

**DRY LAND TRAINING: WATER SHORTAGES AND THE
PEOPLE WHO FIGHT OVER THEM
EXAMINING CONFLICT IN YEMEN**

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ABSTRACT

In recognition of the world's growing concern over environmental resource scarcity, this project examines whether water shortages in Yemen exacerbate conflict between the Houthi rebels in Sa'ada and the Yemeni government—and if so, how? Yemen fulfils a significant number of conditions that environmental security analysts claim should make it vulnerable to 'water wars'. Yet it is evident that those engaged in conflict in Sa'ada display an apparent lack of concern over dwindling water supplies. This single case analysis calls into question some key assumptions of the environmental security discourse. Namely, the notion that resource shortages, coupled with several intervening factors, make conflict more likely. While this project cannot disprove the probabilistic theories of environmental security analysts, it does suggest that if water scarcity is *not* a driver of conflict in water-scarce and conflict-prone Yemen, then the 'water wars' thesis should be viewed with considerable caution.

Keywords: conflict; environmental security; Houthi rebels; resource scarcity; Sa'ada; water wars; Yemen

In North America, we use on average 600 litres of water per person per day.

In the world's poorest countries, people survive on less than 6 litres.

*Dirty water now kills more people in our world than all forms of violence
combined, including wars.*

*Every 8 seconds a child dies from ingesting dirty water and by 2025, 1.8 billion
people will live where water is scarce.*

*This project is deservedly dedicated to all the world's 'water warriors' - from
places that use too much, to those places that have far too little.*

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TABLE OF CONTENTS

Approval	ii
Abstract	iii
Dedication	iv
Acknowledgements	v
Table of Contents	vi
List of Figures	viii
List of Tables	ix
Glossary	x
List of Acronyms	xii
List of Arabic Terms	xiii
1: Introduction	1
1.1 Case Justification	2
1.2 Research Question	4
1.3 Methodology	6
1.4 Outline	7
1.5 Challenges	8
1.6 Key Terms Defined	9
2: Literature Review	11
2.1 Human Security	11
2.2 Environmental Security	12
2.2.1 Resource Scarcity	14
2.2.2 Resource Abundance	16
2.3 Environmental Conflict	17
2.4 Grievance Debate	19
2.5 Critique	22
2.6 Provisions for Water in Environmental Security	24
3: Case Study: Sa'ada	28
3.1 Background to the Conflict	29
3.1.1 Before the Violence	29
3.1.2 Violent Conflict	33
3.1.3 Articulated Grievances and Ceasefire Terms	33
3.1.4 Recent Activity	35
3.1.5 Looking Ahead	36
3.2 Background on Water Shortage	38
3.3 Relating Water and Conflict in Sa'ada	43

4: Making The Case for Water Conflict in Yemen	46
4.1 Political Factors	46
4.2 Economic Factors	49
4.3 Population Factors	51
4.4 Natural Factors	54
4.5 Summary	56
4.6 Alternative Explanations	57
5: Conclusion	60
Appendices.....	63
Reference List	72

LIST OF FIGURES

Figure 1: Linking the environment and conflict through a political focus on governance. Smith & Vivekananda 2009, 10	27
Figure 2: Timeline of Sa'ada Conflict. Smith & Vivekananada 2009, 133.....	32
Figure 3: Anon. 2010. Lonely Planet	37
Figure 4: Poverty Comparison, Yemen Governorates 2005.....	59

LIST OF TABLES

Table 1: Irrigation and arable land: Sana'a and Sa'ada	39
Table 2: Water consumption – Sa'ada.....	43
Table 3: Age groups as a percentage of Sa'ada population	52
Table 4: Weapons estimates for conflict governorates.....	53

GLOSSARY

Armed Conflict (UCDP/PRIO)	“[A] contested incompatibility that concerns government and/or territory where the use of armed force between two parties, of which at least one is the government of a state, results in at least 25 battle-related deaths.”
Civil War (Paul Collier)	A civil war involves two warring factions in the same country, one party being the government, or not, with a minimum threshold of one thousand battle deaths per year.
Environmental Security	Refers to a section of human security that acknowledges that potential security challenges may arise from environmental factors such as scarcity of freshwater, croplands, fish stocks etc.
Houthi Rebels	Referred to as the ‘Houthis’, this rebel movement in North Yemen has challenged the government in seven separate bouts of conflict since 2004. Named after their leader, Hussein Badreddine Al Houthi, who was assassinated by the government in 2004, the movement (also known as the ‘Believing Youth’) represents a sect of Shiite Islam known as the Zaydi Hashemites. The Hashemites ruled North Yemen until revolution in 1962. Since then the country has been controlled by a Sunni majority government.
Human Security	Generally understood to be a notion of security that focuses on the individual as a referent object, meaning that individuals should be centralized in discussions of security.
North Yemen	Formerly known as the Yemen Arab Republic, North Yemen was an independent country from 1962 to 1990. Its capital, Sana’a, and its ruling party, the General People’s Congress, succeeded as the capital and governing body in the unified Republic of Yemen after 1990.
Scarcity (Thomas Homer-Dixon)	Homer-Dixon defines three types of scarcity. Demand-induced scarcity: when a finite amount of a particular resource is strained by an increase in population or usage rates. The same size pie must be divided among a greater number of people.

Supply-induced scarcity: refers to a change in the amount of a resource that was once available to a given number of people. For example, drought ruining cropland or decreases in water tables.

Structural scarcity: refers to an external interference in the delivery of a resource to a given population, either government, rebel, or otherwise. This involves a change in delegation of resources and is mostly political.

South Yemen

Formerly known as the People's Democratic Republic of Yemen, South Yemen gained independence from the British in 1967. It took on a Marxist orientation and remained a socialist republic until it merged with the Yemen Arab Republic in 1990. Its ruling party, the Yemen Socialist Party was subsequently militarily defeated in a civil war against the North in 1994.

Water Warriors

A water warrior is here understood to be any person dedicating their time to the fight for water sustainability.

LIST OF ACRONYMS

AQAP	Al Qaeda in the Arabian Peninsula
GDP	Gross Domestic Product
GPC	General People's Congress – formerly the ruling party of the Yemen Arab Republic who succeeded to power in unified Yemen after civil war in the mid-1990s.
IDP	Internally Displaced Person
LNG	Liquefied Natural Gas
PCE	Primary Commodity Export – used in reference to rebel recruitment literature.
PDRY	People's Democratic Republic of Yemen – what is now South Yemen was formerly known as the PDRY and was a socialist state until unification with the North in 1990.
YAR	Yemen Arab Republic – what is now North Yemen was formerly known as the YAR and was a quasi-democratic state until unification with the South in 1990.
YSP	Yemen Socialist Party – formerly the ruling party of the People's Democratic Republic of Yemen, the YSP were militarily defeated in their challenge to power of the General People's Congress in the civil war of the mid-1990s.

LIST OF ARABIC TERMS

Al-Jawf	A region neighbouring Sa'ada
Al-shabbah al mu'min	“Believing Youth”, an alternative name for the Houthi rebels in North Yemen
Amran	A region in North Yemen
Hajja	A region neighbouring Sa'ada
Hashemites	Hashemites trace their ancestry from Banu Hashim or the Hashim clan. Having died around the year 500, Hashim was the great-grandfather of the prophet Muhammad and therefore holds prominence in the Muslim faith
Hayden	District of Sa'ada that sustained the brunt of the damage in the conflict between the rebels and the government
Houthi	Rebel movement from North Yemen named after Hussein Badderine Al-Houthi, an outspoken religious and community leader from Sa'ada
Ma'rib	Mature oil field
Marran	Mountainous region in North Yemen where Hussein Badderine Al-Houthi hid during the first round of conflict
Masila	Mature oil field
Qabyala	Tribalism
Qat	Narcotic plant chewed during traditional afternoon ceremonies
Razeh	District of North Yemen which was the sight of airstrikes carried out by Saudi Arabia during the conflict between the Houthis and the government
Sa'ada	The name of both a province and city in North Yemen and home to

the Houthi rebels

Salafism	Translated literally as 'predecessor' or 'ancestor' followers of Salafism, a Sunni interpretation of the Muslim faith, adhere to a stricter interpretation of scripture and look upon the first three generations of Muslims as examples of how Islam should be practised. Salafism is widely practised in Saudi Arabia originating with the capture of Mecca and Medina in 1803
Sana'a	Capital city of Yemen
Sharaf	Honour
Ta'iz	Region of Yemen that experienced a collapse of their water basin in 1998
Wahhabi	A Sunni Islamic sect based on the teachings of Muhammed ibn Abd-al-Wahhab, an 18 th century scholar from what is today known as Saudi Arabia
Zaydi	A Shia Islamic sect named after Imam Zayd ibn Ali

1: Introduction

“We have been slow to give up on the myth of Earth’s infinite generosity. Rather grandly, we have overdrawn our accounts.”

- **Barbara Kingslover**

In 1995, Ismail Serageldin, Vice President of the World Bank, cautioned the world, “If the wars of this century were fought over oil, the wars of the next century will be fought over water” (Shiva 2002, IX). Since Thomas Malthus in 1798, discussions of environmental security have revolved around population growth and non-renewable resources. Thomas Homer-Dixon’s (1999) research “indicates that scarcities of critical environmental resources – especially of cropland, freshwater, and forests – contribute to violence in many parts of the world” (12). Wenche Hauge and Tanja Ellingsen (1998) draw a link between a country’s level of environmental degradation and whether or not it is prone to civil conflict. Robert Kaplan (2000) goes as far as to predict a virtual Armageddon over a lack of adequate management of the world’s resources.

Using a single case study analysis I examine the impact, if any, of water scarcity on conflict in Yemen, a country suffering from both acute water scarcity and political violence. Specifically, this project will question the extent to which current and impending fresh water shortages contribute to conflict in North Yemen.

Since its unification in 1990, the country has confronted civil war, a declining economic system, widespread corruption and, according to several

news sources at the beginning of 2010, Yemen is now a breeding ground for terrorists. Yemen faces several *internal* water conflicts rather than a single transboundary water issue. Using the conflict in Sa'ada¹, a Northern city home to a majority of Shiite Muslims that has faced the brunt of damages in a sporadic conflict with the central government in Sana'a since 2004, this project will analyze the relationship, if any, between conflict occurrence and the dwindling water resources in the Sa'ada basin. In short, this project will analyze whether the water shortage exacerbated the violence between the Houthi rebels and the government between the first and sixth rounds of fighting (2004 to 2010), and if it has the potential to trigger a resurgence of conflict. I intend, therefore, to look not at climate change or conflict individually, but at them in combination in the context of Sa'ada.

1.1 Case Justification

The Failed States Index (2009) has dubbed Yemen the next Afghanistan. Headlines around the world have deemed it 'A Nation on the Brink' (Boucek and Donadio 2010), 'A Country in Crisis' (Bennett-Jones 2009), and a 'Nightmare of State Failure' (Fattah 2009). General Anthony L. Zinni, former commander in chief of the United States Central Command, has warned, "we need to work hard before we end up – before Sana'a in Yemen depletes the country for its own benefit – with a catastrophe of major proportions" (Manwaring 2002, xi). These

¹ I wish to note here that several words crucial to the completion of this project (Sa'ada, Sana'a, Shiite, and Zaydi) are Anglicized versions of Arabic words. With this in mind, several variations in translation exist for these words. While I wish no offence in my chosen usage, I simply adopt the most frequent spelling I encountered in my research. Alternative spellings include Sa'da, Saada, Sa'dah, Sanaa, Sana, Shi'ite, and Zaidi. These versions may appear in quotations and are meant to represent the same regions and religions as my adopted spelling.

warnings draw on a cacophony of hardships born by the country including, but not limited to: economic collapse, a separatist rebellion, projected loss of oil revenues, their first democratic transition, some of the world's highest levels of population growth, and a dwindling water supply.

International Alert, in their November 2009 publication on the environment and conflict remind that, "It is impossible and unhelpful to offer generic scenarios of how climate change will interact with other variables to increase conflict risk, since impacts will always depend on context" (Smith and Vivekananda 2009, 8). I chose to evaluate the environmental security debate in the context of North Yemen not only because of its recent media attention in regards to terrorist cells and its potential as a failed state, but also because of its historical significance in regards to water security and scarcity and its inability to handle these problems in an efficient and effective way. Not only is Yemen the poorest country in the Middle East (Yemen: Country Profile 2010), it has been plagued recently by rainfall shortages, cutting off several rural communities from their primary water source. Unable to conserve rainwater, residents of rural areas are in dire need of expensive infrastructure to deliver water to their communities. With some of the lowest water tables in the world, at 125 cubic metres per person, an astonishing thirteen times below the global average, and population growth at around seven percent, Yemen's weak government and lack of institutional capacity have consistently failed to adequately address the water crisis.

This unprecedented shortage makes Yemen a primary global example of what Homer-Dixon euphemistically describes as 'scarcity'. This case study

provides an interesting opportunity to examine the predictions of environmental security scholars precisely because so many of the conditions that they identify as likely to increase the risks of conflict are present. But, despite the fact that the Yemen case is a prime example of a state on the brink of collapse, that the country confronts a desperate water crisis, and that it has been afflicted by conflict, there have been repeated cessations of hostilities even as the water crisis continues — and indeed intensifies.

Despite the decrease in freshwater availability, the failure of the country's economic system, the unaddressed corruption and international pressure to eradicate terrorist cells, the government and the Houthi rebels were still able to reach an agreement in mid-February 2010. My research focuses on the period from independence in 1990, to the end of February 2010 with brief mention of the seventh round of fighting that commenced 22 July, 2010. Although this excludes much of the progress after the February 2010 ceasefire was signed, it includes the cessation and resumption of fighting over the first six rounds. Despite the ongoing nature of the conflict, the conclusions made here remain applicable as grievances remain unaddressed and water scarcity continues to intensify.

