

Water scarcity and slow violence

The effects of water scarcity in Gansu, China and Rajasthan,
India



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Abstract

The focus of this study is the concept water scarcity in relation to unrest, or slow violence. The theory in this study will be based on Thomas Homer-Dixons water scarcity theory, which will be applied in two empirical cases that are not experiencing violent conflict. The first empirical case will be the province Gansu in China, and the second one will be the province Rajasthan in India. This way a democracy and an autocracy will be researched in relation to each other. Both regions are experiencing land degradation and water scarcity. The research question is “How does water scarcity in a democracy differ from water scarcity in an autocracy?”. By focusing on the concept slow violence instead of violent conflict, this study strives to widen the concept of water scarcity. The term slow violence is measured by reports of migration and malnutrition. The water scarcity theory includes concepts such as land degradation, population density and resource captures. The study finds that certain concepts of water scarcity are more common in an autocracy, and some are more common in a democracy.

Keywords: water scarcity, slow violence, land degradation, China, India

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1 Introduction

Global warming has led to a changing climate in many places all over the world. Some places have been more affected than others. Rapidly rising temperatures and a changing climate are resulting in an ever drier landscapes in these places, with less and less fresh water availability (Matthew, 2013, p. 265). In some places, this is resulting in a so-called water scarcity, where people lack enough fresh water. A study published in 2013 showed that as many as 11 percents of the world's population lived without any access to fresh water (Gnacadjia, 2013). In some places, water scarcity is resulting in social changes and people are forced to leave their homes to find water (Haner et. al., 2016).

Before plunging deeper into the purpose of the study, the research question will be presented:

How does water scarcity in a democracy differ from water scarcity in an autocracy? Is a democratic state better than an autocratic state at dealing with water scarcity?

1.1 Purpose

With the rise of climate change as a big political and environmental issue, other questions have also gained attention. Within the social sciences, there have been a lot of research on whether water may cause conflict or not. Some scholars mean that scarce water resources can lead to cooperation (Wolf et. al., 2003). They conclude that cooperation has a greater chance of happening between nation states that are sharing international river basins. While others mean that the water scarcity will lead to conflict. In these cases, they have mainly focused on water scarcity in developing countries. Studies show that there have been conflicts over water, as well as situations where water resources have been used as an instrument of war (Gleick, 1993).

When discussing water scarcity in relation to conflicts there is often a big focus on armed conflict. In these cases, violent conflict is almost exclusively measured in a number of deaths. Thomas Homer-Dixon is one of the scholars discussing water scarcity in relation to conflict. In his work, he is very specific with that he chooses his research areas from two different variables, they should be water scarce and experiencing violent conflict (Homer-Dixon, 1999, p. 169-176).

There is a gap within the water scarcity field related to what type of violence that is focused on. This study aims to fill part of this gap by focusing less on violent conflict, and more on signs of unrest. In this study, unrest will be measured by the

term slow violence. By constantly focusing on water scarcity in relation to violent conflict, a big group of people that are suffering from lesser direct violence is unseen (Nixon, 2011). Shifting away from the classical peace and conflict method of measuring a number of dead could therefore, bring new insights to the field of environmental security.

In addition to the shift from violent conflict to unrest in this study, there will be a comparison between water scarcity in a democratic state and in an autocratic state. Studies show that democracies are better at handling climate issues than autocratic states (Burnell, 2012). Homer-Dixon means that “different countries—depending on their social, economic, political, and cultural characteristics—will respond to scarcity in different ways and, as a result, they will supply varying amounts and kinds of ingenuity” (Homer-Dixon, 1999, 19-25). By comparing two different political systems, it might be possible to see how water scarcity is seen in the respective system. Is a democratic state better at handling water scarcity?

The two areas are selected on the basis that they have similar characteristics. For example, they are both undergoing a desertification process. A process often starts with the loss of vegetation in an area, accelerated by climate change, which then leads to the point where the ground loses the ability to hold water from rainfall. This is the start of a cycle from which it is very hard to come back from. Undergoing a desertification process might therefore, amplify the severity of water scarcity in these regions and increase the number of people that are affected by it, or bring other issues (Gnacadjia, 2013, p. 50-52).

The combination of climate change, water scarcity and land degradation (desertification) is seen as underlying reasons behind full-scale conflicts in the world today. In Syria, studies have shown that land degradation and a lack of access to fresh water have been contributing factors to the war there today (Gleick, 2014). Focusing on other areas that are experiencing water scarcity, and identify a possible tendency of slow violence could therefore, be crucial to avoid bloody wars in the future. If it is possible to see tendencies of unrest on an early stage, it might be possible to determine whether water management should be included as a method of early conflict prevention.

1.2 Disposition

First, a chapter on the theoretical framework of water scarcity will be presented along with definitions for water scarcity and slow violence. This section will start with a brief theoretical background in the field of climate change in relation to social sciences. The main theoretical concepts will also be introduced in this part.

In the next chapter, methodological considerations will be discussed along with the research design. This section will also include a discussion about the material and the different criteria for the case selection.

Chapter 4 will start off with a focus on the historical background for the two regions: the Gobi Desert in Gansu, China, and the Thar Desert in Rajasthan, India.

The main part of this chapter will focus on a presentation of the results for each region separately.

In chapter 5 and 6, the result of the two research areas will be analyzed and a conclusion will be made. Chapter 7 will then focus on a discussion about the study in general.

2 Theoretical and Analytical Model

The social and political aspects of climate change are discussed a lot, both in general and within the academic field today. Some studies show that climate change leads to violent conflict, while others argue that there is no link between the two. The first part of this chapter will work as an introduction to the field of environmental security in general and water scarcity in particular.

Marshall B. Burke for one, argue that there is a clear link between climate change and conflict. More specifically he focuses on the correlation between an increase in temperature and violent conflict. His research in sub-Saharan Africa indicates that years with higher temperatures have resulted in more violent conflicts historically. According to Burke, climate change and global warming could therefore, lead to an increase in violent conflicts (Burke et al, 2009, p. 20670-20671). Halvard Buhaug on the other hand, means that climate change is a poor predictor of armed conflict. Buhaug instead identifies areas such as a weak national economy, the collapse of the Cold War system and ethnopolitical exclusion as the driving factors of conflict (Buhaug, 2010, p. 1-4).

Both of these studies discuss climate change and temperature change in general, in relation to violent conflict. However, the theoretical approach of this study will zoom in on a specific consequence of a changing climate instead of focusing on the climate change in general. The theory in this study will build on Thomas Homer-Dixon's resource scarcity theory – more specifically water scarcity. This theory is focusing on developing countries, undergoing climate change and experiencing scarcities (Homer-Dixon, 1999, p. 172-175; Hauge and Ellingsen, 1998, p. 299-301).

Homer-Dixon applies his scarcity-theory to regions that are experiencing both scarcity and violent conflict. Within the field of Peace and Conflict studies, there are ways to measure violent conflict and war. Different databases are often used when researching violent conflict. Databases such as the *Uppsala Conflict Database (UCDP)* is well suited to analyze regions with armed conflict. Their definition of an armed conflict is 25 battle-related deaths in a single calendar year and conflict (UCDP, 2017). Jürgen Scheffran et. al. mean that data from *UCDP* is not an ideal measurement when discussing climate change in relation to social and political effects because climate change is stronger associated with low-level violence (Scheffran et al, 2012, p. 869-871).

