased conflict between states, municipalities, water users and civil society.



**Figure 3: Current Institutional Network in the SFRB. \*Note: Blue lines denote non-reciprocal ties; the size of the node demonstrates the actor's decision-making power.**

## **Conclusion**

Brazil's national water resources reform and the development of the SAP have initiated the first important steps for creating an enabling institutional environment for IWRM in the SFRB. Considerable efforts are still needed to strengthen the resilience of this framework in order to fully achieve decentralized decision-making, public participation, and stakeholder coordination between sectors at all levels. The key to creating a resilient institutional network in the SFRB will be to build the legitimacy and technical and financial capacity of basin-level institutions, namely the CBHSF and municipalities.

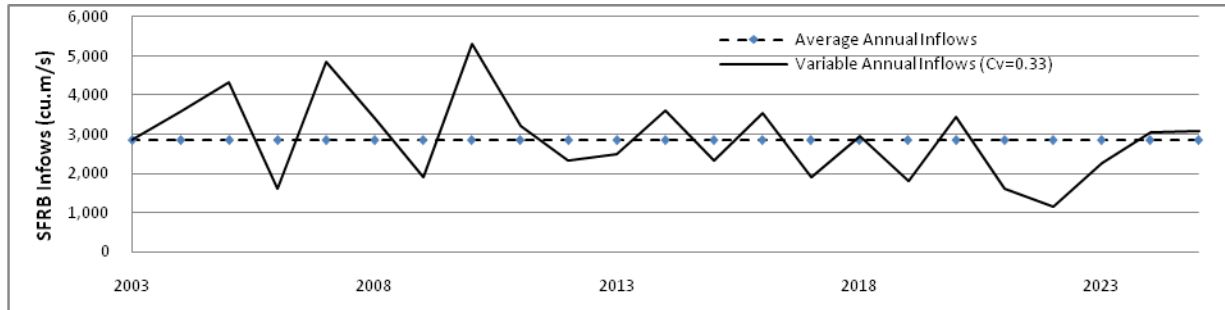
## ***Water Use Analysis***

The São Francisco River and its tributaries have the potential to provide large-scale benefits to the economic activities and livelihoods for residents within the SFRB. The 2,863 km river system yields an average of 89.9 billion cubic meters of water per year (ANA et al., 2004). Though current use accounts for just 7% of total yield, downstream minimum flow requirements for hydropower are significant. Secondly, irregular rain patterns cause periodic droughts that can potentially limit water availability. Though a system of large reservoirs is in place to mitigate the effects of variable flows, increasing water use will test their capacities in the near future. A WEAP model has been generated to investigate whether available water supplied by the São Francisco River and its tributaries is sufficient to meet growing economic and domestic needs in the basin. The baseline scenario contrasts future needs with stochastic inflows based upon historic variation in contributing streamflows. A second scenario investigates the effect of inter-basin water transfers to external users.

## **Description**

The SFRB WEAP application delineates the 636,920 km<sup>2</sup> basin into physiographic regions used in the SAP; Upper, Middle, Lower-Middle, and Lower (see figure 1). Historic average annual inflows and 2003 water use data for each region were also taken from the SAP (ANA et al., 2004). Inflow variability was estimated by evaluating the historic variation in the São Francisco River and its tributaries (UNESCO, 2001). The average variability ( $C_v$ ) was applied to the inflows to generate a random 23 year time-series; 2003 to 2025 (shown in figure

4). Active storage of the four major reservoirs, the Très Marias, Sobradinho, Luis Gonzaga and Xingo are included. Water use in each region is further sub-divided into primary sectors including Rural Domestic, Urban Domestic, Agriculture, and Industry. The proposed inter-basin transfers are taken from the Middle (3,200 MCM per year) and Lower-Middle Regions (800 MCM per year) beginning in 2013.



**Figure 4: Simulated Stochastic and Average Total SFRB Annual Inflows**

Estimated changes in total water use is estimated from trends in population growth, significant planned expansions in irrigated agriculture and national trends in industrial growth. In the baseline scenario all use rates were assumed constant. State population growth was taken from 2000 and 2010 census data (IBGE, 2000; IBGE, 2010). The average national industrial growth rate of 8.8% per year was uniformly applied to all four regions (IBGE, 2008). Agricultural growth was taken from a 2009 study in which five large-scale irrigated agriculture expansion projects included in the decennial plan for the SFRB were evaluated (Maneta et al., 2009). The five projects will expand irrigated agriculture into 550,077 new hectares of land in the Middle and Lower-Middle Regions by 2013 increasing total irrigated land by 150%.

**Results**

Demand (Aggregate)	2003	2013	2025	% Change
Inter-basin Transfer	0	4000	4000	N/A
Rural	274	295	320	17%
Industrial	407	946	2602	539%
Urban	1113	1192	1288	16%
Agriculture	4434	10812	13358	201%
<b>Total</b>	<b>6228</b>	<b>17245</b>	<b>21568</b>	<b>246%</b>
Percentage Change	-	177%	246%	

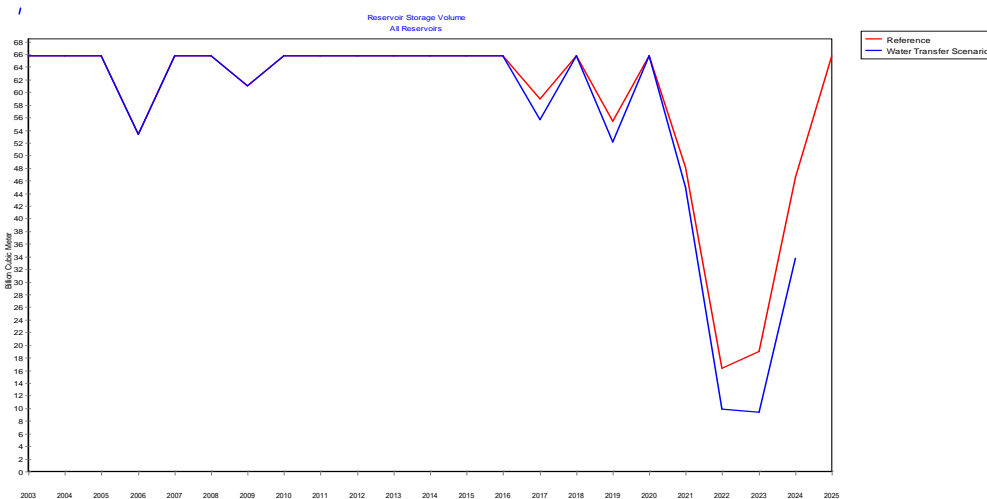
**Table 1: Results of WEAP Analysis by Sector (MCM)**

Region	2003 HDI	2003	2013	2025	%Change
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Upper	0.549 - 0.802	1807	2455	4126	228%
Middle	0.323 - 0.724	2112	7049	8779	416%
Lower-Middle	0.438 - 0.664	1767	3085	3846	218%
Lower	0.364 - 0.534	542	656	817	151%

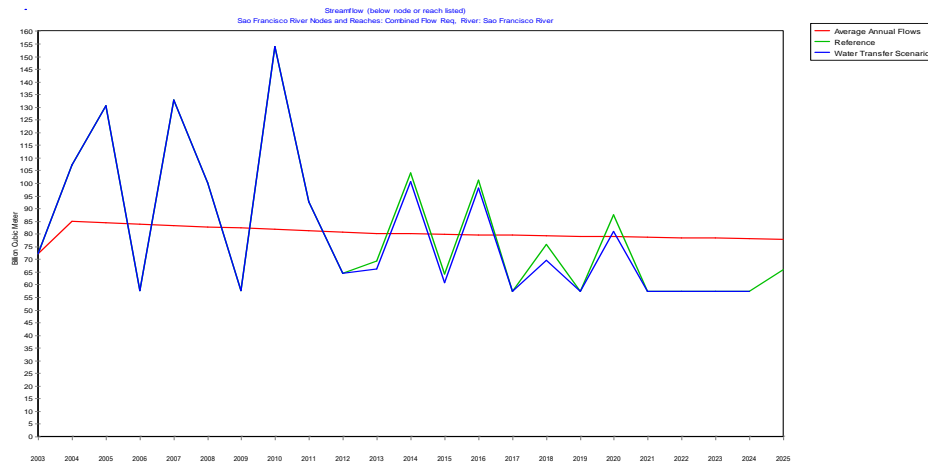
**Table 2: Results of WEAP Analysis by Region (MCM)**

WEAP simulates annual supply, use, and storage in each of the four regions from 2003 to 2025. Tables 1 and 2 show the resulting water use simulated for 2013 and 2025 in comparison to the SAP baseline year, 2003. Total water use increases by 246% in the planning period and is fully supplied by the simulated variable inflows. During low-flow years water users depend on the stored water reserves. Changes in total storage volume are shown in figure 5. The most extreme decrease in stored reserves occurs during a simulated two-year drought in 2021 and 2022 when total system storage is reduced by 75%.



**Figure 5: Total Reservoir Storage Volume over the planning horizon**

Water planning must also consider the impact of flow requirements of dams on water availability. In general they are designed to serve the hydropower industry but can have significant impact on the ecological health of the system and other water users. In the SFRB, 95% of water use occurs upstream of the Xingo Dam. During years with low flow, there is insufficient inflow to meet the needs of both users and the 1,810 m<sup>3</sup>/s flow requirement resulting in the use of stored water. The WEAP simulation shows estimated average flow below the Xingo Dam is trending towards the minimum flow requirement as annual water use increases annually (see figure 6). This implies that increased water use will result in decreasing flow rates below the dam which has potential long-term implications for ecological health.



**Figure 6: Streamflow below Xingo Reservoir (MCM)**

As evidenced by the previous point and table 2, neither current nor future water use is distributed uniformly among the four SFRB regions. Planned irrigated agriculture expansion accounts for the greatest total increase in use and primarily impacts the Middle and Lower-Middle Regions. Industrial water use will increase 639% but the Upper Region will receive 88% of it. The Lower Region accounts for just 5% of total water use by 2025. Assuming roughly uniform growth rates, the lower region will continuously lose pace with the other regions unless its growth is specifically targeted to outpace the others.

## Discussion

Expanded water use has the potential to reduce regional income disparity in the basin, but this will largely depend upon policy decisions and how well stakeholders in these regions are integrated into the decision-making process. Brazil ranks 'high' on the Human Development Index (HDI) with an average value of 0.699. The average HDI value for the SFRB is 0.550. The four SFRB regions vary in value but generally increase in the upstream direction. A range of HDI values can be found in each region of the SFRB. Large increases in industrial growth can improve access to economic opportunity in the Upper Region, particularly in the large city of Bello Horizonte. Increased access to irrigation water in the Middle and Lower-Middle Regions has the potential to improve livelihoods among farmers. As previously discussed, growth in economic water-using activities is estimated to be lowest in the Lower Region with HDI values between 0.364 and 0.534. Water resource development in this region has the potential to improve

the socio-economic condition of its residents. Additionally, water use in the Lower Region is not tied to the flow requirements below the Middle and Lower-Middle reservoirs.

Demand management options can be used to improve the availability of water in the SFRB. The baseline scenario assumes per-unit water use remains constant. Data from the SAP Final Report suggests that irrigation water use per hectare is nearly 11,000 m<sup>3</sup> per hectare in the Middle and Lower-Middle Regions which indicates significant opportunities for efficiency improvements exist. Irrigation water is estimated to account for 76% of total water used in the basin by 2025. Programs aimed at progressively improving irrigation water efficiency will help make more water available to other users and the ecological health of the system.

The proposed water transfer scenario from the Middle and Lower-Middle Regions did not result in un-met demand within the SFRB during the simulated planning period but further reduced reservoir storage during the low-flow events (shown in figure 6). One alternative is to reduce transfers during low-flow years. Increased storage capacities at the consumption end of the transfer might also alleviate induced stress on the SFRB system. Transfers could occur during high-flow periods that could be banked by the receiving basin for later use.

## **Conclusion**

Water use is increasing at a rapid pace in the SFRB. This will mostly occur upstream of the minimum flow requirements of Xingo Reservoir which means it has a large effect on water availability. The proposed 4,000 MCM in transfers is nearly 20% of total use in the basin and could have a large potential impact on availability during periods of low flow. Most importantly, the simulation determined that future needs can be met during a historical supply scenario with increasing dependence upon reservoir storage. Increased variability in rainfall could amplify this dependence to the point of failure if the magnitude or frequency of low-flow years increases. At some point in the future there will be insufficient storage to augment inflows which will result in competition among users and degradation in the ecological health of the basin.

## ***Environmental Impact Analysis***

In the SFRB, environmental health has historically been neglected for the sake of economic development and water supply security. Poor water quality is one of the most prevalent environmental issues in the basin; effluent discharge, stormwater runoff, and industrial

and agricultural runoff are the main sources of water quality problems (ANA et al., 2004). Because most pollution sources of the SFRB are in the upper watershed, water quality problems have a significant impact on many downstream communities and ecosystems.

Sediment flux is another serious issue in the SFRB. Higher runoff from urbanization and agricultural land cultivated without effective soil conservation techniques has increased the river's sediment load (ANA et al., 2004). Infrastructure development has decreased high flows that are necessary to systematically flush the system of sediment. Suspended sediment causes water quality problems, and settled sediment reduces the ability of some fish species to spawn among other effects (Gutberlet et al., 2007).

While less straightforward than water quality or sedimentation, infrastructure has an enormous impact on ecosystem health. Flow regulation and the construction of reservoirs have enabled water security in a region with high spatial and seasonal precipitation variation, but they have consequently interrupted the natural flow regime and fragmented previously continuous ecosystems.

The aforementioned issues are just a few that have led to ecosystem degradation in the SFRB. One of the most useful indicators of ecosystem health within this basin is the strength of the fisheries. Fisheries throughout the entire watershed have felt the impacts of water pollution, but dams have certainly had the largest impact on the river's fishery decline, due to altered flow regimes, increased sedimentation, blocked migration paths, and an increase of invasive species (Gutberlet et al., 2007; Godinho, 2005).

### **The Strategic Action Program and the Environment**

The SAP seeks to address a range of environmental health issues within the SFRB. In its discussion of water quality, the SAP recognizes the need to solve pollution problems at their sources and proposes interventions that integrate land and water management to strengthen both social and ecological systems. The SAP is also integrated across scales as it combines a comprehensive basin-wide management approach with small-scale actions, including planting riparian vegetation, preserving land of riparian ecological importance, managing stormwater, and monitoring water quality (ANA et al., 2004). However, it is unclear from the plan whether actions to address water quality will be sufficient given water resource development trends.



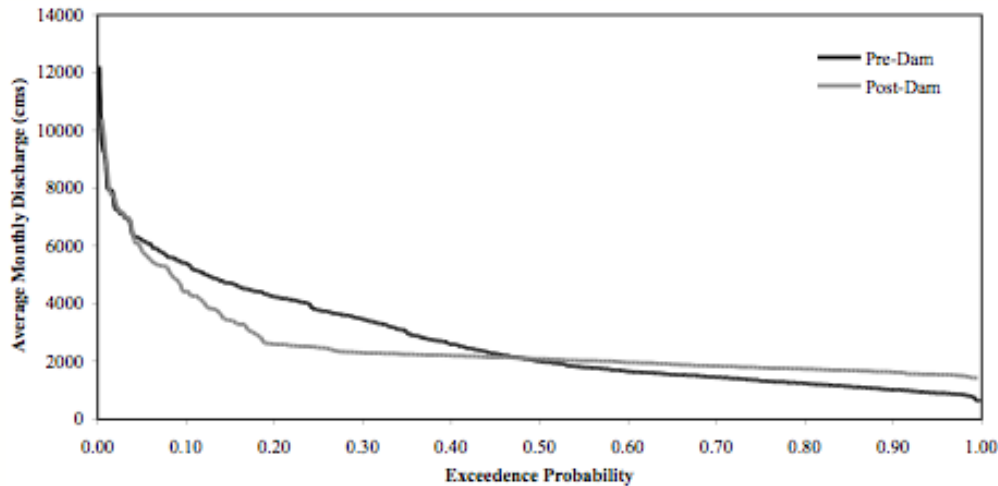
In contrast, the SAP does not have an integrated approach to the river's hydrology and its effect on ecosystems. Minimum flow requirements are commonly used to ensure that a baseline of water is available for aquatic ecosystems; however, minimum flows are only included in the SAP in the context of their ability to provide consistency in hydropower production and navigability. This, combined with the goal of regulating flows via the Annual Flood Prevention Plan (ANA et al., 2004), has created a highly invariable and unnatural river. The system of dams and reservoirs has strengthened the resilience of the basin's water users through energy production and water security, but it has come at the expense of increased ecological vulnerability. At one point, the SAP recognizes the negative impact of this hydrologic regime on fish populations and floodplain agriculture (ANA et al., 2004), but no alternatives were recommended.

Ecological health plays a role in the SAP, but solutions to reduce ecological vulnerability are limited in scope and effectiveness. For example, the decline of native fish populations is detailed, but the solution offered is to create a fisheries management plan to reintroduce native fish species (ANA et al., 2004); there are no proposed actions in the SAP to actually improve these species' habitat through accepted methods such as artificial flooding or fish ladders. In contrast to water quality, proposed efforts to improve ecological health or hydrology are piecemeal projects with no overarching plan or guiding principles to ensure that the approach is integrated and will strengthen system-wide resilience.

### **Analysis of Hydrologic Characteristics**

Given the absence of attention to the hydrologic regime in the SAP, a closer analysis was warranted. Monthly and annual streamflow data were analyzed to better understand how impoundment has affected discharge. The river system is quite large, but data are scarce. Gage data from Juazeiro, below the Sobradinho Reservoir, were chosen due to their lengthy historical record (GGRDC & UNESCO, 2001). While this analysis is geographically limited, it is viable as an indicator of trends in ecological health and the impacts of impoundment.

The comparison of monthly discharge flow duration curves before and after the Sobradinho Dam construction in the 1970s (pre-dam: 1930-1973; post-dam: 1980-1997) display decreased flood discharges and an increase of low flow discharge. There was also a significant decline in streamflow variation at the monthly time-step.



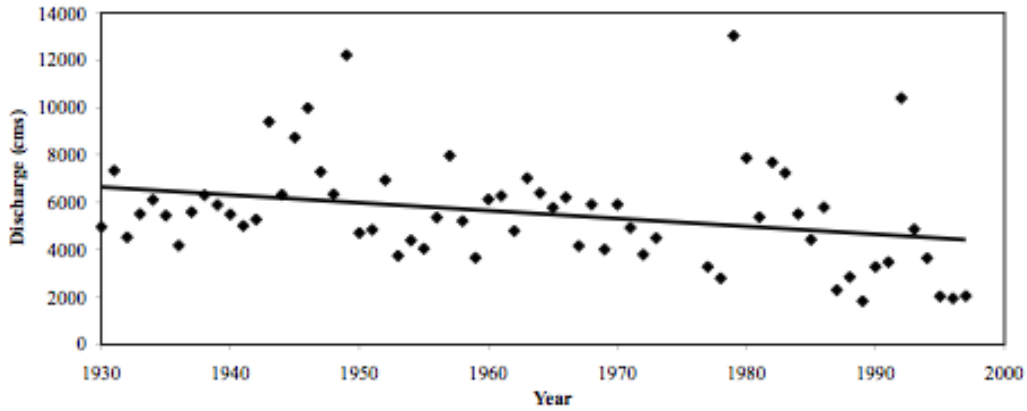
**Figure 7: Flow duration curve of pre- and post-dam average monthly discharges of the São Francisco River at Juazeiro.**

	Pre-Dam	Post-Dam	% Change
Within-Year Average Monthly Discharge* (cms)	1673	941	-0.44
Average Monthly Discharge (cms)	1818	1357	-0.25
Average Annual Discharge (cms)	700	824	0.18

**Table 3: Comparison of pre-and post-impoundment standard deviations for discharges of the São Francisco River at Juazeiro at various timescales. \*Note, this timescale is the standard deviation of monthly discharges calculated for every year and averaged over the given time period.**

Because every flow level provides unique value to aquatic and riparian ecosystems improving hydrologic variability should be central to any effort to improve ecological health in the SFRB (Richter et al., 2006).