1.2 Research Question

This paper examines whether or not the unprecedented water shortage in the Sa'ada basin in North Yemen contributed to the conflict between the Houthi rebels and the government. This raises doubts about the validity of a variety of the scarcity/conflict models proposed by environmental security scholars. If predictions about environmental scarcity increasing conflict potential were

correct, then water shortages in North Yemen would lower the opportunity costs of joining rebel groups since economic opportunities, especially in agriculture, are lacking. With lowered opportunity costs, the potential for increasing membership in the rebel movement grows. If that potential is realised, the conflict between the rebels and the government will be intensified. In addition, a sense of abandonment by the government increases the likelihood of rural villages providing sanctuary and support for rebel groups, indicating that water shortages, which are inadequately addressed by the government, could exacerbate conflict both regionally and nationally. Finally there is the possibility of direct violent conflict over the shrinking water resources. If any country should face environmental conflict over scarce water resources, it should be Yemen. However, this project concludes that while water shortages are affecting the country, they have not yet exacerbated conflict in the Sa'ada region.

Overall, the academic discourse on environmental security assumes that resource scarcity exacerbates pre-existing conditions that increase the risk of organized violence. These preconditions are the subject of sharp debate, but most scholars tend to include: weak political institutions and poor governance practices, high rates of poverty, mounting population growth rates, a high percentage of the population being made up of young men, and scarcity or overabundance and reliance on natural resources (Collier 2009; Collier, Hoeffler, and Rohner 2009; Fearon and Laitin 2003). In varying degrees, all of these conditions are present in Yemen. This indicates that unprecedented shortages of water in addition to these pre-conditions will likely increase the risk of conflict if

the assumptions made by environmental security analysts are correct. The case study is thus a test of environmental security theory that uses the scarcity/conflict model.

Given the presence of so many factors that increase the risk of war, it comes as a surprise that Yemen has managed to not only avoid conflict over scarce water resources, but also actually succeeded in ending conflict peacefully even as the water crisis intensified. This questions both the extent to which environmental scarcity can contribute to conflict and the effect scarcity has on a population. This project will conclude that while environmental scarcity has driven several minor conflicts in Yemen, it has yet to contribute to conflict in North Yemen in the area where water is scarcest. This does not mean that water scarcity will never contribute to conflict, as discussion of a minimum threshold of scarcity is absent from the environmental security literature. Additionally, my findings lend credibility to the counterfactual argument that in times of scarcity, people are likely to cooperate rather than conflict, increasing the likelihood of ingenuity, creative solutions, and peaceful resolution of disputes (Wolf 1998; Wolf 2007; Wolf, Stahl, and Macomber 2003).

1.3 Methodology

As noted above, the methodology of this paper relies primarily on a single case study. Yemen's increasingly precarious water situation makes it an obvious candidate for water scarcity research and a potentially illuminating case study of the hypothesized relationship between water scarcity and conflict. As John Gerring notes, "[s]ometimes, in-depth knowledge of an individual example is

more helpful than fleeting knowledge about a larger number of examples. We gain better understanding of the whole by focusing on a key part” (Gerring 2007, 1). Other cases that could benefit from increased research on the validity and applicability of environmental scarcity/conflict models would include areas facing extreme water shortages and potential or real internal conflict. If water is a well-established contributing factor in rebel movements and collective grievances leading to violence, then acute water scarcity could become a conflict early warning indicator for both conflict escalation and new conflict onsets. The fact that Yemen confronts extreme water scarcity due to growing usage that derives in large part from the exploding population, but suffered neither new onsets nor any escalations of violence, demonstrates at the very least that the alleged scarcity/conflict relationship lacks universality.

1.4 Outline

This paper will examine the literature linking environmental scarcity and conflict and evaluate it using a single case study. It will juxtapose the academic rationale for the scarcity/conflict thesis with the realities in Yemen.

In proceeding, I will define key terms and outline the challenges this project has faced and how they were addressed. This will be followed by an in-depth literature review outlining the environmental security debate, its main proponents and its origins. A single case study will be used to test the assumption that resource scarcity can contribute to conflict. This will include contextual grounding for the issues surrounding the Sa’ada water basin in North Yemen, which faces unprecedented shortages and has the potential to dry up.

Furthermore, I will outline a brief history of the Sa'ada region, which has faced intermittent conflict since 2004. Finally, I will provide possible alternative explanations for the relationship between water shortage and conflict and conclude my findings.

1.5 Challenges

This project has faced several challenges. First, finding relevant current literature is difficult. As a result, there is a heavy reliance on news sources, international organizations working on the ground and translated interviews. Second, many of the sources that are available are often highly politicized. Finally, as water is currently a sensitive issue in Yemen, access to much of the official documentation has been restricted by the government.

I address these challenges by using a varied snowball technique, not to gain interviews, but to get access to a variety of sources. I contacted both the Senior Water Resources Management Specialist and the Head of the Department for the Middle East and North Africa for the World Bank. Both individuals have supplied me with documents, including information unavailable to the public due to government classification.

The environmental security literature is also problematic. Most notably, "research in the field has long suffered from a dearth of reliable environmental data." (Buhaug et al 2008, 35). In addition to highly politicized data sources, much of the environmental information out of Yemen is unreliable and outdated. Specifically, the Sa'ada water basin, as a site of conflict, is difficult to obtain

reliable trend data on. Finally, problems facing the country such as terrorism, the increasing presence of Al Qaeda in the Arabian Peninsula (AQAP), and declining oil reserves are occupying the media, meaning that less attention is paid to environmental scarcity and the potential problems therein.

1.6 Key Terms Defined

Several key terms must be defined in order to properly interpret the meaning and implications of the remainder of this project. All terms defined here enjoy some form of consensus in the environmental security discourse. The first, and possibly most important term to define is 'armed conflict'. For the purpose of this paper I will use the definition put forth by the UCDP/PRIO Armed Conflict Dataset (ACD) which defines armed conflict as "a contested incompatibility that concerns government or territory or both where the use of armed force between two parties results in at least 25 battle-related deaths" (Gleditsch 2008, 3). By using a definition that uses the twenty-five battle deaths benchmark I run a middle course between those researchers who leave out a benchmark altogether and those that use the one thousand battle deaths per year marker, such as Paul Collier.

The case study will focus heavily on the vulnerability of Yemen to water shortages. Vulnerability is understood here as "the degree to which a system is susceptible to, and unable to cope with, adverse effects of climate change, including climate variability and extremes" (Buhaug et al 2008, 16). Matthew, Gaulin and McDonald (2003) use vulnerability to understand the severity of environmental security. It represents, for them, the difference between societies

that are able to adapt to adverse effects related to climate change and those that cannot. This is similar to Homer-Dixon's (2000) theory of the ingenuity gap, which focuses on discrepancies between the adaptive capabilities of developed societies in comparison to developing societies, and how that gap is increasing with time.

This paper will also adopt a third, and related definition of "adaptation" from Buhaug, Gleditsch and Theisen (2008) as "adjustment in natural or human systems in response to actual or expected climatic stimuli or their effects, which moderates harm or exploits beneficial opportunities" (17). One can therefore identify the importance of adaptation in the determination of a society's vulnerability.

Environmental scarcity is outlined in a straightforward and succinct manner by Thomas Homer-Dixon (1999) in his book, *Environment, Scarcity, and Violence*. 'Environmental scarcity' is referred to as "scarcity of renewable resources, such as cropland, forests, river water, and fish stocks" (Homer-Dixon 1999, 8). By distinguishing between renewable resources and finite resources, Homer-Dixon provides a vital distinction that will be addressed in this paper. The decision to choose Yemen's renewable freshwater crisis as my case study is exemplary because of water's prominence in the environmental security debate.

2: Literature Review

“The gods must be furious...We’ve upset the natural order, and now the gods are punishing us.”

- Jia Son, Tibetan Farmer

2.1 Human Security

Human security, according to the UN Human Development Report of 1994, is made up of seven interrelated themes. These themes include: economic, food, health, environmental, personal, community, and political (Brainard and Chollet 2007, 75). Human security is defined by the Human Security Report Project as, “freedom from violence and from the fear of violence” (*Human Security Report Project* 2010). This notion gained increasing support following the Cold War as a departure from traditional security, which is primarily concerned with state-level armed violence. Human security, therefore, changes the referent object of security from the state to the individual or a collection of individuals. This represents an important policy change from state level security to a wider understanding of security that acknowledges the destabilizing potential of economic insecurity, famine, HIV/AIDS, flooding, etc.

However, human security is not without its critics. As Rita Floyd (2007) recognizes, human security “entirely lacks a framework of analysis” she states that, “this is truly the crux of the criticism of human security’s analytical ability” (42). By questioning the analytical utility of the human security approach, Floyd

does not attempt to discount the approach, but points out that, “the human security approach offers an alternative to the securitization approach in terms of normative utility only” (Floyd 2007, 39). Debate about the lack of theoretical grounding for human security and the difference in referent objects are internal disputes among human security analysts, but can be mostly attributed to the fact that human security is still relatively new in the security debate.

Environmental security can be understood under the rubric of human security. As discussions of climate change are popularized in the media and related natural disasters claim a staggering number of lives, it is important to recognize the destabilizing impact that environmental change can have on our individual well-being.

2.2 Environmental Security

Climate change is thought to be responsible for hundreds of thousands of deaths since the 1970s (Brainard and Chollet 2007, 78). This year alone, extreme flooding and associated landslides in China have claimed the lives of over two thousand people (Hogg 2010). A quarter of a million people are estimated to have starved during drought-induced famines in the Horn of Africa in the early 1970s (Manwaring 2002, 56), and Pakistan continues to experience its worst flooding in almost a century (*CBC The Canadian Press* 2010).

Waterborne diseases kill more than 3.4 million people a year, making them the leading cause of disease and death in the world: “[P]oor water sanitation and a lack of safe drinking water take a greater human toll than war,

terrorism, and weapons of mass destruction combined” (Berman 2005). In addition, the economic well-being of approximately three billion people – half the world’s population – is directly reliant on local natural resources (Homer-Dixon 1999, 13). In a world where environmental degradation claims so many human lives, and where all projections estimate a worsening situation in the coming years, the academic discourse on environmental security has gained increased attention.

As an element in the field of human security, environmental security refers to, “the protection of humans and societies from environmental, social, and cultural threats that undermine human security and the sustainable development of societies” (Brainard and Chollet 2007, 75). The link between human security and environmental security is that environmental security focuses on human conflicts induced by the “widening gap between the supply of and demand for environmental resources” (Brainard and Chollet 2007, 77). This gap is accounted for in several ways by a variety of academics and security analysts. Neo-Malthusians have for decades linked increases in population size to decreasing availability of natural resources and connected the resulting stressors to conflict. This view is challenged by some economists who argue that the opposite is true; that the abundance - not scarcity - of natural resources produces conflict by promoting rent-seeking behaviour on the part of governments and pitting social groups against each other in the fight for control.

This chapter will indicate the particular prominence conflicts over water, also known as 'water wars', have been given in this debate, and will conclude with a critique of the environmental security discourse.

2.2.1 Resource Scarcity

The idea that scarcity of essential resources may constitute a security threat was first predicted by Thomas Malthus in 1798. Malthus argued that with a finite amount of resources on our planet, population growth would eventually outstrip our ability to sustain ourselves. While he did not explicitly predict conflict over scarce resources, he did see war as a 'positive check' that would help decrease the population and allow our food supply to last longer (Malthus 1798). Although he was disproved by countless innovations in the efficiency of agriculture, neo-Malthusians have adopted his argument in regards to non-renewable resources like freshwater and oil.

A leading neo-Malthusian is Thomas Homer-Dixon. Homer-Dixon's theory argues that varying combinations of environmental stressors result in scarcity. This scarcity will culminate in disputes between nations or ethnic groups causing civil or intrastate tensions and, possibly, war. As competition over scarce resources increases, a critical threshold may emerge which, once crossed, leads to conflict (Manwaring 2002, 55).

Homer-Dixon (1999) outlines three types of scarcity. The first is supply-induced, where degradation and depletion result in an inadequate amount of a given resource to supply a population. Second, demand-induced scarcity occurs

when population growth or consumption outstrip the rate at which a resource is being renewed. Finally, structural scarcity is a result of unequal distribution, when a percentage of the population takes more than their share, or when elites engage in rent-seeking of natural resources making the distribution to other portions of the population unequal.

This latter argument is echoed by the authors of *Too Poor for Peace* when they suggest that scarcity can be broken into economic scarcity related to quantity, ecological scarcity related to quality, and structural scarcity which concerns the unbalanced distribution of resources (Brainard and Chollet 2007, 77). Both explanations of scarcity reflect the complicated dynamics of resource scarcity, their connection to global politics, and the ecological imperative for clean water.

Homer-Dixon (1999) argues that societies with low levels of development invest far less in research and development to find creative ways to conserve resources or adapt technologically. The result is an ingenuity gap, or an inability to innovate, making countries susceptible to instability and conflict (Buhaug et al 2008, 18). Conversely, developed societies are better equipped to handle environmental degradation, disasters, and scarcities. The unfortunate consequence is that as developed societies continue to technologically diverge from the developing world the ingenuity gap increases, leaving the developing world relatively worse off.

Unfortunately, the regions of the world facing the most dire resource shortages are also those that suffer the majority of armed conflicts and are those

in the worst financial situations. This is also not projected to change in the near future, indeed it is likely to worsen. Ninety percent of the world's population growth over the coming decades is expected to take place in countries where the majority of the population is directly reliant on local renewable resources (Brainard and Chollet 2007, 6). This type of growth will likely result in demand-induced scarcity as a growing population will be reliant on the same amount of food and water most notably. While resource scarcity increasingly plagues regions of the world, security in those same regions is strained. This project argues that resource scarcity in Yemen should exacerbate an already dismal security climate, but has yet to play a contributing factor in conflict.

