

CLIMATE CHANGE AND POOR WATER RESOURCE MANAGEMENT
WILL HAVE SERIOUS SECURITY IMPLICATIONS
IN THE BALKAN PENINSULA

A thesis presented to the Faculty of the U.S. Army
Command and General Staff College in partial
fulfillment of the requirements for the
degree

MASTER OF MILITARY ART AND SCIENCE
General Studies

by

KOSTA DELEV, CAPTAIN, BULGARIAN ARMY
M.S., National Military University, Veliko Tarnovo, Bulgaria, 2008

Fort Leavenworth, Kansas
2015

Approved for public release; distribution is unlimited.

REPORT DOCUMENTATION PAGE				Form Approved OMB No. 0704-0188	
Public reporting burden for this collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing this collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden to Department of Defense, Washington Headquarters Services, Directorate for Information Operations and Reports (0704-0188), 1215 Jefferson Davis Highway, Suite 1204, Arlington, VA 22202-4302. Respondents should be aware that notwithstanding any other provision of law, no person shall be subject to any penalty for failing to comply with a collection of information if it does not display a currently valid OMB control number. PLEASE DO NOT RETURN YOUR FORM TO THE ABOVE ADDRESS.					
1. REPORT DATE (DD-MM-YYYY) 12-06-2015		2. REPORT TYPE Master's Thesis		3. DATES COVERED (From - To) AUG 2014 – JUN 2015	
4. TITLE AND SUBTITLE Climate Change and Poor Water Resource Management Will Have Serious Security Implications in the Balkan Peninsula				5a. CONTRACT NUMBER	
				5b. GRANT NUMBER	
				5c. PROGRAM ELEMENT NUMBER	
				5d. PROJECT NUMBER	
6. AUTHOR(S) CAPT Kosta Delev, Bulgarian Army				5e. TASK NUMBER	
				5f. WORK UNIT NUMBER	
				8. PERFORMING ORG REPORT NUMBER	
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) U.S. Army Command and General Staff College ATTN: ATZL-SWD-GD Fort Leavenworth, KS 66027-2301					
9. SPONSORING / MONITORING AGENCY NAME(S) AND ADDRESS(ES)				10. SPONSOR/MONITOR'S ACRONYM(S)	
				11. SPONSOR/MONITOR'S REPORT NUMBER(S)	
12. DISTRIBUTION / AVAILABILITY STATEMENT Approved for Public Release; Distribution is Unlimited					
13. SUPPLEMENTARY NOTES					
14. ABSTRACT Climate Change is not a new or surprising event, but it has a significant impact human civilization. Our future depends on our ability to predict and mitigate the impact and threats created by climate change. The effects will influence all of us. Climate change is a threat multiplier and puts every nation at risk. The aim of this paper is to define the security threats for the Balkan Peninsula caused by climate change and poor water resource management. This research focuses on surface rather than groundwater and specifically explores the Maritza and Tundja Rivers which form the border area between Bulgaria, Greece and Turkey. The paper details how poor water management in these rivers will create security threats. Using the mixed methodology to analyze the collected data, the results of the research show that climate change and population growth will strain the environment of the Balkan Peninsula, and it will be followed by resource crises. The biggest threat is water scarcity. Reduced water resources will create a tremendous impact on the three countries, their economies and societies will react to the stress. It is government's responsibility to avoid the conflict. The only peaceful solution is to establish a combined center for climate change and to work together for the good of the three nations.					
15. SUBJECT TERMS Climate Change, Turkey, Bulgaria, Greece, Balkan Peninsula, Water resource management, Balance of power, Security threats.					
16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT	18. NUMBER OF PAGES	19a. NAME OF RESPONSIBLE PERSON
a. REPORT (U)	b. ABSTRACT (U)	c. THIS PAGE (U)			19b. PHONE NUMBER (include area code)
			(U)	97	

Standard Form 298 (Rev. 8-98)
Prescribed by ANSI Std. Z39.18

MASTER OF MILITARY ART AND SCIENCE

THESIS APPROVAL PAGE

Name of Candidate: Captain Kosta Delev

Thesis Title: Climate Change and Poor Water Resource Management Will Have
Serious Security Implications in the Balkan Peninsula

Approved by:

_____, Thesis Committee Chair
Wendell Christopher King, Ph.D.

_____, Member
James R. Cricks, M.A.

_____, Member
Matthew K. Green, MMAS

Accepted this 12th day of June 2015 by:

_____, Director, Graduate Degree Programs
Robert F. Baumann, Ph.D.

The opinions and conclusions expressed herein are those of the student author and do not necessarily represent the views of the U.S. Army Command and General Staff College or any other governmental agency. (References to this study should include the foregoing statement.)

ABSTRACT

CLIMATE CHANGE AND POOR WATER RESOURCE MANAGEMENT WILL HAVE SERIOUS SECURITY IMPLICATIONS IN THE BALKAN PENINSULA, by
CAPT Kosta Delev, 97 pages.

Climate Change is not a new or surprising event, but it has a significant impact human civilization. Our future depends on our ability to predict and mitigate the impact and threats created by climate change. The effects will influence all of us. Climate change is a threat multiplier and puts every nation at risk. The aim of this paper is to define the security threats for the Balkan Peninsula caused by climate change and poor water resource management. This research focuses on surface rather than groundwater and specifically explores the Maritza and Tundja Rivers which form the border area between Bulgaria, Greece and Turkey. The paper details how poor water management in these rivers will create security threats. Using the mixed methodology to analyze the collected data, the results of the research show that climate change and population growth will strain the environment of the Balkan Peninsula, and it will be followed by resource crises. The biggest threat is water scarcity. Reduced water resources will create a tremendous impact on the three countries, their economies and societies will react to the stress. It is government's responsibility to avoid the conflict. The only peaceful solution is to establish a combined center for climate change and to work together for the good of the three nations.

TABLE OF CONTENTS

	Page
MASTER OF MILITARY ART AND SCIENCE THESIS APPROVAL PAGE	iii
ABSTRACT.....	iv
TABLE OF CONTENTS.....	v
ACRONYMS.....	vii
ILLUSTRATIONS	viii
TABLES	x
CHAPTER 1 INTRODUCTION	1
Assumptions.....	2
Importance	3
Research Questions.....	4
CHAPTER 2 LITERATURE REVIEW.....	7
Water Security	7
Rivers	10
Maritza Basins	10
Tundja/Tunca River Sub-basin	13
Agreements	15
Maritza	15
Tundja	15
Bulgaria and Greece.....	15
Bulgaria-Turkey	16
Greece-Turkey	16
Turkey-EU	17
Population	18
Bulgaria.....	18
Greece	20
Turkey	21
Population at Maritza and Tundja Basins	22
Water Resource Management.....	23
Deforestation.....	25
Bulgaria.....	25
Greece	26
Turkey	27
History	28

Threats	30
Definitions.....	30
National Security Strategies.....	30
Climate Change Adaptation Plan.....	31
Greece Case-Drought.....	31
Bulgaria-The Floods	32
Migration.....	34
Climate Change Scenarios	35
First Scenario-Optimistic	36
Second Scenario-Realistic.....	36
Last Scenario-Pessimistic	38
Conclusion	42
CHAPTER 3 METHODOLOGY	48
Data Collection	48
Analysis	49
CHAPTER 4	51
What will be the Influence of a Lack of Drinkable and Fresh Water, in the Southeastern Part of Balkans?	54
Summary for Each Country	58
How will the Lack of Drinkable and Fresh Water, in the Research Area Create Security Threats?.....	60
Extreme Weather.....	60
Health System	61
Migration	62
Does Bulgaria Apply Proper Water Management Systems and how this is going to Influence Greece and Turkey?	65
Will the Historical Tensions in this Area Increase the Impact of Climate Change?	68
Conclusion	70
CHAPTER 5 CONCLUSIONS AND RECOMMENDATIONS	74
Suggestion.....	74
Parallel	77
Centralized.....	78
Further Research	79
Conclusion	80
BIBLIOGRAPHY.....	83