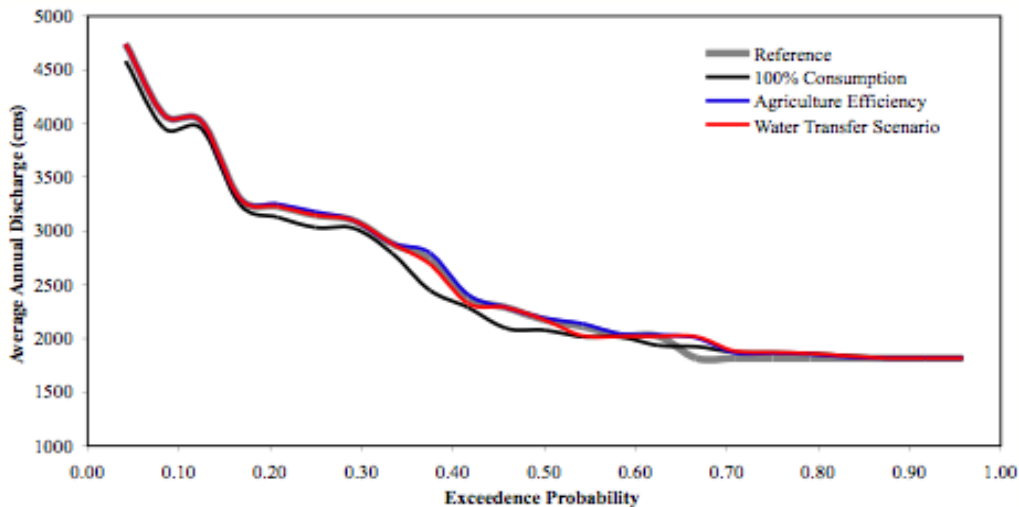
Floodplain lakes are a key component to the ecology throughout the basin; they rely on annual flood pulses to be fertilized with river-borne nutrients (Sato & Godinho, 2004) and act as spawning grounds and nurseries for many fish species (Godinho, 2005). Annual maximum monthly discharge was examined as an indicator of these flood pulses.



**Figure 8: Annual maximum monthly discharge of the São Francisco River at Juazeiro.**  
 $R^2 = 0.089$ ;  $P = 0.016$

The downward trend exhibited by the data is significant ( $P < 0.05$ ) and displays the reduction of the annual flood pulse throughout a period of increased water use and infrastructure development in the SFRB; these high flows are essential to ecosystems and rural livelihoods such as fishing and floodplain agriculture. This demonstrates that strengthening resilience for some stakeholders via infrastructure development currently comes at the expense of increased vulnerability of ecosystems and stakeholders that rely on a naturally functioning river.

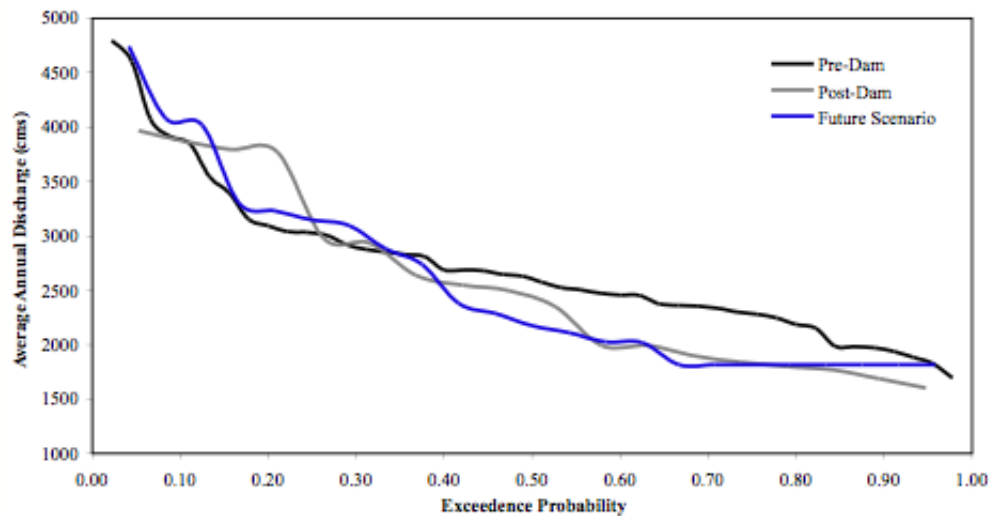
Simulated 2003 to 2025 Sobradinho Reservoir annual flows from the Water Use Analysis were analyzed to determine how future water uses could potentially affect the hydrologic regime. The results showed similar annual flows for every scenario below the Sobradinho Reservoir.



**FIGURE 9: Flow duration curve of future scenarios for average annual streamflow of the São Francisco River at Juazeiro based on a stochastic model.**

Approximately 30% of the flows are at or close to the minimum flow requirement; it is almost 50% at the downstream outflow node. Varying water use scenarios will not likely make an appreciable difference on annual discharge, but an analysis at a smaller time-step is recommended for future research.

The future “reference” scenario was compared to historical flow duration curves. It has comparable high flows to the pre-impoundment data but much lower low flows. It is notable that post-dam low flows are higher than pre-dam at the monthly time-step (see figure 7) but lower in the annual time-step.



**FIGURE 10: Flow duration curve comparing pre- and post-impoundment historical data and the “reference” future scenario based on a stochastic model of the São Francisco River discharge at Juazeiro.**

In summary, streamflow variation has been severely limited in this section of the river, particularly at the sub-annual time-step, and essential high flows have been reduced. While better reproducing the natural hydrologic regime isn’t the only change necessary to rehabilitate basin ecosystems, it is a good foundation for investing in the critical long-term health and resilience of the system. As suggested by Richter et al. (2006), hydrologic planning can and should be a participatory process in which the long-term sustainability of the entire social-ecological system can be improved.

### *Synthesis*

While the development of the SAP is an important step towards implementing IWRM in the SFRB, the preceding analyses identify critical areas of social and ecological vulnerability that

hinder the ability to effectively implement an IWRM strategy. Social vulnerability is evidenced by fragile basin-level institutions and high levels of inequality in the distribution of both income and water. Ecological vulnerability in the basin is demonstrated by rapidly growing water use and infrastructure development without consideration of the natural hydrologic regime. This section examines these areas of vulnerability and proposes ways forward for enabling more resilient and sustainable social-ecological systems.

Rapidly growing water use and insufficient consideration of ecological health criteria are contributing to increased ecological vulnerability in the SFRB. WEAP results indicate that average reservoir outflows are tending towards minimum flow values. This signifies that variation in flow is decreasing due to increased water use. Future growth patterns indicate water use in the SFRB will increase 268% by 2025. To ensure that this growth does not sacrifice the ability of ecosystems to maintain function, ecological health criteria need to be more fully integrated into river basin management decisions.

Better integrated and more coordinated reservoir operations will help to ensure ecological health considerations are incorporated into water use decision-making. The replication of the natural flow duration curve is the best option for promoting ecological sustainability and should guide maximum sustainable yield limits (Richter et al., 2003). An integrated operational approach should be designed that combines optimal use of reservoir storage capabilities and temporal flow patterns. This is particularly important in the SFRB because 95% of water use occurs upstream of significant flow regulations. Monthly averages and flow minimums can be maintained while building variability into the discharge levels at smaller timescales in order to receive the benefits of high flows without excessive sacrifice of hydroelectric production and navigability. Artificial floods will likely improve the production of fisheries (Godinho, 2005) and return essential sediment and nutrient depositions on the floodplains (Richter et al., 2006). These improvements would also benefit rural livelihoods that depend on a properly functioning ecosystem. A comprehensive analysis of historic reservoir yields is recommended to guide reservoir operation. In addition, the creation of a monitoring system using indicators such as fish populations, sediment loading and pollution levels will guard against ecological degradation and enable adaptive management depending on environmental trends. As water use and infrastructure development increases, spatial coordination of reservoir operations will also be necessary to optimize the management of available water. The CBHSF is perfectly situated to facilitate basin-

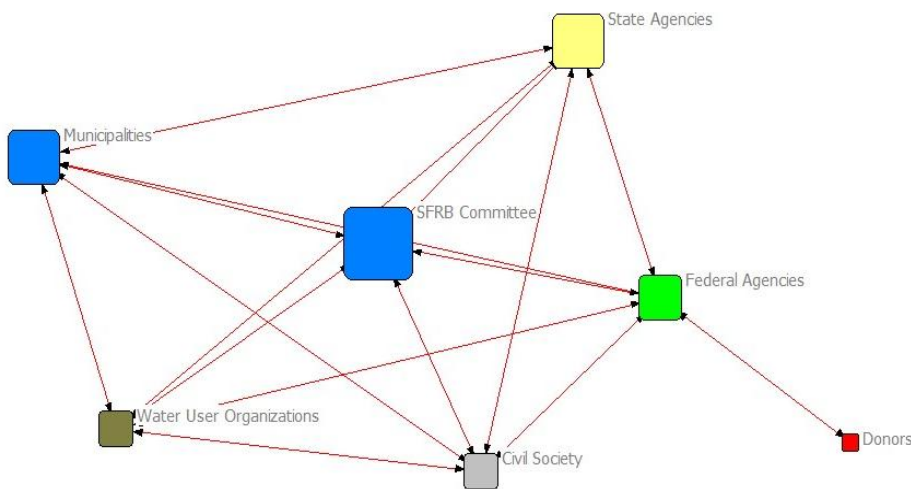
wide coordination of reservoir operations to ensure that decision-making takes into account the upstream and downstream water needs for both social and ecological systems.

High levels of inequity and the limited capacity of the CBHSF and other basin-level institutions contribute to social vulnerability in the SFRB. These areas of vulnerability put the basin at risk for top-down governance in which the most powerful stakeholders control decision-making outcomes while the poor become increasingly vulnerable to adverse shocks.

Social resilience in the SFRB may be strengthened by considering the spatial distribution of future water use. Resilience and equity are inextricably linked because the poor are often the least capable of generating sufficient wealth and forming the social structures necessary to recover from catastrophic events (Holling, 2001). Furthermore, equitable distribution of water resources is a central tenet of both Brazilian national law and the SAP. WEAP results indicate expanded water use will inequitably benefit specific regions within the SFRB. The most effective way to strengthen social resilience is to minimize inequality by implementing pro-poor policies and programs. These interventions should target the Lower Region because it ranks lowest on the HDI, uses the smallest amount of water, and has the least developed water infrastructure. Sustainable rural livelihoods programs should aim to improve human capital, increase farm and non-farm income through productivity growth and expand access to credit. Water pricing policies that stimulate pro-poor growth, such as block tariff schemes, should also be considered.

Policies designed to strengthen the resilience of social-ecological systems can only be implemented through an institutional framework that can adapt to changing conditions by enabling shared governance and decentralized decision-making. The key to creating this resilient institutional framework is to empower the SFRB Committee (CBHSF) in order to ensure its legitimacy and sustainability. Concerted efforts by donors, federal and state agencies are needed to build the capacity of the CBHSF. This would entail not only the provision of technical and financial resources but also ensuring that the CBHSF is recognized by all actors as the principal decision-making body in the SFRB. A financial model that generates sustainable revenue streams for the CBHSF will be important to guarantee its sustainability and reduce dependency on donor funding. Successful implementation of a water tariff collection system through the CBHSF's River Basin Agency will be an essential measure to ensure sustainable finance for the CBHSF. The water tariff system could also be a tool for equitable resource distribution for the basin's various water user groups and socio-economic regions.

A strong and legitimized CBHSF and more capable municipal bodies provide the foundation for a resilient institutional network that can guide IWRM in the SFRB. This network would enable active give-and-take between the three spheres of government (federal, state, and municipal), civil society and water user organizations. This would result in improved decision-making and reduce the likelihood of future conflicts between actors. Figure 11 depicts this resilient institutional network, demonstrating improved coordination and participation among actors, the importance of the CBHSF and municipal bodies as decision-making bodies, and reduced responsibilities of donor agencies and federal bodies.



**Figure 11: Resilient Institutional Network in the SFRB. \*Note: Red ties denote reciprocal ties (mutual coordination) between actors.**

### *Overall Conclusions*

Based on our synthesized analysis, we propose four principal areas of policy and investment recommendations with the goal of informing decision-making of donor agencies, policy-makers and civil society organizations in the SFRB. Implementing these recommendations will help strengthen the resilience of the basin's social-ecological systems and create the necessary enabling environment for IWRM to be applied in the SFRB. Within each recommended area, we suggest specific policy and program interventions that should be supported. These policy and investment recommendations include:

- **Build the capacity of the CBHSF and basin-level institutions.** A strengthened CBHSF and more capable municipal bodies will help accelerate reform efforts and ensure that water resource decisions are made by consensus and with the participation of all stakeholders.



Investments should target the capacity-building of the CBHSF and municipal water agencies through the provision of technical and financial resources. Federal and state agencies should facilitate these efforts by ensuring that all stakeholders recognize the CBHSF as the principal decision-making body in the basin. To provide sustainable revenue streams for the CBHSF, investments are needed to plan, organize and implement a water tariff collection system.

- **Reduce socioeconomic inequality in the Lower Region.** Policies and programs that stimulate pro-poor growth in the Lower Region will reduce inequality and strengthen social resilience. Investments should focus on accelerating rural productivity growth and building human capital. Ramping-up demand-driven agricultural extension services will help increase agricultural productivity of smallholder farmers. This should be coupled with microfinance programs, agricultural input subsidies and pro-poor block tariffs, which will enable the adoption of productivity-enhancing technologies. Infrastructure investments that increase rural access to water (for both domestic and productive uses) in the Lower Region will also help increase productivity and ensure more equitable distribution of water resources. Human capital investments through health and education programs that target the poorest communities will contribute to long-run productivity growth and reduced inequity.
- **Improve water use efficiency among water users.** To reduce ecological vulnerability due to rapidly increasing water use, policies and programs are needed to spur significant improvements in water productivity, especially in the agricultural and industrial sectors. Investments are needed for programs that promote the uptake of improved water-efficient technologies, ranging from drip irrigation, on-farm agronomic practices and improved crop varieties in the agricultural sector to improved cooling systems and water reuse in the industrial sector. The implementation of the water tariff collection system will help incentivize more efficient water use and increase the uptake of improved technologies.
- **Improve the decision-making and coordination of reservoir operations.** Better coordination between reservoir operations will enable more efficient and equitable release decisions, which will optimize water availability for both social and ecological systems. Investments are needed to draft and implement sustainable operational guidelines for reservoirs that take into account ecological health criteria. Additional investments are required to formalize coordination mechanisms between reservoir operations through the CBHSF and to train reservoir operators in the improved operational guidelines.

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## **Taking the Camel Through the Eye of a Needle: Enhancing Pastoral Resilience Through Education Policy in Kenya**

Ahmed Idris<sup>1</sup>

### ***Summary***

Since the introduction of free and mandatory education in Kenya in 2003, the number of children who have enrolled in formal primary education has increased tremendously. However, the pastoralist areas have continuously recorded a much lower enrollment and completion rates as compared to the rest of the country. Increasing scholarship establishes a nexus between the low pastoralist participation in formal schooling and the failed education strategies that are considered inappropriate to the circumstances in Kenya's pastoral districts. Acknowledging this reality, the Government of Kenya formally adopted the Nomadic Education Policy in 2010 to ostensibly boost education access to Nomadic communities. This study seeks to understand content of the Nomadic Education Policy through a prism of pastoral livelihood and resilience. It seeks to establish the extent, which the policy can offer a radical departure from the past, contributing not only to higher enrollment in schools but also enhancing resilience of pastoralist communities.

### ***Introduction***

Pastoral livelihood is considered as the most efficient use of the dry lands (Fratkin, 1986). Even with this importance, nomadic pastoralism has been viewed as a stage in socio-economic evolution and thus an intermediate between hunting/gathering and sedentary agricultural life. The consequence of this was that pastoralism was expected to die a "natural death". Thus modern existence of pastoralism in a period of modernity was seen as an anomaly, which had to be corrected through among other things the introduction of education. In this regard education for pastoralists was considered as an exit strategy, and not an end in itself. Education and pastoralism were considered not to be able to co-exist: there could be no educated pastoralists and vice versa, pastoralism meant missed education opportunities while education was an automatic exit out of pastoralism.

This debate becomes more important in the face of reducing coping capacities of

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pastoralists as a result of eroded asset base, poor policy, climatic stress related with climate change and the negative effects of globalization (WISP, 2007). The objectives of the study are thus two fold. These are (a) To understand the nature of pastoral resilience and how education policy can undermine their coping and adaptive capacity (b) assess the extent which the new Nomadic Education Policy can enhance the resilience of pastoral groups in Kenya. This paper seeks to contribute to the emerging dialogue on education and social resilience and link it to broader study of pastoralism and international development. More importantly the objective of the paper is to present an underlying argument and hypothesis for future research on education policy and resilience.

### ***Background***

Nomadic pastoralism is an ancient form of livelihood. It is said to be the most efficient use of the dry lands such as Arid and Semi Arid Lands (ASAL) of Kenya. The ASAL constitutes about 84% of the total land and populated by about 20% of Kenya's population (GOK 2007). Pastoralism is practiced in 75% of ASAL (Mugo et al, 2009; Krätli, 2001). Nomadic pastoral communities that rely primarily on their animals as a source of livelihoods largely populate these regions. Collectively, these areas constitute the most marginalized parts of the country (Mugo et al, 2009). The economic contribution to Kenya, of the ASAL is significant, contributing to about 50-70% of the total livestock production (GOK, 2006). In terms of agriculture, pastoralism contributes about 50% of the total agriculture GDP (IIED, 2004). Large parts of the ASAL such as Northern Kenya attract the lowest and poorest service delivery.

Pastoralism has not benefited favorably from both the process and outcome of policy development. Usually, they are ignored and even when they are considered, pastoralism is viewed with skepticism. In this regard, development planners have tried to change pastoralism, establishing exit strategies that are clothed in language of legislation and policy. The United Nations Development Programme-UNDP (2009) argued, "Pastoralists have been ill-served by development policies and actions so far, since planners have almost without exception tried to convert the pastoralists into something else, judged more modern, more progressive and more productive".

In Kenya, pastoralists have been marginalized by government policy. The colonial structure considered pastoral livelihood as not being useful to the colonial enterprise, wasteful and administratively disturbing. Further, the pastoralists were not considered as industrious as the agricultural communities (GOK/ALRMP, 2004). The colonial government thus concentrated on areas that maintained the extractive nature of the colonial political economy. The independent governments continued with the policy of marginalization. Sessional Paper No: 10 of 1965 on African Socialism and its Application to Planning in Kenya provided the economic blue print for Kenya's post independence development. This blueprint disturbingly stated as a policy the government would invest in regions that were considered most productive. Sadly, the ASAL were not considered "productive" and was thus largely ignored. Government policy has concentrated on making attempt at sedentarizaion of pastoralist population, which adversely affect pastoralist livelihoods (GOK, 2006).

With regards to education, the policy has targeted an increase in education. The policies were favorable to the needs and interests of those leading a sedentary and urban life. However they proved inappropriate to Kenya's pastoral districts. The consequence was the resulting low levels of educational enrollment, survival and achievement among pastoralists. The general education policy establish a fate accompli, in the sense that it becomes a "trade-off, that nomadic parents and children have to make between acquiring formal education through the school system, and the fundamental, informal learning about their own cultural, social and economic world available to them as members of the complex social networks of nomad life" (GOK, 2010a; 7).