2.2.2 Resource Abundance

Neo-classical economists on the other hand, predict not resource *scarcity* as a potential driver of conflict, but resource *abundance*. Several countries, most notably in Africa, have been home to conflict over an abundance of valuable resources. This phenomenon, sometimes known as the 'honey-pot effect' affects states that have an abundance of particular resources. Theorists contend that states that have large rents available from the exploitation of natural resources lack the incentive to create a social compact. "When states capture enormous rents from natural resources, they face far fewer incentives to bargain away greater economic and political accountability to the populace in exchange for broader rights of taxation" (Brainard and Chollet 2007, 64). These states also leave themselves vulnerable to economic shocks in the world market. Notable examples of the resource curse are diamond conflicts in Sierra Leone, resource

captures of coltan, a valuable mineral used in the production of cell phones, from the Democratic Republic of Congo, and oil conflicts in the Niger Delta. Although resource abundance in Yemen could relate to oil and rent-seeking behaviour therein, it is not a central component of this project due to its limited scope. It is important, however, to acknowledge both sides of the environmental security debate as contextual grounding, and to recognize the impact resource abundance can have on the security climate as well.

2.3 Environmental Conflict

Armed conflicts are increasingly concentrated in the developing world and the ingenuity gap is increasingly leaving those same countries behind. Buhaug et al (2008) explain that “[f]uture environmental changes will place further strains on these countries, possibly reducing the prospects for conflict resolution and sustained economic growth” (15). The growing concern over environmental scarcity is focused on areas that are unable to adapt to rapidly changing environments, and this situation is manifesting most prominently in the developing world.

The connection made by Collier et al (2009), that conflicts are more likely to break out in regions where conflict already exists, also emphasizes the concentration of conflict in the developing world. “Negative security impacts of future climatic changes are likely to be observed primarily in countries and regions that host today’s armed conflict: i.e. the East-Central parts of Africa, the Middle East, and Central and East Asia” (Buhaug et al 2008, 29).

The seemingly opposing views of neo-Malthusians and economists who look at the effects of resource abundance and/or scarcity, converge on the causes of environmental conflict. Both groups generally agree that environmentally induced conflicts are more probable in countries exhibiting certain factors - notably weak governance and authoritarian political institutions (Brainard and Chollet 2007, 68). Disputes over environmental resources (either too much or too little) can act as what Homer-Dixon calls a 'threat multiplier'. This indicates that societies already exhibiting risk factors such as high levels of poverty, income inequality, rapid population growth, poor governance and a high disease burden are predicted to "interact with environmental problems to put enormous pressure on the social fabric of many communities and consequently precipitate insecurity that often leads to conflicts" (Brainard and Chollet 2007, 73). Neo-Malthusians argue that demographic and environmental pressures open 'political space' for violence, while neo-classical economists suggest that these same pressures can cause political leaders to instigate conflict themselves in an attempt to maintain power or by rebel groups seeking to seize power (Brainard and Chollet 2007, 61-63).

Hauge and Ellingsen (1998), hailed authors of the first multivariate statistical assessments in environmental security, have drawn attention to several factors that exert a direct and positive effect on the incidence of civil war. They factors include land degradation, freshwater scarcity, population density, and deforestation (Buhaug et al 2008, 30). Others that have found a correlation between water scarcity and civil war include, Vandana Shiva (2002), Maude

Barlow (2007) and Maude Barlow and Tony Clarke (2002). The following section of this project will reflect on the idea that water scarcity could have a positive and direct effect on civil war in the context of a society exhibiting the contributing factors agreed upon by environmental security analysts. This approach to environmental security focuses on both the most widely accepted 'structural' factors associated with the increased risks of civil war, and one of the most widely accepted factors that could exacerbate those risks.

Examples of conflicts over an abundance of resources, as stated above, are Sierra Leone, The Democratic Republic of Congo, and the Niger Delta. Conflicts over scarcity of resources are evident on the same continent. Theorists have gone to great lengths to connect the Rwandan genocide to land scarcity where a burgeoning population (Rwanda was the most densely populated country in the world at the time) was coupled with an international drop in coffee prices. The fight over a limited amount of land eventually led to grievances that spilled over into the 1994 genocide (Brainard and Chollet 2007, 79-81). Another example is the conflict in the Sudan region of Darfur that pits herders against agriculturists in a prolonged and deadly fight for land rights and water access. Yemen, as a case study, is an important case that examines the intersectionality between conflict and resource scarcity, suggesting that it is an appropriate case for the examination of the scarcity/conflict model as it gains prominence.

2.4 Grievance Debate

Humphreys and Weinstein (2007), in their work on Sierra Leone, test three competing theories of rebel recruitment: grievance, selective incentives, and

social sanctions. The first suggests a general dissatisfaction, sense of grievance, or revenge-seeking behaviour on behalf of individuals. "Participation depends on economic deprivation, marginalisation from political decision-making, and alienation from the mainstream political process" (GSDRC 2010). Selective incentives are based on real or perceived benefits as a result of joining a rebel movement, examples being money, status, safety, food etc. Finally, social sanctions involve stigma associated with non-participation coupled with community pressure. Factors listed as catalysts for civil conflict include: poverty, lack of access to education, and political alienation (GSDRC 2010).

This section will focus on the grievance debate and its relevance to international conflict. As *The Economist* forcefully wrote, "it is easy to give a poor man a cause" (Brainard and Chollet 2007, 4). However, some environmental security scholars have questioned the notion of grievance in detail. Buhaug's (2008) critique most notably calls into question the assumptions made about those who join rebel movements:

[I]t is worth mentioning that the general literature on microfoundations of civil war provides little systematic evidence for the grievance conception common in the environmental security literature that rebels consist primarily of poor, deprived individuals of society who resort to violence in a desperate effort to improve conditions (31).

This supports the idea that rebels are not necessarily those who join out of desperation. In fact, the benefits of joining rebel movements whether they are status, wealth or power may be alluring to *all* individuals.

Oxford Economist Paul Collier (2009) also disagrees with the grievance debate. He claims that rebel groups need little motivation or grievance to engage in civil war. In addition, he says conflict is also unpreventable: “[v]iolent conflict cannot be prevented by addressing the problems that are likely to motivate it; it can only be prevented by making it more difficult” (Collier 2009, 139). Fearon and Laitin also find that rebellion and insurgency are more likely in countries exhibiting conditions that facilitate it. These factors include poverty, political instability, rough terrain and large populations (Fearon and Laitin 2003).

Why people go to war is the topic of much academic debate. This project seeks to examine why rebels in North Yemen have chosen, so far seven times, to fight their government, sustaining great human hardship, damage to their infrastructure, and further exacerbating their already dismal economic situation. How is it that in spite of such damages, rebels are consistently able to recruit fighters and how might water shortages be related to this rebel recruitment?

Factors that exert pressure on people and their societies to fight are important to my examination of Yemen. Stressors such as those outlined by the scholars above, are all indicators of societies at greater risk of civil war and are echoed by environmental security analysts as reasons why fighting becomes more likely when societies are faced with environmental scarcity - and sometimes degradation. Societies that face environmental scarcity *in addition* to these factors, such as Sa'ada in North Yemen, are arguably at even greater risk, making them useful test cases for environmental security assumptions.

Water shortages coupled with a faltering economic system, political instability and weak government institutions act as what Homer-Dixon calls 'threat multipliers', making conflict more likely. The region examined for the purpose of this project is Sa'ada in North Yemen. Here the prospect that water shortage might increase the risk of war in a region already burdened with a recent history of deadly conflict, government neglect and a population facing extreme poverty seems highly plausible.

2.5 Critique

The greatest critics of environmental security are traditional security analysts. Frank McNeil and Max Manwaring (2002) argue in their book *Environmental Security and Global Stability: Problems and Responses*, that the success of the environmental security discourse in gaining recognition and funding is seen by traditional security analysts as a threat. Traditional security proponents worry that environmentalists by making environmental issues into security issues, are seeking to access military budgets to support conservation (Manwaring 2002, 2). While budgetary considerations are important if environmental security is to be included on the security agenda, environmental security seeks to simply recognize that "scarcity, mismanagement, and human-induced degradation of natural resources are seen as potentially capable of destabilizing a region or a country to the same degree as an invading army or external aggressor" (Manwaring 2002, 51). This indicates the importance of making financial provisions for environmental security if the potential threat to

human security caused by environmental problems is comparable to that of armed violence.

Critics of the theoretical grounding of environmental security argue that its status on the traditional security agenda is misplaced because of an absence of direct causation. Environmentalists often rely on “prevailing apocalyptic predictions conditional on scenarios that may either never be realized or that may evolve differently” (Manwaring 2002, 51). This has resulted in a number of neo-Malthusian theorists conceding that while environmental degradation is a potential cause of conflict, it is evidently not the *only* cause of conflict (Manwaring 2002, 52).

Environmental scarcity adds additional stress to regions already suffering from low economic development, weak governmental institutions, and conflict (Buhaug et al 2008, 12). In this way, environmental factors exacerbate an already dismal situation, which can increase the likelihood of conflict but not necessarily lead to its outbreak.

Even while admitting the destabilizing *potential* of environmental security, over-stating the risk of conflict could be counter-productive. “Fuelling fears that climate change will generate threats like terrorism and mass immigration will lead to oversimplified and inaccurate perceptions of the security angle.” (Smith and Vivekananda 2009, 7). Environmental security, therefore, must focus on, while not overestimating, both the physical environmental changes, as well as the social consequences of these changes, including migration in the form of

environmental refugees and environmental terrorism (Smith and Vivekananda 2009, 8).

Because environmental insecurity may not necessarily end in conflicts, focusing only on conflicts may mask potential threats and vulnerabilities that could threaten the existence of human populations and societies. Environmental security therefore should go beyond conflicts and conflict resolution to include the adverse effects on important human and societal functions and structures (Brainard and Chollet 2007, 76).

Whether it causes conflict or not, environmental stress needs to be recognized as a real threat to human security. One issue that has already been recognized as a source of human insecurity in regions as diverse as Asia, Latin America, the Middle East and Africa, has been water quality and water shortage. More precious a commodity than oil, in that it is in-substitutable and indispensable, access to freshwater is a critical human security issue. Conflicts over water, while imposing a relatively low human toll, have been predicted to become a global problem in the years to come. This global problem, should it manifest anywhere, should surface in Yemen.

2.6 Provisions for Water in Environmental Security

While environmental security may pose an increasing overall threat to global stability in the future, this paper examines a much narrower issue. The environmental security literature identifies freshwater as a vital renewable resource (Buhaug et al 2008, 19). Water is the life source of all living things, and is therefore indispensable to the earth's well-being. It is also – unlike most other resources – in-substitutable. While advancements in technology have been able to stretch our food supply to meet the needs of a growing population, scientific

prospects for increasing the amount of freshwater on the earth are limited to expensive, unpredictable and by all accounts, unsustainable solutions such as the melting of glaciers and desalination.

Water scarcity and degradation have had a devastating impact on every continent (*Global Corruption Report 2008*, xxiii). By 2020, between 34 and 76 million people could die as a result of water-related illnesses, even if the UN Development Goals are met (Gleick 2002, 1), and by 2025 more than 3 billion people will be living in water-stressed countries (*Global Corruption Report 2008*, xxiii). Already today 1.2 billion people lack guaranteed access to clean potable water (*Global Corruption Report 2008*, xxiii). Water scarcity and poor water quality already affect more than half the world's population. In addition to the direct impact of scarcity and poor water quality, 'knock-on' social effects can have a direct and devastating impact on millions of people (Brainard and Chollet 2007, 67). Degradation, depletion, maldistribution and desertification have already had severe implications on the survival of mainly rural populations. The Sahel region of Africa has seen the impact of desertification as farmers are pitted against herders in deadly clashes, and a dried up basin in Yemen has already created what some call the first ever 'water war' in Ta'iz². Notwithstanding this, Smith and Vivekananda point out that:

Conflicting claims to water resources have generally not led to violence between states – the record of settling disputes is largely positive in fact – but there remains a considerable risk of conflict within states as different groups contend for diminishing water resources (8).

² After the collapse of the Ta'iz water basin in 1998, conflict in 1999 left six people dead and sixty injured. This is the most prominent example of violent conflict over scarce water resources in Yemen thus far but indicates a dangerous precedent for the country as a whole.

Exacerbating the risk of intrastate conflict is the indisputable link between water and food security in the form of agriculture, regional economic well-being due to industrial reliance on water, and the obvious risk of climate-related migration (Smith and Vivekananda 2009, 7-9).

The interconnected nature of all aspects of human security are clearly evident in the case of water. The cost of water can be economically prohibitive, it is needed to grow the food we consume, we need it to survive, it is nature's most vital resource, it is indispensable and in-substitutable, and its regulation, quality and quantity is becoming increasingly political. By focusing on water as an environmental security issue, I am able to make an in-depth assessment of the validity of the environmental security thesis and by extension human security.

McNeil and Manwaring (2002) acknowledge that, "In particular, 'water wars' and lesser disputes over fresh water and maritime rights, appear to have a future, particularly in the developing world" (3). General Zinni notes that, "water is what I would put as the first priority, and all the problems related to that...are close to being catastrophic problems in many regions of the world" (Manwaring 2002, xi). Maude Barlow (2007) adds that, "[t]he global water crisis has become a most powerful symbol of growing inequality in our world" (1), and it is our society's moral and ecological imperative to act to right these inequalities (1).

Yemen is the poorest country in the Middle East, it has one of the highest population growth rates in the world, Yemini society is blighted by high levels of corruption and the government is unable or unwilling to look after the politically

isolated north. In addition, Yemen is experiencing unprecedented water shortages, while Yemeni society remains rife with religious conflict and a history of environmental conflict over water in the Ta'iz region. If ever there were a candidate for conflict over water, Yemen would be it.