ACRONYMS

CCAM	Climate Change Adaptation and Mitigation.
EU	European Union
IPPC	Intergovernmental Panel on Climate Change
NATO	North Atlantic Treaty Organization
UN	United Nations

ILLUSTRATIONS

	Page
Figure 1. Trans-boundary River Basins of the Balkans	3
Figure 2. Maritza-Evros-Meric Sub-basin with Arda and Ergene Rivers	11
Figure 3. Tundja River-Maritza/Evros/Meric Sub-basin	13
Figure 4. Bulgarian Population Forecast-UN.....	18
Figure 5. Greece Population Projection, 2007-2050	20
Figure 6. Demographic Forecast for Turkey, 2075	21
Figure 7. Population Forecst in Basin of Maritza and Tundja	22
Figure 8. Second Scenario-Realistic, 2021	37
Figure 9. Second Scenario-Realistic, 2035	38
Figure 10. Summer Season, 2035.....	39
Figure 11. Forecast for Business and Population Needs of Water, 2015-2035.....	40
Figure 12. Climate Change as a Threat Multiplayer	52
Figure 13. Relation between Natural Resources and Population	54
Figure 14. Influence of Population Change to Natural Resources System	56
Figure 15. Influence of Climate Change to Natural Resources System.....	58
Figure 16. Balance of Power between Bulgaria, Greece, and Turkey from EU Perspective	63
Figure 17. Migration as a Balance of Power Stressor	64
Figure 18. Balance between the Two Countries.....	65
Figure 19. Balance of Power from each Country's Perspective.....	66
Figure 20. Three Dimensional Balance of Power	66
Figure 21. Change of the Balance of Power at the First and Second Balkan Wars	69

Figure 22. Proposed Parallel Structure for the Center.....	77
Figure 23. Proposed Centralized Structure for the Cent	78

TABLES

	Page
Table 1. Basic Information for Maritza	12
Table 2. Basic Information for Maritza Basing	14
Table 3. Bulgarian Population Forecast.....	19
Table 4. Forecast for Water Extraction (without Nuclear Power Plant), 2015, 2021, and 2035	41

CHAPTER 1

INTRODUCTION

Climate change is not a new or surprising event, but it has a significant impact on human civilization. The future of humans is dependent on the impact and threats created by climate change, and they influence the entire world.

World leaders met to tackle climate change during General Assembly of the United Nations (UN) from 16 to 30 September 2014 in New York. During his speech, the UN Secretary-General Ban Ki-moon, underscored the importance of climate change as the defining issue of our age and called for leadership to cut greenhouse gas emissions.¹ In his speech on 15 January 2015, the President of the United States of America Barack Obama said, “No challenge poses a greater threat to future generations than climate change.”²

When this research began, the author looked for sources which would help to define the root of the problem, or to find something similar in the past. It was surprising how often this event had happened. The global climate is constantly changing for a variety of reasons: shifting of tectonic plates, changes in the Earth’s axis orientation, changes in the Earth’s elliptical orbit around the Sun, volcano eruption, and many other random or cyclical events.³

Because of the climate change, our ancestors were pushed to adapt and survive, or become extinct. Our ancestors adapted to the changes in the environment and they developed new skills which increased their survivability and adaptability.⁴ It took millions of years to develop these skills, but because the climate was changing very slowly they succeeded. This luxury does not exist today, there are not millions of years to

adapt to climate change. The changing of the climate is very rapid and people must adapt more quickly than their predecessors.

Climate models show significant agreement for all emission scenarios in warming (magnitude and rate) all over Europe, with strongest warming projected in Southern Europe in summer, and in Northern Europe in winter. . . . Even under an average global temperature increase limited to 2°C compared to preindustrial times, the climate of Europe is simulated to depart significantly in the next decades from today's climate.⁵

It is obvious from the quotation that climate change will have a significant impact on the European continent. In southern Europe, the impact of climate change has already started. The extreme weather events occurring in the region (floods, droughts, heat waves, intense storms), are increasing dramatically and creating threats for the population.

The rivers in Europe are the veins to the economy and sustaining progress. Climate change, directly or indirectly, can change this balance. In the southeastern part of Balkan Peninsula the rivers flow from north to south. The rivers which spring in Bulgaria feed Greece and Turkey with water. In addition, the boundary between Greece and Turkey is the Maritza River which is very important for the agriculture, industry, and most importantly, for drinking water for the people.

Assumptions

This research is focused on the southeastern part of Balkan Peninsula; the border area between Bulgaria, Greece, and Turkey. In addition, the thesis will focus on surface water rather than groundwater, and specifically on the Maritza and Tundja Rivers and how poor water management in these rivers will create security threats (see figure 1).



Figure 1. Trans-boundary River Basins of the Balkans

Source: GRID-Arendal, “Trans-boundary River Basins of the Balkans,” accessed 20 October 2014, http://www.grida.no/graphicslib/detail/transboundary-river-basins-of-the-balkans-overview_80e1#.

Importance

The threats created by climate change will influence the entire world. Predictions are that by the end of this century the world population will increase to more than ten billion people and the world temperature will increase by at least two degrees centigrade. The ocean level could rise by as much as one meter and fresh water resources will decrease dramatically. According to the Intergovernmental Panel on Climate Change (IPCC) *IPCC - Climate Change 2014 Impacts, Adaptation, and Vulnerability* (hereafter referred to as IPCC 2014), “For each degree of global warming, approximately 7 percent

of the global population is projected to be exposed to a decrease of renewable water resources of at least 20% (multi-model mean).”⁶ For example, the population of the African continent will double and they will need more food, more fresh water, and more land. This future environment with more people, higher temperatures, rising oceans levels, and fewer fresh water resources will create new and additional types of problems. Because of these dramatic changes, water management is going to be very important. These changes are going to create tensions between the neighboring countries, because of poor water management or lack of it:

Some 181 conflicts over water are reported to have occurred between 3000 B.C. and the end of 2007. . . . Some 146 of these conflicts took place in the 5,000 years between 3000 B.C. and the year 2000. The remaining 59 conflicts therefore occurred in this century. During that same brief decade, new forms of actual and potential conflicts over water emerged. These include homegrown terrorist threats to water infrastructure in Afghanistan and Iraq, and a foreign terrorist threat issued by Al-Qaida in 2003 against domestic water supply systems in the United States.⁷

This research will focus on, “how the climate change and poor water resource management practices will have serious security implications in the Balkan Peninsula.” The Balkan Peninsula is a crossroad between Asia, Africa, and Europe. The focus will be only on the southeastern part of the Balkan Peninsula, Bulgaria, Greece, and Turkey, and how they act and interact in this new environment. This study will focus on how important it is, and what can be done to be prepared or even avoid the negative effects of climate change and poor water resource management.

Research Questions

The primary research question is, What are the security threats for the Balkan Peninsula caused by climate change and poor water resource management?

The secondary research questions are:

1. What will be the influence of a lack of drinkable or fresh water, in the southeastern part of the Balkans?
2. How does the of lack of drinkable or fresh water, in the southeastern part of the Balkans create security threats?
3. Does Bulgaria apply proper water management systems and how will this influence Greece and Turkey?
4. Do the historical tensions of this area influence application of good management practices?