This [UCDP] excludes other forms of violent or nonviolent behavior that may be affected by climate change such as protests, riots, or livestock theft, let alone conflict as a positional difference over interests, values, or goals. These distinctions are relevant as, in recent decades, climate variability may have been more associated with low-level violence and internal civil war...

As mentioned briefly in the introduction, this study will not choose cases based on both violent conflict and environmental scarcity. The basis of the water scarcity model will instead be used to research areas that are experiencing environmental scarcities, but not violent conflict. Thus, it is not useful to use a measurement such as the UCDP database, as it is not possible to compare the two regions with this classical Peace- and Conflict-method. The focus will instead shift from focusing on violent conflict to include the concept slow violence (Nixon, 2011).

The primary focus of the study will be to research how water scarcity is affecting a democracy and an autocracy respectively. Slow violence is used as a way to identify violence or unrest that may be the result of the scarcities presented in the theory below.

2.1 Resource Scarcity and Violent Conflict

The base of the theoretical framework in the main theory is the resource scarcity theory, by Homer-Dixon. One of the natural resources that are linked with environmental degradation and the one that will be focused on in this study is fresh water.

This theory draws inspiration from two well-known fields within international relations – neo-Malthusianism and environmental security.

Dividing the resource available with the number of people in a specific region is inspired by a neo-Malthusian way of thinking. In this school of thought, they focus a lot on a growing population as a problematic area. A neo-Malthusian thinker might argue that the reason there is a problem with water scarcity is that the population has been growing disproportionately compared to the resources available (Floyd and Matthew, 2013, p. 3-7).

In addition to a Neo-Malthusian approach, the main theory that will be used in this study is inspired by the theory of environmental security. This theory focuses on the way environmental events and trends is seen as threats towards nations, communities or individuals. This is a version of the securitization theory where a non-traditional security issue is transformed into an existential threat – in this case the environment (Buzan et al, 1998, p. 23-26; Homer-Dixon, 1999, p. 3-5). This environmental security theory has been adapted further, to focus specifically on environmental scarcity and resource scarcity as a security issue (Homer-Dixon, 1999, p. 48-51, 81-88; Gleditsch and Theisen, 2010, 223-225).

This concept will be separated into three different types of scarcity, measured by different theoretical mechanisms. These are:

Supply-Induced Scarcity – This refers to the absolute supply of a resource, how to extract it, how vulnerable it is, and the quality of the water resource. “Supply-induced scarcity occurs when environmental degradation, pollution, natural variation or a breakdown in the delivery infrastructure constraints or reduces the total supply or local availability of a specific resource” (UNEP, 2012, p. 9). Water scarcity has led to conflict in many developing countries in the world. The level of water scarcity is measured by the amount of water available per capita in a specific

region. In the cases where water scarcity has led to a conflict, “it always interacts with other political, economic, and social factors” (Homer-Dixon, 1999, p. 66-68, 178). The second indicator is the degree of land degradation (or desertification) in a region, which has been linked to signs of unrest (Hauge and Ellingsen, 1998, p. 301-302). The reason land degradation is used as an indicator for supply-induced scarcity is that the water scarcity may vary locally, within a region. As of now, fresh water per capita for a specific region is the most accurate way to measure water scarcity, but this level may still vary within each region chosen. Reports of land degradation can help explain events linked to water scarcity in these regions because it is often linked with extremely low water availability. Land degradation has been described as nature’s own indicator of extreme water scarcity (Gnacadjia, 2013, p. 50-51).

Demand-Induced Scarcity – This term is based on the neo-Malthusian way of thinking because the demand for a resource has increased. There are several factors that can result in a reduction in the per capita availability of the resource from this point of view. It could be because more people have been born recently, due to migration, new technologies or increases in consumption rates. In sum, demand-induced scarcity means that the demand for the specific resource increases. This is measured by the population density in a region, because countries with high population density have been known to experience a higher risk of conflict (Hauge and Ellingsen, 1998, p. 301-302). Homer-Dixon uses an example from the Rwandan genocide in 1994. The theory means that the high population density in the country caused demographic pressures, which led to environmental scarcities. These scarcities played a role the events leading up to the genocide 1994 (Homer-Dixon, 1999, p. 16-17).

Structural Scarcity – Structural scarcity refers to the way the resources are being divided among the population. A structural scarcity occurs when some parts of the population get disproportionately large shares of the resources compared to others. Structural scarcity can result from poor natural resource governance, social and economic barriers, cultural practices or gender dynamics (UNEP, 2012, p. 9). Thus, the focus of this will be reports of inequalities in the way the water resources have been divided among the population. The indicator that is used for this is resource captures (or water grabbing). This refers to the way the rich and powerful people’s decisions result in an unequal divide of the water resources. A bigger piece of the cake for some will result in smaller pieces for others. As a result of this, some people may not get access to enough fresh water in one place, which forces them to migrate. When discussing resource capture, Homer-Dixon uses South Africa as an example. Here rich white people controlled 87 percent of the land, while blacks (75 percent of total population) were left to live in areas that accounted for only 13 percent of the land. These inequalities were a contributing factor for the uprising leading to the end of apartheid (Homer-Dixon, 1999, p. 15-16).

The effects of scarcities will be seen earlier, and to a greater extent, in developing countries than in more developed countries (Homer-Dixon, 1999, p. 4-5).

Developing countries tend to be much more dependent on environmental goods and services for their economic well-being; they often do not have the financial, material, and human capital resources to buffer themselves from the effects of environmental scarcities; and their economic and political institutions tend to be fragile and riven with discord.

To determine what level of water scarcity a region is facing, a specific indicator is used. This is measured by how much fresh water each person has access to per year. The *Falkenmark Water Stress Indicator* is the scale that will be used to determine the degree of water scarcity (Anisfeld, 2011, p. 77-80). This indicator divides water availability in a region into four different levels of water availability, depending on the amount of water available per person and year.

A person that has access to more than 1700 m³ fresh water per year is considered to have sufficient water, although occasional or local water stress may still occur. The three other stages are all different severity of water scarcity. The first grade of water scarcity occurs when the fresh water availability is 1000-1700 m³ per capita and year. This level is regarded as a *regular water stress*. The second grade of water scarcity occurs between 500-1000 m³ per capita and year. People who live with this level of water scarcity is affected by a *chronic water shortage* according to the indicator. The third and most severe degree of water scarcity is when the access to water is less than 500 m³ per capita and year. This degree of water scarcity is referred to *absolute water scarcity* (FAO Water Reports, 2012, p. 6-8; Anisfeld, 2011, p. 77-80).

2.2 Slow Violence

While the resource scarcity focuses on battle-related deaths, this study will focus on other factors. To define this, a new concept will be introduced. The concept slow violence shifts focus from battle-related deaths to another type of violence. The man who coined the term – Rob Nixon, describe the term as “a violence that occurs gradually and out of sight, a violence of delayed destruction that is dispersed across time and space, an attritional violence that is typically not viewed as violence at all” (Nixon, 2011, p. 2). Concepts included in this term are climate change, deforestation and acidifying oceans, together with “a host of other slowly unfolding environmental catastrophes” (Nixon, 2011, p. 2).

To exemplify what the term slow violence means, the repercussions after the war in Vietnam will be used as an example. Nixon means that the death toll from the war continues to rise because of the extensive use of the chemical Agent Orange. Just because the bodies are not there to line up at the end of the war does not mean that they are not a cause of the practices during the war (Nixon, 2011, p. 2-4, 133, 152, 243-244). In a similar way, greenhouse gases emissions over the last decades can now be seen in a changing climate. This has led to extreme climates in some parts of the world, leading to migration, malnutrition, and conflicts over food.