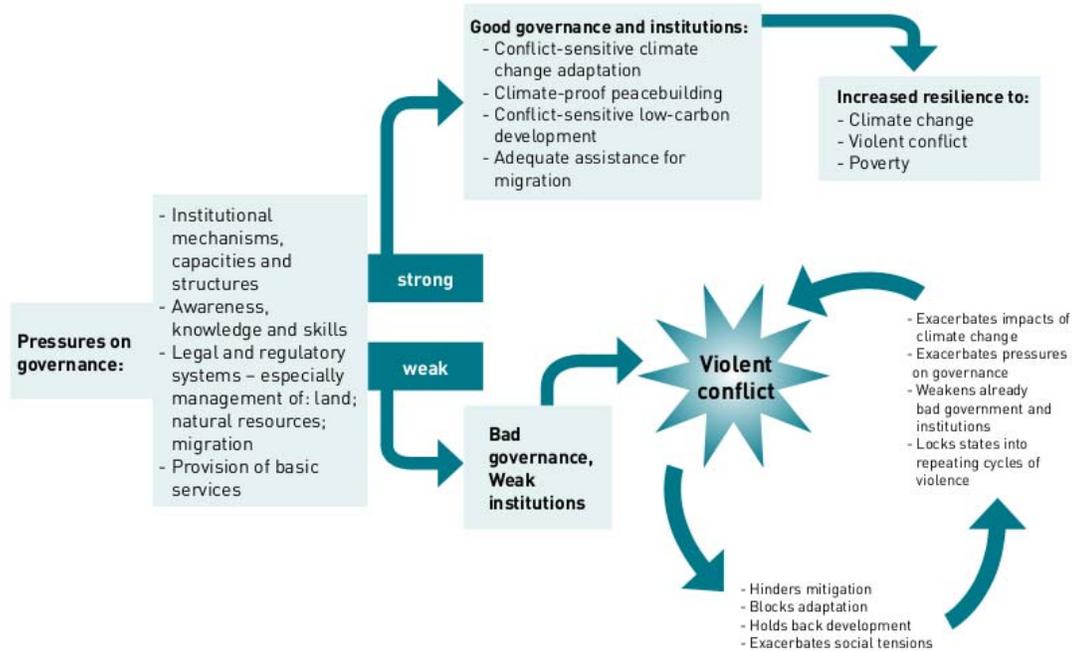


Figure 1: Linking the environment and conflict through a political focus on governance. Smith & Vivekananda 2009, 10

3: Case Study: Sa'ada

“Water is most expensive to provide for those least able to afford it.”

- Tina Rosenberg

Yemen's northern province of Sa'ada poses unique challenges to the central government. Not only is Sa'ada home to the second water basin in the country that is estimated to run dry by 2035, it is also the epicentre of intense fighting between the Houthi rebels and the central government. The region is afflicted by sporadic warfare, hundreds of thousands have been displaced, and it faces an array of environmental challenges exacerbated by the war. This section aims to outline both the relevant history of the conflict, and the present and immediate future of water in Sa'ada. While it is difficult to surmise a direct correlation between water shortages and the conflict, I will provide supporting evidence for most if not all the factors that, while exacerbated by environmental shortage, *should* lead to conflict according to environmental security analysts. These factors, coupled with unprecedented water shortages, should, according to the environmental security thesis, lead to conflict, but my research shows that there are no environmental provisions in the ceasefire terms of the various peace agreements, nor were environmental concerns raised during the negotiations.³

³ See ceasefire terms in Appendix B

3.1 Background to the Conflict

3.1.1 Before the Violence

An estimated 25,000 people have died, 150,000 have been displaced, and over 3,000 have been arrested since 2004 in connection with the conflict between the Houthi rebels and the Government of Yemen (OCHA 2009). In order to understand the underlying causes of the conflict, a brief outline of its history will provide context.

Recognized as a conflict based on religious fundamentalism, it is noteworthy that Yemeni society is divided. While Sunni's represent a majority of Yemen's population, Shiites are the dominant religious group in the north. The division between Shia and Sunni Muslims dates back to the death of prophet Muhammed in 632. The Sunni's thought the new leader of the Muslim nation should be elected from those close to Muhammed and practised in religious teachings, Shiite's believed the successor should be drawn from the prophet's own family. Sunni's prevailed with the appointment of Abu Bakr and the two groups have been divided politically ever since.

Revolution in 1962 in North Yemen led to the establishment of a republic and ended over a thousand years of rule by the Zaydi Hashemites (Shiites) who claim to be descendants of the Prophet Muhammed. Until 1962, the Zaydi Hashemites had dominated both political and religious spheres (*International Crisis Group* 2009, 2). Sa'ada, in the north, was the Zaydi's main stronghold. Since their fall from power the city and its inhabitants have been largely ignored by the government. Therefore, Sa'ada remains severely underdeveloped

economically compared to the rest of the country on account of this neglect, making it an attractive location for Shiite Muslims who are increasingly disenchanted with their government.

Far from being solely a religious conflict, the origins of Yemeni conflict are in fact an intricate combination of competing tribal identities, endemic regional underdevelopment, perceived socio-economic injustices, and historical grievances (Boucek 2009, 15). Regional resource constraints (most notably harsh geography and dispersed population) have kept the Sa'ada region relatively underdeveloped economically and have fostered "hyper-local identities" (Salmoni et al 2010, 3). With the government rarely intervening in political affairs in the north, Sa'ada has become a largely self-governing autonomous region. The developed power structure was a form of tribalism (qabyala), which sees honour (sharaf) as "solidarity with kinsmen, protection of a kin group's women and other subordinate allies, and the inviolability of an individual or group's territory and possessions" (Salmoni et al 2010, 3). The leaders in this system gain legitimacy based on their ability to gain access to material goods and provide for their civilians. In order to facilitate the movement of these material goods advanced trade routes such as roads and footpaths were developed between villages to overcome the natural obstacles in the mountainous region (Salmoni et al 2010, 4).

Sa'ada, Amran and Hajja areas have received disproportionately little government investment in infrastructure, social welfare, education and security (Salmoni et al 2010, 5). This neglect and consequent shared hardship

encouraged the development of a form of 'imagined community', a notion made popular by Benedict Anderson whereby individuals feel a sense of commonality towards other members of their "group" based on a particular characteristic even though they may have never met (Anderson 2006). In North Yemen this meant Sa'adans specifically, Northerners generally, and all those following the Zaydi faith felt a sense of unity based on their religion and geographical location. While Zaydi is a minority religion in Yemen, it is the majority religion in the north with Sa'ada as its epicentre. Regional leaders responded to government neglect in the 1980s and 90s by forming their own religiously affiliated summer camps, school programs and associations known as the al-shababab al mu-min, or "Believing Youth" (Salmoni et al 2010, 5).

An increasing feeling of isolation, rising literacy rates, higher material expectations and the religious revival of sects of the Muslim faith combined to increase regional unrest and dissatisfaction with the government. Specifically the encroachment of Wahhabi-influenced Salafism (a strict practice of Sunni Islam) from Saudi Arabia, worked to encourage Zaydi Muslims to act collectively to protect their faith.

Particular members of the Zaydi faith, namely Hussein Badderine Al-Houthi, gained prominence in the community by holding lectures, making and distributing cassette tapes and publicly supporting Zaydism while criticising government inaction in the region. Houthi, a member of parliament, challenged President Saleh, (himself a Zaydi originally from Sa'ada) who found the rising resistance particularly threatening.

The Houthi movement was internationally recognized in the media after their condemnation of the central government's decision to act as a partner to the United States after the terrorist attacks of September 11th, 2001. Most famously their slogan of 'God is great, death to America, death to Israel, curse to Jews, and victory to Islam' attracted international concern from North America and its allies in the Middle East. By the mid-2000s the government decided to try and repress the Houthi movement by force, which resulted in violent armed conflict that has been waged intermittently ever since. An overview of the first six rounds of fighting has been provided below.

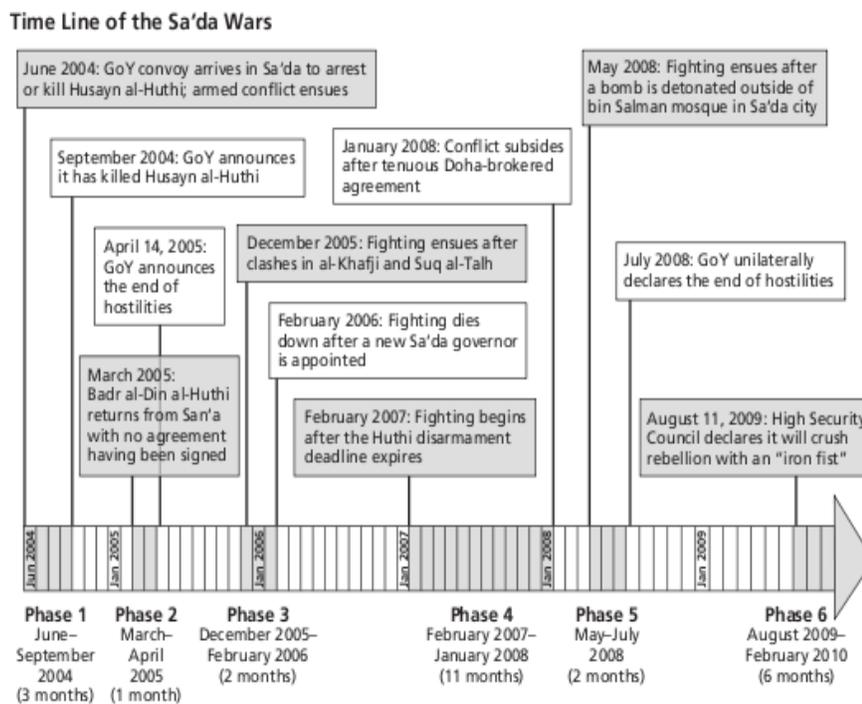


Figure 2: Timeline of Sa'ada Conflict. Smith & Vivekananda 2009, 133

3.1.2 Violent Conflict

The government, looking to stifle the movement of the Houthis in the summer of 2004, militarily confronted the Houthi's leader and spokesperson, Hussein Badderine Al-Houthi. That same year, the initial conflict erupted because of al-Houthi's attempted arrest and subsequent assassination by the military (Boucek 2009, 14). Al-Houthi's assassination on 10 September 2004 only served to protract and exacerbate a political conflict and escalate it to a violent armed conflict, which is now led by his brother, Abdul-Malik al-Houthi.

3.1.3 Articulated Grievances and Ceasefire Terms

The cessation of each bout of violent conflict has been mitigated by a ceasefire. The ceasefire terms, listed in Appendix B, portray the power dynamic between the rebels and the government. The most recent grievance by the Houthis included in the ceasefire terms was in the 2007/2008 mediation by Qatar. In the two most recent ceasefires the Houthi's demands have been absent.

The government accuses the rebels of receiving support from Iran and Hizbollah (a claim that is unsubstantiated), as well as seeking to restore the Shiite imamate (religious form of government), which the government sees as equivalent to treason (Boucek 2009, 3). On the other hand, the "Houthis are calling for freedom of worship and social justice. They accuse the government of corruption, and of meddling with the delicate religious balance between Zaydi Shi'as and Salafi Sunnis" (Hill 2010, 5). These grievances are represented in the ceasefire terms where the government's demands include adherence to Yemeni

law, cessation of rebellion and sabotage activities, relinquishment of weapons to the state, and releasing prisoners. The Houthis articulate demands that address not the conflict itself, but the underlying reasons for their discontent. The Houthis ask for an extension of the state's general order to the north, equivalent to a request for equal treatment to the rest of Yemen, respect of their freedom of opinion and association in order to form their own political party representative of their beliefs and support in rebuilding the areas in the north damaged during the conflict (Salmoni et al 2010, 315-317).

The rebels, whose demands have not always been included in ceasefire negotiations, also reject Saleh's cooperation with the United States in 'the war on terror'. The government seeks U.S. assistance in what they see as a multi-front battle against terrorism, while the rebels claim to be resorting to violence in protest of Saleh's relationship with the United States (Hill 2010, 5).

While violent conflict in North Yemen stems from a variety of grievances and historical hostilities between the rebels and the government, water shortage poses a potentially more devastating affect than religious discrimination and political ignorance combined. As the livelihoods of northerners become increasingly threatened with water scarcity, it becomes more likely that conflict will occur over scarce water and that the government's inability to politically or economically facilitate its delivery will weigh heavily as a grievance for the rebels. However, the rebels have yet to articulate an environmental demand and, as evident in the next section, their tactics and grievances have remained static.

3.1.4 Recent Activity

Al-Houthi declared on 2 January 2010 that he would welcome Saleh's renewed call for a ceasefire if the government would halt its operations in the North (Crisis Watch 2010, 11). A sixth ceasefire was officially signed by both parties on 12 February 2010 and was being monitored by Sheikh Ali Nasser Qersha, a correspondent for Al Jazeera News. "Rebel fighters in northern Yemen have freed 178 soldiers and civilians held captive during their battle with government forces" (*Al Jazeera* March 17 2010). However, Qersha claimed that stable peace was unlikely, as it did not address rebel complaints of discrimination by the government. Rebels continue to object to the army leaving its barracks in the North, but apparently had no objection to civil servants returning to their posts there. "The Sanaa government said that Houthis were failing to meet some of the six key points of the ceasefire agreement", which included freeing all prisoners (including Saudis who joined the fighting in November), opening roads to the North, withdrawing from government buildings, returning weapons seized from security forces, handing over captured army posts, and a pledge not to attack Saudi Arabia (*Al Jazeera* March 17 2010).

Human Rights Watch argued that there has been a continuing failure on both the part of the Yemeni government and the Houthi rebels as they closed their sixth round of fighting without addressing violations of the laws of war, failed to hold perpetrators to account or to compensate victims (*Human Rights Watch* April 7 2010). The numerous grievances of the rebels remain unaddressed, as the peace terms were chosen by the government in Sana'a without consultation

with the rebels (*Gulf Times* March 13 2010). These combined failures complicate any sustainable effort to prevent the war from restarting.

Therefore, the conflict seems to be at a stalemate and neither side can come to an agreement nor prevail on the battlefield. There is still no clear agreement between parties, accumulated grievances remain unaddressed, tensions are high and the willingness to compromise is low (*International Crisis Group* 2009). Qatar's conciliation attempt, which has been the most well intentioned and whole-hearted, failed not because of a lack of effort, but because of the inability of either of the parties to agree and move past collective grievances (*International Crisis Group* 2009).