Summary

In conclusion, people do not have millions of years, the climate is changing very fast, and they have to adapt more quickly than their predecessors. The global threats created by climate change around the world will influence everyone. The Balkan Peninsula, where this research is focused, is a crossroad between Asia, Africa, and Europe. The rivers which spring in Bulgaria, feed Greece and Turkey with water. Furthermore, the boundary between Greece and Turkey is the Maritza River which is very important for agriculture, industry, and most importantly for the population to have drinkable water. For these reasons, water management has become very important for the future of the region to facilitate the adaptation to climate changes.

¹ UN News Center, “Ban Ki-moon’s Speeches: A Quick Guide to Statements on Key Issues on UN Agenda,” UN News Service, 16 September 2014, accessed 28 September 2014, <http://www.un.org/apps/news/infocus/sgspeeches/>.

² Madison Park, “Obama: No Greater Threat to Future Than Climate Change,” CNN, 21 January 2015, accessed 4 May 2015, <http://www.cnn.com/2015/01/21/us/climate-change-us-obama/>.

³ Government of Canada, “Canada’s Action on Climate Change, Causes of Climate Change,” last modified 10 December 2013, accessed 28 September 2014, <http://www.climatechange.gc.ca/default.asp?lang=en&n=65CD73F4-1>.

⁴ Wikipedia, “Human Evolution,” Wikipedia Foundation, last modified 17 May 2015, accessed 28 September 2014, http://en.wikipedia.org/wiki/Human_evolution.

⁵ Intergovernmental Panel on Climate Change, *IPCC - Climate Change 2014 Impacts, Adaptation, and Vulnerability Part B: Regional Aspects*, ed. Vicente R. Barros and Christopher B. Field (New York: Cambridge University Press, 2014), 1276.

⁶ *Ibid.*, 232.

⁷ Gro Harlem Brundtland, *The Global Water Crisis: Addressing an Urgent Security Issue*, ed. Harriet Bigas, Tim Morris, Bob Sandford, and Zafar Adeel (Hamilton, Canada: UNU-INWEH, 2012), 12.

CHAPER 2

LITERATURE REVIEW

The global threats created by climate change will influence everyone. The Balkan Peninsula, where this research is focused, is a crossroad between Asia, Africa, and Europe. The rivers which spring in Bulgaria, feed Greece and Turkey with water. Furthermore, the boundary between Greece and Turkey is the Maritza River which is very important for agriculture, industry, and most importantly, for the people to produce drinkable water. Because of that, water management is very important for the future of the region.

This chapter will focus on providing a good understanding of the problem, in order to define what the threats from the climate change are, and how they will influence the relationship between Bulgaria, Greece, and Turkey. The chapter will be develop in the following order: Water Security, Rivers, Agreements, Population, Water Resource Management, Deforestation, History, Threats, and Climate Change Scenarios. Using this order the author will collect the important information that can aid in understanding and analyzing the problem.

Water Security

The definition of water security can provide a good understanding of the potential for future problems related to water. The UN definition is:

Water security is defined as the capacity of a population to safeguard sustainable access to adequate quantities of acceptable quality water for sustaining livelihoods, human well-being, and socio-economic development, for ensuring protection against water-borne pollution and water-related disasters, and for preserving ecosystems in a climate of peace and political stability.¹

Based on this definition, the key factors in analyzing the issues are: the population, health system, economy, peace, and political stability. Water security here is not defined as a resource, but it has this meaning. However, this means that if there is a secure water resource, there are no water-related problems for the population, health system, economy, peace, and political stability.

In addition, according to “Global Water Security: Intelligence Community Assessment:”

Our bottom line: During the next 10 years, many countries important to the United States will experience water problems—shortages, poor water quality, or floods—that will risk instability and state failure, increase regional tensions, and distract them from working with the United States on important US policy objectives. Between now and 2040, fresh water availability will not keep up with demand absent more effective management of water resources. Water problems will hinder the ability of key countries to produce food and generate energy, posing a risk to global food markets and hobbling economic growth. As a result of demographic and economic development pressures, North Africa, the Middle East, and South Asia will face major challenges coping with water problems.²

This is a short but informative prediction for future insecurity and its causes . It expands on the information from the definition by noting how shortages of water or floods can cause state failure and increase regional tensions. The other key concepts are effective management of water resources, energy, and food. They define the areas at risk as exclusive on the Balkan Peninsula, but this does not mean that it is not broadly applicable. The same document goes on to state:

According to the IPCC, semi-arid and arid areas are particularly exposed to the impacts of climate change on water resources. Many of these areas (e.g., Mediterranean Basin, western United States, southern Africa, northeast Brazil, southern and eastern Australia) almost certainly will suffer a decrease in water resources due to climate change.

We judge that mismanagement of water resources—especially groundwater overdrafts and wasteful agricultural irrigation practices—will exacerbate the supply problem in many regions.³

Focusing on the Mediterranean basin, which includes Greece and Turkey, and recognizing the mismanagement of water resources is very important for the purpose of this research, the forecast for the near future shows the importance of this research. Climate change and water resources are tied together. Obviously, climate change and the associated lack of fresh water cannot be stopped today, but water management can be used as a tool to compensate for the influence of the changes.

In the book *The Global Water Crisis: Addressing an Urgent Security Issue* the author poses the question, “Will the Next Wars Be Fought over Water?” Bob Sandford provides important information and conclusions about the past and future conflicts based on water:

A careful assessment of this history of conflict reveals that while water systems have been used as weapons and targets during war, water resources in themselves have rarely been the sole source of violent conflict or war. This has led water scholars to maintain that – since the 1940s, at least – water is more than twice as likely to be a source of international cooperation as of conflict . . . But as Peter Gleick points out, the fact that there has been widespread international cooperation over water should not allow policy-makers to underestimate the complexity of the relationship between water and national security.⁴

Two points that can be extracted from the information. The first point is that the water can be used as a weapon and it can be a source for violent conflicts. The second point is that water is important for national security. Next, Sandford presents an idea of how these “water wars” can be avoided or diminished:

There are a number of factors that reduce the risk of traditional water wars, such as the presence of new transnational institutions like the United Nations, more effective international laws, the emergence of the International Court of Justice, more comprehensively crafted treaties, new water conservation measures and technologies, and better dispute resolution mechanisms. This hope, however, is founded upon the anticipated stability, or rather stationary, of both demand for and reliable availability of global water supplies. Unfortunately, our global hydrological situation is changing rapidly . . . and may soon no longer resemble anything that has existed on Earth before, at least in human memory.⁵

The importance of this block is if there is a probability that conflicts will happen based on water, there is a way this probability can be reduced or even avoided. He suggests a few ways to do that: to use international institutions; to sign an agreements; to establish better dispute mechanisms; and finally, to use new technologies to reduce the loss and increase the effectiveness of water use.

In conclusion, water can be a source for the future conflicts, more precisely, a shortage of water or floods can cause state failure and increase regional tensions. Furthermore, water can be used as a weapon and can be a source for violent conflicts. Water has a direct linkage to population, economy, energy, peace, and political stability.

To achieve peace, solutions can be developed through the use of international institutions, signing agreements, establishing better disputed mechanisms, and using new technologies to reduce the loss and increase the effectiveness of water use. This means that with better agreements and better water resource management, conflicts may be avoided.