Fratkin (1986) citing Holling (1973) defines resilience as the ability of a system to undergo shock and still maintain its ongoing functions and controls. A resilient population is therefore one that is able to absorb sharp changes and disturbances and still maintain its functionality. Social resilience is defined as the ability of groups to tolerate, survive and respond to environmental and socioeconomic constraints through adaptive strategies (Bradley & Grainger, 2004). Closely linked, adaptive capacity is a range of mechanisms that a society possesses to cope with change (Nelson et al., 2007). Thus

pastoral adaptive capacities refer to the cumulative capacity of pastoral households to adjust their livelihoods to multiple and interacting stressors (WISP 2007).

Pastoral herders live in uncertain climate and are experienced at coping with climatic variability and drought (Dietz, 1987; Little et al., 2001b). The risk vulnerability faced by pastoralists is high as a result of diseases conflict, climatic hazards and poverty. Their lives is based on the ability to successfully assess and manage risks, including being sensitive to climatic changes. Pastoralists are thus referred to as shrewd managers of risks and resilience (WISP, 2007). The climatic variability requires a system of flexibility required to cope with the hazards of livelihoods. Pastoralists use various strategies that facilitate adaptive and flexible risk management strategies. A central strategy for resilience and adaptive capacity is mobility, which is the ability for both people and livestock to move from place to place on the basis of need. Beyond mobility, pastoralists utilize a range of other techniques and institutions. These include herd splitting, herd diversity, using social capital and opportunistic cultivation. These risk management strategies enhance resilience (WISP, 2007).

For policy makers, mobility is viewed as a reflection of the ‘tragedy of the commons’, ‘backward’, and ‘chaotic’, ‘unnecessary’ and ‘socially & environmentally disruptive’ (UNDP, 2009). However, mobility is a rational response to ecological patterns in the dry lands. It is informed by several factors including climatic conditions, seasonal environmental conditions and the household exigencies. In this regard mobility can be seasonal or “regular as a pendulum between two well-defined pasture areas, following marked transhumant routes that have not changed for centuries” (UNDP, 2009; 3). Pastoral herders utilize the variety of pastures based on seasons, watering points and other resources within their ecological range with high climatic variability (Galvin, 2009). It is therefore an adaptation to the challenges of risky environment and a key feature of resilience in pastoral livelihood.

### ***Methods***

A review of published works was conducted, analyzing broad topics on pastoral livelihoods and education policy. Whereas no specific limitations were set, literature dealing with geographical areas outside the East Africa and more so Kenya was



systematically excluded to reduce the search giving attention to capturing literature on key concepts of this study.

The researcher conducted interviews (both in person and telephone) with individuals with extensive experience in education management in pastoral areas. In the summer of 2010, the author attended the launch of the Nomadic Education Policy in Garissa, Kenya. During this event, the author conducted semi structured interviews with public opinion leaders including representatives to the National Parliament, religious leaders and government officials. The researcher further conducted focus group discussions that were held in Isiolo and Garissa, Kenya. Three discussion groups were conducted in Garissa, one with randomly selected individuals who had achieved post secondary education, one with elders from the community and a third one with primary school teachers with varying degrees of experience. In Isiolo the groups were divided into neat categories of traditional elders and school going children from pastoral communities. In both locations selected for the focus group discussions the nature of outcome was perceived rich as a result of the researchers personal background of the area.

The researcher acknowledges from the onset that the questions of discussion were not framed in the language of resilience, however, key perspectives of resilience such as adaptation, coping mechanisms and survival were posed for discussion.

## ***Findings and Discussion***

### **Issues**

Pastoralists have an ambivalent relationship with education. On one hand, taking children to school is a strategy on adaptation to facilitate an alternative livelihood for families and communities. On the other hand, education presents danger to the pastoral livelihood by antagonizing social institutions and altering social learning (GOK, 2010a). In the Kenyan context, education undermines institutions and systems that are utilized in pastoral livelihoods. It displaces both the technical knowledge and the social relationships of pastoral livelihoods with detrimental results (Krätli, 2001). In this regard education in pastoral communities possess both conceptual and practical challenges (Krätli and Dyer, 2009). Our study confirms the nature of this ambivalence. Those interviewed especially the older members of the community, raised concern about the future of the community

and about the fear that children might not manage their pastoral livelihood because they learn “the wrong things”.

As a result of the ambivalence, ASAL have had lower enrolment, retention, completion and achievement rates than the rest of the country. (Mugo et al, 2009, Sifuna, 2005). Only 32.3% of the total population in North Eastern Kenya<sup>1</sup> has enrolled in school compared to a national average of 76.8%. This situation is worse when it is viewed in light of low enrolment in post primary education. The secondary school enrollment rate for the ASAL was at 5% as of 2007 (Mugo et al 2009). In North Eastern Kenya, the population that has attended post secondary learning averages 0.6%. (KNBS 2008). Our study indicates that such dismal enrollment rate is as a result of the nature of secondary schools in these areas, which are largely boarding schools. Almost all secondary schools in the ASAL are boarding schools, which meant students are required to reside in the school within a school term and for the upper classes extending to part of the regular holiday.

Whereas government policy has sought to address this, the main focus has been on increasing enrollment and performance. (GOK, 2007; MOE, 2006). The solution was to increase education facilities (GOK, 1974), provide low cost boarding schools (GOK, 1970). When these strategies failed to achieve results, the simple solution was to withdraw the services, even in some cases prematurely (ALRMP/AAK, 2004). The strategies didn't consider the value and effect of education on resilience and coping capacities of communities and hence their failure. A corollary of this is that little attention was given to the opportunity cost that results in taking children of school going age away from their homes and the resulting effect of the household economy (Krätli, 2001).

With young boys and girls going to school, there is a redistribution of household tasks including herding of cattle being done by parents. Whereas this might not appear to be harmful, the fact that the certain groups haven't been socialized for these functions makes them more vulnerable as households. Pastoral livelihood is largely dependent on the individual and group specialization (Scoones, 1994). With the basic unit of pastoral economy being the household, absence of children will result in limited source of labor, in the sense that they are not available for mobility whereas the mobility of their labor

force is central to adaptation and risk management strategies of pastoralists (Fratkin, 1986). Distribution of households to undertake both diverse duties and share in the burden of task management is one perspective.

However, pastoralists also have other unique strategies to manage and spread risks among family members. One technique is to distribute portions of the herds to different family members to settle in diverse areas to both spread the risk and to access better grazing land (Galvin, 2009). The result of this was that pastoralists were pushed into sedentarization. Fratkin (2004) found that pastoralists in Northern Kenya have been forced into sedentarization by among other factors social services provided in towns such as schooling, which increases their vulnerability. In this regard the work of McPeak & Little (2005) establishes an empirical link between vulnerability to livestock losses in a drought with increase in sedentarization, their conclusion being higher levels of mobility result in less drought-related livestock losses and vice versa.

The gap between education policy and pastoral need became a crisis in 2003 when the government instituted Free Primary Education (FPE). The objective of this was ostensibly to attain Education For All (EFA) and more specifically Universal Primary Education (UPE). For the pastoralist, this thinking was not new since in 1971 through a Presidential decree, payment of school fees in ASAL areas was abolished. The impact of this was disappointing since it didn't have significant impact on enrollment rates. This necessitated the premature end of the program in 1974 (GOK 1974).

As a result of the FPE, the gross National Enrollment Rate (NER) as at 2007 was at 91.6% (Mugo et al, 2009). The areas with the lowest NER were from the ASAL areas (MOE, 2009). For example, North Eastern Kenya had an enrolment rate of 27.5% (GOK, 2010a). The combined enrollment rate for all the districts in the ASAL was 51.7% as at 2007(Mugo at al, 2009). This shows that whereas FPE has improved enrollment throughout the country, it is lowest in regions where it was needed most, the marginalized ASAL. Low school enrollment among pastoralists is a sign of resistance to an education system that would eventually undermine the pastoral livelihood (Krätli 2001).

The pastoralists interviewed highlighted that the manner in which the free primary education was implemented placed their livelihood in jeopardy. One elder in Isiolo said the local chief (a government official) came with policemen and took his two sons to

boarding school, threatening to arrest him if he resisted. He sarcastically inquired whether the government would send him any one to help him look after the cattle. This is indicative of the argument that in development policy planning and management there is insufficient understanding of the coping capacities, adaptive strategies and livelihoods patterns of the pastoral populations in the dry lands (Eriksen et al, 2006). Our research shows that whereas the intention of government in mandatory primary education is good, negative consequences in community livelihoods have not been considered. More specifically such policies made communities more vulnerable to the vagaries of pastoral life and no cushioning was provided.

An extensive study by Krätli (2001) established education for pastoralist was implemented as an exit strategy and largely resisted by the intended beneficiaries. However, the pastoralists “use it as a security net and a way to strengthen the pastoral enterprise” (Krätli, 2001;4). The research established that pastoralists are not inherently averse to education. Most of the elders interviewed appreciate that education could bring success to their people especially in light of the changing environment. Their concern was to place it figuratively, “putting all their eggs in one basket”. Our findings indicate the realization that education has an immediate advantage to pastoralists has necessitated sending some children to school. However, the logic of pastoralism discourages complete disruption of the household economy as a result of lack of labor. To find a balance pastoralists have opted to send some children to school, while retaining others at home.

The curriculum and instruction of schools in Kenya have had very little significance to the pastoral population. It has largely been biased to agricultural and urban communities (Mugo et al, 2009). For the pastoralist, education results in “cultural alienation” (Sifuna, 2005) and it has deskilled the pastoralists giving them “aspirations” that are not in line with the use and reality of pastoral life (Mugo et al., 2009). A major concern raised by the local community elders was the content of what children were learning. The shared view was that it was not responsive to the immediate needs of the communities they lived in. From their perspective, children were going to school to become “stupid”! On being prompted about their perception of the future of their communities, those interviewed expressed great concern about the survival of their way of life, with less children taking time to learn it and more being forced to go to school.

Over time, pastoralists have developed a social system that passed important information increasing social memory. When social-ecological system has low levels of social memory, then it becomes vulnerable to disturbance and crisis (Folke et al., 2005). Because the pastoralists don't go to school, it does not mean they don't learn. To the contrary, they undergo a thorough process of learning which gives the children the necessary know how for pastoral management. The practical skills that are imparted rather than instructed include details about their extended families, how to build bridging ties through effective negotiations, skills on interpreting weather phenomena, pseudo scientific skills on people, animal health and hydrology (Krätli, 2001).

Social capital strengthens resilience in communities. It comprises networks of relationships where social obligation is felt and shared (Fratkin, 2004 ; Krätli, 2001). It means developing, trusts, appreciating reciprocity and shared roles within a group. In the strict sense social capital includes, the bonding ties, which are relationship between same family, neighbors and friends. In its broadest sense social capital includes such bridging ties that are geared towards strengthening relationships outside the family. This is considered necessary to establish a relationship of reciprocity with other social groups (Folke et al., 2005). The pastoralists interviewed (mainly the elders) expressed difficulty in children learning social ties when they are absent from their homes most of the days attending to school. Boarding schools are especially problematic since they meant children would be away much longer. When this was raised with one education official, he estimated that children attending boarding school would be at their homes on average nineteen weeks in a calendar year with the rest of the time spent in school.

Social ties, shared but differentiated roles and networking are essential components of the pastoral livelihood. Social networks are essential and carefully managed. Taking time to learn management of relationships within a group and outside the group is taught from a young age. This requires time and continuous presence around communities they live in order to learn. It is therefore inherited and passed from one generation to another and “they provide a stable network of primary associations on which people then build their own dynamic systems of alliances” (Kratli, 2001: 27). Central to social learning is the level of importance the individuals attach to their livelihoods, the collective attitude and psyche of the people. In terms of attitudes of

children who have gone to school, our study contradicts the findings in Kratli (2001). With respect to the perception of those who have been educated, our study indicates that they considered pastoralism as not being viable in the long run and in many respects education established in the words of Kratli, an “unbridgeable cultural divide”. Those who managed to establish successful lives outside pastoralism considered it a key priority to assist their relatives “out of” pastoralism.

### **Nomadic Education Policy**

The launch of the Nomadic Education Policy (hereafter, the policy) was held in Garissa Kenya on the 10<sup>th</sup> of July 2010 in an open function attended by top education officials, members of National Parliament from ASAL areas and other opinion leaders. The policy was the result of a process of collaboration between development agencies, the government and the pastoral communities. It seeks to address various issues surrounding nomadic education. According to education officials interviewed, the importance of the nomadic education policy was that it responded to the fears of the pastoralists. Whereas the officials doubted the feasibility of an almost immediate implementation, they expressed hope that it would make a difference. A discussion on the objectives of the policy indicates that pastoralists welcome conceptual thinking that informs the policy. An elder from the Somali community in Garissa noted, “if the government wants to combine educating our children and supporting our people, we will cooperate”. An education official shared this thinking saying it would make the work of the Administrators easier, if a system that both educates and allows pastoralists to maintain their way of life was in place.

The policy provides that the government would consider education strategies that would benefit both the children and their parents. Previous strategies had targeted only children as the beneficiaries of schooling. Young pastoralists interviewed suggested that this would benefit the young. In their opinion, it will serve to make the older people appreciate the value of education. Further, the older people felt this would be an opportunity for the children to learn from their parents important social issues in the comfort of the classroom rather than just learn modern things.

The policy contemplates education terms based on seasons rather than calendar terms. Pastoral livelihood revolves around seasons. Different seasons imply varying requirements of labor at the household level. Tasks are shared between family members when labor demands are high for example herding tasks are shared in the season where water is plenty during the wet season. While in other seasons, households may be divided with the productive animals being placed in satellite camps way from the main household locations (GOK, 2010a). To the extent that learning can be adopted around these seasons, livelihoods would be strengthened.

The policy requires the government to implement modes of education that take into account children's work at home and therefore schedule lessons outside nomadic working hours (GOK, 2010b; 2). By considering the reality of social capital, the policy locates the child in his/her role in the structure of pastoral livelihood. This by extension reduces vulnerability of households by strengthening social capital base. Opinion leaders interviewed stated that telling the pastoralist that they need to send children to school without suggesting an alternative source of labor for the household is an uphill task. This policy suggestion is a useful step in addressing this question.

The policy considers use of an academic calendar that would be flexible and factor in climatic conditions and patterns of nomadic livelihood (GOK, 2010b; 11). Education calendars will further utilize early warning system to ensure appropriate planning to avoid emergencies disrupting education (GOK, 2010b; 9). To this end government would utilize non-formal systems that are community based which can be used for education while at the same time remaining local to the community needs (GOK, 2010b; 10). Our study indicates that this provides an opportunity for the pastoralists to manage their own learning instead of learning managing them. Broadly this establishes opportunity for integrating education into traditional institutions and social systems that enhance adaptive capacities of communities.

The policy provides for the development of curriculum that would be useful to pastoral lifestyle. In development of this curriculum, the government would adopt participatory methods for management of the curricula in schools (GOK, 2010b; 10). The curriculum would also recognize the value of traditional knowledge and technique integrating them to the curricula. This would be buttressed by providing informal

learning materials that would carry information specific to these communities. In our interviews, leaders from pastoral communities considered participatory mechanisms as essential for the system to understand pastoralism and the pastoralists to understand the system.

### ***Conclusion***

In conclusion, the study confirms our hypothesis that education system as currently modeled undermines pastoral livelihood. Arising out of this, the study confirms our argument that the Nomadic Education Policy presents a framework that is sensitive to pastoral needs and by extension enhances the resilience of pastoral communities. It addresses both directly and indirectly the fundamental challenge of enhancing resilience of pastoral communities. In the alternative, it seeks not to undermine the resilience of the communities. The objective is to put in place a system that can provide quality education, which can be useful in pastoral adaptation while at the same time maintaining the strength of livelihood of the pastoral communities. The policy thus builds upon and supports pastoral resilience and adaptive capacity. The findings and discussion above hold important implication for understanding the resilience of pastoral communities in Kenya. However, further empirical research will needed to establish the effect of the policy on the resilience of pastoral communities.

<sup>1</sup>North Eastern Kenya is composed of three districts, which cumulatively forms a large chunk of ASAL.

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## Security and Resilience

Ola Dahlman<sup>1</sup>

### *Summary*

We witness today dramatic developments in Egypt and Tunisia that may lead to fundamental changes in many of the social-economic-political structures in these and maybe also other countries in the region. We have in the past seen such dramatic and rapid changes, most memorably during the break up of the Soviet Union some twenty years ago. How come that these dramatic changes are coming so rapidly and unexpectedly? Can we use the concept of resilience to help understand what is happening and why? May we, at some time in the future, even be able to use resilience to predict when a state or a group of nation states are approaching a dangerous situation and to find a safe way to avoid failure? This paper gives a brief introduction to the resilience concept and presents some examples of developments within large-scale social-economic-political systems that might be looked at through the lens of resilience. The intent is to stimulate thinking on how to conduct more comprehensive resilience analysis to address the stability of nation states and other large scale and complex social-economic-political systems.

### *Introduction*

A nation state is a multidimensional system where a number of complex parameters are interacting, and many of those parameters are influenced by human behavior and decisions. A number of human related elements may likely be creating and influencing the current situation in Egypt and Tunisia including an autocratic political system with lack of democracy, age distribution of the population, unemployment, economic conditions, and global connectivity. We cannot, in a technical sense, model a complex system dependent on human interactions, rational or irrational. Instead, the resilience concept may be used to describe such systems. This paper is not trying to provide a thorough resilience analysis of a state or of a particular event, much more work is needed to fully understand such a complex issue. The purpose is rather to illustrate that the resilience concept might facilitate the understanding of the stability and security of a nation state or any other large-scale social-economic-political system.

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### ***What is resilience?***

Resilience is a notion borrowed from material sciences and describes the ability of a material to recover its shape after a deformation. Many technical systems behave in a linear way, with a direct relation between the size of a disturbance and the effect on the system. This is not true for a system with complex non-linear relations between its elements. Such systems might be facing discontinuities and uncertainties that make them totally fail if a disturbance exceeds a critical threshold. A non-linear system must be analyzed in terms of its ability to adapt to changes and recover from disturbances while providing options for future developments. Resilience building aims at increasing the range of surprises that a system can cope with. It should prevent the system from moving into undesired system configurations in the face of stresses and disturbances. Building resilience requires understanding of the complex interaction among the different components and actors in a society over the scales in time and space relevant for the system. Biological, social, commercial and political systems behave in this way. They are nonlinear and capable of self organizing to sustain their existence, but unpredictable and may survive unexpected events but or fail completely. They are complex, adaptive and generally dynamic and may contain thresholds and exhibit hysteresis and irreversible changes. Hysteresis describes a situation where the effect is lagging behind its cause creating a non-linear relation between the two. The resilience concept has over the last few decades been introduced to describe complex systems, especially systems where human interaction has a significant influence. It was introduced into the analysis of ecological systems by Holling (1973) and a number of interesting studies of such systems have been reported since. An overview developed by many experts was given by Folke et al (2002), and there are several other published studies related to resilience of social-ecological systems (Walker and Holling, 2004, Folke et al 2004, Carpenter et.al 1999, Anderies et.al 2004, and Walker and Meyers, 2004).

Resilience has been described in terms of a number of defining characteristics (Walker et al, 2002):

- The amount of change a system can undergo and still be in the same configuration - retain the same controls on functions and structure. A more resilient system can absorb larger shocks without changing in a fundamental way;
- The degree to which the system is capable of self-organization; and
- The degree to which the system expresses capacity for learning and adaptation.