In this study, the term slow violence will be used to identify the outcomes of water scarcity. Within the theory of slow violence, there are many different concepts. This study will focus on two indicators of slow violence – migration and malnutrition. Migration is chosen as an indicator because it is often discussed in relation to climate change as climate refugees or environmental migration. The reason for migration is often discussed in push and pull factors. The push factor means that there are reasons to why you cannot stay at a place, often linked to environmental degradation. The pull factor means that there are reasons “pulling” migrants to another place. This is often promises of better economic possibilities in another place (Homer-Dixon, 1999, p. 94-96.) Malnutrition has been linked to water scarcity and environmental degradation in several cases and it has been shown to be a cause of water scarcity and land degradation. The reason these two indicators are chosen is that they are shown to be strongly linked with water scarcity. They are also two of the main indicators within the theory of slow violence (Nixon, 2011, p. 133, 263-266).

3 Method

To apply these theoretical models there are methodological considerations to be made along with a discussion about the material. The first part of this chapter will focus mainly on the operationalization of the different theoretical concepts. The second part will shift focus to discuss the material chosen in this study, along with methods to analyze the material (Höglund and Öberg, 2011, p. 6).

The goal of this study is cumulative to its nature because it intends to expand the theory of water scarcity (Teorell and Svensson, 2007, p. 18-19). It will focus on how water scarcity appears in a democracy and an autocracy and examine if there are any indications of slow violence the respective region. It will also focus on whether there is any link between water scarcity and slow violence.

To be able to apply the theoretical framework on the empirical cases, the three theoretical mechanisms must be operationalized. Specific operational definitions related to each one of these will be derived (Bjereld et. al., 2009, p. 111-112). The three mechanisms – supply-induced scarcity, demand-induced scarcity, and structural scarcity – will be thoroughly operationally defined and motivated. This is done to make sure that the study maintains validity, meaning that each theoretical mechanism has correctly chosen indicators, to avoid systematic errors. This will also be crucial in giving the study a level of intersubjectivity. By operationalizing the abstract concepts it will be easier to recreate the study (Teorell and Svensson, 2007, p. 54-57).

The operationalization of the theoretical mechanisms and their corresponding indicators will be presented in the table below. Each indicator will then be thoroughly described – both in how to measure it – and why this method is chosen.

Table 1. Operationalization of the theoretical mechanisms

<i>Theoretical mechanism</i>	<i>Indicator</i>
<i>Supply-induced scarcity</i>	Water scarcity
	Land degradation
<i>Demand-induced Scarcity</i>	Population density
<i>Structural scarcity</i>	Resource captures
<i>Slow violence</i>	Migration
	Malnutrition

There are different types of indicators to consider when doing a study like this – or rather – different ways of measuring them. Depending on which type of indicator one choose to focus on there are different ways of measuring it, these are

described as different scales of measurements (Teorell and Svensson, 2007, p 107-108).

The first and the one which is preferred in this study is the interval scale of measurement. In this study, this type is measured by data found in official databases or in credible secondary sources referring to official databases. Out of the five indicators, it is possible to measure two of them with this method. These are the *water scarcity* (supply-induced scarcity) and the *population density* (demand-induced scarcity) for each region.

Population density is measured by dividing the total population in a region with its size. The reason population density is used instead of the total population is that it must be possible to compare the two regions even though they are different sizes – population- and area-wise. Using the average number of people per square kilometer are therefore much more accurate.

The best way to measure water scarcity is to analyze the amount of fresh water per capita, and year in a specific region. Here the same rules apply as when using population density instead of total population. An average is used when measuring water availability – to make sure it is possible to compare the two regions.

As can be derived from the description of the two indicators, the method when using an interval scale of measurement is straightforward; compare the data in one region, with the corresponding data in the other region. It is preferable to use this type of data for all the indicators. Unfortunately, this is not possible in this study due to missing data for the specific regions. Thus, a second method is introduced.

The second method that will be used for the indicators is the ordinal scale of measurement. This will be used for the indicators *land degradation* (supply-induced scarcity), *resource captures* (structural scarcity), *migration* and *malnutrition* (slow violence).

Using an ordinal scale of measurement require that the reliability is considered. By defining criteria for each one of the indicators, the risk for unsystematic errors will decrease. For example, slow violence will be represented by two of the main concepts in the theory – migration, and malnutrition instead of the abstract concept slow violence. To avoid risking the validity of the study, the different indicators will not only be measured by its occurrence but in how it is portrayed empirically. (Teorell and Svensson, 2007, p. 57-59). The focus of the study is to measure the social effects of water scarcity. Thus, it is relevant to focus on how the different issues are portrayed. If an indicator is not discussed as a security issue within the literature, it will most likely not be treated as one in the region (MacQuarrie and Wolf, 2013, p. 170-172).

The first two indicators will be measured by if they are portrayed at all, and if they are mentioned in relation to slow violence (migration and malnutrition). The ordinal scale will therefore, be designed like this: *no reports of specific indicator – reports, but no link to slow violence – reports linked to slow violence*. In addition to this, slow violence will be measured in its relation to water scarcity. Is it reported to be a result of water scarcity or caused by other factors? The ordinal scale for this relation will be designed like this: *no reports of slow violence – reports, but no link to water scarcity – reports linked to water scarcity*. Using just three values for the ordinal scale might not seem specific enough. It is however, better than the

alternative, a nominal value, where the focus would have been to measure the occurrence of an indicator and nothing else. Along with each indicator will follow a motivation to why it gets a certain value on the ordinal scale. This motivation will be used to grant the study a better level of intersubjectivity. Without a motivation like this, it would be hard to maintain the validity of the study.

The empirical material will be analyzed according to the table below. The values of the ordinal scale will be defined as *no reports*, *no link*, and *strong link*. This is used to present the results in a consistent way to make them more comprehensible.

Table 2. Values for ordinal scale.

	<i>No reports</i>	<i>No link</i>	<i>Strong link</i>
<i>Water scarcity</i>	X	No link to migration or malnutrition	Reports linked to migration or malnutrition
<i>Land degradation</i>	No reports of land degradation	Reports, but no link to migration or malnutrition	Reports linked to migration or malnutrition
<i>Population density</i>	X	No link to migration or malnutrition	Reports linked to migration or malnutrition
<i>Resource captures</i>	No reports of resource captures	Reports, but no link to migration or malnutrition	Reports linked to migration or malnutrition

As can be seen in Table 2 above, water scarcity and population density will never get the value *no reports*. The reason for this is that the two indicators will always have a value. It cannot be measured by its occurrence or not. There is always a degree of water scarcity population density.

The study will be comparative to its nature. This means that the goal of the research question is to understand how the two regions are experiencing water scarcity and if there are any indications of slow violence connected to this (Esaiasson et. al., 2012, p. 35-37). Solutions on how to solve the water scarcity in these regions will be left for others to research.