Jane Novak, a freelance journalist in Yemen states that, "Each of the six wars in Yemen was a photo copy of the one before, except the bombs got bigger the children more frail, and the jails more crowded" (Novak 2010a). Leaving the voice of the rebels unheard in the resolution of conflict means leaving important reasons for fighting unaddressed. The inability to find common ground now will be increasingly problematic as the country's economic and ecological problems mount.

3.1.5 Looking Ahead

In the summer of 2010, the underlying issues that have driven the conflict remain unresolved. The armed confrontation itself has taken the form of intervals of violence—seven all told since 2004—followed by periods of relative peace. The shortest period of conflict lasted approximately one month, the longest,

eleven months. The fighting has generally been confined to military challenges to the rebels in Sa'ada province, which has borne the brunt of damages to infrastructure, and many of whose population have been displaced by the violence. The more than 150,000 people who have become internally displaced people (IDPs) due to the conflict now face severe water, food and medicine shortages in the areas to which they have been relocated.



Figure 3: Anon. 2010. Lonely Planet

Recurrence of conflict follows each subsequent failure of diplomatic solutions. The Gulf Research Center, based in Dubai, is sceptical of the sustainability of any diplomatic solution (Stracke 2010). All internal and external mediation efforts have ultimately suffered from the severe distrust of the parties towards one another, the fact that the government refuses to recognize the

rebels as equals, and from the strict requirements of tribal law in the mediation process requiring the legitimacy of the mediator in the eyes of all tribes ensuring their neutrality and intention. Peace terms are repeatedly violated (both in reality and perception) and conflict reignites. Most recently, evidence mounted that Houthi rebels had begun “actively controlling access to the western part of the country and closed strategic roads used as supply lines for the Yemeni army” (Stracke 2010). The potential re-emergence of violent conflict in the North threatens the government’s control of territory and legitimacy, and therefore represents an existential threat to the Yemeni state.

By late July 2010 the parties opened their seventh round of fighting with the death of nine soldiers and pro-government tribesmen and ten Houthis as rebels carried out a night attack (*BBC News* July 22 2010). The Houthis maintain that the attack is in response to continued economic and religious discrimination left unaddressed by the February ceasefire (*BBC News* July 22 2010). Whether a sustainable peace is ever possible between the Houthis and the government remains to be determined. Just as it is important to understand the numerous mitigating factors in the Yemeni conflict, the next section will explore the particular water scarcity situation in Sa'ada and relate it to the explanatory theories surrounding water scarcity.

3.2 Background on Water Shortage

The shortage of water in Yemen is linked to economic misuse, government neglect of monitoring responsibilities over drilling, unlucky geographical landscape, and a burgeoning population. The government has

made little effort to monitor the drilling of new wells. This resulted in rapid depletion of water tables due to the sheer number of illegal wells drilled. The terrain of Yemen is very difficult. The land is mountainous and Yemen's population is spread thinly over its rural areas. This makes the transportation of water from natural basins to settlements difficult and the construction of infrastructure impractical due to the inflated cost.

Yemen's water shortage is not new, but has been exacerbated by continued rapid population growth and rainfall shortages in the past year. Water in the country is highly regulated by an increasingly weak state, and the poorly regulated deliveries are inefficient. A vicious cycle is created between poor water management and weak governance: "As water scarcity worsens, the government's attempts to mitigate it are undermined by its weak control over the state. Without successful policies to mitigate water scarcity, the government's legitimacy is further weakened" (Rogers 2009).

Irrigation Sources and Arable Land of the San'a and Sa'da Governorates

Governorate	Dams/ Barriers	Floods	Springs	Wells	Cultivated Area (hectares)	Arable Land (hectares)
San'a	405	505	3,303	46,705	132,568	136,596
Sa'da	283	122	1,219	12,201	37,642	40,721

Table 1: Salmoni et al 2010, 26

The combined effect of these factors has been that water tables have sunk to an all time low and are projected to fall even farther in the years to come. Water tables in Yemen are falling at some of the fastest rates in the world; more

than one metre a year according to the Global Corruption Report (2008, 19). Water use per capita in Yemen is approximately 125 cubic metres per person, per year, and is projected to fall to 62.5 cubic metres by 2025, around the same time the capital city is expected to run out of water completely (Al-Ariqi 2006). These challenges are intensified further by the demands of one of the fastest growing populations in the world (Bennett et al 2010), especially in the capital due to urbanization. The population growth rate in the capital is now seven percent per year (Boucek 2009, 6).

The World Bank reports that the situation is critical in Yemen; ninety percent of the population relies on less than 90 cubic metres of water annually for domestic use (Al-Ariqi 2006). This compares to the global average of 1,500 cubic metres per year, leaving only 44 percent of the population with access to adequate water supplies and only twelve percent with adequate sanitation (Al-Ariqi 2006). With limited access, citizens have taken matters into their own hands. Chatham House estimates that ninety-nine percent of all water extraction in Yemen is unlicensed, meaning such extractions are not subject to any customs, duties or taxes, further limiting the revenue of the state (Boucek 2009, 6) and accelerating the decline of aquifers.

Water governance in Yemen is the responsibility of two government ministries, the Ministry of Water and Environment (MWE) and the National Water Resource Authority (NWRA) both of which are charged with the design and implementation of Yemen's water policies. Mahmoud Sultan, NWRA studies research director, admits that, "Government concern came out after the

emergence of serious problems like the Ta'iz city water shortage, whose water basin collapsed in 1998, and the obvious threat of drought in the Sana'a and Sa'ada basins" (Al-Ariqi 2006). MWE experts also note that although many countries in the world are facing a water crisis, no other capital city in the world faces the prospect of running out of water within the next decade (Al-Ariqi 2006).

In order to address the increasing water shortages, the central government has sought to decentralize the provisioning and delivery of water, leaving regional governorates to cope with water shortages on their own. Although understandable in political terms, this decision simply underscores the lack of political control the central government exerts over much of the country (Boucek 2009, 7). The situation is especially dire in rural parts of the country as the rural-urban divide separates more than just economic status; this divide in Yemen signifies who has access to water and who does not.

Yemen faces the prospect of greatly increased water scarcity in all the forms described by Homer-Dixon. Demand-induced scarcity is evident in the growing number of people relying on the water sources in Yemen. In 2004, Sa'ada was an area of approximately 25,000 square kilometres and was home to nearly 700,000 people (Ahmed no date, 1). With a population growth rate of seven percent, one of the highest in the world, the already dwindling amount of water is being increasingly divided among more and more people. Homer-Dixon (1999) forcefully demonstrates the potential effect of population growth on scarcity:

Increased population size and increased per capita demand for a given resource can have dual effects on environmental scarcity: they both increase total demand for the resource, and they can decrease supply by contributing to the resource's depletion or degradation. Growing populations and greater per capita resource demands can thus simultaneously boost demand-induced and supply-induced scarcity. (52).

Supply-induced scarcity involves environmental degradation of the basin in question. The Sa'ada basin suffers from drought-like conditions and over-extraction. Jac van der Gun, Director of Groundwater Resources Assessment Center in the Netherlands says that, "Saada has a huge water problem, but they can't think about the future because they are thinking about today" (*Al Arabiya News Channel* August 30 2009). Finally, structural scarcity is evident in government neglect of crumbling water infrastructure and inefficient delivery systems. The government's lack of action against illegal wells further exacerbates the water problem as farmers use more than their share to grow qat (a locally grown narcotic plant) and leave residents without adequate water for personal consumption.

Incentives and Water Consumption for Primary Sa'da Crops

Crop	Incentive	Constraint	Water Consumption
Grapes	High quality and reputation Cash and subsistence crop High social value	Labor intensive	Drought resistant
Pomegranates	High quality and reputation Exports to Saudi Arabia Storage capacity	Needs expertise Easily damaged from over-irrigation	Water intensive
Citrus fruits	High social, religious, and economic value	Disease Lack of experience Market saturation	Water intensive
Apples	High economic and social value	Disease Lack of experience	Water intensive
Qat	High demand and price Flexible irrigation Dry-season demand Demand in Saudi Arabia	Changing religious value Fear of disease Theft	Drought resistant
Alfalfa	Livestock (social value) Livestock (economic value)	Water scarcity Lack of livestock Daily labor	Water intensive
Sorghum	Social value (breakfast) Fodder Food self-sufficiency	—	Drought resistant

Table 2: Salmoni et al 2010, 32

3.3 Relating Water and Conflict in Sa'ada

While Yemen as a whole faces dire water shortages plagued by inefficiencies and political games, Sa'ada's shortage is of particular concern. Like the 1998 water shortage in Ta'iz, Sa'ada is projected to be an 'at risk' basin in Yemen, meaning that overuse and misuse of the water basin, if sustained at their current levels, will force the collapse of the water basin, destroying the livelihoods of thousands of people.

In addition to the rural population, which relies heavily on water to sustain agriculture and livelihoods, water is also needed to sustain the growing number of persons displaced by the conflict. While water does not appear to play a critical role in the grievances of the Houthis, it will play a definitive role in the sustainability of displaced persons camps since the availability of water determines where the camps are set up and ensures the health of those in the camps.

The Houthis could potentially draw on the unavailability of water to further criticize the government and gain support. In an effort to pressure the rebels the government has cut off trade and supply routes to the north, the Houthi leadership could therefore blame increasing water and food shortages on inaccessible trade routes and heighten dissatisfaction with the government. The Houthis have already proved adept at maintaining both a material base in Sa'ada, as well as popular support in the region, both of which could be furthered by criticism over trade route closures by the government (Salmoni et al 2010, 1).

Scarce resources are allocated across a harsh geographical environment. Population concentrations are scattered and relatively small, separated by deserts, mountains, and other natural obstacles to movement—or external penetration. Material survival has thus required a certain amount of local self-sufficiency, as well as the maintenance of interregion trade routes (Salmoni et al 2010, 3).

These trade routes are those blocked by the government and rather than pressuring only the rebels, the population as a whole suffers. This can serve to garner support for the rebels who are seen as the providers of material goods in the area, rather than the government who withholds those goods.

There is also a potential for conflict fatigue among the northern civilians. Having lived in a place repeatedly and frequently ravaged by conflict in the last six years, it is possible that citizens of the north are fed up with the inability of the rebels and government to reach an agreement. This fatigue could fuel discontent with the rebels and bring support for a cessation of hostilities.

Grievances over water may well overstate the possibility of conflict as addressed in the grievance section of environmental security. With this in mind, it is unlikely that the hundreds of thousands of IDPs created by this conflict and now living on even scarcer water than the rest of the governorate will take up arms against the government in the fight for freshwater. Currently, the water war theory has little merit in Yemen, but it is possible that the water shortage could still become a catalyst for violent conflict in the future if the conflict continues.

4: Making The Case for Water Conflict in Yemen

“We learn to live within nature’s increasingly unpredictable means, we move elsewhere, or we perish.”

- **Elizabeth Royte**

Environmental security analysts have conceded that while water shortage or environmental scarcity on its own may not be enough to instigate conflict, it can act as a catalyst or 'threat multiplier' in countries where other conflict risk factors are present. Some of these factors were noted earlier. They include: weak governments and authoritarian political institutions, high levels of poverty and income inequality, rapid population growth and a high proportion of unemployed young men, and either an extreme abundance or an extreme shortage of resources. Each of these factors will be examined in turn in Yemen to make the case that if there were ever a society where water shortages should precipitate conflict, it would be in Yemen's Sa'ada region.

International Alert suggests that “Poverty, state fragility and a propensity to violent conflict make a vicious circle, full of negative feedback: each feeds on the others”, (Smith and Vivekananda 2009, 10). The vicious circle in Yemen is growing tighter and tighter, with some experts predicting state failure.

4.1 Political Factors

Although Yemen is praised as a country that has persevered in the face of seemingly insurmountable challenges, the government is increasingly unable to

deal with the problems it faces. As conflict starts its seventh round in the north, separatists feelings still fuel clashes in the south, and AQAP sees Yemen as an attractive new home, the central government in Sana'a is quickly being overwhelmed by several potentially existential threats at once. The strategy of decentralization has meant not that state capacity grows stronger, but that the governorates are left to rule themselves in lawless areas where the government exerts little control. Sa'ada is the best example of one of these lawless governorates.

Sa'ada, a province in the north of Yemen, has been left to its own devices for the longest of any of the provinces because of hostility towards the government, and geographic isolation. Thus this region has become a potent source of insecurity.

Weak governments are often unable to adequately control their territory – leaving lawless areas and natural resources to be hijacked by predatory actors. Fragile states can become breeding grounds for criminal activity, internal strife, or terrorist networks – and often all three simultaneously (Brainard and Chollet 2007, 3).

Isolation of the Sa'ada governorate has not served the interest of the government. Capitalizing on isolation and government neglect, the Houthis have managed to create a power base that draws support from government failures and has sustained the conflict there over seven rounds of fighting.

“Underdevelopment and poor governance, in turn, can generate grievances and open political space for organized violence” (Brainard and Chollet 2007, 64).

This represents what Fearon and Laitin (2003) identify as the most important factor in civil conflict. A weak state fosters political instability, usually associated

with 'anocracies' - regimes that are neither fully democratic nor autocratic but a mix of the two - as a major risk factor. Anocratic governments, like the Saleh government in Yemen, open the political space for rebellion because they are too weak to militarily defeat rebellions and they are financially incapable of buying off their grievances (Fearon 2003).

Political corruption is another critical issue. Transparency International's 2008 Corruption Perception Index ranked Yemen 141st out of 180 countries, up from 111th in 2006 (Hill 2010, 8). One Yemeni democrat summarizes it well; he says that, "the problem is so acute...that the regime is 'killing the chicken instead of stealing the eggs'" (Hill 2010, 8). Unfortunately, ridding the country of corruption appears to be a low priority for the Saleh government, whose thirty-five years in power must come to an end in the upcoming 2013 elections, because Saleh will have reached the limit of his renewable terms. This will be the country's first democratic transition, provided the process proves democratic. The Saleh government has neglected to impose disciplined anti-corruption measures furthering the grievances of groups in both the North and South (Johnsen 2010).