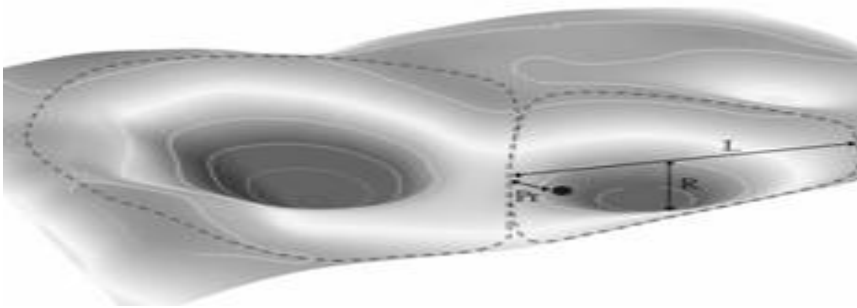
As Carpenter et al (2001) highlighted, resilience must be considered in a specific context: resilience of “what to what”? This means that we have to define what functions or elements of a system are resilient to what changes. If a system is composed of elements forming different system levels, it can be resilient at some of the levels but not necessarily at others. How can an enterprise or a state be resilient without having resilient sub-systems? A large-scale system, such as a nation state, could be overall resilient even if a number of systems in the society fail. A nation state could, on the otherhand fail due to a large-scale political or economic crisis, even if many of its systems are intact.

### ***The Resilience Landscape***

For each system, one can define a multi-dimensional space in which the system parameters reside. A basin of attraction is a region in this space where the system tends to remain. There might be more than one such basins of attraction for any system. The various basins and their boundaries are known as the “stability landscapes”. The topology of a stability landscape is dynamic. Resilience is a measure of the topology of the basin of such a dynamic landscape.

A resilience landscape has three important parameters:

- Latitude – The maximum amount a system can be changed before it changes significantly and moves out of the present basin of attraction This is basically the width (L) of the basin of attraction (see Figure 1).
- Resistance – The ease or difficulty of changing the system – how resistant it is. This is related to the topology of the basin. The deeper (R) the basin, the higher the resistance.
- Precariousness – Measures how close the system is to a limit of a basin or threshold.



**Figure 1** - Stability landscapes and attributes of resilience (from Walker et al, 2004). Three-dimensional stability landscape with two basins of attraction showing, in one basin, the current position of the system and three aspects of resilience, L = latitude, R = resistance, Pr = precariousness.

For a simple system, with only two well defined basins of attraction where the system can reside, both theory and application are clear. For a more complex system, where the resilience landscape is likely to have many dimensions and multiple basins of attraction, there is still a need to develop an understanding of how to integrate the effects on a system of such a multidimensional landscape.

An important first stage is to try to define the resilience landscape: specifically, what is

- the likelihood that a threshold exists?
- the probability of crossing that threshold?
- the consequence/s of crossing the threshold?

A smooth landscape is likely to offer less unexpected events than a landscape with many and deep basins. To actually define a multidimensional resilience landscape

is a great challenge still to be met. More achievable is to define a number of important elements and try to identify critical situations.

Having identified a resilience landscape, at least tentatively, and the place of the actual system in that landscape, one may want to influence the resilience of the system. Human actors are key drivers to move a system from one basin to another or to create a new resilience or stability landscape. Moving a system between basins or reshaping the stability landscape are both examples of adaptability. People in the system might well see some basins as more desirable and want to keep or move the system there. Different people or groups of people may have different views on what is desirable.

At times actors may find themselves trapped in an undesired basin, where moving or reconfiguration is extremely difficult. It thus may prove necessary to change the system in a basic way and configure an entirely new stability landscape. Tension may exist between maintaining resilience of a system and at the same time building capacity to adapt a system to the existing landscape and to transform the landscape. There is likely overlap in the attributes that promote the ability to adapt and transform.

How can we then increase the resilience of a system? Resilience is dependent on the initial stability of the system and its ability to resist disturbances. It is even more dependent on the ability of the system to renew and reorganize itself following a large-scale disturbance and provide options for future actions after the disturbance. Robustness will thus be achieved through resilience rather than resistance. Systems that use rigid and centralized control mechanisms are generally less resilient than decentralized systems that are flexible and open to learning. When building resilience it is important to attend to slow-changing, fundamental parameters of a system. For a nation state these may be democracy, freedom, social infrastructure and values and economical and technical infrastructure. These words have been heard clear and loud from the streets of Cairo and Tunis.

Human actions are crucial in any social– economic-political system. Human behavior is generally unpredictable, especially in and after a crisis situation. To create resilience it is therefore essential to design a system in a way that facilitates human action that is conducive to bringing back the system to

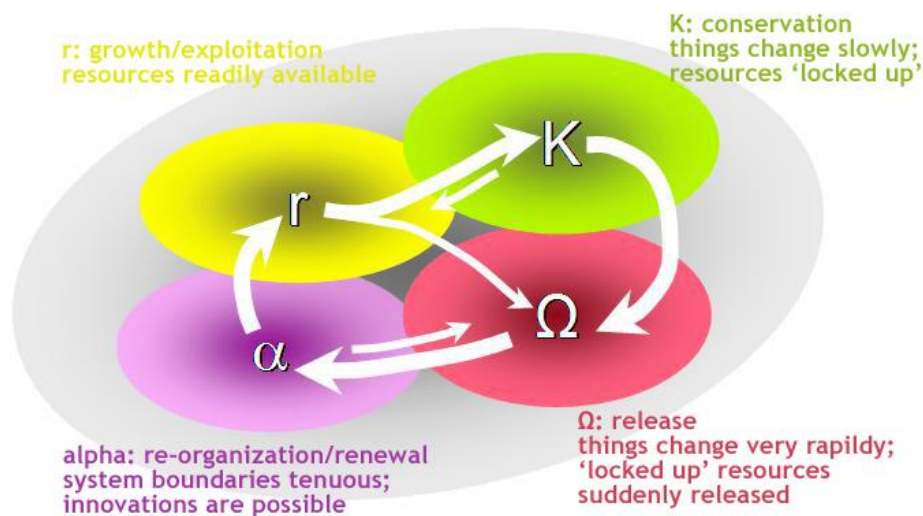
normal function after a major disturbance. An important element is to present decision makers reasonable options for future actions. A resilient system should also, as far as possible, be able to cope with irrational actions by individual stakeholders.

### *System Dynamics in Four Phases*

The dynamics of a social– economic–political system can be described in four principal phases and below are some of the many examples of societies that have been through this process (see Figure 2).

- A growth or entrepreneurial exploitation phase,
- A conservation or organizational phase
- A destruction or release phase
- A restructuring or reorganization phase

**Figure 2** (Source: Resilience Alliance [http://www.resilience.org/index.php/key\\_concepts](http://www.resilience.org/index.php/key_concepts))



Each phase in such an adaptive circle creates the condition for the next. The two first phases have quite predictable dynamics. The first one is usually characterized by rapid growth and creativity. In the second phase resources get locked up and the system becomes less flexible. These two fairly predictable phases are followed by two, more



unpredictable and usually more rapid ones, where the system breaks down and reorganizes.

Systems function across a hierarchy of scales, each having its own adaptive circles with different extensions in time and space. An important part of an over-all adaptive cycle for a complex system is the cross-scale effects when such cycles, at different scales in time and space, interact with each other. In general resilience derives from conditions that change and can be restored only slowly. Usually systems change in a smooth way, but sometimes there are dramatic shifts or even discontinuities. A process by which systems grow, adapt, transform and in the end collapse is so metimes referred to as Panarchy.

Holling ( 2004) extended the discussion of resilience and panarchy beyond environmental-social systems and into other parts of the society. He suggested that adaptive cycles occur in a similar way in other environments, in personal lives, societies, institutions, and in economical and political systems. An important part of the cycle is the destruction phase, which is unpredictable, rapid and with weakened control. Instability creates an opportunity for a fundamental transformation of a system and the rules that guide relations between its elements. Such instability might be part of a process of creative or destructive transformation. This is a time when a Gandhi or a Hitler may grab the situation and it might be hard to predict the outcome. Different persons and groups of people might have different agendas and views on what is desirable and what is not.

### ***Need for a new approach to manage systems***

The earlier view of nature and society as a system near equilibrium is being replaced by a dynamic view with emphasizes complex non-linear relations between entities under continuous change and facing discontinuities and uncertainty. The complexity of social-economical systems makes it necessary to abandon the perception of a global steady state. Instead it requires the ability to cope with, adapt to and shape changes without losing options for future development - it requires resilience. We must focus on learning to live within systems rather than controlling them.

Resilient management aims at preventing the system from moving to undesired system configurations in the face of external or internal stress and disturbance. It further nurtures and preserves the elements that enable the system to renew and reorganize itself

following a massive change. Management that uses rigid control mechanisms to harden conditions of social – economical - political systems can erode resilience and promote collapse. In contrast management can build resilience by being flexible and open to learning. It attends to slowly-changing, fundamental variables that create memory, legacy, diversity and the capability to innovate in the social, economic and political components of the system. Resilient building management increases the range of surprises that a system can cope. Building resilience requires understanding of the complex interaction among the different components and actors in society over the scales in time and space relevant for the system. Resilience analysis also enables stakeholders to compare maps of various pathways to the future. Such analysis is better attuned than command-and control solutions to address the conflicting objectives and complexity of a pluralistic society.

Resilience may not be always desirable. Some systems may be in an undesired state and there is a desire to change the situation. In such a case it might be interesting to reduce resilience to more easily change the system. Terror and criminal networks and groups could be resilient in an undesired way. Law enforcement authorities may today find those networks too resilient and want to explore ways to reduce their resilience. The on-going dramatic events in North Africa and the Middle East may illustrate that their autocratic systems are too resilient to allow a smooth transition to democracy.

Resilience has a cost. To increase resilience is different from improving the performance of a system in times of growth. Just as there are costs and benefits involved in diversifying an investment portfolio there are trade-offs and synergies between production and resilience in any social– economic–political system. As nobody gets credit for fixing problems that never happened, businesses do not generally pay enough attention to improve resilience of their systems (Repenning and Sterman, 2001). This may be equally true for social-political systems. Resilience building is focused on the behavior of a system rather than just the output. Applied to a nation state this could raise issues of security, social cohesion, health care and supporting development across the society.

Can resilience of nation states be measured? So far we have not been able to predict large scale turmoils be it Egypt, Tunisia or Soviet Union. How can we monitor key system variables and indicators of gradual changes and receive early warning signals of loss of resilience?

We have to understand where resilience resides in the system and how it can be gained and lost. Partial measures such as multiple independent indicators are inadequate. There is a need for an inclusive, integrated measure. “Inclusive Wealth” presented by Walker (2005) is an attempt to provide such an integrated measure of sustainable development. Assessing sustainability inevitably involves a forecast of the future and an assessment of the value of what is being sustained. This is similar to capital stocks where the current values depend on a forecast of the future. Physical capital includes any infrastructure of a society, and social capital refers to the rules used by those governing, managing and using the system.

An additional complication is that any measure of resilience deals with values. These can be judged quite differently among societies and among groups in a society. Policy should strengthen and stimulate development that enhances resilience in social-economic-political systems, recognizing the existence of multiple thresholds in a multi-dimensional space.

To establish a resilience landscape for a nation state is a huge challenge and a far-reaching goal. It is a substantial undertaking that should be shared by many. Even if the journey towards that goal would be long, it would gradually enhance our understanding of how different factor individually and in interaction with each other would influence the stability and sustainability of a state.

### **Resilience from the perspectives of a nation**

The following examples show how nation states have reacted to critical events and how their reaction might be discussed in terms of resilience. Terror events have happened during many years in several European countries including Germany, Italy, Spain, and UK (Judt 2007). This has no doubt been painful for those countries and specific countermeasures have been taken. All four countries have, however, maintained the basic values that underpin their societies and they have not changed their overall way

of acting, internally or externally. In terms of resilience they have not crossed a threshold but remained in the same basin of attraction.

The 9/11 event in the US had a more significant impact on the American society. As a result of the event the government made drastic changes in its foreign and defense policy with the declaration of war on terror and with military interventions. It also changed its attitude to fundamental values such as civil and human rights. Without having defined more specifically the US resilience landscape one may say that the US society has changed significantly and may have moved into new basin of attraction.

The break up of the Soviet Union is a dramatic example of the collapse of a non-resilient system. It was not a move from one stable state, or basin of attraction, to another, as for the US. It was an example of a destructive phase where the system could not remain in any stable basin of attraction. There were many reasons for this break-up, many of them related to the lack of resilience in the Soviet Union system. The system was rigid and lacked capability for self-organization and adaptation. The system lacked diversity in a number of important functions in the society; in its political, social and economical fields. Politically, the Soviet Union system did not contain multiple levels of governance with a fair degree of autonomy. The system was close to several thresholds in all these dimensions. It was also exposed to internal and external pressures. Given these clear signs of a fragile system, it is interesting to note that nobody predicted the rapid break-up of the Soviet Union. This illustrates what has been noted also for a number of social-ecological systems, that it is quite possible to explain events after they have happened but it has so far not proven possible to predict what will happen. Despite all the interesting work done so far we seem to lack the tools and understanding of how to assess resilience of a complex system and predict when it is likely to cross significant thresholds.

The collapse of the Soviet Union created opportunities for a fundamental transformation of the former system. It resulted in the creation of a number of independent nation states, those in East Europe have systems that over time moved very far from that of the former Soviet Union with a completely different stability or resilience landscape. It also reshaped the landscape in Russia and created a radically different economic, social and political system

A number of nations have gone through a cycle of growth, conservation, destruction and reconstruction. Paul Kennedy (1989) gives comprehensive analysis of a number of states that have gone through such a cycle. The rise and fall of many of those nations could present interesting cases for resilience analysis. Jared Diamond (2005) gives additional examples of societies that failed to sustain themselves and their systems.

China is another interesting example. It has undergone most significant changes over the last decades and its influence on the world scene has increased dramatically both economically and politically. China's economy and trade have developed in a dramatic way. The economical changes, not least the monetary and financial policies have been firmly controlled, and dramatic speculation that have been seen in other countries in the region, has so far been avoided (Stiglitz 2002; 2007). The rapid economic development has improved the social and economical situation for many Chinese citizens. The wealth has, however, been unevenly distributed, creating tension in the society. Even if the Chinese society has changed in many ways, the political system has remained essentially unchanged. Looking at the Chinese situation in the perspective of a resilience stability landscape, one may conclude that the system, in a decisive way, has been moved from one basin of attraction to another, offering improved economical and financial condition, keeping other elements of the society essentially unchanged. This has been done carefully avoiding crossing other thresholds that might make the system slide away in an uncontrolled way. It will be most interesting to see if this basin of attraction is stable enough to cope with the pressure that is likely to increase within the Chinese society from the uneven distribution of wealth and social welfare and the lack of democracy and human rights.

At the time of writing we witness how the people of Egypt and Tunisia have taken to the streets to demand democracy, freedom, economical and social reforms. Within a period of a couple of weeks the presidents of Egypt and Tunisia left their countries and a new era is about to begin. At this moment there is a great uncertainty where this will lead and how stable the process forward will be. The developments in Egypt and Tunisia are also influencing neighboring countries. These dramatic events were not predicted even if we in retrospect might understand why those countries were close to crossing significant thresholds with dramatic effects.

How about other nation states in the region and elsewhere? Can we use the concept of resilience to help understand what is happening and why? We are still far away from fully understanding the way different conditions in a country contributes to an integrated stability landscape and how to identify and avoid critical thresholds. It is, however, high time to explore if and how the resilience concept might be a valuable tool in addressing national and global security issues.

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## **The North Korean Healthcare System: On the Fine Line Between Resilience and Vulnerability**

Jasmine Barrett<sup>1</sup>

### ***Summary***

The healthcare system of the Democratic People's Republic of Korea (DPRK or North Korea) has been under significant stress due to lack of resources since the country fell into economic recession in the mid 1990s. This paper examines the current status of the system using the lens of resilience, focusing on the coping mechanisms employed by individuals, families, and healthcare workers. It is suggested that although the system has demonstrated elements of resilience, it would appear that it has been unable to return to "normal" function following the economic recession, and is now in a seemingly permanent position of vulnerability due to its reliance on international assistance.

### ***Introduction***

While the world pays keen attention to the nuclear program of the Democratic People's Republic of Korea (DPRK or North Korea), the serious humanitarian situation, including healthcare, is largely ignored. Relying on the most recent media (or humanitarian agency) reports and scholarly published articles, this paper provides an analytical commentary on the status of the North Korean healthcare system as seen through the lens of resilience, in the process exposing the vulnerabilities of the system. It will examine the coping mechanisms employed by individuals and families burdened by illness when the healthcare system is not functioning normally. It will also examine the coping mechanisms of healthcare workers to keep the system running as best they can, despite continuing challenges. Ongoing food shortages and subsequent widespread malnutrition are likely to contribute to an increasingly greater disease burden for the population and their healthcare system. However a discussion of the link between food security and health is beyond the scope of this paper.

Resilience and vulnerability will be examined at the system level, while coping mechanisms will be discussed at the individual and family level, as this is most pertinent to the

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current situation in North Korea. The following definitions of resilience and vulnerability are used in this paper:

*“Resilience is the capacity of individuals, families, communities, and institutions to anticipate, withstand and/or judiciously engage with catastrophic events and/or experiences; actively making meaning out of adversity, with the goal of maintaining ‘normal’ function without fundamental loss of identity.”* (Almedom 1)

*“Vulnerability: physical feature or operational attribute that renders an entity open to exploitation or susceptible to a given hazard.”* (Department of Homeland Security 34)

### ***History and Structure***

The North Korean healthcare system was established soon after the end of the Second World War, when the Korean peninsula was liberated from Japanese colonial rule. A publicly funded socialist system, it was modeled on the Soviet healthcare system. Free medical care for all citizens is guaranteed, to the present day, by the DPRK Constitution (Chapter 3, Article 56). The national public health law defines “preventative medicine” as the foundation of socialist medicine in the DPRK (Article 3). In fact, some hospitals are not called “hospitals” at all, but rather “prevention centers.” The section doctor system, where one doctor is responsible for the primary care of around 130 households, forms the foundation of the healthcare system. There are more than 800 hospitals at central, provincial, and county levels, and about 1000 hospitals and 6500 polyclinics at the Ri and Dong levels (a Ri is the administrative unit beneath a county in a rural area, and a Dong is same in an urban area). The entire healthcare workforce is estimated at 300,000 (WHO 2008: 35). Each of the ten provinces has its own medical university providing a steady supply of workers into the system (WHO 2009: 22).

### ***Devotion Movement***

The Devotion Movement was formalized within the North Korean healthcare system in the early 1960s by President Kim Il Sung, but had in fact existed unofficially since the mid 1940s, as the Workers Party of Korea emphasized the importance of healthcare workers’ devotion to their patients. The message of the Devotion Movement is summarized in Article 42 of North

Korea's Public Health Law: "*Medical personnel shall treat patients kindly, and afford them all possible wisdom and devotion in order to cure them.*" The Devotion Movement has similar characteristics of other loyalty movements in North Korea which emphasize loyalty to the Korean Workers Party, the leader Kim Il Sung, and to the fatherland. As part of the Devotion Movement, healthcare workers in North Korea wear name badges bearing the word 'Devotion' along with their name, position, and a red cross. According to one South Korean author, the purpose of the Devotion Movement is to "*reform the people's thought and mind along with complementing the lack of human and material resources*" (Choi et al. 48). Unfortunately, empirical data does not exist with regard to the impact of the Devotion Movement on patient care. However its importance cannot be underestimated as it remains the cornerstone of healthcare workers' philosophy toward their work, and may have a positive impact on system resilience.

### ***Economic Recession***

According to the World Health Organization (WHO), North Korea "*had achieved an efficient and effective free universal health-care system accompanied by impressive health indicators*" prior to the 1990s (WHO 2009: 11). However, the system suffered a severe blow as the entire national economy fell into recession in the 1990s. GDP per capita fell by half within the space of a few years dropping from USD 991 in 1993, to USD 457 in 1998 (Unicef 2003: 3). The largest single contributing factor to this dramatic contraction of the economy was the loss of favorable trade relationships with the former Soviet Union and China. During the Cold War, the North Korean economy had been supported with significant subsidies in its trade with the former Soviet Union and China, but this came to an abrupt halt and North Korea was forced to pay market prices in hard currency. Additionally, 1994 and 1995 saw severe flood and drought, and there was a breakdown in the public distribution system which prevented rations from being delivered. This plunged the country into a devastating famine leaving an estimated six hundred thousand to one million people dead (Haggard and Noland 1).