The study will seek to use first-hand sources where it is possible. However, much of the empirical material will come from secondary sources like scientific articles or case studies. Thus, it is important to review the sources of the material. When using scientific, peer-reviewed articles, the risk of tendency is low. However, the source-critical term centrality should be considered because the author might not know that much about the region. In case-studies, the problem might be the opposite. They offer good knowledge about the local context, which grants them good centrality, but tendency may be lower because they risk being biased in what

they choose to report (Höglund and Öberg, 2011, p. 188-191). To confirm the authenticity of the material, triangulation will be used. If it is not possible to use this method to confirm the source, this will be noted in the text, or it will be removed from the study completely.

3.1 Case selection

This part of this chapter will focus on how to select the two regions. There are several criteria that need to be met to make sure it is possible to compare the two empirical cases (Bjereld et. al., 2009, 112-115). Identifying these criteria and making a strategic decision on which two regions to focus at is a part of this process. This study will use Mill's method of difference when deciding which cases to research. This means that the two areas should be similar in general, but different in one specific aspect (Teorell and Svensson, 2007, p. 225-229).

The first step in the research process is to identify two different regions experiencing a similar level of water scarcity. A similar level of water scarcity is important to be able to compare the regions on equal terms. This will be measured by the amount of fresh water available per person and year in a region (FAO Water Reports, 2012, p. 6-8). One might think it would be better to focus on a specific desert instead of a state with different characteristics when measuring water scarcity. The reason the water data for the entire state is used in this study is to include the effect of land degradation in the study (Homer-Dixon, 1999).

The second criterion is to find water scarcity in two different developing countries because they are more vulnerable to climate change than developed countries. Developing countries does not get the financial and institutional power to counter water scarcity as effectively as more developed countries. A report from the United Nations will be used to identify developing countries (WESP, 2014).

The first objective of the research is to compare if a democracy can handle water scarcity better than an autocracy. Thus, one of the areas should be a democracy, and the second one should be an autocracy. This is measured by the *Freedom in the World Index* presented by the independent watchdog organization Freedom House (Freedom House, 2017).

Both areas should be going through a land degradation process because studies have shown that this process may intensify water scarcity. Maps will be used to locate regions on the outskirts of deserts.

Several areas experiencing water scarcity must be excluded due to the fact that they were experiencing violent conflict. The reason for this is that one of the main objectives of this study is to focus on areas where there is no violent conflict. It will be impossible to research slow violence if a bloody conflict is already taking place in the region. UCDP data will be used to exclude regions where there has been violent conflict (UCDP, 2017).

After applying these criteria two states were found: China and India. Due to their immense size, the scope of the research will be limited to one province in each country that are fulfilling the criteria. This decision is made based on a report from

the *Food and Agriculture Organization* where they mean that: “Averages [in water scarcity] at the country level are also not very meaningful, in particular for large countries with strong regional variations” (FAO Water Reports 38, 2012, p. 8). The provinces that are best suited for research are Gansu province in China and Rajasthan province in India.

Before moving over to the respective areas, a time period for the analysis must be specified. Due to the specific choice of regions and the design of the research question, a wide timeframe will be chosen. A ten-year period from 2006 to 2015 will be used to make sure it is possible to find enough material to make a fair comparison (Höglund and Öberg, 2011, p. 6). A shorter period may result in a lack of empirical material for the given period, which is why it is not used. The reason a longer time-period is not researched is partly to maintain centrality, but also to ensure that focus remain on water scarcity by excluding other factors.

When starting to analyze the two cases selected, one notices that some of the data are inadequate; the fresh water availability is not available on an annual basis in one of the regions. Due to the specific criteria for the two chosen cases, this is unfortunately unavoidable. For the sake of the study, an average value for each region will be used as a static value for the full ten-year period (Hauge and Ellingsen, 1998, p. 302, 305-307). This way it will be possible to include empirical data for the full ten-year period.

4 Empirical Cases

For the last few decades, China and India have been growing very fast. Both economically and population wise. Thus, the two states seem to be under constant comparison and both countries are now playing the role of regional superpowers (Branigan and Arnett, 2014). Water scarcity is causing problems in many developing countries across the world. How are China and India handling the water scarcity within their own borders?

4.1 Gansu, China

4.1.1 Background

Gansu is a province stretching from the center of China to the northwestern part, bordering to Mongolia. In the southern part of the region, the Yellow River passes through the region, improving the water levels here. The majority of the region is situated more than 1000 meters above the sea level, as it lies between the Tibetan Plateau and the Loess Plateau. In addition to bordering the two plateaus, parts of the vast Gobi Desert stretches into the province, as well as small parts of the Badain Jaran Desert and Tengger Desert. This results in a very dry climate in the northern parts with very cold winters and warm summers.

There are reports in the region of water problems. Reuters reports that hundreds of rivers have already vanished due to climate changes in the north-western parts of Gansu (Stanway, 2013). It is no longer possible to grow the same crops as before, because of a lack of water and a changing climate (Zhao et. al., 2014).

In parts of rural Gansu, it is still possible to see why China is classified as a developing country (TWB: China. 2017). The most important sector economically in the region is the mining sector, although many people still rely on small-scale agriculture. Even though the economic situation in the region is not that good, Gansu is a peaceful region who has been spared violent conflict since the start of measuring in 1989 (UCDP, 2017).

The political freedom in the region is limited as the country is autocratic. It gets a Freedom Status as *Not Free* on the Freedom in the World for the full ten-year period (Freedom in the World: China. 2015).

Several different projects are working to combat water scarcity and land degradation in the region. The *Asian Development Bank* is working together with the *State Forestry Administration of China* to combat desertification and land degradation. In Gansu, there has been one project finished in 2001 and one in 2003 focusing on this (ADB, 2001; ADB, 2003). The Chinese government also initiated

a project in 1978 to create a second great wall – this time a green one. The “Great Green Wall of China” is a project to tackle the land degradation caused by the different deserts in the north. This project of planting trees as a wall, to prevent the desert from spreading too far will continue to the year 2050 (The Economist, 2014).

4.1.2 Results

The result in for the Chinese province Gansu will be presented in this section. The different types of scarcities will be focused on first. Supply-induced scarcity will be first, with the two indicators water scarcity and land degradation. Thereafter focus will shift to demand-induced scarcity with its indicator population density, and then to the structural scarcity and the corresponding indicator – resource capture. The two indicators of slow violence – migration and malnutrition – will be presented in their relation to water scarcity. Finally, a table will be provided with a summation of the results.

The amount of available water in the Gansu province is presented by the *National Bureau of Statistics of China*. In the ten-year period 2006-2015, the water scarcity has varied from the lowest level in 2006 with 710 m³ water per capita, to the highest level in 2013 with 1042 m³ water per capita (NBS, 2017; Appendix 9.1).

The numbers for each year are analyzed with the *Falkenmark Water Stress Indicator*. For the greater part of this period, the water scarcity has been classified as chronic water shortage, with just a few outliers stretching just above the limit. These years are, at most, 42 m³ per capita over the upper-limit for chronic water shortage, and with both the median and the medium year within the range for this level of water scarcity. When comparing the two regions one static number will be used. This will represent the average level of water scarcity for the region, for the whole ten-year period. The average level of water scarcity here is 836 m³ water per capita per year. Thus, the ten-year period will be referred to as a period with chronic water shortage in further arguments (Appendix 9.1).

Water scarcity will also be put in relation to the two indicators of slow violence. This is measured by looking for reports linking water scarcity to migration and malnutrition. First, the link between water scarcity and migration will be focused on and then, the link between water scarcity and malnutrition. In Minqin county in Gansu, more than 10 000 people have been forced leave their home. This is reported both by local farmers and environmental experts criticize the poor management of water scarcity, as a reason for the “ecological migration” (Hook, 2013; Vajpeyi, 2013, p. 156-158). The value for the link between water scarcity and migration is therefore classified as a *strong link*.