Finally, several scholars agree that a society with a history of conflict is most likely to see the resurgence of conflict. While the number of wars is decreasing worldwide, particular regions and countries remain at heightened vulnerability to conflict as they become protracted, "often cycling back into conflict after stability has been established." (Brainard and Chollet 2007, 4). Collier et al (2003), identify a history of conflict as an important indicator of future

conflict. Additionally, research suggests that as many as one-third of civil wars will restart (Brainard and Chollet 2007, 2). Since civil wars affect the livelihoods of the people living in the region in which fighting takes place, poverty can become, “both a cause of insecurity and a consequence of it” (Brainard and Chollet 2007, 2). For this reason, economic factors before, during and after conflicts are important to predictions of further conflicts and the sustainability of peace.

4.2 Economic Factors

The most important of all economic factors in terms of conflict is poverty. Poor economic indicators are not only highly associated with conflict, but they are also mutually reinforcing with weak political institutions as addressed in the previous section. A vicious cycle is also created between poverty and environmental degradation, where poverty contributes to a worsening of environmental resources, which in turn deepens poverty (Brainard and Chollet 2007, 61).

Having a low GDP and/or being a low-income country is strongly associated with the potential for civil war (Collier 2009; Collier et al 2009; Fearon and Laitin 2003; Humphreys and Weinstein 2007). It is for this reason that conflict is concentrated in regions like Africa and the Middle East. Given that Yemen is the poorest country in the Middle East (Yemen: Country Profile 2010), it is not surprising that it is at risk of conflict. The GDP per capita, according to the Global Property Guide, is \$1,182, making it the poorest country in the region,

the closest being Egypt with a GDP per capita of \$2,161 (*Global Property Guide* 2004-2010).

Although relatively unaffected by the global economic crisis, oil revenues that make up a quarter of the GDP and seventy percent of government revenue dropped fifty percent in 2009 from 2008 levels (CIA Factbook 2010). Meaning that the government's ability to address not only the oil shortage, but also other potentially existential threats in the country is limited as their revenue decreases.

Academic consensus on low-income countries holds that a combination of weak state capacity and low opportunity costs for joining rebel groups increases the risk of war. Evidence of the relationship between poverty and conflict is statistically supported and widely agreed upon. Incidences of civil war can increase poverty rates by up to thirty percent (Brainard and Chollet 2007, 2). Furthermore, increased growth can make civil war less likely, "For each additional percentage point in the growth rate of per capita income, the chances for conflict are about 1 percent less; doubling the level of income cuts the risk of conflict in half." (Brainard and Chollet 2007, 4). Berkeley economist Edward Miguel and his colleagues have produced a study on Sub-Saharan Africa which provides a forceful example of the connection between poverty, the environment, and conflict. Miguel argues that while poverty itself increases the likelihood of conflict, "the drop in per capita income associated with drought significantly increases the likelihood of civil conflict in the following year" (Brainard and Chollet 2007, 3). His argument makes a direct causal link that is often missing in environmental security analyses. This proves that since drought is naturally

occurring, violent conflict is proven to be driven by poverty and not the reverse (Brainard and Chollet 2007, 4).

Sa'ada has become stuck in what Brookings scholar, and now US ambassador to the UN, Susan Rice calls the 'doom spiral' (Brainard and Chollet 2007, 4). This is a vicious circle of insecurity and poverty as well as facing the drought-like conditions examined by Miguel. Unfortunately, poverty rates in Sa'ada are only projected to increase as conflict rages and population rates remain static as some of the highest in the world.

4.3 Population Factors

The world's population is estimated to increase from 6.5 billion in 2005 to 9.1 billion in 2050 (Brainard and Chollet 2007, 69). Seventeen million of these people are youth refugees and IDPs, over one hundred million of them are illiterate and three hundred thousand are child soldiers, “collectively, young people make up almost 60 percent of the world's poor” (Brainard and Chollet 2007, 11). Paul Collier asserts that large youth demographics in a country lower the cost for rebels to recruit fighters (Brainard and Chollet 2007, 12), and Henrik Urdal of PRIO determined that, “for each percentage point increase in youth population as a share of the adult population, the risk of conflict increases by more than 4 percent” (Brainard and Chollet 2007, 11). He argues that in countries like Yemen, where youth represent more than 35 percent of the population, the risk of armed conflict increases 150 percent (Brainard and Chollet 2007, 11).

The Middle East has some of the highest youth unemployment in the world; approximately 25 percent, making unemployment mostly a youth problem (Brainard and Chollet 2007, 14). This problem is particularly challenging in Yemen, a place facing some of the highest population growth rates in the world.

Age Groups as a Percentage of Sa'da Population

Age Group	Number	Percentage of Sa'da Population	Males as Percentage of Sa'da Population
5-15	220,964	32	16.4
16-44	279,404	40	21
45-59	46,675	7	3

Table 3: Salmoni et al 2010, 31

Several population factors have been thought to contribute to the likelihood of civil war. The most fundamental being the Malthusian argument that population would soon outstrip natural resource production and lead to an Armageddon-like catastrophe, a notion carried on by neo-Malthusians like Robert Kaplan (Malthus 1798; Kaplan 2000). Aside from population growth, population density, a high proportion of young men, and sheer population size have all been noted as contributing factors to conflict.

Yemen's population growth as recently as 2008 ranked as one of the highest in the world. A seven percent growth rate means that the population of nearly twenty-four million is set to double by 2035. Yemen was also ranked 162nd in a global comparison of population density in 2006, with approximately forty-five persons per square kilometre. The population now faces high rates of

urbanization, making Sana'a's growth rate an extraordinarily high seven percent. In addition, two-thirds of the population reside in what was once North Yemen, including Sa'ada, making that area even more densely populated (Ahmed no date, 1). The population remains very young, with nearly forty-four percent of the population below the age of fourteen and an overall median age of 18 (CIA Factbook 2010).

Proliferation of small weapons throughout Yemen increases the likelihood that young men are easily recruited to rebel movements. “Ali Mohammed al-Anisi, the director of the Presidential Office and chairman of the National Security Bureau, observes that unemployed youth are exploited by extremist elements, including al-Qaeda and Houthi rebels” (Boucek 2010, 10). Since 25,000 people enter the workforce every year, 35 percent of people remain unemployed and population continues to expand, economic opportunities are limited, especially to untrained youth. This makes them easy targets for recruitment.

Weapons Estimates for Conflict Governorates, 2004

Governorate	Population	Males Age 16–44	Weapons per Male	Weapons in Governorate
Sa'da	695,091	146,095	2	292,190
'Amran	885,601	179,525	2	359,050
Jawf	450,030	109,768	3	329,304
Total	2,030,722	435,388		980,544

SOURCE: Republic of Yemen Central Statistics Organization 2004 Census Data Release; Derek Miller, “Demand, Stockpiles, and Social Controls: Small Arms in Yemen.”

Table 4: Salmoni et al 2010, 38

4.4 Natural Factors

Yemen faces a unique mix of both resource abundance (or perceived abundance) in the form of oil, and resource shortage, in the form of water. While water shortages have the potential to initiate conflict, over-dependence on oil could also become a problem.

The discovery of offshore oil straddling the border between the Yemeni Arab Republic and the People's Democratic Republic of Yemen is understood as the impetus for state unification with the purpose of avoiding conflict over the oil and fostering cooperation between the two states.

After its discovery in the 1980s, the Yemeni economy became heavily reliant on oil exports for state revenue. Although Yemen has the lowest output of oil in the whole of the Middle East, its reliance on oil revenues is increasingly worrisome as the only two mature fields; Masila and Ma'rib approach the end of their life cycle (Hill 2010, 7). Exports have declined from more than 450,000 barrels per day in 2003 at the peak of Yemen's exporting capabilities, to only 280,000 barrels per day in January 2009 (Hill 2010, 5). This decline, coupled with recent drops in international oil prices has severely affected the domestic economy.

Britain has assessed Yemen's oil reserves to be 2.8 billion barrels; Sana'a fiercely denies the accuracy of these numbers and maintains hope for the possibility of discovery of future oil deposits (Hill 2010, 4). Security is also a concern for oil producers. The rising number of pirate attacks in the Gulf of Aden may inhibit further exploration of offshore oil fields (Hill 2010, 8). The most

worrisome projections come from the World Bank, which has noted that, “by 2017 the government of Yemen will earn no income from oil” (Hill 2010, 5). With no prospects for alternative income, or plans for a transition to a post-oil economy, this could mean a fall to less than a quarter of current state revenue.

As the World Bank indicates, alternative plans are minimal. The 2008 state budget totalled 1.8 trillion Yemeni Rials, equivalent to about US\$8.76 billion. Over three-quarters of that came directly from oil (*IRIN* February 4 2010). Liquefied Natural Gas (LNG) is the most promising alternative. A new LNG plant that was scheduled to start production in 2009 is projected to bring in approximately \$10.9 billion to the state over the course of its estimated twenty-year production period (Hill 2010, 8). LNG revenue, however, will do little to compensate for the loss of oil revenue and could also be compromised by security breaches in the Gulf of Aden. The government’s budget, which is heavily reliant on oil, will soon be unable to support itself unless viable alternatives are found.

Sa'ada will remain least affected by a decline in oil revenue, since the government spent little of its budget on development in the north. However, this decline will pose significant threat to the overall stability of the state and its ability to continue to battle the Houthis in the north. Natural catalysts of civil war that are present in Sa'ada, aside from water shortage, are those explained in rebel recruitment literature.

Fearon and Laitin (2003) and Collier et al (2009) agree that geography can play an important role in conflict. Fearon and Laitin (2003) argue that

rebellion is more likely in areas where physical space separates the rebel group from the central government. This is the case in Yemen as the conflict in the South has been separated from the central government since unification in 1990, as well as in the North where, although much closer to the capital, Sa'ada is still isolated by towering mountains, and poorly maintained roadways. Factors aiding rebels identified by Collier et al (2009) include both mountainous terrain and forest cover. Although Yemen lacks forest cover due to the mostly desert climate and hundreds of years of deforestation, it is extremely mountainous. The difference between the highest and lowest point in Yemen is more than 3,500 metres (CIA Factbook 2010). Mountains were the location of the first round of fighting which was concentrated in the Marran Mountains, Hussein al-Houthi's original stronghold located thirty kilometres south west of Sa'ada (Ahmed no date, 1).

4.5 Summary

Based on the literature on environmental security, we might have expected to see Yemen as a country torn by civil war over access to freshwater. Instead what we notice is a striking lack of environmental justifications for conflict in the various peace negotiations. This section will examine the factors that should contribute to civil war and conclude with a critical note on environmental security and its predictability.

Yemen's precarious position is a culmination of economic failure, corruption and poor planning. The inflation rate is twenty-seven percent, indicating that they are facing hyperinflation (Hill 2010, 3). The unemployment

rate is as high as forty percent in some estimates (Hill 2010, 3), making it higher than the unemployment rate in the United States during the Great Depression (*IRIN* February 4 2010). Half of Yemen's twenty-two million citizens, a population that is set to double by 2035, are under the age of sixteen, and nearly half of all children suffer from malnutrition, putting Yemen on par with some sub-Saharan African countries (Hill 2010, 3). Illiteracy rates also reach nearly fifty percent (almost seventy percent for women), while a majority of people earn less than \$2 per day (*IRIN* February 4 2010). These statistics are further underscored by a highly corrupt and ineffective government. The result is a country that is a prime candidate for conflict, compounded by the pending resource crunch, so it would hardly be surprising that conflict over scarce water, if it were to occur anywhere in the world, would occur in Yemen.

There is clearly potential for water scarcity in Yemen to lead to conflict since the terms of the peace agreement left the water issue and other environmental challenges unaddressed. The state of resource dependence, political instability, geographical indicators, economic status, history, and population demographics all suggest a country vulnerable to civil war, but the evidence suggests that the primary risk of renewed civil war lies with religiously rooted grievances and not environmental factors.

4.6 Alternative Explanations

Homer-Dixon (1999) asserts that while environmental scarcity does not factor as a prominent catalyst for conflict as of yet, "we can expect it to become a more important influence in coming decades because of larger populations and

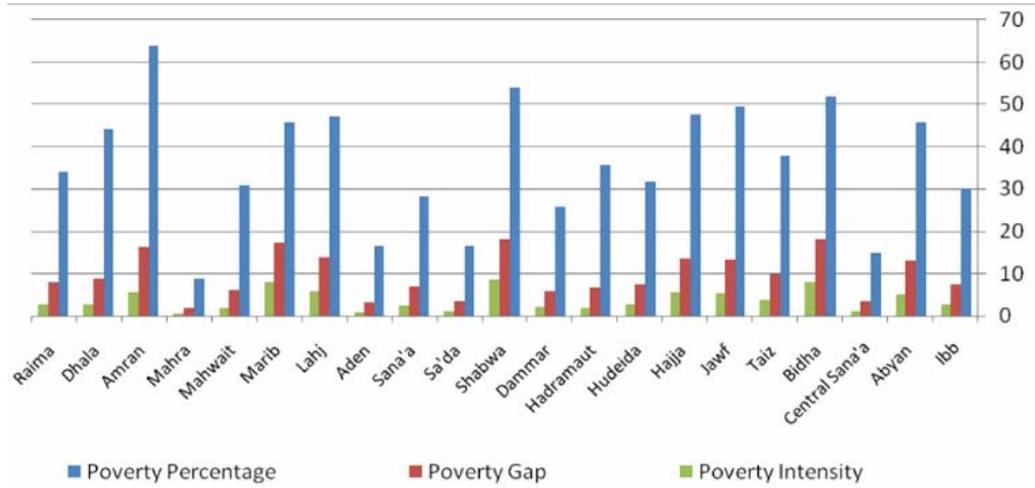
higher per capita resource consumption rates” (13). Taking this into account violent conflict over water in Yemen remains a possibility and the North may be faced with a genuine 'water war' some time in the future. The lack of a clear timeline for when resource scarcity should produce conflict is one reason the environmental security discourse is highly critiqued. Without a numerical threshold below which conflict would occur, the arguments of environmental security analysts lack predictability and generalizability.