Rivers

Maritza Basins

Figure 2 and table 1 provide some basic information on the Maritza basin based on data from existing sources and information from the Ministry of Environment and Water of Bulgaria.



Figure 2. Maritza-Evros-Meric Sub-basin with Arda and Ergene Rivers

Source: International Network of Water-Environment Centres for the Balkans, “Maritza-Evros-Meric Sub-Basin With Arda and Ergene Rivers,” accessed 13 October 2014, http://www.inweb.gr/workshops2/sub_basins/13_14_15_Evros_Ardas_Ergene.html.

The Maritza River basin is the second largest in the Balkan Peninsula after the Danube River. It is a trans-boundary river that forms in Bulgaria, crosses the central and southeastern part of Bulgaria, crosses into Turkey and Greece, and after a 500 kilometer journey flows into the Aegean Sea. It is the border river between Greece and Turkey.

Table 1. Basic Information for Maritza

<i>Greece</i>	<i>Bulgaria</i>	<i>Turkey</i>
Size of basin in km²		
3,340 km ² (+ Arad: 345 km ²)	21,083 km ² (+ Arda 5,200 km ²)	14,650 km ²
Length and width in km		
180 km	321.5 km	Ergene 180 km
Topography, including altitude range in m		
The delimitations of river Evros boundaries are to the north the mountain chain of east Rodopi, to the south the Aegean sea, to the west the palisades and low land areas which extend up to the northern Rodopi mountain chain and to the east the border line between Greece and Turkey. Altitude from 0 to 622 m Average altitude 150-200 m	Maritsa River springs from the Rila Mountain near the summit of Mancho (2,378 m a.s.l.). It runs south-east following the Balkan mountains, crossing to Thrace. Maritza river has 100 tributaries, situated symmetrically on both sides. Tundja and Arda rivers are the main tributaries. The mean catchment altitude is 579 m asl. The mean slope is 7.3 ‰ and the density of the river net 0.74 km/km².	The topography of the region is mainly composed of Strandja Mountains lying parallel to the Black Sea with the highest peak (1,018 m) close to the Bulgarian border. In the south (the coast of the Marmara Sea), there are single peaks such as Tekir Mountain and Isiklar Mountain. Between these mountainous areas is the Ergene river basin with its tributaries flowing from north to the south and from the south to the north.
Rainfall, average annual and seasonal distribution, etc.		
Average annual rainfall: 500 - 1,100 mm	Average annual rainfall: 500 - 1,100 mm	Average annual rainfall: 500 - 1,100 mm
Total population in basin		
133,048 people (census 1991)	1,758,000 people	987,216 people
Other relevant characteristics		
The Evros delta (188 km²) is protected by the RAMSAR convention and has been characterized as 'Important Bird Area for Greece and Special Protection Area' (Directive 79/409/EEC, Barcelona Convention).	Approximately 66 % of the total population in the basin are connected to a sewerage system and 24 % to a WWTP. The towns that are already served by a WWTP are: Plovdiv, Nova Zagora, Pamporovo, Ihtiman and Hisarya.	The area is one of the most developed part of Turkey, therefore the income in that place is almost 2 times higher than in the other part of TR. Industrial facilities in the area have enormously increased after the 90's due to the geographic properties of the area (close to Europe and the main roads to Europe) as well as the vicinity with Istanbul, the economic capital of Turkey.

Source: International Network of Water-Environment Centres for the Balkans, "Maritza-Evros-Meric Sub-Basin With Arda and Ergene Rivers," accessed 13 October 2014, http://www.inweb.gr/workshops2/sub_basins/13_14_15_Evros_Ardas_Ergene.html.

Tundja/Tunca River Sub-basin

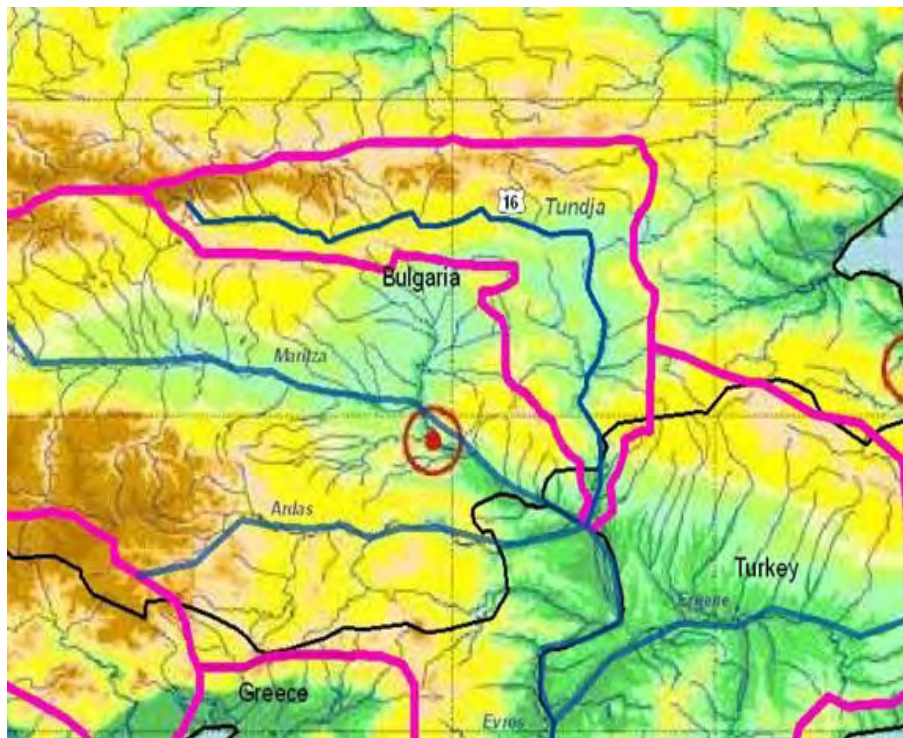


Figure 3. Tundja River-Maritza/Evros/Meriç Sub-basin

Source: International Network of Water-Environment Centres for the Balkans, “Tundja/Tunca River Sub-Basin,” accessed 13 October 2014, http://www.inweb.gr/workshops2/sub_basins/16_Tunja.html.

The Tundja River is part of the Maritza/Evros/Meriç sub-basin, including Arda and Ergene tributaries, and one of the major river systems located in the eastern Balkans. It has a length of 350 kilometers and a watershed area of 7,780 square kilometers in Bulgaria. Main cities on the Tundja are Kazanlak (population of 62,000), Sliven (population of 136,000) and Yambol (population of 110,000). The river crosses into

Turkey at Tunca before flowing into the Maritza/Evros/Meric River at the Greece-Turkey border in the city of Edirne (Turkey).

Table 2. Basic Information for Maritza Basing

<i>Bulgaria</i>	<i>Turkey</i>
1.1. Geographical properties	
Longitude/latitude at downstream river outlet	
1. Latitude at outlet: 42° 43' 40" N 2. Longitude at outlet: 24° 58' 10"	1. 26° 34' 46" E 2. 41° 50' 52" N
Size of basin	
7,784 km ²	Nearly 200 km ²
Length and width in km	
350 km	Nearly 30 km on Turkish territory
Rainfall, average annual and seasonal distribution, etc.	
Average annual precipitation for the river basin is 617 mm. The precipitation has minimum in August and September with a secondary winter minimum, but in some sectors of the river basin in February and March.	The long term average annual rainfall is 589 mm with 134.5 standard derivation. The catchment is characterized by Mediterranean climate
Total population in basin	
520,900 people	Lalapaşa town: 10,767 people

Source: International Network of Water-Environment Centres for the Balkans, “Maritza-Evros-Meric Sub-Basin With Arda and Ergene Rivers,” accessed 13 October 2014, http://www.inweb.gr/workshops2/sub_basins/13_14_15_Evros_Ardas_Ergene.html.