It is harder to find reports of links between water scarcity and malnutrition in Gansu. A study by *Department of Child-Adolescent and Maternal Health* at the Lanzhou University in Gansu showed that many kids are affected by malnutrition (Xue, 2010). In addition to this study, UNICEF reported that they distributed “food supplements packages” to people in Gansu province (UNICEF, 2012). However, none of these two sources present water scarcity as the reason for malnutrition in

the area. Thus, the link between water scarcity and malnutrition is ascribed the value *no link*.

The second indicator of supply-induced scarcity is land degradation. The focus will first be land degradation in relation to migration, and then in relation to malnutrition. On the ordinal scale, there is a *strong link* between land degradation and migration. The reason for the decision to categorize it like this is that the empirical material reports that there is a link between desertification and migration forcing people to leave their homes. For example, there are reports of climate refugees in Gansu, showing that the majority of the migrants live on the border between urban and rural areas (Haiying, 2009, p. 85; Williams, 2009, p. 222). Although there are reports of land degradation, there are no clear links between this indicator and malnutrition in any report from Gansu. Thus, the value on the ordinal scale for the link between land degradation and malnutrition be *no link*.

The second theoretical mechanism, demand-induced scarcity, is researched by the population density in the province. This is measured by dividing the total population in the region with the area – measured in square kilometers. Thereafter the average population density will be measured for the ten-year period. For Gansu, this number is 60 people per square kilometer (NBS, 2017b).

As was mentioned before, there have been reports of both migration and malnutrition in Gansu. Next step is looking for reports linking population density to these indicators. Reports from the regions are generally focusing on in-state migration, resulting in a rapid urbanization process (Liu et. al., 2015, p. 258-260). There is a link between population density and migration, albeit mainly within the province. The value for the link in the ordinal scale is thus a *strong link*. For the link between population density and malnutrition, there are no links in the empirical material. Thus, the value on the ordinal scale will be *no link*.

The third theoretical mechanism for water scarcity is structural scarcity, which is measured by the occurrence of resource captures in relation to migration and malnutrition. There are however no reports of resource capture in relation to migration and malnutrition in Gansu. In fact, there are no reports of resource capture at all. Thus, resource capture gets the value *no reports* in relation to both migration and malnutrition.

A summary of the findings will be presented in the table below.

Table 3. Ordinal scale results - Gansu.

<i>Indicator one</i>	<i>Slow violence</i>	<i>Result in ordinal variable</i>
<i>Water scarcity</i>	Migration	Strong link
	Malnutrition	No link
<i>Land degradation</i>	Migration	Strong link
	Malnutrition	No link
<i>Population density</i>	Migration	Strong link
	Malnutrition	No link
<i>Resource captures</i>	Migration	No report
	Malnutrition	No report

4.2 Rajasthan, India

4.2.1 Background

Rajasthan is a province in the western part of India bordering to Pakistan. The dry, western part of the region is covered by the Thar Desert. This is also stretching into neighboring Pakistan, although more than 60% of the Thar Desert is located in Rajasthan. The temperatures range from very hot during the summer months, to temperatures just below freezing during the winter. Some of the rivers in the region have a problem with high saline content which contaminates the water. In addition to this, the region in general, gets a low amount of rainfall each year, which causes the Thar Desert to spread.

In addition to problems with high saline content in the water, there are several other reports of water problems in the region. In some cities, they do not even receive water every day, causing big problems for people living there (World Bank, 2012, p. 23). The lack of water in some places has also resulted in a change of agriculture practices. This is tough for a developing country like India (WESP, 2014). In Rajasthan, the economy is based mainly on different types of agricultural practices.

Rajasthan is a rather peaceful region in general. There has however been one big attack by the Indian Mujahideen on civilians in Jaipur 2008, which resulted in many fatalities. Other than this attack there are no reports of what UCDP describes as armed conflict. Thus, this single act of terror aimed at Hindus and tourists will not change the general status of the region as peaceful (Ramesh, 2008).

The political rights in Rajasthan are widespread, as well as in India in general. The country gets a Freedom Status as *Free* on the Freedom in the World for the full ten-year period (Freedom in the World: India. 2015). There are also several irrigation projects in the province. The *Indira Gandhi Canal* is a big irrigation project in north-western Rajasthan supplying water to much of the Thar Desert (Maitra, 1987).

4.2.2 Results

In this section, the results for the different indicators will be presented for the Indian province Rajasthan. The structure of this part will be similar to the corresponding section for Gansu presented above. Here the different theoretical mechanisms of water scarcity will be focused on one-by-one. Supply-induced scarcity will be first, with the two indicators water scarcity and land degradation. Thereafter, the focus will shift to focus on demand-induced scarcity with its indicator population density and then on structural scarcity and its corresponding indicator resource capture. The two indicators of slow violence – migration and malnutrition – will be presented in their relation to water scarcity. Finally, a table will be provided with a summation of the results.

In Rajasthan, there are no official databases on water scarcity for all the years available. Instead, several different sources have been used when finding the levels for water per capita and year in the province. The source of the data will be presented along with the water scarcity level to confirm the authenticity of the source. In a peer-reviewed report for the non-profit organization *International Association of Hydrological Sciences*, Hussain et. al. presents a water scarcity level of 780 m³ for the year 2014 (Hussain et. al., 2014). In a report for *World Bank Group* member *International Finance Corporation*, Mirdha Hooda reports that the water per capita level for Rajasthan was 710 m³ in 2009¹ (Mirdha Hooda, 2013, p. 32-33). Narain et. al. writes in their report for *International Water Management Institute* that the water level for 2006 was 762 m³ per capita. By looking at the water scarcity level for the years just outside the time period selected, one can see that the level has remained unchanged for a long time (Narain, 2005). The water scarcity level for Rajasthan will therefore, be represented by an average for the whole period between 2006-2015. The average water scarcity for the period 2006-2015 is 738 m³ water per capita and year (Appendix 9.2).

The link between water scarcity and the two indicators migration and malnutrition will be focused on in Rajasthan. There are plenty of links between water scarcity and migration. Water scarcity is often described to spark migration from rural areas to more urbanized areas (White, 2011, p. 71-72). The general reason for the migration to more urbanized areas is a result of decreased agricultural productivity due to water deficiency (Bansil, 2006, p. 135-138). Malnutrition is also linked to water scarcity. In western Rajasthan, a study showed that young kids in rural areas were suffering from malnutrition. The study means that one of the reasons for this malnutrition was a result of poor water availability (Singh et. al., 2006, 89-91). The link between both migration and malnutrition can therefore, be given a *strong link* to water scarcity.

The second indicator for supply-induced scarcity is land degradation. This will first be focused at in relation to migration, and then to malnutrition. Degradation of the land in Rajasthan is threatening agricultural production, leading to job losses in this sector, thus contributing to migration in some areas of Rajasthan (Sharma et. al., 2014). Land degradation-induced migration in the province is often directed one way – from the rural areas to urban areas (Dutta and Chaudhuri, 2015). Thus, there is a *strong link* between land degradation and migration. However, no link between land degradation and malnutrition has been reported from the region. Thus, *no link* will be made connecting the two indicators to each other.