Specific to Sa'ada, Arwa Ahmed (n.d.) posits that while Sa'ada is in dire need of development, so is the rest of the country. He argues that while poverty levels are high and education levels are low in Sa'ada, the rest of the country suffers similar challenges. “[W]hen we analyze the poverty indexes governorates-wise we can see that the percentage of poverty in Sa'da was estimated %16.55...the poverty level in some other governorates is higher than Sa'da; In Amran Governorate, for instance, the poverty percentage reached %63.93” (Ahmed no date, 2). It might be argued, therefore, that Sa'ada is not the region in Yemen most likely to succumb to conflict.

However, Sa'ada's rate of conflict recurrence, in combination with other risk factors, makes it a likely candidate for renewed violence regardless of the higher poverty levels in other parts of the country. Illiteracy remains among the highest in the country in Sa'ada at 59.8% (Ahmed no date, 7), and Sa'ada faces a higher urban than rural poverty rate (18.1% urban and 16.2% rural) (Ahmed no date, 5). This is significant since poverty in the rest of the country is concentrated in rural areas. This indicates that rebel recruitment may be more

easily facilitated as rebel forces recruit from the illiterate and unemployed living in cities.

Figure 4: Poverty Comparison, Yemen Governorates 2005



Source: Arwa Ahmed, "Marginalizing the Truth of Development in Sa'da". Sheba: Center for Strategic Studies, 2.

5: Conclusion

“We wake up every morning fighting over water.”

- **Kamal Bhate, Nehru Camp, Delhi**

This paper has used Sa'ada, Yemen as a case study to investigate claims made in the environmental security discourse about the heightened risks of conflict in countries afflicted by acute water scarcity. What began as a search for supporting evidence for the phenomenon of 'water wars' led to an inquiry of the central claim of environmental security theorists. Although environmental scarcity is one possible driver of civil conflict, academic consensus finds that war is likely to occur only when other risk factors are present. These factors are based on unstable politics, weak and corrupt governance, poverty, a history of previous violence and a rapidly growing population, each of which have been examined in turn in Yemen. The persistence of low economic indicators, a high proportion of young men in a booming population made up primarily of people under the age of twenty-five, and over-dependence on oil are only a few of the reasons. Increasingly critical water scarcity in Yemen renders the country an obvious candidate for "water wars" - or so it would seem. However, the evidence suggests that water scarcity has played a minimal role in conflict in the Sa'ada region.

With this in mind it is important to recognize that all the risk factors noted above are projected to get worse. So while at this time there are few indicators

of environmental scarcity leading to conflict this is not to say that water scarcity will never be an important cause for conflict in the future. This paper therefore does not disprove the central claim of environmental security theorists that links resource scarcity to the risk of conflict—in the long term. The findings of a single case study can never disprove a probabilistic theory, but the case of Yemen should at the very least be a cause for reflection.

By using a single case that is representative of the scarcity/conflict model I have explained the foundation of the model and questioned its lack of a numerical threshold. Without the generalizability of a numerical threshold, the environmental security discourse is limited in its prediction capacities. While the literature review on human and environmental security was provided as context to my argument, it was also meant to address both the strengths and weaknesses of this approach to security. Using the individual as a referent object we are allowed a wider lens through which to view global security, but we also lack reliable causal mechanisms for prediction of conflict.

This project would have benefited from field research. Due to the limited scope of this project this was not possible, and therefore the assumptions made herein about the grievances and character of the rebels and the government had to be surmised from secondary. Further research is needed to follow-up on the questions raised here about the applicability of environmental security, as one case study is insufficient to make concrete conclusions therein.

Yemen, as a number of media commentators have suggested, may be the first country in the world to run out of water. The country is also deeply

impoverished, religiously divided, oil dependent and badly governed. Yet despite the fact that all these and other risk factors are worsening, conflict in the country has not intensified, it has stopped.

APPENDICES

APPENDIX A

Houthi Leaders wanted by the Government of Yemen as of August 2009.

1. Badr al-Din al-Huthi
2. Ahmad Salah al-Hadi
3. 'Abd al-Rahman Qassim Mushahham
4. 'Abd al-Malik Badr al-Din al-Huthi
5. 'Abdullah 'Aidha al-Razzami
6. Amin Hassan al-Mu'ayyad
7. Qassim bin Qassim al-Hamran
8. Muhammad Badr al-Din Amir al-Din al-Huthi
9. Yahya Qassim Ahmad Abu 'Awwadah
10. Salih Ahmad Habra
11. Dayf Allah Qassim al-Shami
12. Yusuf 'Abdullah al-Ghayshi
13. Majid 'Ali 'Abdullah al-Matri
14. Muhsin Saleh al-Hamzi
15. Ahmad Yahya Muhammad Hamid
16. Yusuf Ahsan Isma'il al-Madani
17. 'Abdullah Yahya Khatir
18. Hassan Hamud 'Athaya
19. Salman Ahmad Hassan al-'Ayani
20. Ahmad Saleh Hindi Dughsan

21. Yahya 'Ali Yahya Muhsin Fawqa'
22. Saleh Ahmad Fadil
23. Hamd Dayf Allah Faris 'Aran
24. Mahdi 'Ali Shawban
25. 'Abdullah Yahya al-Hakim
26. 'Ali Muhammad Muhammad al-Mu'ayyad
27. Ahmad Husayn Salim Sarhah
28. Husayn Muhammad 'Ali a-Ghayli
29. Saleh Musfir Farhan
30. 'Abdullah Yahya Ahsan al-Majli
31. Muhammad 'Ali Muhammad al-'Awjari
32. Muhammad 'Abdullah 'Amr al-'Izzi
33. Ahmad 'Ali Husayn al-'Amri
34. Ahmad Jabir Sari'
35. Ahmad 'Ali Qassim al-Khatib
36. Jar Allah Muhammad Isma'il
37. 'Ali Husayn 'Abd al-Karim al-Qassimi
38. Salim 'Izah Jabal
39. 'Abd al-Latif Hamud al-Mahdi
40. Saleh 'Ali al-Samad
41. Yahya Nasir al-Yusufi
42. Ahmad Nasir al-Ba'dan
43. Husayn 'Ali Da'h

44. 'Abd al-Mushin Qassim Ta'us
45. Hazmal 'Ali Hazmal Shadhabah
46. Taha Ahsan Isma'il al-Madani
47. 'Abdullah Muhammad al-Hataf al-Hamzi
48. Yusuf Muhammad 'Abdullah Dahma
49. Najib al-Kashri
50. Husayn Yahya Ahmad Hanash
51. Salih Muhammad 'Ali Rahmah
52. al-'Asir 'Ali Munsir al-Ka'bi
53. 'Abd al-Basir 'Ali Ahmad al-Hadi
54. Ahmad Qassim al-Qassimi
55. 'Abd al-Ilah Yahya Qassim al-Husni

Source: Salmoni et al 2010, 319-320

APPENDIX B

Doha Agreement, 2007–2008

Text of agreement produced by Qatari mediation, summer–fall 2007. GoY-Huthi representatives also met in Qatar in January–February 2008. The Doha agreement was signed on February 1, 2008.

1. Cessation of military operations; and adherence, of the Huthi and those with him, to the republican order [system], the constitution and the laws in force in the country.
2. Ending of the rebellion; implementation of the general amnesty decision; and the release of prisoners, except for those charged in cases turned over to the general prosecutor or under consideration by the courts; and search for [discovery of] the missing people and care for injured/wounded people; and release of corpses by whomever possesses them.
3. Life [should] return to normal in the regions [of conflict], and everyone [should] return to his area, and live as safe citizens, as all the other citizens in the regions of the republic.
4. Extension of the state's general order in the region, as in all other regions of the republic.
5. The relinquishment of medium weapons, along with their ammunition, to the state.
6. Respect for freedom of opinion, to include the right to establish a political party in accordance with the constitution and the laws in force in the country.
7. The arrival of 'Abd al-Malik al-Huthi, Yahya al-Huthi, 'Abd al-Karim al-Huthi, and 'Abdallah 'Izza al-Razzami to Qatar, without undertaking any political or media activity hostile to Yemen and without leaving Qatar except after the agreement of the Yemeni government.

8. Cessation of all matter of media campaigns and acts of provocative incitement.

9. The Yemeni government will undertake the reconstruction of what the war has destroyed and the treatment of its effects; the praiseworthy state of Qatar will undertake to contribute to a fund for the rebuilding of the affected areas and for the compensation of those affected [by the fighting], and this fund will be open to the contributions of Arab and friendly states.

The GoY's Six Ceasefire Conditions, August 2009

These six conditions were originally enumerated by the GoY as the sixth round of fighting commenced. They were articulated by President Saleh in a speech delivered on the first night of Ramadan, Friday, August 21.

1. Withdraw from all of the districts and lift all roadblocks.
2. Descend from the mountains and trenches and stop "acts of sabotage."
3. Return stolen civilian and military property.
4. Reveal the fate of the six foreign kidnapping victims "which confirms information that the rebels were behind their kidnapping."
5. Return citizens who had been kidnapped by the group.
6. Do not interfere in the "local authorities' affairs."

The GoY's Five Ceasefire Conditions, September 2009

These five conditions were established by the GoY on September 19, 2009, when it announced the implementation of a ceasefire arrangement. The following are the conditions of the ceasefire, which has essentially been nullified by continued clashes.

1. “Adhere to the ceasefire, opening roads, removing land mines, descending from mountains,” and stop digging trenches.
2. “Withdraw from the districts and stop interfering in the local authorities’ affairs.”
3. Return stolen civilian and military property.
4. Free prisoners, including civilians and soldiers.
5. “Adhere to the constitution, regime, and laws.”

The Six-Point GoY-Huthi Agreement at the Ceasefire of February 12, 2010

The Huthis agree to...

1. Adhere to the ceasefire, open the roads, remove land mines, descend from mountainous heights, and end the digging of trenches near military points and along roads.
2. Withdraw from districts [occupied by Huthis] and not to interfere in the business of local authorities.
3. Return captured Saudi and Yemeni weapons, ammunition, equipment, and civilian goods.
4. Release Saudi and Yemeni civilian and military detainees.
5. Adhere to the law and the constitution.
6. Adhere to non-aggression against Saudi territory.

Source: Salmoni et al 2010, 315-317

APPENDIX C

Intensity of the first five phases of conflict. Salmoni et al 2010, 313

	Phase 1 June– September 2004	Phase 2 March– April 2005	Interim 2 April – December 2005	Phase 3 December 2005–S February 2006	Interim 3 February 2006– February 2007	Phase 4 February 2007– January 2008	Interim 4 January– May 2008	Phase 5 May–July 2008
Duration (months)	3.5	2	6	3	10	11	5	2.5
No. of incidents	14	39	16	75	18	519	15	37
Average days between incidents	7.7	1.5	4.2	1.48	7.7	0.66	5.6	1.5
Casualties	480	500	75	270+	80+	3,035	65	200+
Huthi-initiated	4	12	11	33	12	140	5	6
GoY-initiated	6	14	2	14	2	166	8	12
High-level Huthi casualties	2	3		2		10		
High-level GoY casualties		10	9	6		16	2	

REFERENCE LIST

- Ahmed, A. No date. Marginalizing the Truth of Development in Sa'da. *Sheba: Center for Strategic Studies*.
<http://shebacss.com/docs/PolicyFoucs/scssep006-10.pdf> (Accessed June 10, 2010)
- Al Arabiya News Channel*. 2009. Yemen water crisis threatens population. August 30. <http://www.alarabiya.net/articles/2009/08/30/83384.html> (Accessed June 5, 2010)
- Al-Ariqi, A. 2006. Water War in Yemen. *Yemen Times*, March 27.
<http://www.yementimes.com/DefaultDET.aspx?i=932&p=health&a=1> (Accessed February 26, 2010)
- Al Jazeera*. 2010. Yemen rebels free prisoners. March 17.
<http://english.aljazeera.net/news/middleeast/2010/03/20103175563951226.html> (Accessed March 18, 2010)
- Almadhagi, Ahmed Noman Kassim. 1996. *Yemen and the United States: A study of a small power and super-state relationship 1962-1994*. London: Tauris Academic Studies.
- Anderson, Benedict. 2006. *Imagined Communities: reflections on the origins and spread of nationalism*. London: UK Verso.
- Anon., *Lonely Planet*. <http://www.lonelyplanet.com/maps/middle-east/yemen/> (Accessed June 29, 2010)
- Arab experts predict Mideast water wars. 2009. *United Press International*, November 13. http://www.upi.com/Science_News/Resource-Wars/2009/11/13/Arab-experts-predict-Mideast-water-wars/UPI-56281258138250/ (Accessed February 26, 2010)
- Bakker, Karen. Ed. 2007. *Eau Canada: the future of Canada's water*. Vancouver: UBC Press.
- Barlow, Maude and Tony Clarke. 2002. *Blue Gold: The Battle Against Corporate Theft of the World's Water*. Toronto: McClelland & Stewart Ltd.
- Barlow, Maude. 2007. *Blue Covenant: The Global Water Crisis and the Coming Battle for the Right to Water*. Toronto: McClelland & Stewart Ltd.