Tables 1 and 2 contain basic information about the two rivers basins. The influence of these rivers on the region is incredible. These rivers are important because their flow supports the water system of the region. Also, these rivers serve as natural

borders between the majority of the states of this world; however, this can become a tipping point for the region too.

Agreements

Maritza

Although Maritza/Evros/Meric River, are shared by Greece, Bulgaria and Turkey, is the second longest river after the Danube in the Balkans. This river and its tributary Arda (shared by Greece and Bulgaria) are lacking considerable recent bilateral or trilateral agreements. This situation is mainly due to the past non-trusted political relationships between the three countries. Parts of the Evros/Meric River bed serve as the state border between Greece and Turkey. Thus, both Evros and Ardas rivers are located in a military controlled area. Special permit from military authorities is needed for all scientific or other activities near the rivers. Its delta is an important bird area protected by the Ramsar Convention and the Bern Convention on special species of flora and fauna. It is also cited in the list of regions of special protection according to the EU Directive 79/409/EEC and the national Greek legislation 66/81.⁶

Tundja

The basic framework for the management of cross-border water bodies, the Helsinki Convention (1992) signed by Bulgaria. There is no agreement between Bulgaria and Turkey for the Tundja river basin. Some seasonal agreements exist with TR for water releases from the BG dams.⁷

Bulgaria and Greece

These two countries are European Union (EU) members and their laws are harmonized with EU laws. Before 2007, when Bulgaria joined the EU their agreement was:

The bilateral cooperation in the use of water dates back to 1964. Both countries ratified the Helsinki Convention for protection and use of transboundary watercourses (1992; in GR in force since 1996) and the Espoo Convention. After the implementation of Helsinki Convention, GR and BG are cooperating by a joint monitoring in the three common river basins, i.e Struma, Mesta (including the tributary Dospat) and Maritsa (including the tributary Arda).⁸

The main agreements on the protection and use of trans-boundary watercourses are based on the Internationally Shared Surface Water Bodies in the Balkan Region:

1. Greece-Bulgaria (GR-BR) agreement on co-operation for the use of watercourses flowing through the two countries.
2. Second Protocol of the GR and BG agreement about the regulation of economic questions and development of the economic co-operation.
3. Agreement between GR and BG concerning the formation of a joint committee for the cooperation in the field of electric energy and the use of cross-border River waters.
4. Agreement between GR and BG on scientific and technical cooperation.
5. Protocol for the Joint GR-BG Technical Working Group and Environment Group (approved 1990).
6. Protocol for the co-operation of GR-BG Experts for flood control of Strymonas River.⁹

Bulgaria-Turkey

7. 1968-flood protection, data exchange, joint studies, no harm principle, dispute settlement;
8. 1998-joint infrastructure projects;
9. 2002-exchange of data on water quantity.

Greece-Turkey

10. 1955- joint construction of flood control;
11. 2001-General MoU on Cooperation on Environmental Protection.

However, the tension between Bulgaria, Greece, and Turkey continue mostly because of the floods routinely impacting Greece and Turkey:

One of the most urgent fields of action in the basin is flood protection. Even though agreements exist for cooperation in flood prevention and control, adherence to them has not been satisfactory in the past. After the severe floods of March 2005, Turkey is reported to have sent Bulgaria a note of protest because of her alleged failure to abide by the bilateral agreement. Likewise, Greece also blamed Bulgaria for flood incidents.¹⁰

Turkey-EU

In December 2004, the European Council decided that official accession negotiations with Turkey would commence in October 2005 with full EU membership for Turkey as the possible outcome.¹¹

The European Council's strong attention to transboundary water management within the context of Turkish EU accession was illustrated by the EU-Turkey accession partnership dating from May 2003. . . . In this document, the European Council rated Turkish transboundary water management as a priority that needed short-term effort and improvement.¹²

This became very important because negotiations have been stopped between the two countries. This means that in the near future, Turkey will not be part of the EU. On the other hand, Bulgaria and Greece are part of the EU. However, the main idea is that Turkey has to improve transboundary water management agreements, in the short-term, and it should be in accordance with EU laws.

In conclusion, there are many agreements between the neighboring countries, but it is obvious that they should be updated in accordance with the new realities. Bulgaria changed its status in 2007 and became a member of the EU, but there is no new agreement between Bulgaria and Turkey. According to the EU council, Turkish transboundary water management has to be improved in the short-term, which is an indicator of the problem with the other countries which are EU members.

Moreover, the problems between Bulgaria, Greece, and Turkey regarding the floods require special attention. This problem requires more detailed information which can be found in the section on floods.

Population

The three countries have different population growth rates. First, population data for Bulgaria will be presented, followed information for Greece and Turkey. Finally, the combined population forecast for the region will be presented.

Bulgaria

The population growth is negative as in the majority of the European countries, but in Bulgaria it is the lowest in the EU, negative 0.83 percent. From a world prospective, the Bulgarian growth rate is 224th, which shows there is a big problem. The World Population Review site states, “Bulgaria’s population is now shrinking at an alarming rate, losing 582,000 in ten years, and 1.5 million since 1985, which is a global record. By 2050, the UN projects Bulgaria will have a population of just over 5 million, a huge drop from 1985's 9 million.”¹³ Figure 4 shows the forecast from World Population Review.

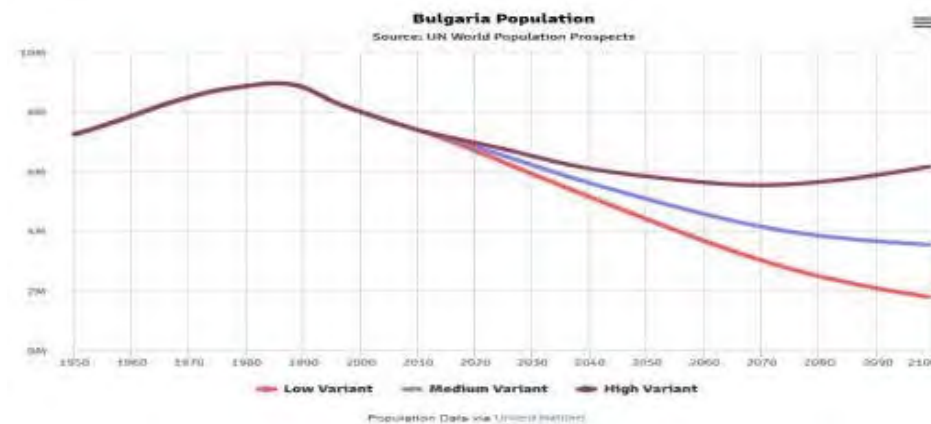


Figure 4. Bulgarian Population Forecast-UN

Source: World Population Review, “Bulgaria Population 2015,” 5 January 2015, accessed 23 April 2015, <http://worldpopulationreview.com/countries/bulgaria-population/>.

In comparison, table 3 shows the Ministry of Environment and Water of Bulgaria forecast of population change. The impact here is much smaller than it is on figure 4. For the year 2035 they are close, but for the year 2060, only the high variant is close. It is based on a different analysis, but it is obvious that the uncertainty in each forecast has some boundaries. No one can predict the random or unexpected events like earthquakes, volcano eruption, and others things which can change the outcome.