The second theoretical mechanism is the demand-induced scarcity with its indicator population density. In Rajasthan, updates for the size of the population is published every 10 years. In this study, the data from the year 2011 will be used for the total population. The total population is divided with the size (in square kilometers) of the province. The population density in Rajasthan is 201 people per square kilometer (Appendix 9.2).

¹ The water scarcity level varied between 640 to 780 m³ per capita in the region, with an average of 710 m³ per capita for the given year.

There are reports of both migration and malnutrition in the region. The link between population density and migration is similar to the one in Gansu. Reports of migration in Rajasthan is discussed mainly in terms of migration within the province, with a flow of people from rural areas to urban areas. The total population density for the province will remain unchanged, but the population density in rural and urban areas will change (Sharma et. al., 2014; Birkenholtz, 2016, 94-97, 102-103). Thus, there is a *strong link* between population density and migration. The links between population density and malnutrition are not as clear. The only indication of a link between the two indicators is that it is hard for healthcare to reach people in need of help in less populated areas (ACF International, 2010, p. 15). This link is deemed too weak to include in this study. Thus, the value on the ordinal scale will be *no link*.

The third theoretical mechanism, structural scarcity will be measured with the indicator resource captures. There is a *strong link* between resource captures and migration in Rajasthan. A state-led process in the province has relocated water resources from rural farmers into urban Jaipur. The focus of this redirection of water is to support “domestic, commercial and industrial uses”. The consequence for rural farmers is severe. Many have been forced to leave their home and migrate to urban parts of the province (Birkenholtz, 2016, 94-97, 102-103). The link between resource captures and malnutrition is not as strong. There are reports of resource captures risking food security for rural farmers (Kumar, 2003, p. 7-8). Due to the criteria set for the ordinal scale resource captures must be discussed in relation to malnutrition. Thus, there is *no link* between resource capture and malnutrition.

In the following table, a summary of the findings will be presented.

Table 4. Ordinal scale results – Rajasthan.

<i>Indicator one</i>	<i>Slow violence</i>	<i>Result in ordinal variable</i>
<i>Water scarcity</i>	Migration	Strong link
	Malnutrition	Strong link
<i>Land degradation</i>	Migration	Strong link
	Malnutrition	No link
<i>Population density</i>	Migration	Strong link
	Malnutrition	No link
<i>Resource captures</i>	Migration	Strong link
	Malnutrition	No link

5 Analysis

This chapter will discuss the results presented for Gansu, China and Rajasthan, India. When analyzing the results the theoretical framework will be used. The results of each theoretical mechanism and the corresponding indicator will be compared one-by-one between the two regions.

The first theoretical mechanism, supply-induced scarcity will be analyzed by focusing on water scarcity and its link to the concept slow violence. Both regions have a similar level of water scarcity. With 836 m³ water per capita and year, and 738 m³ water per capita and year, both regions are suffering from chronic water shortage. A difference of less than 100 m³ in water per capita and year is deemed too small to have any noticeable effects on the outcomes in any direction. Both of the regions have a water scarcity level well within the criteria for chronic water shortage (500-1000 m³ per capita and year). This implies that there should be a strong link between both of the indicators for slow violence, and water scarcity.

There is a strong link between water scarcity and migration in both regions, which means that the theory predicted the results correctly. This migration is mainly directed from rural areas to urban areas. Even though there are reports of water scarcity in relation to migration in both regions, it would not be correct to assume that this is the only reason. For example, Homer-Dixon means that there are no recorded cases where water scarcity is the sole reason for conflict (Homer-Dixon, 1999, p. 178). When applying this logic to Gansu and Rajasthan, one notices an obvious difference in how migration are being portrayed. In both regions, migration is directed from rural to urban areas. In Rajasthan, much of the migration is reported to be related to economic opportunities in addition to water scarcity (Sharma et. al., 2014). In Gansu, the reason for the migration to urban areas is reported to be more strictly related to environmental scarcities and they do not mention the economic possibilities as a factor to migrate (Hook, 2013). This represents the push and pull factors of migration, included in the slow violence theory. In Gansu, the migration is driven mainly by push-factors, while the migration in Rajasthan is driven mainly by pull factors.

This indicates that there is a difference between a democratic, and an autocratic state in the way migration appears in relation to water scarcity. This might be because the economic possibilities are greater in India, as it is a democratic state.

The link between water scarcity and malnutrition is not as clear. Theoretically environmental scarcities should result in malnutrition in both regions. However, in Gansu this is not the case. Here, there are *no links* between water scarcity and malnutrition in the empirical reports. The only reports that discussed malnutrition at all were presenting medical results or action plans on how to tackle it. In Rajasthan however, the link between water scarcity and malnutrition was deemed

as *strong*. The reports regarding malnutrition from this province does cover the reasons for malnutrition, and they present water scarcity as a contributing factor.

Indications in the empirical material show that malnutrition as a result of water scarcity is more common in a democratic state than in an autocratic state.

The second indicator for supply-induced scarcity – land degradation – will also be analyzed in relation to migration and malnutrition. Theoretically, this concept would have a strong link to both migration and malnutrition. The reason for this is that it is hard to produce any food on land degraded land – forcing people to migrate or starve. In the reports from the respective regions land degradation has been linked to migration in both provinces. However, there are once again reports of push and pull migration. In Rajasthan, the migration is closely linked to economic opportunities (pull migration) in addition to land degradation. In Gansu, migration is once again linked to push migration, with land degradation as the strongest reason. Regarding malnutrition, land degradation is shown to have *no link* in either Gansu or Rajasthan.

Based on this material, indications are that the economic incentives to migrate are once again highlighted (in addition to land degradation) in the democratic state, India. In the autocratic state China reports are focusing more on land degradation as a push-factor than on economic incentives.

The second theoretical mechanism – demand-induced scarcity – with its indicator population density shows two very different levels in each region. In Gansu, there are 60 people per square kilometer and in Rajasthan, there are 201 people per square kilometer. Using the theoretical framework to analyze these numbers indicates that there is a much higher risk for slow violence in Rajasthan than Gansu. Thus, this implies that it should be a *strong link* between population density, and migration or malnutrition. High population density should result in an outflow of people, due to demographic pressures leading to environmental scarcities as well as less food and water per capita.

Empirically there is in fact, a *strong link* between population density and migration in both regions. However, it do not correspond with the population density on the province-level. Instead, population density tends to increase in urban areas and decrease in rural areas within the province. Most reports indicate that the migration results in a changing population density in urban and rural areas. There is *no link* between population density and malnutrition in any of the two regions.

Based on the results given in this study, a democratic state and an autocratic state are experiencing similar levels of slow violence in relation to population density. This is interesting because the levels of slow violence remain the same, irrespective of the different levels of population density. There are two possibilities for this. Either the population density has no relation to slow violence, or a democratic state is better at handling high population density.

The last theoretical mechanism is structural scarcity, measured by the indicator resource captures. Reports of resource captures in any of the regions would theoretically result in strong reports of both migration and malnutrition because some people will risk not get enough water to sustain themselves in a certain location. In Gansu, there were *no reports* of resource captures at all. Resource captures in Rajasthan on the other hand, had a *strong link* to migration, but showed

no link to malnutrition. The migration is a type of push-migration since the government is taking their water sources, and relocating it to industries in urban areas (Birkenholtz, 2016, 94-97, 102-103). Without sufficient water resources, it will not be possible for them to continue to farm their land.