- BBC News*. 2010. Fighting in north and south Yemen leaves 24 dead. July 22. <http://www.bbc.co.uk/news/world-middle-east-10722635> (Accessed July 22, 2010)
- Bennett, Jon, Ines Rothman, Debi Duncan, Sushila Zeitlyn, and Ginny Hill. 2010. Evaluation of DFID's Country Programmes: Yemen 2004-2009. *Department for International Development*, EVSUM EV707 (February).
- Bennett-Jones, O. 2009. Inside Yemen: a country in crisis. *BBC World Service*, December 18. http://www.bbc.co.uk/worldservice/news/2009/12/091215_yemen_nh_sl.shtml (Accessed June 10, 2010)
- Berman, J. 2005. WHO: Waterborne Disease is World's Leading Killer. *Voice of America*, March 17. <http://www1.voanews.com/english/news/a-13-2005-03-17-voa34-67381152.html> (Accessed April 9, 2010)
- Boucek, C. and D. Donadio. 2010. A Nation on the Brink. *The Atlantic*, April. <http://www.theatlantic.com/magazine/archive/2010/04/a-nation-on-the-brink/7982/> (Accessed June 10, 2010)
- Boucek, Christopher. 2009. Yemen: Avoiding a Downward Spiral. *Carnegie Papers*, Number 102, September. Washington DC: Carnegie Endowment for International Peace.
- Boucek, Christopher. 2010. Testimony of Christopher Boucek Before the United States House of Representatives Committee on Foreign Affairs: Yemen on the Brink: Implications for U.S. Policy. *Carnegie Endowment for International Peace* (February 3).
- Brainard, Lael and Derek Chollet. Ed. 2007. *Too Poor for Peace? Global Poverty, Conflict and Security in the 21st Century*. Washington D.C.: The Brookings Institution.
- Buhaug, H., N. P. Gleditsch, and O. M. Theisen. 2008. Implications of Climate Change for Armed Conflict. *Social Dimensions of Climate Change World Bank Workshop*. Washington, DC: World Bank Workshop, February 25.
- Caton, Steven. 2005. *Yemen Chronicle: An Anthropology of War and Mediation*. New York: Hill and Wang.
- CBC The Canadian Press*. 2010. Pakistan flood death toll hits 430. July 30. <http://www.cbc.ca/world/story/2010/07/30/pakistan-flooding-death-toll.html> (Accessed March 14, 2010)
- CIA Factbook: Yemen. 2010. (May 27) <https://www.cia.gov/library/publications/the-world-factbook/geos/ym.html> (Accessed June 10, 2010)
- Collier, Paul. 2009. *Wars, Guns and Votes: Democracy in Dangerous Places*. HarperCollins Publishers: New York.

- Collier, Paul, Anke Hoeffler, and Dominic Rohner. 2009. Beyond greed and grievance: feasibility and civil war. Oxford University Press: *Oxford Economic Papers* vol 61, no1, 1-27.
- Crisis State Research Centre. No date. *The London School of Economics and Political Science*.
<http://www.crisisstates.com/download/drc/FailedState.pdf> (Accessed February 11, 2010)
- Crisis Watch. 2010. *International Crisis Group*, No. 77, p. 11. (January 4).
- CSS *Analysis in Security Policy*. 2010. Yemen: Challenges of Counterterrorism. *ETH Zurich* No. 70, March.
http://www.humansecuritygateway.com/documents/CSS_Yemen_ChallengesOfCounterterrorism.pdf (Accessed April 9, 2010)
- Delli Priscoli, J. and Aaron Wolf. 2009. *Managing and Transforming Water Conflicts*. Cambridge; New York: Cambridge University Press.
- Diehl, Paul F. and N. P. Gleditsch. Ed. 2001. *Environmental Conflict*. Boulder: Westview Press.
- Dyer, G. 2008. *Climate Wars*. Toronto: Random House.
- European Union and United Nations: Partnership in Action*. 2006. Yemen: EU Deploys Election Observation Mission. August 14. http://www.europa-eu-un.org/articles/en/article_6189_en.htm (Accessed April 9, 2010)
- Fattah, K. 2009. The Nightmare of State Failure in Yemen. *Yemen Times*, December 8.
<http://www.yementimes.com/DefaultDET.aspx?i=1277&p=opinion&a=3> (Accessed March 17, 2010)
- Fearon, J. D. and D. Laitin. 2003. Ethnicity, Insurgency, and Civil War. *American Political Science Review*, Vol 97, No 1, 75-90.
- Fiske, G. and S. Yoffe. 2001. Use of GIS for analysis of indicators of conflict and cooperation over international freshwater resources. *Water Policy*.
- Floyd, R. 2007. Human Security and the Copenhagen School's Securitization Approach: Conceptualizing Human Security as a Securitizing Move. *Human Security Journal*, Volume 5, Winter 2007.
<http://www.peacecenter.sciences-po.fr/journal/issue5pdf/6.Floyd.pdf> (Accessed June 8, 2010)
- Gerring, John. 2007. *Case Study Research: Principles and Practices*. Cambridge: Cambridge University Press.
- Ghani, Ashraf and Clare Lockhart. 2008. *Fixing Failed States: A Framework for Rebuilding a Fractured World*. New York: Oxford University Press.

- Gleditsch, P. et al. 2008. *UCDP/PRIO Armed Conflict Dataset Codebook*. UCDP/PRIO, Version-4. <http://www.prio.no/sptrans/1664678440/Codebook.pdf> (Accessed May 10, 2010)
- Gleick, Peter, H. 2002. Dirty Water: Estimated Deaths from Water-Related Diseases 2000-2020. *Pacific Institute Research Project*, August 15.
- Global Corruption Report 2008: Corruption in the Water Sector*. 2008. Cambridge: Cambridge University Press.
- Global Property Guide*. 2004-2010. GDP Per Capita – Yemen Compared to Continent. 2004-2010. <http://www.globalpropertyguide.com/Middle-East/Yemen/gdp-per-capita> (Accessed July 22, 2010)
- Grover, V. I. 2006. *Water: a global common and global problems*. Enfield, N.H.: Science Publishers.
- Grover, V. I. 2007. *Water: a source of conflict or cooperation?* Enfield, N.H.: Science Publishers.
- GSDRC: Governance and Social Development Resource Centre, Document Library (2006). <http://www.gsdrc.org/go/display&type=Document&id=3661> (Accessed June 18, 2010)
- Gulf Times*. 2010. Yemen's rebels insist they are implementing ceasefire terms. March 13. http://www.gulf-times.com/site/topics/article.asp?cu_no=2&item_no=342812&version=1&template_id=37&parent_id=17 (Accessed March 18, 2010)
- Hamner, J. H., and A. T. Wolf. 1997. Patterns in International Water Resource Treaties: The Transboundary Freshwater Dispute Database. *The Colorado Journal of International Environmental Law and Policy 1997 Yearbook*.
- Handley, C. D. Ed. 2001. *Water Stress: some symptoms and causes: a case study of Ta'iz, Yemen*. Aldershot: Ashgate.
- Hauge, W., and T. Ellingsen. 1998. Beyond Environmental Scarcity: Causal Pathways to Conflict. *PRIO Journal of Peace Research*, Vol. 35, No. 3, p. 299-317.
- Hill, G. 2010. Yemen: Fear of Failure. *Chatham House Middle East and North Africa Programme Briefing Paper*, January.
- Hogg, Chris. 2010. China landslide: More than 700 people confirmed dead. *BBC News*, August 10. <http://www.bbc.co.uk/news/world-asia-pacific-10922991> (Accessed August 14, 2010)
- Homer-Dixon, Thomas F. 1999. *Environment, Scarcity, and Violence*. Princeton: Princeton University Press.

- Homer-Dixon, Thomas F. 2000. *The Ingenuity Gap*. New York: Knopf.
- Human Rights Watch*. 2010. All Quiet on the Northern Front? Uninvestigated Laws of War Violations in Yemen's War with Huthi Rebels. April 7. http://www.humansecuritygateway.com/documents/HRW_Yemen_AllQuietOnTheNorthernFront_UninvestigatedLawsOfWarViolations.pdf (Accessed April 9, 2010)
- Human Security Report Project*. 2010. Human Security Backgrounder: What is human security? <http://www.hsrgroup.org/press-room/human-security-backgrounder.aspx> (Accessed June 18, 2010)
- Humphreys, M. and J. M. Weinstein. 2007. Who Fights? Determinates of Participation in Civil War. *American Journal of Political Science*, 52.2.
- International Crisis Group*. 2009. Yemen: Defusing the Saada Time Bomb. Middle East Report No. 86, (May 27).
- International Crisis Group*. 2010. Report on Yemen. <http://www.crisisgroup.org/home/index.cfm?id=2440> (Accessed March 14, 2010)
- IRIN a project of the UN Office for the Coordination of Humanitarian Affairs*. 2010. Analysis: Yemen's rebellions fuelled by economic meltdown. February 4. <http://www.irinnews.org/PrintReport.aspx?ReportId=87996> (Accessed March 18, 2010)
- Johnsen, G. D. 2010. Yemen's coming power struggle. *The National*, March 18. <http://www.thenational.ae/apps/pbcs.dll/article?AID=/20100318/REVIEW/703189982/1008> (Accessed April 9, 2010)
- Joint Operating Environment 2008: Challenges and Implications for the Future Joint Force. Anon. 2010. *United States Joint Force Command*. <http://www.jfcom.mil/newslink/storyarchive/2008/JOE2008.pdf> (Accessed April 10, 2010)
- Kaplan, Robert. 2000. *The Coming Anarchy: Shattering the Dreams of the post-Cold War*. New York: Random House.
- Ludwig, F. 2009. *Climate Change Adaptation in the Water Sector*. London; Sterling, VA: Earthscan.
- Mahdi, Kamil A., Anna Würth, and Helen Lackner. Ed. 2007. *Yemen Into the Twenty-First Century: Continuity and Change*. Reading, UK: Ithaca Press.
- Malthus, T.R. 1798. *An essay on the principle of population, as it affects the future improvement of society*. London: printed for J. Johnson.
- Manwaring, Max G. Ed. 2002. *Environmental Security and Global Stability: Problems and Responses*. Oxford: Lexington Books.

- Matthew, R. A., M. Brklacich, and B. McDonald. 2003. Global Environmental Change and Human Security: Gaps in Research on Social Vulnerability and Conflict. *Woodrow Wilson Center*. http://www.afes-press.de/pdf/Matthew_Mont_5.pdf (Accessed June 8, 2010)
- Matthew, R. A., T. Gaulin, and B. McDonald. 2003. The Elusive Quest: Linking Environmental Change and Conflict. *Canadian Journal of Political Science*, Vol. 36, No. 4, 857-878.
- Novak, J. 2010a. Peace with Dignity in Yemen: Can the Cycle of War be Broken? *Examiner.com National*, April 21. <http://www.examiner.com/x-36012-Yemen-Headlines-Examiner~y2010m4d21-Peace-with-Dignity-in-Yemen-Can-the-Cycle-of-War-be-Broken> (Accessed June 5, 2010)
- Novak, J. 2010b. Yemen: Prisoner exchange may undermine shaky peace in five year war. *Examiner.com National*, February 14. <http://www.examiner.com/examiner/x-36012-Yemen-Headlines-Examiner~y2010m2d14-Yemen-Prisoner-exchanges-may-undermine-shakey-peace-in-five-year-war> (Accessed April 9, 2010)
- OCHA. 2009. Yemen – Sa'ada Emergency. Situation Report No. 2 (August 28).
- Olivera, O. 2004. *¡Cochabamba! Water War in Bolivia*. Cambridge: South End Press.
- Patel, Raj. 2007. *Stuffed and Starved*. Toronto: HarperCollins Publishers Ltd.
- Pompe, Jeffrey J. and J. R. Rinehart. 2002. *Environmental Conflict: In Search of Common Ground*. Albany: State University of New York Press.
- Postel, S. and A. Wolf. 2001. Dehydrating Conflict. *Foreign Policy*, pp. 60-67.
- Rayner, G. 2010. Haiti earthquake: death toll may hit 200,000. *Telegraph*, January 16. <http://www.telegraph.co.uk/news/worldnews/centralamericaandthecaribbean/haiti/7003057/Haiti-earthquake-death-toll-may-hit-200000.html> (Accessed March 17, 2010)
- Rogers, W. 2009. In Yemen, Water's Role in the War on Terror. *The New Security Beat*, March 27. http://newsecuritybeat.blogspot.com/2009/03/in-yemen-waters-role-in-war-on-terror_1295.html (Accessed March 3, 2010)
- Salmoni, Barak, A., Bryce Loidolt, and Madeleine Wells. 2010. *Regime and Periphery in Northern Yemen: The Huthi Phenomenon*. Santa Monica, CA: RAND Corporation.
- Shiva, Vandana. 2002. *Water Wars: privatization, pollution and profit*. Cambridge, MA: South End Press.

- Smith, Dan, and Janani Vivekananda. 2009. Climate Change, Conflict and Fragility: Understanding the linkages, shaping effective responses. *International Alert*, November.
- Stracke, N. 2009. War in Saada: The Yemeni Military Offensive against the Houthi Rebels. *Gulf Research Center*, August 13. <http://www.grc.ae/print.php> (Accessed March 18, 2010)
- Sunil, T. S., and Vijayan K. Pillai. 2010. *Women's Reproductive Health in Yemen*. Amherst, New York: Cambria Press.
- The Failed States Index. 2009. *Foreign Policy*, June 22. http://www.foreignpolicy.com/articles/2009/06/22/the_2009_failed_states_index (Accessed February 15, 2010)
- Ward, D. R. 2002. *Water Wars: drought, flood, folly and the politics of thirst*. New York: Riverhead Books.
- Weinstein, Jeremy. 2007. *Inside Rebellion: The Politic of Insurgent Violence*. Cambridge: Cambridge University Press.
- Wolf, A. T. 1998. Conflict and Cooperation along International Waterways. *Water Policy*, Vol. 1 #2 pp. 251-265.
- Wolf, A. T. 2007. Shared Waters: Conflict and Cooperation. *Annual Review of Environment and Resources*, Vol. 32 pp. 3.1-3.29.
- Wolf, A. T., K. Stahl, and M. F. Macomber. 2003. Conflict and Cooperation within International River Basins: The Importance of Institutional Capacity. *Water Resource Update*, Vol. 125.
- Wolf, A. T., S. B. Yoffe, and M. Giordano. 2003. International Waters: Identifying Basins at Risk. *Water Policy*, Vol. 5 pp. 29-60.
- Yemen: Country Profile. 2010. *BBC News*, April 28. http://news.bbc.co.uk/2/hi/middle_east/country_profiles/784383.stm (Accessed May 10, 2010)
- Yoffe, S., and B. Ward. 1999. Water Resources and Indicators of Conflict: A Proposed Spatial Analysis. *Water International*, Vol. 24, #4 December 1999.
- Zeitoun, Mark. 2008. *Power and Water in the Middle East: the hidden politics of the Palestinian-Israeli water conflict*. London; New York: I.B. Tauris.