### ***Current Status of the North Korean Healthcare System***

The economic downturn had a significant impact on healthcare, and throughout the 1990s key health indicators such as the maternal, infant, and child mortality rates worsened as a result. Although there have been significant improvements in recent years, health indicators have still

not recovered to pre-recession levels. Furthermore, there is significant discrepancy between the health statistics cited by different institutions. The WHO put the maternal mortality ratio at 370 in 2005 (WHO, *World Health Statistics* 2008: 36).

Year	1993	1998	2008
Maternal Mortality Rate (deaths per 100,000 live births)	54	105	77
Infant Mortality Rate (deaths per 1000 live births)	14	24	19
Under-five Mortality Rate (deaths per 1000 live births)	27	50	55

Table 1. Sources IFRC (2), UNICEF (2003: 3-4), and (UNICEF 2008: 1) citing DPRK government figures.

Life expectancy has also decreased for both sexes from 72.7 years in 1993 to 69.3 years in 2008 (IFRC 2). Significant improvement has been seen in chronic malnutrition which decreased from 62% in 1998, to 37% in 2004 (WHO 2008: 34). According to the WHO, malaria re-emerged in North Korea in 1998, and reached epidemic proportions by 2001, with 300,000 reported cases. Concerted efforts by the Ministry of Public Health, the WHO, and other organizations have brought about a dramatic 95% decrease in the number of malaria cases from 185,420 cases in 2002, to 9300 cases in 2006 (34).

While the basic infrastructure of clinics, hospitals, and healthcare workers continues to exist, a number of stressors have had an ongoing negative impact on the system's ability to operate including a lack of financial resources, medicines and vaccines, power and heat, limited supply of clean water, and food shortages. Significantly, the shortage of electric power is said to be responsible for the decline of the domestic pharmaceutical industry, forcing North Korea to import medicine which had previously been produced domestically. In recent years the North Korean government has emphasized the revival of pharmaceutical plants, and one pharmaceutical factory now has Good Manufacturing Practice (GMP) certification; however the country remains dependent on drug imports (IFRC 3).

### ***Current System Weaknesses (Barriers to Resilience)***

Current system weaknesses include (a) health finance, (b) transportation and communication infrastructure, (c) human resource development, (d) clean water and energy, (e)

medicine and equipment. As we discuss the current system weaknesses it is worth noting the significance of the ongoing food shortage as a barrier to resilience. However, as mentioned earlier, discussion of the link between food and health is beyond the scope of this paper.

### **Health Finance**

The lack of finance affects all aspects of the healthcare system and means all resources are constantly in short supply. It is difficult for the system to return to normal function or build resilience without sufficient funding (Grundy and Moodie 120).

### **Transportation and Communication Infrastructure**

Shortage of vehicles limits the mobility of healthcare workers and the transportation of vaccines and hospital supplies. The limited and dilapidated road network means it takes four days to travel from the capital city of Pyongyang to the northeast corner of the country, a journey of 600 kilometers. In the summer monsoon season, travel can also be hindered by flooding. The insufficiency of finance and transportation greatly hinder the maintenance of the cold chain when transporting vaccines (121). In terms of communication infrastructure, private telephones are uncommon, but most hospitals are equipped with one or more telephones. Internet access is not available across the entire country, except in the offices of international organizations. However, most areas are connected to a domestic 'Intranet'. A 3G cell phone network operated by the Egyptian/DPRK joint venture Koryolink, began operations in December 2008, and now reportedly provides signal coverage within reach of 75% of the population. Coverage areas include the capital Pyongyang, 54 other cities and towns, and 22 highways and railways. As of September 2010 it had over 300,000 subscribers and was rapidly expanding (Williams).

### **Human Resource Development**

Human resource development is critical to the modernization and updating of the health sector, but due to the isolation of North Korea, some health practices and standards are outdated. Most hospital directors are trained in medicine but not in management and supervision. North Korean healthcare workers could greatly benefit from additional training to modernize their skills, as well as domestic or international peer exchanges for which there are currently few opportunities (Grundy and Moodie 120-121).

## **Clean Water and Energy**

Particularly in rural areas there is a shortage of electrical power and clean water supply to hospitals and clinics. This is particularly challenging in winter months when temperatures drop to below freezing for weeks or months on end, and the only heat source available is scarce firewood or coal. The lack of a sufficient clean water supply to some clinics seriously affects their ability to maintain cleanliness and hygiene (120).

## **Medicine and Equipment**

The shortage of medicine means that hospitals often do not have sufficient medicine to treat patients, nor can they keep a buffer stock of supplies in case of an emergency. The shortage of medical equipment means hospitals are forced to use worn out tools and reuse products which are designed to be disposable. Surgery is particularly risky in this situation and can lead to poor outcomes. Inadequate sterilization of equipment leads to disease transmission and post-secondary infection. Although there are no available statistics, experts suspect these practices contribute significantly to Hepatitis B transmission (Interview with HL).

## **Vulnerability to Politics and Sanctions**

While the DPRK's reliance on international assistance to support its healthcare system is not uncommon for a low income country, this reliance presents an added vulnerability. North Korea's political relations with its immediate neighbors (South Korea, China, Japan, Russia) and the US are tense at best, and often outright confrontational. South Korea, China, and the US are incidentally North Korea's largest donors of humanitarian assistance. While donors' intention is to de-link humanitarian assistance from politics, unfortunately this rarely happens. In February 2010, the US Special Representative for North Korea Policy, Ambassador Stephen Bosworth, reiterated the US policy to begin a discussion on aid to North Korea, only once "significant" progress had been made in the Six Party Talks on denuclearization (Bosworth). An example of this policy in action was seen in 2008 when the United States pledged to supply 500,000 metric tons of food aid to North Korea as part of a denuclearization deal. However, only about a third of this aid was delivered before disagreements between the two governments prematurely ended the aid program (Manyin and Nikitin 7).

In relation to the political situation, the DPRK's national economy has been stifled for decades under international sanctions, which intensified after it carried out nuclear tests in 2006 and 2009. In September 2005 the US implemented financial sanctions against Banco Delta Asia

in Macao, after the Financial Crimes Enforcement Network (FinCEN), a part of the US Treasury Department, designated it a “financial institution of primary money laundering concern” (US Department of Treasury). This led to a run on the bank by customers. Macanese authorities responded by freezing \$24 million in North Korean accounts while an audit was conducted (Taylor 32-33). In addition, suspected involvement of the North Korean state in the trafficking of narcotics, as well as counterfeit US dollars and cigarettes, has brought further condemnation, particularly from the US. Such concerns and allegations have left the country increasingly isolated (Perl 4).

A recent report to the US congress admits it is difficult to gauge the effectiveness of international sanctions in deterring further nuclear tests and illicit trade (Nikitin 16). The situation has made life difficult for the average citizen, as foreign partners and humanitarian programs are deterred from engaging in legitimate trade and aid implementation. UN agencies are required to implement additional accountability measures which take precious financial and human resources away from actual health work. In the case of the Global Fund to Fight AIDS, TB, and Malaria, this is known as the Additional Safeguards Policy (ASP). Furthermore, sanctions impede what can be imported into the DPRK. For example, one US based NGO, was stopped from donating soccer balls to children at a pediatric hospital, because “sporting goods” are included on the list of prohibited ‘luxury’ items under UN Security Council Resolution 1874 (UN Security Council Resolution).

### ***Strengths***

Despite the weaknesses discussed above, the North Korean healthcare system's strengths include its 300,000 strong workforce and far-reaching hospital and clinic system, based on the section doctor system (WHO 2009: 6). A seasoned NGO worker commented on the remarkable creativity, inner strength, and tenacity exhibited by North Korean healthcare workers. They are accustomed to getting by with very few resources, so when given even a small amount of assistance “they pick up and run with it,” often producing big results, according to the NGO worker (interview with HL). Indeed, the system has demonstrated an impressive ability to perform well and produce results when the necessary financial resources are available. The centralized administration is able to implement a nationwide plan in record time using the

extensive network of hospitals and clinics. For example, in 2007 the WHO released the following press report:

*“PYONGYANG, 20 April 2007 -- In one of the fastest responses to a major outbreak of measles, 16 million children and adults [two thirds of the entire population] ...have now been immunized against the disease, less than a month after the government asked for assistance.*

*In the first phase, more than six million children, aged six months to 15 years, were vaccinated between 14 and 18 March 2007, some of them within just three days of the arrival of the vaccines in the capital of Pyongyang. The second phase from April 9 to 11 targeted more than 10 million children and adults aged from 16 to 45.”*

### ***Cracks in the System?***

In 2010, Amnesty International released a report on the state of the North Korean healthcare system based on interviews with 40 former North Korean citizens who had resettled in South Korea. The interviewees describe the situation of healthcare in North Korea somewhat differently to the picture painted by internal sources. Interviewees claim healthcare is no longer free, and doctors have to be bribed for their services. Furthermore, medicine is generally not available at hospitals and clinics, and therefore has to be purchased at a market (Amnesty International 2).

The situation with bribing doctors warrants further analysis. Is this a situation where doctors are taking advantage of their positions and demanding money for personal gain? Or, is it rather the case that doctors are forced to charge for their services in order to keep the system functioning because the resources they receive from the state are insufficient? Based on brief personal observations and limited conversations with North Korean doctors, I would suggest that it is the latter. Doctors admit that due to financial constraints the state cannot provide them with sufficient resources to maintain their hospitals, nor can international humanitarian agencies for that matter. Their only options are to improve self-sufficiency (which will be discussed below as a coping mechanism), or directly charge patients for treatment. Although I have no direct knowledge of doctors receiving monetary payments from patients, doctors do talk of families supplying food to the healthcare facility where their relative is an inpatient. Indeed, the barter economy is significant in North Korea, a socialist country where the monetary economy is of far lesser significance than in a capitalist country. There is insufficient data to form a reliable picture

of the prevalence of healthcare workers charging patients for treatment, be it monetary or non-monetary forms of payment. Regardless, Amnesty International identifies a legitimate concern regarding access to healthcare by those with the least social support (i.e. the homeless, elderly without family, or orphaned children) who may be falling through the cracks (10).

Next, there is the situation of access to medicine, which according to Amnesty International's report, is often unavailable at hospitals, or, if it is available, it is not free. The report states that medicine can also be purchased at markets, but this poses certain risks as it is an unregulated business and many of the available drugs are counterfeit (16). Likewise, this represents an area for further research as too little is known about the prevalence of these practices or the accuracy of the claims.

### ***Individual and Family Coping Mechanisms***

Coping mechanisms employed by individuals and families affected by illness include going to China to seek treatment, or borrowing money from friends and relatives to pay for medicine and treatment. Sometimes overseas relatives send money to support their family members. However, such coping mechanisms are likely to be limited to border residents and the middle and upper classes.

Increasingly, people from all sectors of society are not turning to hospitals for treatment when they are sick (Grundy and Moodie 121), but rather staying at home and having their family members nurse them back to health. This allows families to stay together, and reduces work for the caregiver, who would otherwise have to make a journey to the hospital to provide patient food. Another potential benefit of at-home treatment is that the sick individual's ration stays with the family. When an individual becomes an inpatient their ration is transferred to the hospital, which can have a negative impact on the food security of their family. At-home treatment for TB patients is also said to be preferred because the social stigma attached of having the disease limits marriage and career prospects, and individuals try to hide their TB status through at-home treatment. According to the IFRC, another reason for at-home treatment is the lack of heating at healthcare facilities, where winter temperatures can drop to -30 degrees Celsius, and voluntary bed occupancy rates are often below 50% of institutional capacity (IFRC 2-3).

However, there are several risks associated with this behavior. For example, successful treatment of TB requires a patient to take a specific course of several drugs over a period of six



to eight months. These medicines often have side effects, and must be taken under a doctor's supervision. If a patient takes the medicines incorrectly, or stops taking them prematurely, they can relapse and the disease organism can develop drug resistance to the medicines. Furthermore, in an at-home situation sick individuals are more likely to spread infection to their family members.

### ***Healthcare Workers Coping Mechanisms***

As the North Korean healthcare system fails to provide sufficient resources, healthcare workers are increasing their self-sufficiency by growing herbal medicine, food crops, and raising livestock on the land surrounding their hospitals. Doctors are increasingly prescribing traditional (Koryo) medicine due to the lack of pharmaceutical drugs (WHO 2008: 33).

As described above in the report by Amnesty International, healthcare workers are able to keep their hospitals and clinics open despite the lack of resources from the state, by charging for services and selling medicine. Another creative money earner is selling medical certificates which excuse people from showing up for work. These medical certificates are sought after by people who seek to engage in trade or private enterprises, rather than performing their state assigned occupations (Amnesty International 21).

### ***Maladaptive Coping Mechanisms***

On a more somber note, there have been anecdotal reports of healthcare workers suffering due to the lack of safety measures to protect their physical health in the course of their daily work. Officials from the Ministry of Public Health have expressed concern for their colleagues, TB doctors, who willingly expose themselves to infected patients, even when they do not have the resources to protect themselves from infection. They may eventually contract the disease, and may suffer several relapses over the course of their careers causing them to take TB drugs for an extended period of time. The drug Isoniazid taken for TB treatment has been linked to memory loss (Isoniazid Fact Sheet), which has been reported in doctors who have been taking it long term. This may affect their ability to manage their patients and administrative tasks.

Due to a lack of alternative technologies, TB patients are sometimes diagnosed using direct fluoroscopy. This involves having the patient sit in front of a radiation source in a dim room. The radiation is projected through the patient onto a fluoroscopy screen in front of the

doctor's face, allowing the doctor to view the patient's lungs in real time. However, doctors frequently lack the protective garments to needed prevent exposure to radiation in the process (Linton et al. 153). This practice is known to cause cataracts, and one US based NGO has reported radiation related deaths due to this practice (Glain).

A third maladaptive coping mechanism to try to extend the application of medicines in short supply involves dripping medicine directly into patient's lungs instead of giving the standard oral dose. Linton describes this *“extremely painful process involv[ing] inserting a very long hypodermic needle into the patient's lungs with the tuberculosis medicine. The doctors have also experimented with the insertion of a tube down the trachea into the lungs and dripping medicine on a daily basis. Inevitably, there is a high risk of post-secondary infection and pneumonia”* (Linton et al. 154).

### **Conclusion**

The North Korean state has been engaging with humanitarian agencies, including UNICEF, the WHO, and private NGOs to strengthen the system and promote resilience. However, health indicators as well as on the ground reports confirm it has not been sufficient to return the system to 'normal' function. Indeed, the system as it currently stands is alarmingly vulnerable due to its reliance on international humanitarian aid, which rests to a large extent on North Korea's political relationships with its neighbors.

North Korea's institutionalized philosophy of devotion represents a unique aspect of the North Korean healthcare system, and may contribute to increased resilience at the system level. Faced with inadequate resources, healthcare workers employ a variety of coping mechanisms which they attribute to the devotion movement. In this sense, the Devotion Movement may represent an institutionalized emphasis on finding and implementing creative coping mechanisms.

The efforts of healthcare workers to keep the system running are remarkable and demonstrate an inner resilience, but these efforts are probably not sustainable in the long term, nor are they a replacement for much needed systemic inputs such as financial resources, and clean water and energy infrastructure and supply. A great deal more international assistance is needed to bring North Korea's healthcare system back to full functioning capacity. The North Korean government has been vocal in their requests for further international humanitarian assistance, a tacit admission that they realize they are unable to meet the people's healthcare

needs on their own. However, in recent years the amount of aid forthcoming has been woefully insufficient to meet the dire need. Given the political situation, it is unlikely that such assistance will be forthcoming in the short-term, and the past fifteen years of failed denuclearization negotiations do not bode well for a diplomatic solution to current political tensions. A realistic solution to the challenges plaguing the North Korean healthcare system appears to be out of reach in the short term. In the long-term, reunification with South Korea could be the catalyst needed to attract international support and assistance, which might feasibly provide the necessary impetus and resources to repair and revitalize the system.

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## **No Recourse Left: The Impact of Poverty on the Resilience of Women from the Migrant-Sending Countries of Central Asia to HIV/AIDS**

Hillary Eason<sup>1</sup>

### ***Summary***

In recent years, Central Asia has found itself with one of the fastest-growing HIV epidemics in the world. Poverty, while not a direct cause of HIV/AIDS infection in the region, is a recurring theme in any overview of the many ways Central Asian women find themselves susceptible to the disease. This paper attempts to trace poverty as a variable that negatively affects the resilience of women in the migrant-sending countries of Central Asia (Tajikistan, Uzbekistan, and Kyrgyzstan); resilience is defined as “the capacity of individuals, families, communities, systems and institutions to anticipate, withstand and/or judiciously engage with catastrophic events and/or experiences” (Strauch, Muller, and Almedom 2008). In the paper, the direct and indirect effects of poverty on women’s social capital are analyzed, as well as its impact on women’s tendencies towards high-risk behavior. The evidence presented suggests that HIV prevention for women in the region should be expanded from current approaches that focus largely on existing high-risk populations, and that a shift in our HIV paradigm is necessary in order to understand the disease as a social health issue that requires structural reforms to effectively halt.

### ***Introduction***

In Central Asia, approaches to HIV/AIDS prevention for women have tended to be directly prophylactic, with both efforts and study focused on prevention among existing high-risk groups such as intravenous drug users (IDUs) and commercial sex workers (CSWs) (Renton et al. 2006). Given the continuous rise of infection among women in the region over the past decade, however, it is increasingly clear that an ecological approach to the epidemic may also merit consideration (Donoghoe, Lazarus, and Matic 2005). By considering the structural factors that lead women into risky situations, it may be possible to stem the rising tide of infections, both by ameliorating risk for women in potentially hazardous situations and by decreasing the number of women at risk.

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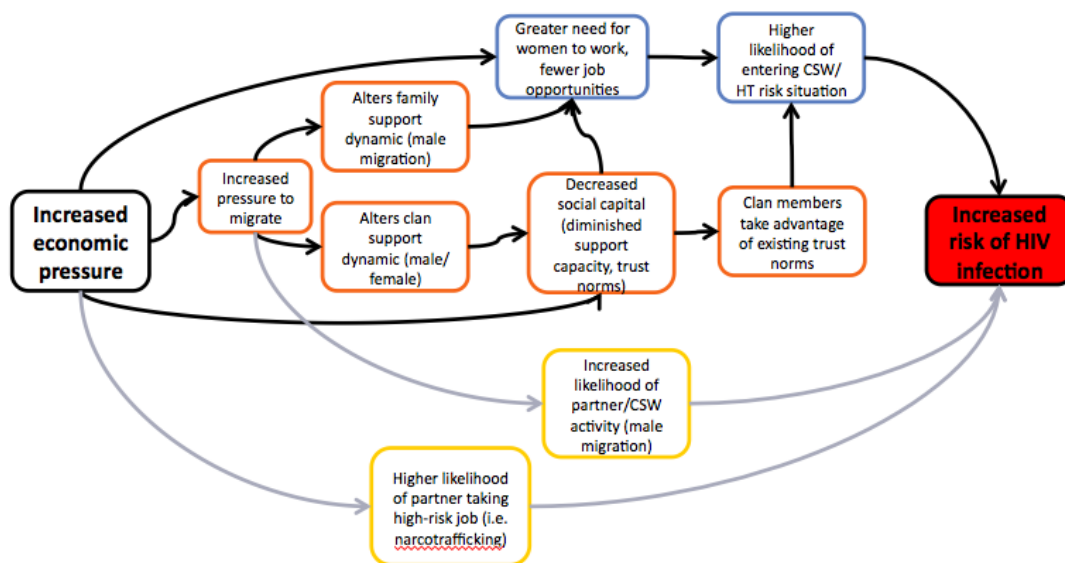
Poverty, while not a direct cause of HIV/AIDS infection, is a recurring theme in any overview of the many ways women find themselves susceptible to the disease. In addition to negatively affecting both the employment situation and the job market for Central Asian women, increased financial instability in the region has also led to labor migration trends that have seriously affected the underlying structure of these societies, effectively depleting the supply of social capital on which women might otherwise rely in times of financial stress. Furthermore, poverty has also led increasing numbers of men to high-risk jobs such as narcotrafficking, thus increasing the risk that women will take on sexual partners who are HIV positive.