There are no reports of resource captures in the autocratic state in the material. This indicates that an autocratic state might be better at preventing resource captures than a democratic state. Especially since India, as a democratic state actively supports resource captures, in favor of rich and powerful industries.

The results of this study do not give any clear indications in whether democracies are better at handling water scarcity issues or not. Thus, it is not possible to confirm Peter Burnell's study (2012), where he mean that democracies are better at handling climate issues than autocratic states. Homer-Dixon meant that water scarcity would lead to violent conflict. This study shows that this is not always the case. Homer-Dixon may still be right though; the water scarcity can still cause violent conflict in the future (Homer-Dixon, 1999).

Throughout the study, it has been hard to find reports of malnutrition. It has however been much easier to find reports of migration. The reason for this could be that people prefer to migrate than staying in the same place and suffer from malnutrition. Often these migrants are described as economic migrants instead of environmental refugees, or migrants. In this study, migrants were often described as economic migrants – especially in Rajasthan. This change in terminology removes these people from the spectrum of environmental security, which could result in limited actions to help the migrants.

6 Conclusion

The aim of this study was to compare how water scarcity differs between a democratic and an autocratic state. In the conclusion, India will represent democratic states and China will represent autocratic states. With the basis in the results of this study, the findings show that there are some differences in how water scarcities appear in the two type of states.

First, the second question will be answered. The question was: *Is a democratic state better than an autocratic state at dealing with water scarcity?* The answer is that it depends on which finding one values highest of the ones presented below.

The first finding is that democratic states are more vulnerable to resource captures than autocratic states. The reason for this seems to be that powerful people and industries have more power in democratic states than in autocratic states.

There are two possible conclusions regarding population density in relation to slow violence. Either different levels in population density does not affect slow violence, or democratic states are better at handling high population density.

Migration is often linked to economic possibilities in a democratic state than in an autocratic state. In an autocratic state, migration is linked to pushing factors such as land degradation or water scarcity.

Within the academic field of environmental scarcity, this study will help fill a gap. Introducing a link between water scarcity and slow violence, instead of violent conflict, opens a field where much more research can be made. However, extensive case studies for each case will be needed in order to gather more material and to strengthen the link between water scarcity and slow violence.

7 Discussion

This part of the study aims to describe some of the different considerations that has been made while conducting this study.

When gathering the material, it is important to remember that some of the data for the regions might be censored. China is known to have low scores for freedom of the press (Freedom House, 2017). Articles that are criticizing the regime in may therefore, be removed completely, which could lead to a biased result. The ideal would therefore, be to visit the regions and research the actual conditions directly. However, this would take way too long time and require a good knowledge in the local language.

Analyzing the material with the water scarcity method can sometimes be complicated. The three types of scarcity are very well suited when researching a theoretical concept. On the other hand, it is hard to see which scarcity comes first because they are often interlinked with each other.

If more data was available for the regions other indicators could have been used for the different theoretical mechanisms of water scarcity. Including an indicator with an interval scale of measurement for the theoretical mechanism structural scarcity would improve the theory a lot. Income inequality, or relations between urban and rural income per capita, in the respective region would be a good indicator for this. However, no such data were available for any of the regions.

In this study, an ordinal scale of measurement was used for several of the indicators. Ideal when using this method would be to find similar studies and use a benchmarking method (Esaiasson et. al., 2012, p. 148-153). Unfortunately, there are no previous studies researching the link between water scarcity and slow violence. The studies with a similar scope (focusing on conflict) have quantified the data. There are not enough data for the regions chosen to use more quantitative data in this study.

8 References

- ACF International, 2010. Acute Malnutrition: Situational Analysis in the States of Rajasthan and Madhya Pradesh, India. *ACF International*.
- ADB, 2001. Optimizing Initiatives to Combat Desertification in Gansu Province. *Asian Development Bank*.
- ADB, 2003. Optimizing Initiatives to Combat Desertification in Gansu Province. *Asian Development Bank*.
- Alavian, Vahid et al., 2009. Water and Climate Change: Understanding the Risks and Making Climate-Smart Investment Decisions. The World Bank.
- Anisfeld, Shimon C., 2011. "Water Resources". Island Press.
- Bansil, P. C., 2006. *Poverty Mapping in Rajasthan*. Concept Publishing Company
- Birkenholtz, Trevor, 2016. "Dispossessing irrigators: Water grabbing, supply-side growth and farmer resistance in India". *Geoforum*. Vol 69. pp. 94–105.
- Bjereld, Ulf – Demker, Marie – Hinnfors, Jonas, 2009. *Varför Vetenskap?* Studentlitteratur: Lund. 3:rd ed.
- Branigan, Tania – Arnett, George, 2014. China and India - 13 charts that show how the countries compare. *The Guardian*. Sep 16.
- Buhaug, Halvard, 2010. "Climate Not to Blame for African Civil Wars," Proceedings of the National Academy of Sciences, nr. 107, pp. 16477–82
- Burke, Marshall B. et al., 2009. "Warming Increases the Risk of Civil War in Africa," Proceedings of the National Academy of Sciences, nr. 106, pp. 20670–4
- Burnell, Peter, 2012. Democracy, democratization and climate change: complex relationships. *Democratization*. Vol. 19
- Buzan, Barry – Wæver, Ole – de Wilde, Jaap, 1998. Security: A New Framework for Analysis. Lynne Rienner Publishers
- Census Info India, 2011. Rajasthan Profile: Final Population Totals. *Census Info India*
- Dutta, Srimoyee – Chaudhuri, Gargi, 2015. "Evaluating Environmental Sensitivity of Arid and Semiarid Regions in Northeastern Rajasthan, India". *Geographical Review*. 105 (4): pp. 441–461
- Esaiasson, Peter – Gilljam, Peter – Oscarsson, Henrik – Wängnerud, Lena, 2012. *Metodpraktikan: Konsten att Studera Samhälle, Individ och Marknad*. Norstedts Juridik: Stockholm. Ed. 4:1.
- FAO Water Reports 38, 2012. Coping with water scarcity: An action framework for agriculture and food security. *Food and Agriculture Organization of the United Nations*.
- Floyd, Rita – Matthew, Richard, 2013. Environmental Security. Routledge: New York.