Table 3. Bulgarian Population Forecast

Options	2015	2020	2025	2030	2035	2040	2045	2055	2060
I	7 159 819	6 950 436	6 734 989	6 519 217	6 311 454	6 115 526	5 929 267	5 567 060	5 384 040
II	7 171 499	6 994 911	6 823 688	6 657 777	6 501 522	6 355 423	6 215 927	5 938 897	5 792 819
III	7 154 213	6 928 843	6 691 178	6 450 454	6 216 500	5 994 985	5 784 382	5 376 290	5 173 546

Source: проф. д-р Антон Попов, АНАЛИЗ И ОЦЕНКА НА РИСКА И УЯЗВИМОСТТА НА СЕКТОРИТЕ В БЪЛГАРСКАТА ИКОНОМИКА ОТ КЛИМАТИЧНИТЕ ПРОМЕНИ; ОПЕРАТИВНА ПРОГРАМА ОКОЛНА СРЕДА 2007-2013. [Anton Popov, Ph.D., *Analyze the Risk and Vulnerability of Bulgarian Economy from the Climate Change; Operational Program Environment 2007-2013* (Sofia, Bulgaria: Republic of Bulgaria, 2007), 158, accessed 10 February 2015. http://www.moew.government.bg/files/file/Press/Konsultacii/2014/Specialna_chast.pdf.]

When the population is decreasing it creates a lot of other problems, which are not the focus of this research. From table 3 and figure 4 one can conclude that a strongly negative population forecast will create a problem with the labor force in Bulgaria which will lead to the problems of sustaining, fixing, and upgrading the existing water infrastructure which is a threat to the country and a security threat. This will create an

overall negative impact on the region. The existing water system should be maintained for a lower population and the tendency is to have more in the big cities and less in the villages. Of course, there is another point that a smaller population needs less water, but the agriculture and economy will still need water.

Greece

As shown in figure 5, the demographic forecast for Greece for the period 2015 to 2060 is almost constant, approximately 11.3 million.

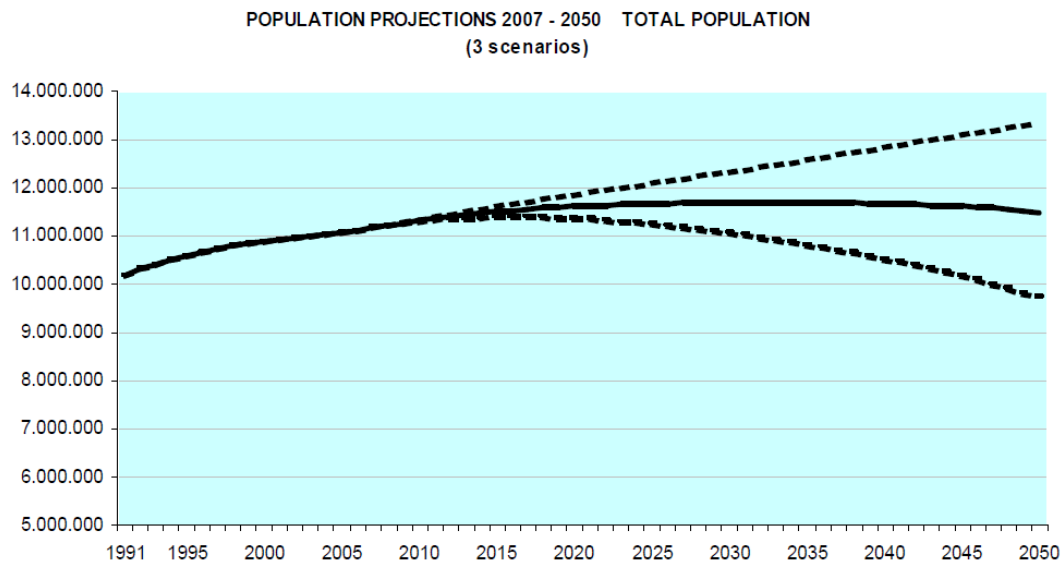


Figure 5. Greece Population Projection, 2007-2050

Source: Hellenic Statistical Authority, “Population Projections of Greece 2007-2050,” accessed 23 April 2015, http://www.statistics.gr/portal/page/portal/ESYE/BUCKET/A1602/Other/A1602_SPO18_MT_AN_00_2007_00_2050_10_F_EN.pdf.

The constant population and decreasing water resources creates a problem. This requires that the Greek government take measures to protect the water resources and have better water resource management for the future.

Turkey

The current population of Turkey is approximately 76.5 million people. The demographic forecast for Turkey is that it will grow until 2050. This means that Turkey needs more water resources to maintain the population and economic needs. However, the tendency is to become more arid in this area of the world.

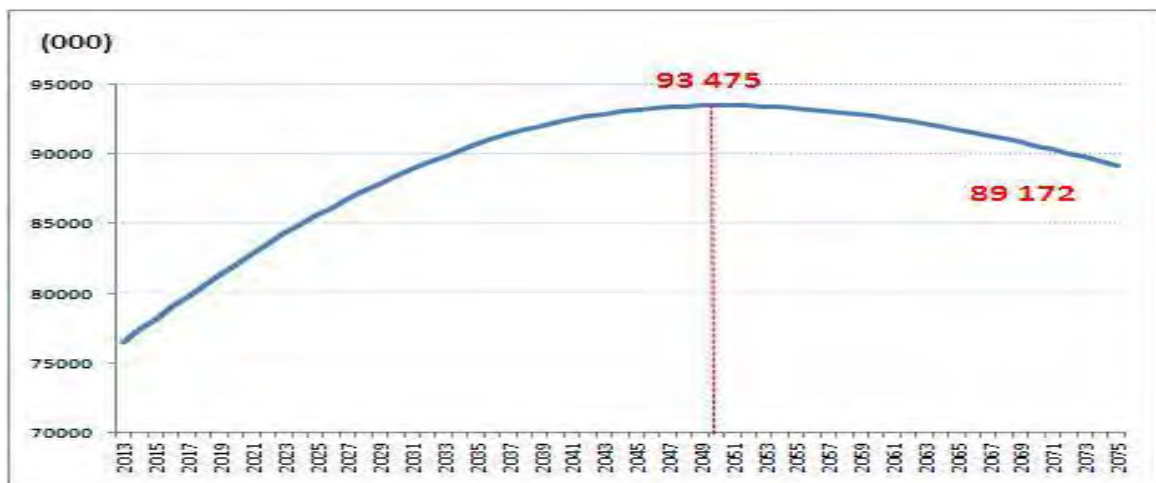


Figure 6. Demographic Forecast for Turkey, 2075

Source: Turkish Statistical Institute, “Population Projections, 2013-2075,” accessed 9 May 2015, <http://www.turkstat.gov.tr/PreHaberBultenleri.do?id=15844>.

The data in figure 6 leads to the conclusion that the population growth in Turkey is the largest and will create the most pressure on the system. From the population perspective, this is the biggest problem of the three countries. Their population is going to

increase almost 50 percent in the study area, and the needs of society are going to increase by at least 50 percent as well.

Population at Maritza and Tundja Basins

Figure 7 represents the forecast of the population in the Maritza and Tundja basins. The population in the Bulgarian region is decreasing, the population of Turkey is increasing, and the population of Greece stays almost constant. What does this mean and how will this influence the region?