This paper attempts to trace poverty as a variable that negatively affects the resilience of women in the migrant-sending countries of Central Asia (Tajikistan, Uzbekistan, and Kyrgyzstan). Resilience is defined as “the capacity of individuals, families, communities, systems and institutions to anticipate, withstand and/or judiciously engage with catastrophic events and/or experiences” (Strauch, Muller, and Almedom 2008). While some linkages have been posited in Western cultures between decreased economic opportunity and poor health outcomes (Smolak 2010), less significant analysis has been devoted to the role it plays specific to HIV/AIDS in Central Asia. My argument focuses on “capability poverty” – a measure that incorporates access to public services, assets, and employment (Falkingham 1999) – in addition to the more conventional “income poverty.”

In the paper, I argue that both capability and income poverty have the potential to hurt women’s ability to anticipate and withstand this public health emergency in three major ways: by increasing economic pressure to engage in high-risk occupations and work patterns, by depleting the social capital on which women might otherwise rely in times of financial stress, and by increasing the risk level of their sexual partners. The overall effect is to make both women and their partners increasingly more likely to engage in high-risk activities by necessity, rather than allowing them to make considered choices about their chosen activities and occupations that might allow them to sidestep potential exposure to HIV.

Because accurate numbers remain difficult to obtain, this paper can only be considered a beginning investigation into the possible effects of poverty on this

demographic's resilience; nonetheless, existing trends suggest that, at the very least, further fieldwork be conducted in this area. They also suggest that HIV/AIDS should be considered a holistic "social health" issue, one whose solutions will require structural reforms in addition to preventative efforts. While this approach has been adopted in some academic circles, the continuing focus of major donors such as USAID on direct prevention and treatment rather than the integration of structural reforms suggests that continued promotion of awareness of HIV's extenuating factors is necessary.



**Figure 1: A causal pathway of the effects of poverty on female resilience to HIV.**

### *Methodology*

This paper focuses on the countries of Tajikistan, Uzbekistan, and Kyrgyzstan, which are classified as "migrant-sending" rather than "migrant-receiving" based on the proportion of population exit and entry (Marat 2009). Because Kazakhstan, the fourth country in Central Asia, has a marginally stronger economy based on the presence of considerable oil reserves, it tends to receive many more migrants than it sends (Marat



2009). For the migrant-sending countries, however, common poverty-related factors affecting women are considerably easier to isolate.<sup>2</sup>

My analyses for this paper are drawn largely from existing literature and statistics documenting the linkages between poverty, social capital, and various high-risk activities, as well as that detailing the linkages between those activities and increased likelihood of HIV/AIDS contraction. The purpose of this research is to collate existing knowledge of these potential causal pathways, with poverty as the common driving factor, and examine it through the framework of resilience.

### ***Background***

The Central Asian countries are among the poorest of the post-Soviet states. After the fall of the USSR, the region was left with an economic infrastructure heavily dependent on an empire that no longer existed (Sievers 2003). Combined with poorly executed transitions to a free-market economy and widespread resource mismanagement (Sievers 2003), this led to skyrocketing unemployment, with 26 million jobs lost in the decade after independence (UNICEF 1999). The rise in unemployment has led to huge increases in the number of labor migrants, who tend to leave rural areas in hopes of finding jobs in better-off cities or countries. In Tajikistan, for example, one in four households are reported to have a migrant member (Marat 2009).

Women face additional obstacles in the post-Soviet workforce with the renewal of formerly abandoned patriarchal norms (Corcoran-Nantes 2005). While women under the Soviet system had considerable participatory power, the position of women underwent what Corcoran-Nantes characterizes as a “rapid deterioration” in the years following the fall of the USSR. Without the enforced gender parity of Soviet rule, women have found themselves increasingly unable to advocate for education, equitable working conditions, and political representation (Lubin et al. 2007).

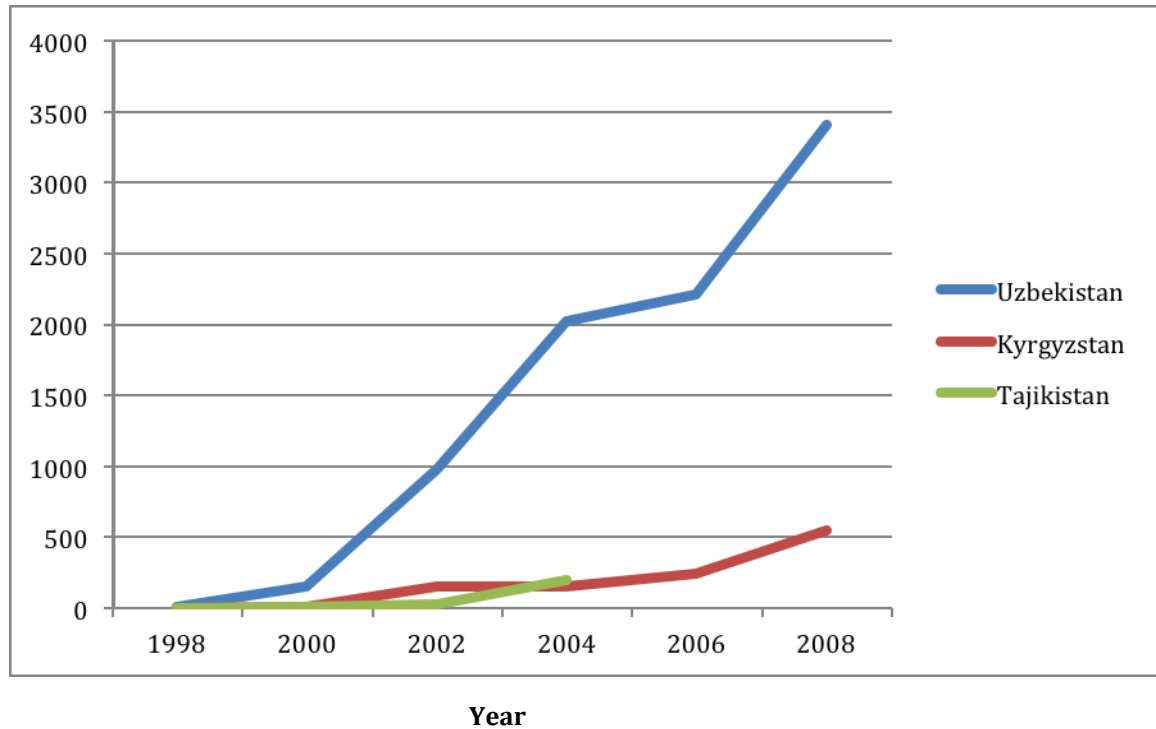
The post-Soviet period has also been marked by a significant rise in disease, especially HIV/AIDS and tuberculosis (Zahorka and Bodiang 2002). While infection

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<sup>2</sup> Turkmenistan, the fifth country considered to be part of Central Asia, has a roughly neutral net migration count (Marat 2009). Additionally, information about HIV/AIDS statistics in the country is for the most part unavailable due to governmental restrictions. For those reasons, it is not included in this analysis.

statistics reported by the governments of these countries remain incomplete, the limited numbers available reveal a significant (and, in the case of Uzbekistan, exponential) increase in the rates of new infections diagnosed each year. (See Figure 1.)

**Newly Diagnosed HIV/AIDS Infections in Central Asia, 1998-2008**



**Figure 2: Newly Reported Infections, 1998-2008. (Source: UNAIDS, USAID, WHO) (note: no data is available for Tajikistan in the year 2006)**

While the population numbers of people living with HIV/AIDS (PLWHA) remain low relative to the rest of the world, UNAIDS has calculated that the disease is spreading faster in Central Asia than anywhere else in the world (Krastev 2008).

***Poverty, Female Resilience, and High-Risk Employment Patterns***

Perhaps the most obvious manner in which economic pressures negatively affect women’s capacity to anticipate HIV infection is by drastically limiting their employment options. While commercial sex work remains highly stigmatized in Central Asia (Oberzaucher 2006), all of the countries in the region have seen dramatic increases in the number of sex workers (Pickup 2003). In Dushanbe (the capital of Tajikistan) alone, the number of CSWs nearly doubled over a three-year period, from 2,725 to 5,000 (Sarang

2005). Surveys of sex workers in these cities have suggested that both internal migrants and immigrants comprise an active portion of this population (Amin 2005; Marat 2009)

Given the dubious perceptions and frequently illegal nature of commercial sex work, confirmation from women of their participation in CSW can be difficult to obtain, which suggests that the numbers available may actually be low estimates (Bosc 2001). Both anecdotal and statistical evidence, however, suggests that the rise in voluntary participation in sex work has been precipitated, at least in part, by increased economic necessity (Sarang 2005). Human capital indicators, such as literacy, are decreasing but remain high in the region (UNICEF reports, for example, that 99% of Uzbekistan's residents are literate) (Anon 2004), a factor that suggests that women are not turning to commercial sex work because of a lack of education or capacity.

Further supporting the theory that commercial sex employment is driven at least somewhat by economics is evidence from a survey of Central Asian sex workers conducted by the Central and Eastern European Harm Reduction Network, which revealed that CSWs were more likely to engage in unsafe sexual activity (e.g. forgoing condom usage) in exchange for more money (Sarang 2005). Furthermore, sex work is the sole source of income for the vast majority of sex workers (Watson 2000), 85% of whom are also supporting children or other family members (Sarang 2005).

Economic pressure also leads many women into situations of human trafficking, in which women find themselves involuntarily working as sex workers. Surveys of human trafficking victims have shown that they often serve as the head of their household and have at least one child to support (Bosc 2001), and many do not receive any sort of federal unemployment benefit (Watson 2000). Advertisements or word of mouth convey promises of retail jobs, domestic work or mail-order bride positions, generally requiring relocation (Watson 2000); after migration, women often find themselves living illegally in foreign countries with little to no legal protection (UN Office on Drugs and Crime 2006). The power dynamics of sex work in Central Asia make HIV/AIDS transmission far more likely than among non-sex workers (Sarang 2005). Error! Bookmark not defined. Because women find themselves in such an occupation for financial reasons, they often have little recourse but to acquiesce to customers' demands, which makes implementing preventative measures such as condom usage difficult (Oberzaucher 2006).

The unwillingness of the police to intervene in situations in which sex workers may feel threatened (Smolak 2010) contributes further to sex workers' difficulties in implementing prophylactic and protective measures.

The same issues apply, but with greater magnitude, to victims of human trafficking, who may face threats of violence and familial retribution if they attempt to assert their right to protection (Bosc 2001). Given the unwillingness of the governments of these countries to acknowledge trafficking in persons as a major issue (Mattar 2005), victims have little recourse in seeking to escape the human slave trade.

The ultimate effect of these trends on female resilience is a decreased capacity to anticipate HIV/AIDS infection. Even with prior knowledge of how the infection is transmitted (Todd et al. 2007), women under intense pressure to provide for themselves and their families may not be able to avoid entering the sex trade, where their ability to take action to protect themselves from HIV is further compromised. As Anya Sarang describes it in the CEE/HRN report, "Much of the region, especially in Central Asia, comprises culturally conservative countries in which women who engage in any sex act outside of marriage are frequently abused, shunned, and ostracized by their families and society overall. That they would turn to—or be forced into—sex work provides some of the strongest proof possible that many nations' social and economic safety nets have frayed into irrelevance. Young women engaged in sex work are among the most vulnerable members of male-dominated societies from every perspective imaginable."

### ***Poverty, Female Resilience, and Social Capital***

While decreased employment opportunities do contribute to women's likelihood to engage in high-risk employment patterns, such a pathway does not provide a full explanation for this increased vulnerability. In Central Asia, where familial clans are the basic unit of societal structure, women in earlier times have been able to rely on their clan networks when faced with severe poverty (Collins 2006). There is evidence, however, that economic pressures are eroding both the availability and capacity of such networks for women. Because many of the effects of poverty on social capital are at least in part attributable to relatively recent labor migration patterns, only preliminary study has been done on the consequences of these population shifts for existing societal structures, and it

is possible that their effects are only beginning to be seen. However, initial findings suggest that this is an area of potentially great significance that merits further study.

### **Definition and utility of “social capital”**

The construct of social capital is one with a wide variety of definitions, all of which attempt to quantify the effects of relationships and networks on human well-being (Foley and Edwards 1999). Much of the literature regarding social capital and health focuses on either the effect of various diseases (HIV/AIDS very much included) on a culture’s supply of social capital or the effects of behavioral norms on high-risk activities (Campbell 2001). However, an empirical review of the concept of social capital by Michael Foley and Bob Edwards in the *Journal of Public Policy* finds “little to recommend in the use of ‘social capital’...to represent norms, values, and attitudes,” while social-structural interpretations of social capital...have demonstrated considerable capacity to draw attention to, and illuminate, the many ways in which social resources are made available for individual or group benefit, which we take to be the prime focus and central attraction of the social capital concept (Foley and Edwards 1999). The case of the migrant-sending countries of Central Asia, where high stigmatization of HIV/AIDS risk behaviors has failed to stem the growth of the CSW and IDU populations, would seem to bear this analysis out.

For that reason, this paper considers “social capital” as a variable that focuses on resources available to individuals. In this paper, I use Eric Sievers’ definition of the term, applied to the region in his book *The Post-Soviet Decline of Central Asia: Sustainable Development and Comprehensive Capital*, in which he defines a social capital asset as a network combining two or more people and a society’s stock of social capital as “the sum and breadth of such networks” (Sievers 2003). Such a definition is especially useful in the context of Central Asia, where interpersonal clan networks have historically played a significant role in individual survival (Starr 2006).

### **Social capital before the fall of the Soviet Union**

According to Kathleen Collins, a clan is defined as “an informal social institution in which actual or notional kinship based on blood or marriage forms the central bond among members” (Collins 2002). Clans have “defined Central Asian life for centuries,”

in part due to the persistent presence of outside conquerors (Carrington 2008). Clans function as an extended safety net based on loyalty (UN Office on Drugs and Crime 2006), and play an integral role in day-to-day life: depending on location and clan, everything from budget to cooking pot may be shared between clan members (Kandiyoti 1999). The rise of Soviet oppression, rather than weakening these structures, may actually have strengthened them (Rose 1998).

### **Social capital and clan structure after the fall of the Soviet Union**

While clans have retained much of their importance in the post-Soviet period (Starr 2006), there is evidence that increased economic pressures have begun to weaken the support networks – and thus, the social capital – available to their members, especially women. For a woman living under the poverty line in the region, this can take several forms: labor migration can remove her spouse, creating increased pressure for her to serve as a breadwinner; economic pressures may require her to migrate, which deprives her of the highly localized networks that might otherwise support her as she looks for a job; family and clan members themselves may be facing economic strain that prevents them from providing financial and employment assistance; clan members may be tempted by economic incentives to take advantage of existing trust norms by luring women into human trafficking; and increased general patterns of migration among clan members may simply unravel formerly dense – but highly localized – clan networks.

### **Direct Effects of Individual and Spousal Migration**

As previously mentioned, the vast majority of women engaging in sex work are functioning as economic supports for other people in their lives. One frequent reason for this is that partners, with whom they could divide support responsibilities, have also been forced to leave the more rural areas of the migrant-sending countries in order to find work; while remittances from these absentee spouses may be weeks or months in coming, sex work provides an “immediate financial exchange” (Smolak 2010). Effectively, this depletes social capital in that it deprives women of one asset of social capital – that is, a relationship between two people. As a result, women have an increased burden in terms of family support, without the economies of scale present with two salaries (Bosc 2001).

Female migrants, meanwhile, are often separated from the clan networks on which they have traditionally relied, a fact that deprives them of support as they seek to find a safe way in which to provide for themselves and their families. According to Sarang's CEE/HRN survey of support organizations for female migrants and sex workers,

Nearly all projects surveyed for this report said that a substantial proportion—often more than half—of their clients were migrants from rural areas, regional cities, or other countries in the region. Migrants are usually more likely than natives to be vulnerable to harassment and abuse from authorities and clients, often because they are reluctant to report violations (they may be illegal immigrants) or are unfamiliar with their surroundings. Their isolation may be exacerbated by a lack of family assistance or social support network (Sarang 2005).

Such women are also more likely to be unaware of social services, such as harm reduction services, about which they might otherwise have heard through word of mouth (Sarang 2005), which further compromises their ability to educate themselves on and protect themselves from HIV/AIDS infection. In addition, female migrants are more likely to be in a financially precarious position (Renton et al. 2006), and without the support networks that might otherwise provide job leads or assistance with child support (Marat 2009), they may find themselves more quickly required to turn to available high-risk employment (IRIN 2006).

### **Decreased capacity of clan support networks**

As previously described, clans have historically played a vital role in supporting individuals' financial and physical well-being. This is due in part to the depth and breadth of the networks they provide. However, the capacity of the clans themselves have been diminished by poverty-driven migratory labor patterns that disrupts the traditional structure of the clan, by lessened individual ability to support other clan members financially, and by poverty-driven erosion of trust norms that may decrease the number of networks a woman is willing to use.

### **Fraying of clan networks**

Clan-based networks, as they currently exist, provide a vital survival tool for their members, especially those considered to be “non-elite.”<sup>3</sup> Indeed, as Collins’ comprehensive ethnography of clan structure describes it, “Even if non-elites wanted to escape the network, they would have difficulty surviving outside of it” (Collins 2006). Clans assist with the social and economic crises of their members, helping with “finding jobs, dealing at the bazaar, gaining access to education, getting loans, obtaining goods in an economy of shortages, and obtaining social or political advancement” (Collins 2006).

Because clans are defined in part by their ability to live, work, and play together (Starr 2006), however, the drastic increase in rural-to-urban migration has begun to affect the efficacy of these networks. Kostyukova’s ethnography of Kyrgyzstan showed that the traditional *aul* structure of Kyrgyz clans was under severe strain due to increased migration, causing network fragmentation (Kostyukova 2002). Collins, too, argues that the “dramatic increase” in labor migration is likely to “transform” clan relations (Collins 2006).

### **Inability of clan networks to provide financial support**

As previously stated, one of the major purposes of the clan network is to function as what the UN characterizes as a “social safety net” (UN Office on Drugs and Crime 2006). However, overall poverty diminishes the strength of these networks in terms of mutual support. Kanji’s survey of women’s livelihoods in Tajikistan (2002), for example, found that respondents reported that they were increasingly unable or reluctant to request assistance from friends and neighbors, as so many families were having difficulty procuring enough food for their own households. As Kandiyoti (1999) characterizes it, “The decision of whether to share daily consumption, or not, involves a wide range of considerations, both monetary and relational, and may undergo modifications depending on changing circumstances.”

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<sup>3</sup> While the definition of “elite” may vary from clan to clan across the countries in question, women are less likely than men to acquire this status given their traditionally subordinate role in clan life.



### **Decline in traditional clan trust norms**

Human trafficking victims are often brought into their situation by recruiters – men or women who promise marriage, jobs, and financial stability to women in poverty. These recruiters, employed by traffickers, tend to be known to the victim, often taking the form of formerly trustworthy roles such as relatives or friends (Marat 2009); parents, especially in constrained financial circumstances, are also reported to be major links between young women and traffickers (Mattar 2005). In many cases, victims themselves may be brought back to recruit among friends and relatives in exchange for financial remuneration (UNICEF 2009).