- Freedom House, 2017a. About Freedom in the World: An annual study of political rights and civil liberties. *Freedom House*. <https://freedomhouse.org/report-types/freedom-world> (Retrieved: 2017-05-29)
- Freedom House, 2017b. Freedom of the Press 2017. *Freedom House*. <https://freedomhouse.org/report/freedom-press/2017/china> (Retrieved: 2017-05-29)
- Freedom in the World: China, 2015. Freedom in the World: China. *Freedom House*
 TWB: China. 2017. Overview. *The World Bank*. <http://www.worldbank.org/en/country/china/overview> (Retrieved: 2017-05-29)
- Gleick, Peter H., 1993. Water and Conflict: Fresh Water Resources and International Security. *International Security*, Vol. 18, No. 1, pp. 79-112
- Gleick, Peter H., 2014. “Water, Drought, Climate Change, and Conflict in Syria”. Pacific Institute. Oakland: California
- Gleidsch, Nils Petter – Magnussen Theisen, Ole. Resources, The Environment and Conflict. 2010. In Dunn Cavelt, Myriam – Mauer, Victor (ed.). *The Routledge Handbook of Security Studies*. Routledge: New York
- Gnacadjia, Luc, 2013. “Land Degradation: The Hidden Face of Water Scarcity”. *Harvard International Review*. Edition 35(2).
- Haiying, Liu, 2009. The Impact of Climate Change on China. In Yang, Dongping. *The China Environment Yearbook, Volume 3: Crises and Opportunities*. Brill: Leiden
- Haner, Josh – Wong, Edward – Watkins, Derek – White, Jeremy, 2016. Living in China’s Expanding Deserts. *The New York Times*. https://www.nytimes.com/interactive/2016/10/24/world/asia/living-in-chinas-expanding-deserts.html?_r=0 (Retrieved: 2017-05-29)
- Hauge, Wenche – Ellingsen, Tanja, 1998. Beyond Environmental Scarcity: Causal Pathways to Conflict. *Journal of Peace Research*, Vol. 35, No. 3. pp. 299-317
- Homer-Dixon, Thomas F., 1999. *Environment, Scarcity and Violence*. Princeton University Press. Princeton: New Jersey.
- Hook, Leslie, 2013. China: High and dry. *Financial Times*. May 14. <https://www.ft.com/content/7d6f69ea-bc73-11e2-b344-00144feab7de#axzz2TMae0Kjs> (Retrieved: 2017-05-29)
- Hussain, J. – Husain, I. – Arif, M, 2014. “Water resources management: traditional technology and communities as part of the solution”. *Proceedings of the International Association of Hydrological Sciences*: 364, p. 236-242.
- Höglund, Kristine – Öberg, Magnus, 2011. *Understanding Peace Research: Methods and Challenges*. Routledge: New York.
- Kumar, M. D., 2003. “Food security and sustainable agriculture in India: The water management challenge”. *International Water Management Institute (IWMI)*.
- Liu, Hailong – Shi, Peiji – Tong, Huali – Zhu, Guofeng – Liu, Haimeng – Zhang, Xuebin – Wei, Wei – Wang, Xinmin, 2015. “Characteristics and driving forces of spatial expansion of oasis cities and towns in Hexi Corridor, Gansu Province, China”. *Chinese Geographical Science*. Volume 25, Issue 2, pp 250–262
- MacQuarrie, Patrick – Wolf, Aaron T., Understanding Water Security. 2013. In Floyd, Rita – Matthew, Richard. *Environmental Security*. Routledge: New York.

- Maitra, Ramtanu, 1987. The Indira Gandhi Canal: greening the desert in India. *Executive Intelligence Review*. Vol 14, num 7.
- Matthew, Richard. Climate Change and Security, 2013. In Floyd, Rita – Matthew, Richard. *Environmental Security*. Routledge: New York.
- Mirdha Hooda, Sweta, 2013. Rajasthan Water Assessment: Potential for Private Sector Interventions. *International Finance Corporation, World Bank Group*.
- Narain, P. – Khan, M. A. – Singh, G., 2005. Potential for water conservation and harvesting against drought in Rajasthan, India. Working Paper 104 (Drought Series: Paper 7). Colombo, Sri Lanka: *International Water Management Institute (IWMI)*.
- NBS, 2017a. Annual by Province: Gansu. Indicators: Resources and Environment: Water Resources. *National Bureau of Statistics of China* <http://data.stats.gov.cn/english/easyquery.htm?cn=E0103> (Retrieved: 2017-05-29)
- NBS, 2017b. Annual by Province: Gansu. Indicators: Population – Total Population. *National Bureau of Statistics of China* <http://data.stats.gov.cn/english/easyquery.htm?cn=E0103> (Retrieved: 2017-05-29)
- Ramesh, Randeep, 2008. Indian Mujahideen claims responsibility for Jaipur blasts. *The Guardian*. May 15.
- Scheffran, Jürgen et al., 2012. Climate Change and Violent Conflict. *Science*. nr. 336, pp. 869-87
- Sharma, Hemant – Burark, S. S. – Meena, G. L., 2014. "Land Degradation and Sustainable Agriculture in Rajasthan, India". *EM International*. 31(1) pp 7-11.
- Singh, Madhu B. – Lakshminarayana, J. – Fotedar, R. – Anand, P.K., 2006. "Childhood Illnesses And Malnutrition In Under Five Children In Drought Affected Desert Area Of Western Rajasthan, India". *The Journal of Communicable Diseases*. 38 (1). pp. 88-96
- Stanway, David, 2013. Chinese government sees its own reflection in water crisis. *Reuters*. <http://www.reuters.com/article/us-climate-ipcc-china-idUSBRE98M0BP20130923> (Retrieved: 2017-05-29)
- The Economist, 2014. Afforestation in China: Great Green Wall. *The Economist*. Aug 23.
- UCDP, 2017. Definition of Armed Conflict. *Uppsala Universitet Department of Peace and Conflict Research*. http://www.pcr.uu.se/research/ucdp/definitions/definition_of_armed_conflict/ (Retrieved: 2017-05-29)
- UNICEF, 2012. Lifelong effects of infant malnutrition: Focus on "stunting" in China. *UNICEF*.
- Vajpeyi, Dharendra K., 2013. *Climate Change, Sustainable Development, and Human Security: A Comparative Analysis*. Lexington Books: Cambridge.
- WESP, 2014. Country Classification. *World Economic Situation and Prospects*. https://www.un.org/en/development/desa/policy/wesp/wesp_current/2014wesp_country_classification.pdf (Retrieved: 2017-05-29)
- White, Gregory, 2011. *Climate Change and Migration: Security and Borders in a Warming World*. Oxford University Press

- Williams, Adrian – et. al., 2009. Land Tenure, Property Rights and Institutional Arrangements. In Squires, Victor R. 2009. *Rangeland Degradation and Recovery in China's Pastoral Lands*. CABI
- Wolf, Aaron T. – Stahl, Kerstin – Macomber, Marcia F., 2003. Conflict and Cooperation Within International River Basins: The Importance of Institutional Capacity. *Water Resource Update*. Issue Number 125, p. 31-40.
- World Bank, 2012. India: Improving Urban Water Supply & Sanitation Services. *The World Bank*
- Xue, HL – Li, ZL – Xie, PM – Liu, H – Jin, N – Ma, GY, 2010. Survey on the influencing factors of malnutrition in rural children under 7 years of age in Gansu Province. *Department of Child-Adolescent and Maternal Health*. Lanzhou.
- Zhao, Hong-Yan – et. al., 2014. Climate Change Impacts and Adaptation Strategies in Northwest China. *Advances in Climate Change Research*. 5(1): 7-16

9 Appendices

9.1 Data – Gansu

Gansu Province, China				
	Per Capita Water Resources (m3)	Population	Area	Population density
2015	635	26000000	425800	61
2014	767	25910000	425800	61
2013	1042	25820000	425800	61
2012	1038	25780000	425800	61
2011	945	25640000	425800	60
2010	842	25600000	425800	60
2009	794	25550000	425800	60
2008	715	25510000	425800	60
2007	876	25480000	425800	60
2006	710	25470000	425800	60
Total 2006-2015	8365			603
Average 2006-2015	836			60

9.2 Data – Rajasthan

Rajasthan Province, India				
	Per Capita Water Resources (m3)	Population	Area	Population density
2015			342239	
2014	780		342239	
2013			342239	
2012			342239	
2011	699	68621012	342239	201
2010			342239	
2009	710		342239	
2008			342239	
2007			342239	
2006	762		342239	
Total 2006-2015*	2951			201
Average 2006-2015	738			201