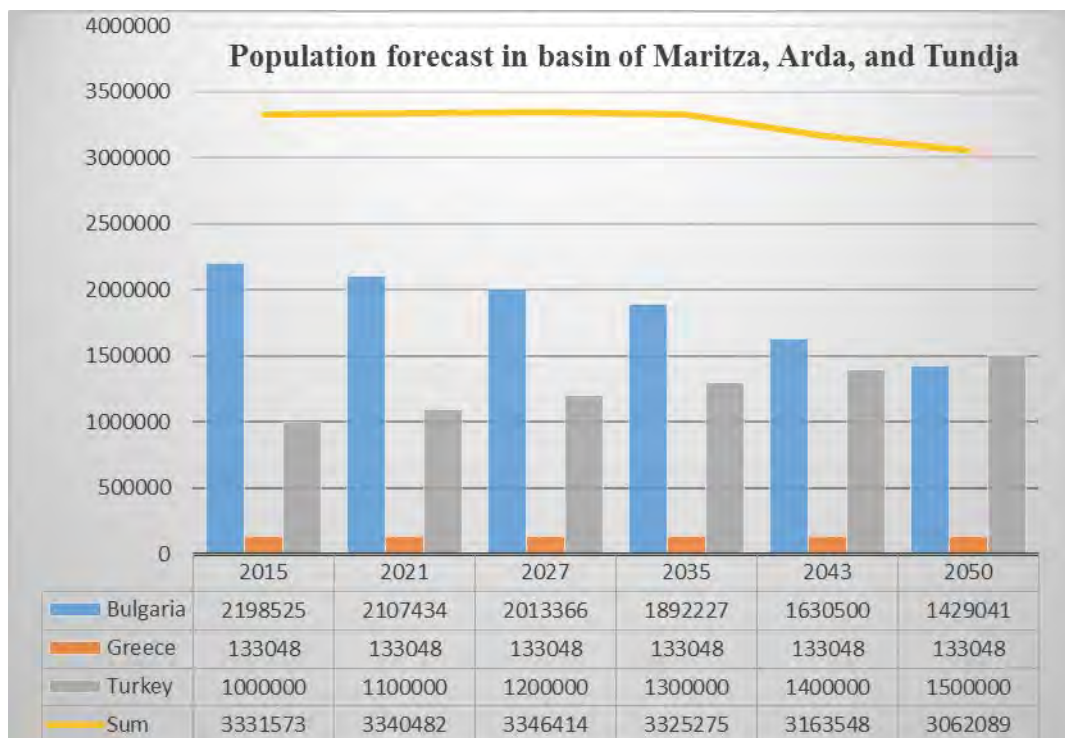


Figure 7. Population Forecast in Basin of Maritza and Tundja

Source: Created by author.

The population from the three countries living in these watersheds will decrease by nine percent by 2050: Bulgaria minus thirty-five percent, Greece will almost be constant, and Turkey plus fifty percent. The graphic obviously shows that the population of Turkey will become the largest in that basin by 2050, but the problem is that the size of the territory remains the same. Because this is the richest area of Turkey, the migration can create additional problems. These people will need more food, water, space to live and work. This requires more food production, energy, and growth in towns and villages. All this will require more resources and water.

Water Resource Management

Before starting to explore the water resource management, one must understand what water management is. The definition of water management is:

Water management: as used in this report, pricing decisions, allocations of water based upon hydrological modeling, development of water infrastructure (e.g., dams, levies, canals, water treatment facilities), the use of water infrastructure to control water flow, trade of products with high water content, and effective transboundary water agreements.¹⁴

Water resource management is very important because through this process the influence of climate change can be reduced. From the definition the following main points can be extracted: allocate resources, develop infrastructure, control the water flow, and effective transboundary water agreements. These are all tools that can help to manage the problem.

“Water resources management in Europe has experienced a general shift from ‘hard’ to ‘soft’ measures that allow more flexible responses to environmental change”¹⁵

Public participation has also increased in decision making, for example, river basin management planning . . . flood defense plans (e.g., TE2100), and drought contingency plans. . . . Guidance has been developed on the inclusion of adaptation in water management . . . and river basin management plans Adaptation in the water sector could also be achieved through the EU Water

Framework and Flood Directives . . . but a study of decision makers, including local basin managers, identified several important barriers to this. . . . Water allocation between upstream and downstream countries is challenging in regions exposed to prolonged droughts such as the Euphrates-Tigris river basin, where Turkey plans to more than double water extraction by 2023.¹⁶

From these two quotations from the IPCC 2014, the most important information is: hard to soft measures, through the planning and management, and use of the best practices to reduce the effect of water stressors. The countries have to prepare, educate, or develop decision makers for the climate change to adapt the agreements to the new reality caused by climate change, and to use and adapt the models for these specific cases.

“Studies indicate a significant reduction in water availability from river extraction and from groundwater resources, combined to increased demands from a range of sectors (irrigation, energy and industry, domestic use) and to reduced water drainage and runoff (as a result of increased evaporative losses)”¹⁷ The reduction of water quantities is huge problem for the entire system. It influences every single aspect of the economy and society and puts pressure on them.

Water resource management is the only tool that that can be used to influence the effects of the climate changes and lack of fresh water. The best practices which were already tested in a few European cities can be used. How to transfer, redirect, collect, or slow down the water can be managed. Dam systems can be built, or the water can be transferred through canals or other water conveyances. The level of the water on the dams can be regulated as a preventive measure against floods.

Deforestation

In both developing and developed countries, global climate change may affect the size and distribution of forest. Over time, climate change can impact temperature, the quantity and temporal distribution of water, and soil structure, all of which help determine the type of vegetation, including forests, that an area naturally sustain. The facts are irrefutable; however, actual regional impacts are very difficult to differentiate from naturally occurring change and, therefore, are difficult to predict.¹⁸

This conclusion leads directly to the impact of the climate change on the forest. It is not a direct threat, but it influences the entire system and interrupts the relationship between them. The forest actually influences the climate too. The Amazon jungle for example has its own micro climate. All this shows the interrelations between the climate and forests.

Bulgaria

Almost forty percent of the Maritza basin is covered with forest. Forests protect and support the quality of eight-five percent of the water in Bulgaria. The Bulgarian Ministry of Agriculture and Food (MAF) is the main principal for forest management. They created the *National Strategy for Forestry Sector Development 2013-2020*.¹⁹ It began with the vision for Bulgarian forest development. The analysis showed a tendency for a growth of almost two percent for the Bulgarian forest from 2006 to 2011. The production and use of the wood sector is only fifty percent of the natural forest growth. Moreover, MAF plans to increase the Bulgarian forest by almost five percent by 2020. All of this means that deforestation is not a problem in this area.

However, this is the official version of the report of the Bulgarian Ministry of Agriculture and Food. There are a lot of other non-government organization reports of illegal deforestation from the criminal gangs which are destroying a large part of the

Bulgarian forest. Deforestation in the mountains areas increases the effect of climate change with floods, land erosions, and drastically reduces the level of underground and surface water.

For the purpose of this research the author will use the official report from the Bulgarian Ministry of Agriculture and Food and the *National Strategy for Forest Development of Republic of Bulgaria 2013-2020* developed by the Bulgarian Ministry of Agriculture and Food. Wood exports to neighboring countries is the biggest problem. The criminal elements are selling the timber material illegally. Beginning 1 March 2015, the government of Bulgaria put sanctions on the export of wood material from the country for a three-month period, and ordered police units to help to protect the forest from this type of crime.