The rise in human trafficking, coupled with the formerly vital role that clan ties play in both individual and collective life, suggest extreme financial pressures being exerted on the recruiter. Because clan members exist in a densely woven network of interconnection, strong norms of community trust exist (Collins 2002) that may not be broken lightly, as the potential damage may be irreparable.

The sum of this decline in social capital, in layman's terms, is that while cultural expectation remains that support networks can provide for women in times of financial stress, the actual economic and social support that women are both able and willing to take advantage of is less abundant. The likelihood, then, of women finding themselves in positions of vulnerability – in which they are not empowered to anticipate infection and make the safest choices available to them – is greatly increased.

### ***Poverty, Female Resilience, and Partner Risk***

The last component of the effect of poverty on the resilience of Central Asian women to HIV/AIDS is the potential risks increased poverty creates for their sexual partners. While unemployment has disproportionately affected women, men in the migrant-sending countries have also seen a decline in available jobs, which has contributed to increased risk in two major ways: by increasing the likelihood of participation in a high-risk occupation (in the case of men, this is more likely to involve narcotrafficking than sex work (Donoghoe, Lazarus, and Matic 2005)), and by increasing the likelihood of commercial sex worker usage (Godinho 2005). Male migrants are also more likely to emigrate to Kazakhstan and Russia, where HIV infection rates are even

higher than in the migrant-sending countries of Central Asia, a factor that further exacerbates their risk of infection (Aslan 2008). Marriage norms and financial dependency in the region, however, often prevent women from engaging in protective measures even with committed sexual partners (Oberzaucher 2006), and such potentially hazardous relationships further decrease their resilience to HIV/AIDS exposure.

### **Sexual Partners and Narcotrafficking**

Trafficking in narcotics has been on the rise in the region for the better part of the past two decades, with opiates produced in Afghanistan frequently sent along the so-called “Northern Route” that cuts through Tajikistan, Uzbekistan, and Kyrgyzstan (Thachuk 2007). Drug abuse rates increase along these routes (UN Office on Drugs and Crime 2006), and correlation between narcotrafficking, intravenous drug use, and HIV/AIDS infection is so high that epidemiologist Chris Beyrer has actually traced the spread of HIV along the most commonly used drug transportation routes in the region (Beyrer and Stachowiak 2002).<sup>4</sup>

The increased participation in drug trafficking in Central Asia can be understood as part of the region’s overall economic decline (Donoghoe, Lazarus, and Matic 2005). As the former Kyrgyz chair of the Commission on Drug Control describes it, “In some regions, the only way to survive is to take part in the drug trade” (Burghart and Sabonis-Helf 2004). In Tajikistan, where calamitous economic mismanagement means that even white-collar employees such as doctors and civil servants barely make enough to survive, displays of conspicuous wealth – such as cars – are derisively referred to as “drug mobiles.” “If you see a nice car in Tajikistan,” says CACI’s Svante Cornell, “some say, ‘I wonder how many kilos it cost’” (Buckley 2005).

There are several established routes in the region through which narcotics tend to be trafficked although traffickers have also been known to take more hidden mountain routes (UNODC 2008). Drug trafficking, then, is an inherently migratory trade, requiring

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<sup>4</sup> Beyrer’s analysis of trends involving HIV and heroin trafficking actually allowed him to predict the HIV outbreak that struck Almaty in 2000. For more on the subject, see: Beyrer C. “HIV infection and heroin trafficking in Eastern Europe and Central Asia.” *International Journal of Harm Reduction* 2002;4:4-6.

both travel to the route and travel up and down the trafficking corridor. After encountering these increased opportunities for disease exposure, men may return to their families, bringing HIV with them.

### **Male Migration and CSW Usage**

Male migrant workers are also more likely to visit commercial sex workers, a group that, as previously discussed, already has a considerably higher probability of infection than other demographics. According to a recent World Bank study, most migrants “engage in risky sexual behaviors (having on average 2-3 different sex partners over the course of 6-9 months)” (Godinho 2005). Condom usage among CSWs remain low (Todd et al. 2007), increasing the likelihood of HIV/AIDS transmission.

Furthermore, most CSW clients are also married (Thorne, Ferencic, and Malyuta 2010). This, then, makes it more likely that migrants at risk for sexually transmitted diseases may bring those diseases home to their wives and partners. Despite significant advances in women’s rights over the course of the Soviet period (Corcoran-Nantes 2005), women are often still expected to submit to their husbands (Lubin et al. 2007), which makes self-protection – even when it means self-preservation – difficult.

Finally, the majority of male migrants emigrate to and from Kazakhstan and Russia (Pickup 2003), where work is more plentiful – and where HIV infections continue to outpace those of the migrant-sending countries (Anon 2010). The likelihood of acquiring HIV from commercial sex workers or from intravenous drug use in these countries, then, is even higher, a fact that puts women at further risk.

### ***Conclusions and Policy Recommendations***

While it is clear that some sort of relationship exists between poverty and HIV risk behavior among women of the Central Asian migrant-sending countries, further study is undoubtedly needed in order to better understand the issues at hand and quantify the magnitude of the hazard. Given the difficult nature of seeking information from high-risk populations, fieldwork is especially vital in this regard. Consistent monitoring of evolutions in clan structure and their impact on women will also be necessary in order to

mitigate these effects and contribute to community health and cultural preservation efforts.

Nonetheless, the connection between poverty and diminished HIV resilience underscores the necessity of viewing AIDS as a holistic social phenomenon and treating it as such. For that reason, gender-focused structural reforms should be understood as a vital part of the fight against HIV. While job creation programs and community/network facilitation among female migrants may not appear to have a direct correlation with AIDS prevention efforts, such efforts do work to alleviate poverty, a key factor in the decision of many women to enter the field of sex work. Similarly, although not gender-focused, efforts to supplant the drug trade with other means of economic sustenance can be viewed as a crucial way to reduce drug consumption and HIV risk among both men and women. None of these measures, of course, can or should replace immediate harm reduction strategies among high-risk populations, but it is increasingly evident that harm reduction alone is failing to curb the epidemic's growth.

Finally, female resilience can be enhanced greatly through culturally-sensitive female empowerment mechanisms. If a culture is developed in which women, even in high-risk situations, are able to implement protective mechanisms such as condoms, they will greatly reduce the chances of acquiring HIV. Women who choose to engage in sex work should be assisted in organizing themselves in order to advocate for better wages, greater condom availability, and easier access to AIDS prevention, testing, and treatment. Because the clan-based patriarchy has a long history, its alteration will not be an easy process, but it may be possible to start with Soviet-based gender reforms – with which the Central Asian cultures are familiar – and evolve from there.

HIV, like poverty, is debilitating on both an individual and a societal level. It is only through enabling women to support themselves that they will be able to make the choices that will keep them as healthy and vital members of Central Asian society. Without empowerment, however, there may be no end in sight to the epidemic.

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## **Understanding the Cholera Epidemic in Haiti: Comparing Disease focused, with a Complex Adaptive Systems [CAS] Approach**

Ashraf Elhofy<sup>1</sup>

### ***Summary***

*Vibrio cholerae*, has managed to easily weave its way through the country of Haiti resulting in the deaths of thousands of people. This is in part due to instabilities in a number of infrastructural components needed to secure the health of the Haitian people. Political strife influenced by both international and local entities continues to plague Haiti resulting in poor management and allocation of local and international funds. Water and sanitation infrastructure is non-existent, leading to the spread of lethal diarrheal diseases. The healthcare system is inadequately funded, resulting in poor access to essential healthcare. Social support networks are faltering as violence washes through the streets. And these are just a few examples of instability in critical systems required to ensure the health and safety of the Haitian people. What adds to the complexity are the many hands that are involved in “fixing” the problems of Haiti. Thousands of Non-Governmental Organizations (NGOs) are currently operating in Haiti, many focusing on the recent cholera epidemic. The pervasive strategy addressing the cholera epidemic in Haiti has been a disease-focused approach that measures its success based on a number of health indicators. Where health indicators are helpful, if they are not used appropriately it can lead to a deficient strategy that neglects the larger picture. This paper will explore and compare the disease focused and complex adaptive system (CAS) approaches. The purpose is to demonstrate how CAS holistically evaluates a system identifying critical interactions that effect long term stability. Through the understanding of these interactions appropriate strategies targeting a number of systems (political, water and sanitation, healthcare, economic, social, etc.) can be developed, thereby moving away from the traditional only intervention/outcome approach to embrace a comprehensive, holistic one.

### ***Introduction***

The cholera epidemic in Haiti resulted in data collection agencies struggling to amass accurate data, NGOs scrambling to provide life saving services, public health workers launching numerous education campaigns, and water and sanitation workers attempting to distribute the needed supplies to contain the epidemic; all the while political strife plagued the infrastructure

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building efforts by the Ministry of Health and the country's economic system continued its downward spiral. The pervasive strategy addressing the cholera epidemic in Haiti is a disease-focused approach that measures its success based on a number of health indicators. Where health indicators are helpful, if they are not used appropriately it can lead to a deficient strategy that neglects the larger picture. This paper will explore and compare the disease focused and complex adaptive system (CAS) approaches. The purpose is to demonstrate how CAS holistically evaluates a system identifying critical interactions that effect long term stability. Through the understanding of these interactions appropriate strategies targeting a number of systems (political, economic, social, etc.) can be developed, thereby moving away from the traditional only intervention/outcome approach to embrace a comprehensive, holistic one.

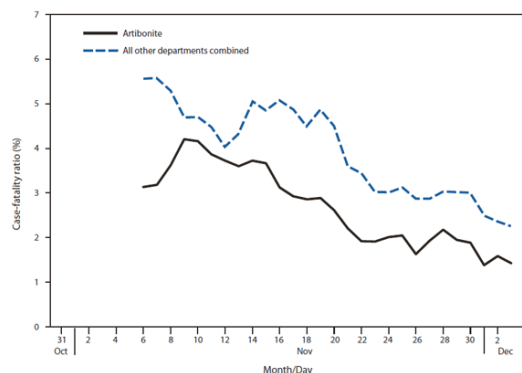
When applying the disease-focused approach, specific health indicators of concern are identified, and interventions designed to adjust the health indicators in the appropriate directions are implemented. In the case of cholera, the number of deaths and number of cases caused by cholera are the two primary health indicators. During the implementation phase of health interventions the interdependence between sub-systems (political, economic, social, etc.) may be acknowledged, however, the effects the intervention has on the dependent sub-systems may not be identified because only the specified health indicators are being evaluated. For this reason, the disease focused approach and CAS approach are competing frameworks. In emergency situations the default approach is disease-focused, which primarily addresses short-term stability. However, the application of this approach may in fact drastically hinder long-term stability by adversely effecting critical dependent sub-systems. By using the CAS approach the effects of both short and long term actions can be evaluated in the context of the entire system.

Identifying a system as a CAS has certain implications. The first is that the system is considered non-linear and must be evaluated as a number of interdependent sub-systems (e.g. they cannot be analyzed independently). Secondly, a CAS is probabilistic; therefore, a level of uncertain behavior should be expected from the sub-systems. Uncertainty should be differentiated from unpredictability, the former suggests that the exact future state cannot be determined from a number of possible known states; however, the latter suggests that the system acquires a state that was not identified as a possible state (i.e. cholera in Haiti). Lastly, a CAS can result in chaos induced by only small changes in the overall system's state. Through the use of the CAS framework it becomes possible to understand the interdependence of the sub-

systems, prepare for uncertainty, promote resilience to unpredictable states through sound infrastructure building, and identify states that may lead to chaos. For example, the early promotion of a water and sanitation system in Haiti could have provided resilience to the cholera epidemic (an unpredictable state).

***Background to the Ongoing Protracted Emergency Situation***

The cholera outbreak in Haiti was first detected on October 21, 2010; the first outbreak witnessed in at least a century. As of December 3rd, 2010 the Ministry of Health (MSPP) has reported 91,770 cases, and approximately 2,071 deaths.(MMSP 1586) What’s even more alarming is that some epidemiologists warn that the country could face more than a half a million cases over the next year.(Butler) Assuming the current case-fatality ratio of 2.3 % (Figure 1) over the next year, the country will experience an estimated 11,500 deaths. Figure 1 does however present promising data, the case-fatality ratio has halved over the course of a month, presumably from the efforts of the MMSP, Pan American Health Organization (PAHO), and the many NGOs providing logistical support.



\* Case-fatality ratio calculated as new hospital deaths divided by new hospitalizations during the 7-day period ending on that date.

**Figure 1: Rolling 7-day hospital fatality ratio\* for Artibonite and all other departments --- Haiti, October 31—December 3, 2010 (MMSP 1586)**

That being said, Dr. James Wilson, a founding member of the Biosurveillance Indication and Warning Analysis Community and founder of the Haiti Epidemic Advisory System (HEAS), which represents over 215 NGOs and individual responders in Haiti, reports that the figures stated by the MSPP are “gross underestimates” of the true caseload. HEAS states “The greatest discrepancies in reporting are observed in the difficult to reach mountainous, rural areas. There are currently no credible statistics to account for these communities, which are thought to represent nearly 2/3 of Haiti by land area.”(HEAS HEAS SiteRep) It is unclear what the true

statistics are, but what appears to be clear is that even using conservative estimates the current efforts are not sufficient to contain the rapidly moving disease blanketing the country of Haiti. The U.N. Secretary-General Ban Ki-moon's remarks during the General Assembly's informal meeting on Haiti (took place in New York on December 3<sup>rd</sup>, 2010), clearly emphasizes this position.

And yet one thing is clear: admirable as they may be, these collective efforts are simply not sufficient. Without a massive and immediate international response, we will be overwhelmed. The lives of hundreds of thousands of people are at risk. And it is up to us to act, with maximum speed and full resources. (Ki-moon)

### ***Disease-focused Approach***

The current strategy employed is mainly a disease focused approach that concentrates on treatment, containment, and prevention. Where there is some convergence in the goals established using both the disease focused and complex adaptive systems approach, there is a stark difference in the underlying methodology. Interventions that subscribe to the disease focused approach aim to affect health indicators directly associated with cholera, e.g. number of cases and case-fatality ratio.

### **Treatment**

Treatment in the context of the disease focused approach is Oral Rehydration Therapy (ORT) and antibiotics, which serve to lower the case-fatality ratio. Severe cholera can quickly lead to death, in the most severe cases, the rapid loss of large amounts of fluids and electrolytes can lead to death within 2-3 hours, and in less extreme cases 18 hours to several days.(Mayo) Therefore, successful treatment is contingent upon immediate detection and application of ORT. The potentially rapid onset of cholera poses several logistical problems for Haiti. Firstly, areas that are known to have cholera cases must have a sufficient number of treatment centers. Secondly, the people experiencing severe diarrhea must be aware of the severity of the condition, know the location of cholera treatment centers, and have the ability to get to a cholera treatment center in a timely fashion. Lastly, nationwide surveillance systems must be able to quickly detect newly exposed areas, and rapidly deploy treatment centers to those areas. As shown in Figure 1 the case-fatality ratio has gradually dropped indicating these processes have been effective. However, using the case-fatality statistic as an indicator of nationwide treatment success could be problematic if the HEAS is correct in stating the current figures are “gross

underestimates". At this point it is too early to generalize the data to the entire Haitian population; the only substantiated assessment now is that treatment appears to be effective in the areas surrounding data collection points.

### **Containment**

Containment is primarily achieved through clean water distribution and proper hygiene and sanitation, and serves to lower the total number of cases. Transmission typically occurs through the contamination of water and food sources by fecal matter infested with the *Vibrio cholerae* bacteria. Contamination occurs mainly through two mechanisms: improper sewage disposal and the lack of or improper hygiene. The current containment strategy focuses on the distribution of clean drinking water, chlorine tablets used to disinfect water originating from questionable sources and soap. Where these measures have certainly helped slow the spread of cholera, they do not address the fundamental issue of waste disposal. There is currently no sewage treatment facility in Haiti, and experts believe that the threat of cholera and other waterborne diseases will continue to be pervasive until this void has been filled.(Schmall) Since January of 2010, humanitarian organizations have installed approximately 13,000 latrines, most of which are concentrated in the tent camps that average 50 people to every toilet.(Schmall) Henry Gray, a water and sanitation emergency coordinator for the Paris-based nonprofit Medecins Sans Frontiere (MSF), states "It's not the camps where we are seeing a disproportionate number of cases. It's the slums. The number of toilets in the slums is a worry. There are very few."(Schmall) In Canaan, an estimated 12,000 family camp city spread over three miles share 50 latrines.(Schmall) And where toilets do consolidate and control the spread of fecal matter, they do not solve the problem of waste disposal. "Critical decisions have to be taken now, open new sites special for cholera waste and treat waste disposal correctly to avoid a new epidemic coming from all that waste," Dr. Michael Janssens, an MSF press officer said.(Schmall)

### **Prevention**

In times when cholera is not present, containment methods act to prevent isolated cases of cholera from manifesting into an epidemic. Therefore, it can be argued that there is a great deal of overlap in containment and prevention strategies. However, one preventative method that cannot be used in the containment phase, is the use of vaccines. The use of vaccines has been discouraged by PAHO in areas where the cholera outbreak has reached.(Knox) Generally,

vaccines are most effective when given to people who have not yet been infected. However, because cholera is asymptomatic in many cases, it is not apparent who has been infected. It is thought that in infected regions 80% of the people are carrying it without any symptoms.(Knox) Dr. Jon Andrus, deputy director of PAHO and vaccination specialist, says, “The horse is out of the barn, so you can’t determine with any accuracy where that bacterium is circulating... You already have transmission outside your ring,” referring to the “ring vaccination” strategy that was critical in eradicating smallpox.(Knox) Another issue is one of logistics. To properly be vaccinated two doses are required for adults and three in young children. “Keeping track of who’s been vaccinated and getting them back for a second and third dose presents enormous logistical problems and a lot of personnel. And even with all that effort, it still takes three weeks at the least for immunity to build in the body,” Andrus says.(Knox) That being said, the use of vaccines is a viable strategy that is being considered in areas where the outbreak has not spread. A main concern however, is the availability of the vaccine; there are only 200,000 doses of Dukoral, the only vaccine that has been approved by the World Health Organization (WHO) as safe. Another vaccine Shanchol is available in larger quantities, but has yet to be approved by the WHO.(Knox; WHO)

### ***An Alternative Approach – Complex Adaptive Systems***

In contrast to the disease-focused approach, the complex adaptive systems approach attempts to predict the emergence of a particular outcome by observing the complex interrelationship of the multiple sub-systems involved. John H. Holland, a computer scientist with joint appointments at the University of Michigan and the Santa Fe Institute is a co-founder and significant contributor in developing the characteristics that define complex adaptive systems, states:

Many of our most troubling long-range problems-trade balances, sustainability, AIDS, genetic defects, mental health, computer viruses - center on certain systems of extraordinary complexity. The systems that host these problems - economies, ecologies, immune systems, embryos, nervous systems, computer networks - appear to be as diverse as the problems. Despite appearances, however, the systems do share significant characteristics, so much so that we group them under a single classification at the Santa Fe Institute, calling them complex adaptive systems [CAS]. This is more than terminology. It signals our intuition that there are general principles that govern all CAS behavior, principles that point to ways of solving the attendant problems.(Horgan 104-109)

The theory attempts to construct a unified structure that can be used to simulate/evaluate seemingly very different problems that have similar underlying characteristics or principles governing their behavior. It is important to note that where the unifying nature of complex adaptive systems is novel, the nature of complex adaptive systems is not foreign to those who are holistic experts. If you were to ask Dr. Paul Farmer, an anthropologist and physician who is the Presley Professor of Medical Anthropology in the Department of Social Medicine at Harvard University and an attending physician at Brigham and Women's Hospital in Boston, about the reasons for the lack of access to clean water and sanitation in Haiti, he would be able to describe the complex interactions associated with Haiti's history, current politics, economy, social systems, international community, etc... The complex interactions between systems in Haiti will be highlighted by providing a brief historical context, followed by news surrounding the cholera outbreak.

### **Historical Context**

A significant factor affecting Haiti's expenditure on public health is its external debt.(Chatterjee 615-618) Haiti's history of debt can be traced back to their independence from France in 1804; the Haitians say that in 1825, France, with warships ready to be deployed, demanded that the Haitian government compensate them for their loss of a slave colony. (Chatterjee 615-618) The French demanded 150 million Francs (approximately \$21 billion today), in exchange for French recognition of Haiti as a sovereign republic and to lift the trade embargo.(Chatterjee 615-618) The colony at the time was designed primarily to provide agricultural exports such as coffee and sugar, however, with the Europeans and the United States following the French-led embargo on Haiti, it was unlikely they would be able to find other customers.(Farmer 305-325) These pressures resulted in a large debt taken on by the nation. Jean Price-Mars, a Haitian anthropologist, states, "From a country whose expenditures and receipts were, until then, balanced, the incompetence and frivolity of the men in power had made a nation burdened with debts and entangled in a web of impossible financial obligations."(Farmer 305-325) The United States refused to recognize Haitian independence until 1862, however, the isolation was largely diplomatic and rhetorical.(Farmer 305-325) Throughout this time the United States was increasingly present acting as a trading partner and policeman. Eventually, their continued naval presence led to their occupation of Haiti.(Farmer 305-325) This resulted in a number of military and paramilitary governments ruling from 1957 to the Duvalier regime, which accrued millions

of dollars in debt.(Farmer 305-325) Fast-forwarding to post 2000 elections, Jean-Bertrand Aristide became the first democratically elected president. However, because he was highly unpopular with the United States government the claim was made that the elections were corrupt, which led to the subsequent use of the United States' influence with international lending institutions to freeze already approved loans earmarked for development and improving health, education, and water quality in Haiti.(Farmer 305-325) Furthermore, direct aid from the U.S. government bypasses the formal national structures, such as the Ministry of Health and Education, and is solely distributed to nongovernmental agencies (NGOs).(Farmer 305-325)

This history clearly outlines a series of events that led to political and civil unrest, international interference, failure to establish a thriving economy or build health, education, and water and sanitation infrastructure. Additionally, the current policy to bypass the Ministry of Health and Education only serves to weaken the Haitian government's ability to control the development of their infrastructure. "Since NGOs are basically accountable to the constituencies that sponsor them, and Haitian government officials and politicians rely heavily upon them to access the resources (financial or otherwise) necessary to gain internal political consensus, the power of NGOs to steer and influence local politics is likely to be much stronger than the local electorate's."(Zanotti 755-771)

### **Recent News**

In January 2010, a devastating earthquake hit the Haitian people, leaving over 1.5 million people displaced from their homes.(Sontag) October 2010's cholera outbreak has led to large scale protests and riots as Nepalese United Nations troops are blamed for carrying a foreign (Asian) strain of cholera into Haiti.(Associated) In the town of St. Marc, a group of local residents demonstrated violently against a cholera treatment center established by MSF. The facility was being built on a soccer field near a school, and the 300 protesters feared the clinic would bring more disease to the town and infect the children. Françoise Otero, an MSF representative said "They didn't understand well what was the purpose of this camp and how are we going to treat the patients there."(Mulholland) Currently, there is speculation that the recent election results are fraught with corruption leading protestors to take to the streets. President René Préval, said "people are suffering because of protests that have spread throughout the capital since the results were announced late Tuesday (Dec, 7<sup>th</sup>, 2010)."(Associated) What is ironic is that twelve of the eighteen candidates wanted to cancel the elections due the lack of



preparation and chaos at the polls; however, the international community pushed hard for Haiti to launch the November 28th, 2010 election.(Beaubien; Mozingo) With \$6 billion in aid pledged for the country, the international community claims to want a stable, legitimate government for the reconstruction effort.(Mozingo) Amidst this chaos cholera is spreading and people are suffering. The experts know that an effective water and sanitation system is the answer to their problems, "Critical decisions have to be taken now, open new sites special for cholera waste and treat waste disposal correctly to avoid a new epidemic coming from all that waste," says Dr. Michel Janssens, an MSF press officer.(Schmall) However, the inability of the international community to comprehend the realities in Haiti, leads to disconnected policy and the withholding and misallocation of critical funds.

### **Complexity and Emergence**

The historical context and recent news outlines the complexity of the situation. And those who are holistic experts in the area will have an intimate understanding of the interactions that have led to the chaos that currently plagues Haiti. Adding to the complexity are those (non-experts) that attempt to perform a number of functions in Haiti without having the contextual knowledge that has shaped political, economic, social, education, health, and water and sanitation systems, among many others. Currently there are “non-experts” who staff the thousands of NGOs now operating in Haiti, as well as powerful international agencies that force an agenda with possible outcomes that are not well understood.(Zanotti 755-771) Therefore, it is imperative to put these complexities within a framework that will allow local and international agencies to better understand the nature of the outcomes that may result from their actions. Utilizing the CAS approach, models can be created that describe/detail the interactions between political, economic, education, social, health, and water and sanitation systems. It may be found that attempting to establish a water and sanitation system with the current levels of political and civil unrest may not be feasible or lead to an ill planned inefficient system that could be detrimental to the people of Haiti. This however does not abandon the idea of establishing a water and sanitation system, it simply means that other systems must first be strengthened before the development of a water and sanitation system becomes viable.

John H. Holland and many others at the Santa Fe Institute have been working on CAS computer models that can be used to simulate potential system interactions associated with actions taken by an entity such as an NGO.

If we are to make parallel simulations of complex adaptive systems accessible, two criteria must be satisfied. First, the parallel simulation must directly mimic the ongoing parallel interactions of the complex adaptive system. Second, there must be a visual, game-like user interface that provides natural controls for experts not used to exploring systems via computers. For example, a policy maker should be able to try out an economic model in much the way that a pilot tries out a flight simulator.(Holland 17-30)

By having a flexible computer model, “non-experts” can adjust parameters associated with political, economic, social, information and communication, healthcare, educational, transportation, legal, protective, food and nutrition, and energy systems. Through this investigative process, it may become evident that strengthening several of these systems may be required before the emergence of an effective water and sanitation system becomes viable. The power of the collective use of this framework, is that “non-experts” will converge on a set of systems, which will effectively concentrate resources where they are needed most. The convergence will occur in a distributive fashion, where the players involved are not being guided by a central agency, rather through the use of this framework they are individually coming to this conclusion. This is a powerful feature because creating a central agency to coordinate thousands of NGOs would be a logistical nightmare and an unrealistic task. Once the players have converged on the systems that require building, they have essentially established a common set of rules by committing to the strengthening of specific set of infrastructural components. “Assuming that individual or local units want what’s best for themselves (common set of rules) spontaneous cooperativity will emerge from chaotic events.”(Rihani) This implies that once a common set of rules has been established, a pattern of cooperation will evolve between thousands of NGOs without the need for a central organizing agency. Currently there is no common set of rules between the individual and local units involved in Haiti, and for the most part there has not been the cooperative emergence of stable structures. “How on earth could one rebuild such a broken place? Haiti has no roads to speak of and poor telecommunications. Agriculture has faltered, perhaps irreparably, and no industry promises to replace it. There are of course great polemics regarding the methods of “grassroots” development and production for export and equally high sentiment regarding foreign aid.”(Farmer 305-325)

The CAS models being developed at the Santa Fe Institute are in the development phase and may not be available for several years. However, there are local and international holistic

experts such as Paul Farmer, and interdisciplinary teams who can in the intern serve this function. It is incumbent upon “non-experts” to involve holistic experts and/or interdisciplinary teams in their decision making process before committing time and resources to an intervention that could possibly support destabilization processes.

An example demonstrating the power of the CAS approach was highlighted in a case study performed within Bosnia between 2004 and 2005. It was found that the introduction of a primary health care system required the intimate and coordinated involvement of political, social, and economic systems.(Atun et al. 28-39) They identified the need for a simultaneous and holistic analysis of the context, the innovation, the adopters and the interactions between them over time.(Atun et al. 28-39) Within a few years, multifaceted reforms in Bosnia led to over 25% of the country having access to primary health care services. This case study is especially compelling because the primary care infrastructure was developed in spite of considerable resource constraints and a challenging post-war context.(Atun et al. 28-39)

### ***Conclusion***

There is a stark difference between the disease focused and complex adaptive systems approaches. The disease focused approach identifies specific health indicators, and using a number of approaches aims to drive those indicators in the desired directions. Infrastructure building may be a strategy employed, however it is not implied. Therefore, it cannot be assumed that positive trends in the health indicators are associated with long-term stability. Furthermore, because only health indicators are used to monitor the effects of the interventions, other sub-systems may be adversely affected and not identified in the process. In contrast the CAS approach aims to establish long term stability by understanding the nature of the interdependence between the subsystems (political, economic, social, education, health, etc...). Through the understanding of these processes resources can be used more efficiently as beneficial and harmful interactions are highlighted. Furthermore, CAS focuses on sub-systems and infrastructure building, which inherently promotes long-term stability.

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## BOOK REVIEWS

By

John Parker<sup>1</sup>

**Victor, Peter A. *Managing Without Growth: Slower by Design, Not Disaster*. Cheltenham, UK: Edward Elgar Publishing Limited, 2008. 260 pp. ISBN: 978-1-84844-205-4.**

**Ridley, Matt. *The Rational Optimist: How Prosperity Evolves*. New York: HarperCollins Publishers, 2010. 438 pp. ISBN: 978-0-06-145205-5.**

As the world faces growing and interconnected natural resource-related challenges, exemplified by dwindling renewable and non-renewable resources, stretched food supplies, global climate change, biodiversity loss, and habitat fragmentation, the ‘Neo-Malthusian’ and ‘Cornucopian’ debate has come to the fore once again.

With rising incomes in emerging economies driving increased demand for food, fuel and fiber and the world’s population projected to reach over nine billion by 2050, neo-Malthusians contend that resource consumption and economic growth will collide with the limits of a finite planet. Cornucopians counter that these same dire predictions have been made for hundreds of years, only to be proven wrong by human ingenuity and technological innovation. These differences of opinion are reflected in two recent books that discuss future global challenges and our ability to meet them:

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Peter Victor’s “Managing Without Growth: Slower by Design, Not Disaster” and Matt Ridley’s “The Rational Optimist: How Prosperity Evolves”.

In “Managing Without Growth: Slower by Design Not Disaster”, Peter Victor sees the world on a crash course with the planet’s biophysical limits. According to Victor, this destructive path has been paved by the relentless pursuit of economic growth by Western economies. He challenges what is often considered unquestionable: the belief that economic growth – as measured by a rise in Gross Domestic Product (GDP) – is the principal contributor to progress and well-being of society and individuals.

In Chapter 1, Victor begins his critique of economic growth by reviewing the history behind its rise to the top of economic policy agendas in the 1950s. While growth was initially sought as a means for reducing unemployment, Victor asserts that this goal has been replaced over time by a strategy of growth for the sake of growth. Many view the “new paradigm” of sustainable development as a promising alternative to the growth-dominated agenda; however, Victor argues that, in many cases, current sustainability discourse is simply “new wine in old bottles” and “economic growth in disguise” (p. 19).

Victor lays out the core of his argument for ‘managing without growth’ in Chapter 2. He describes the interconnected nature of economic and ecological systems, defining economies as ‘open systems’ that are sub-systems of the broader ecosystem. Because economies depend upon ecosystems as a source of materials and energy and a sink for depositing wastes, Victor questions whether economic growth is desirable or even possible over the long-run, given the planet’s limited supply of natural resources.

In Chapters 3 through 7, Victor explores the ecological impacts of economic growth in greater detail, discussing the three interconnected biophysical limits: sources (the supply of materials and energy), sinks (the locations in which waste produced by economies is disposed – on land, in water or in air), and services (the benefits ecosystems provide for human use, such as water, air, food/fiber). He describes the problems inherent in prices, which fail to convey accurate and complete information about the interactions between the economy and the environment. As economies continue to grow, these economy-environment interactions become stronger and place even greater stress and strain on ecosystem goods and services upon which society and economies depend.

In Chapter 8, Victor extends his critique of economic growth beyond the ecological implications to its impacts on human welfare, challenging the assumption that economic growth leads to improved subjective well-being of society and individuals. Reviewing the empirical literature on the causality between economic growth and “happiness”, Victor makes a convincing case that happiness depends on many other factors beyond income growth, especially measures of social capital.

Victor’s critical assessment of economic growth sets the stage for his empirical investigations of the macroeconomics of “managing without growth” in Chapter 10. Using a computerized model of the Canadian economy, Victor simulates a variety of growth scenarios, ranging from “business-as-usual” growth to “no-growth” and “low-growth”, to determine possible macroeconomic impacts of a no- or low-growth strategy. The results are illuminating: while an immediate no-growth scenario leads to high levels of unemployment and poverty, the scenarios of

near-term slower growth with stability by 2030 result in full employment, poverty reduction, more leisure time, and reductions in Greenhouse Gas emissions.

While the results of Victor’s simulations have significant policy implications, they are not without limitations. As Victor admits, the model is highly aggregated and does not provide detailed information related to economic impacts on specific populations and regions. In addition, because Victor only applies the model to one country’s economy (Canada), it is impossible to determine whether these results would be similar across different countries and contexts.

There are also conceptual limitations to Victor’s approach to managing without growth. He focuses his discussion exclusively on the traditional ‘rich’ economies, arguing that their growth should be curbed to leave room for lesser-developed countries that have greater needs. However, this neglects the fact that resource consumption in rapidly industrializing ‘developing’ countries, namely the BRICs (Brazil, Russia, India and China), is projected to surpass Western economies in the very near future. Already, China is the largest emitter of carbon dioxide. It is unclear from Victor’s argument at what point along the development spectrum he believes countries should begin pursuing a strategy of managing without growth. Is this based on total resource consumption of a country? GDP per capita? Or levels of absolute poverty? If resource consumption and biophysical limits are of greatest concern to Victor, then his discussion should not just be limited to the traditional ‘rich’ countries. Effective policies aimed at confronting global environmental and resource-related challenges need to take into account the ecological implications of rapidly growing emerging economies, in addition to those already developed.

Where Victor's "Managing Without Growth" expresses serious concern about the current and future state of the world, Matt Ridley's "The Rational Optimist: How Prosperity Evolves" believes that human beings will continue to create the conditions that allow for sustained progress. Ridley's outlook for the future is indeed a bright one: "The twenty-first century will be a magnificent time to be alive. Dare to be an optimist." (p. 359). Ridley's Cornucopian perspective (the belief that mankind will overcome resource constraints through innovation, which will enable continued progress), is drawn from what history has shown us about the human ability to triumph over adversity.

In Chapter 1, Ridley begins his justification for optimism by rattling off statistics that show just how much better off humans are today: "Since 1800, the population of the world has multiplied six times, yet average life expectancy has more than doubled and real income has risen more than nine times" (p. 14). He follows this with country-specific examples: "the average Mexican lives longer now than the average Briton did in 1955" (p. 17); "infant mortality is lower today in Nepal than it was in Italy in 1951" (p. 17). According to Ridley, these improvements are not just limited to human beings, but are also visible in the environment: "In Europe and America rivers, lakes, seas and the air are getting cleaner all the time" (p. 17); "Today, a car emits less pollution travelling at full speed than a parked car did in 1970 from leaks" (p. 17).

In Chapter 2, Ridley describes the catalyst behind mankind's sustained improvements. As Ridley sees it, this continued progress throughout history is not due to the intelligence of human beings as individuals, but because of our "collective brain" (p. 47).

Human beings work together by exchanging ideas and information, which helps to catalyze innovations and propel society forward. This exchange of knowledge and ideas has allowed humans to specialize, which, in turn, has enabled the trade of goods and services.

In Chapters 3 through 5, Ridley provides examples throughout history of how exchange has enabled cooperation, specialization, innovation and, ultimately, progress. In the context of agriculture, Ridley argues that the opportunity to exchange provided incentives for farmers to specialize in certain agricultural goods, which helped to generate food surpluses for trade. Ridley states, "the first farmers were already enthusiastic traders breaking free of subsistence through exchange, and farming was just another expression of trade" (p. 128). He extends this argument to cities, describing the emergence of urban centers as principally due to the desire of individuals to take part in trade.

In Chapters 6 through 8, Ridley describes how a steady supply of inventions facilitated by new knowledge and information exchange has helped to prove past Malthusian predictions wrong. "The more knowledge you generate, the more you can generate. And the engine that is driving prosperity in the modern world is the accelerating generation of useful knowledge" (p. 248). Ridley introduces the many reasons for pessimism that have been predicted in the past, including overpopulation, Nuclear Armageddon, widespread famine, exhaustion of resources, plagues, the inability of computers to cope with the year 2000, all of which have thankfully failed to live up to their hype. Ridley follows this discussion with a pointed reference to the advocates of limits to growth: "Many of today's extreme environmentalists not only insist that the



world has reached a ‘turning point’ – quite unaware that their predecessors have made the same claim for two hundred years about many different issues – but also insist that the only sustainable solution is to retreat, to cease economic growth and enter progressive economic recession” (p. 311).

Ridley then turns his attention to the “two great pessimisms of today” (p. 313): poverty in Africa and global climate change. In addressing poverty in Africa, Ridley cites examples of bottom-up change (as opposed to top-down free-market reform prescriptions) that are helping to increase prosperity in many African countries. Technologies, such as the spread of mobile phones, are catalyzing information exchange, specialization and trade. Bottom-up evolution of institutions and legal systems are reducing bureaucratic barriers in the way of entrepreneurs. Ridley is undeniably optimistic about Africa: “...inch by inch its population will stabilize; its cities will flourish; its exports will grow; its farms will prosper; its wildernesses will survive and its people will experience peace” (p.347).

Ridley is equally optimistic about society’s ability to tackle climate change. Based on a broad review of relevant scientific literature on climate change, Ridley concludes that the probability of extreme climate outcomes is exceedingly small. He also argues that it is unlikely that climate change is the problem that will cause the most harm to societies. “The four horsemen of the human apocalypse, which cause the most premature and avoidable death in poor countries, are and will be for many years the same: hunger, dirty water, indoor smoke, and malaria” (338). As for society’s ability to combat and adapt to climate change, Ridley sees human beings as having an arsenal of tools available that, thanks to our networked world, will only increase in the future.

While Ridley’s optimism is indeed a fresh perspective among the myriad doomsday predictions about the future, the greatest flaw in his argument is the assumption that simply because humans have overcome adversity in the past, we will continue to do so in the future. Social, ecological and economic systems are complex networks that are never static and predictable. It cannot be assumed that what has worked in the past will work in the future.

Overcoming current and future societal challenges requires us to move beyond the neo-Malthusian versus Cornucopian debate into a new paradigm that focuses on building stronger, more resilient social, ecological and economic systems. Interestingly, despite their disagreements, Victor and Ridley are both ultimately seeking the same goal: to build a more resilient future. While they differ in their perspectives of how resilience might be strengthened, the core principles underlying both authors’ arguments are important components of building resilience in linked social-economic-ecological systems. As Victor advocates, economic systems are subsystems of the broader ecosystem and economic and ecological systems need to be thought of as interconnected. Too much pressure on the planet’s biophysical limits can cause social, ecological and economic collapse. Meanwhile, harnessing the power of our “collective brain”, as Ridley suggests, is essential for spurring innovation and adaptation, which are essential components of resilient systems. Fully integrating these principles into policy and programming frameworks would be important steps towards building resilient systems that are more capable of anticipating and withstanding the unexpected and uncertain events of the future.