Greece

29.1%—or about 3,752,000 hectares—of Greece is forested. Of this, none is classified as primary forest, the most biodiverse form of forest. Change in Forest Cover: Between 1990 and 2000, Greece gained an average of 30,200 hectares of forest per year. The amounts to an average annual reforestation rate of 0.92%. Between 2000 and 2005, the rate of forest change decreased by 8.4% to 0.84% per annum. In total, between 1990 and 2005, Greece gained 13.7% of its forest cover, or around 453,000 hectares. Measuring the total rate of habitat conversion (defined as change in forest area plus change in woodland area minus net plantation expansion) for the 1990-2005 interval, Greece gained 0.1% of its forest and woodland habitat.²⁰

Vulnerabilities-Greece

Between now and 2100 coniferous and broadleaf evergreen forests will expand by 2% to 4%, while the forests of spruce, fir, beech and black pine will shrink by 4% to 8%, depending on climate change scenario (SRES B2 or A2) for 2100. . . For 2100 a reduction of timber production is expected of 27% (B2) to 35% (A2) (16).²¹

From the data it is obvious that there is a problem; however, the government of Greece is working to fix it and even with the climate change impact the results should be positive.

Turkey

13.2 percent—or about 10,175,000 hectares—of Turkey is forested. Of this, 9.6%—or roughly 975,000 hectares—is classified as primary forest, the most biodiverse form of forest.

Change in Forest Cover: Between 1990 and 2000, Turkey gained an average of 37,200 hectares of forest per year. The amounts to an average annual reforestation rate of 0.38%. Between 2000 and 2005, the rate of forest change decreased by 36.3% to 0.24% per annum. In total, between 1990 and 2005, Turkey gained 5.1% of its forest cover, or around 495,000 hectares. Turkey lost 236,000 hectares—0—of its primary forest cover during that time. Deforestation rates of primary cover have increased 31.9% since the close of the 1990s. Measuring the total rate of habitat conversion (defined as change in forest area plus change in woodland area minus net plantation expansion) for the 1990-2005 interval, Turkey lost 2.2% of its forest and woodland habitat.²²

The situation is the same for Turkey; there is a problem. The government defined this and added it to the *Republic of Turkey Climate Change Strategy 2010-2020*.²³ It is still in the development stages, but there is a political will to fix it.

The most important conclusion is that deforestation has a direct impact from and to climate change, and increases its effects; for example, floods, and land erosion can drastically reduce the level of underground and surface water. Greece and Turkey have more problems with deforestation than Bulgaria, which leads to the conclusion that they are more vulnerable. The three countries defined deforestation as a problem which is linked to climate change. It is obvious that there is a political will to protect the forest and decrease the impact of the climate change.

History

The Balkan Peninsula has a long history. It was and still is famous with the perception of uncertainty and conflicts between the neighboring countries. This research will focus only on the last 100 years and mostly on relations between Bulgaria, Greece, and Turkey. Prior to the First World War, the Balkans countries had two wars; the First Balkan War and the Second Balkan War.

The First Balkan War in 1912, was between The Balkans league (formed from Bulgaria, Greece, Montenegro, and Serbia), and Ottoman Empire. The war was short and the Balkans league won. During the second Balkans War in June 1913, Serbia and Greece formed a new alliance against Bulgaria. Soon Romania entered the war and attacked Bulgaria from the north. The Ottoman Empire saw this as an opportunity to regain its lost territories and also attacked from the southeast. Bulgaria lost The Second Balkan War and sued for peace.

During, the First World War, Bulgaria and the Ottoman Empire decided to ally with Germany and Austria and signed an alliance with them, along with a special Bulgarian-Turkish arrangement. It envisioned that Bulgaria would dominate the Balkans after the war. Greece was allied with the other side. Finally, Bulgaria and the Ottoman Empire lost the war.

During the Second World War, Bulgaria and Turkey were again allied with Germany, and Bulgaria occupied northern Greece. After the end of the war. Bulgaria was under the Iron Curtain and was transformed to a communist country. Greece and Turkey became members of the North Atlantic Treaty Organization (NATO), while Bulgaria was part of the Warsaw Pact.

Even though Greece and Turkey were NATO members, they had a small conflict in 1974, and still have a problem over Cyprus. This crisis is like a never ending story, and Cyprus finally became an EU member in 2004 without the problem being resolved. Even today, the people of Cyprus are separate because of the past.

“Moreover, since 2006 eight chapters of the negotiations between Turkey and the EU for Turkey’s joining the EU have been frozen because Turkey has not opened its ports to ships from Cyprus.”²⁴

Aegean Dispute with Greece

The Aegean Dispute between Turkey and Greece has four dimensions which are all interrelated (Pratt and Schofield 1996). These are the disputes over territorial waters, the continental shelf, air space jurisdiction and militarization of the islands.²⁵

In 1981, Greece became a member of the EU. Turkey started negotiations in 1987, but is still not a part of the EU. Moreover, the negotiations are frozen for now. After the fall of communism in 1989, Bulgaria changed course and in 2004 became a member of NATO and in 2007 joined the EU.

Even from this short history summary, one can conclude that tensions between the three countries were, and are, going to be based on two things. The first reason for tension is their cultures, which are based on their history. The second reason for tension is resources. These two reasons will have a direct impact on the future decisions linked to the climate changes in the region. A good example that history matters, are the relationships between Greece, Cyprus, and Turkey. The biggest impediment to Turkey to becoming a part of the EU is Greece and Cyprus. They had and still have a lot of problems that are disputable.

Threats

Definitions

Before giving the definition of threat, it is important to provide the definition of security: “The state of being free from danger or threat.”²⁶ This is a simplest definition, but it is a full of information.

There are many different types of security: National security, Global security, internet security, informational security, human security and so on. Even the first bullet of this chapter is water security. This is linked to the definition of being free from danger or threat. Chapter 4 will analyze the threats, define what these threats are, and how they are linked to the thesis. There are a number of different definitions of threat, and it depends on the context of the threat. For the purpose of this thesis, I will use this definition: “an indication or warning of probable trouble.”²⁷ This will give more freedom to define what threats are from different perspectives. The three countries define different threats to their national strategies, but they are linked. Next, the author will define how these threats are interrelated and create security threats for the region.

National Security Strategies

Bulgaria, Greece and Turkey all define climate change as a threat in their National Security Strategies. It is well defined at the strategic level, and establishes a good foundation to create the lowest level plans and roles. Even these strategies can be used for changing or adapting the legislation of the countries to address the climate change threats.

Climate Change Adaptation Plan

All three countries have developed climate change adaptation plans which are good foundations to fix the problems. However, the author has defined there are some problems with these plans:

1. The plans are more conceptual than concrete.
2. The plans are not synchronized between the neighboring countries.
3. The plans are focused on the short-term, 2020-2035, and do not define real long-term measures and funding for them.
4. From a water management prospective, they do not target the root of the problems, they are just a synchronization for early warning for the floods. There are no concrete measures to decrease the effect of floods and drought.

The biggest problem for the three countries appears to be defining certain measures to mitigate and adapt to the climate change, and to link these measures with the funds for the water managements projects.

Two cases will be presented; one is the impact of a lack of water in Greece, and the other is the problem of floods in Bulgaria. Both cases are dangerous for the population and increase the level of tension.

Greece Case-Drought

In the last decade, the rising temperatures have started to affect particularly moderate climate countries. . . . The summer of 2007 was a turning point for Greece since the extreme heat waves caused less rainfall, high evaporation, water shortages and even droughts . . . Mainland Greece as well as Greek Islands faced similar difficulties at the same time and the water shortages affected daily lives and led Greek economy to slow down as it has been discussed above.²⁸

To sum up, climate change has been affecting many countries in the world and Greece is among them. Climate change has been one of the causes behind the

water crisis in Nafplion since it has caused less precipitation levels and droughts. When other causes such as increasing water demands, water overcharging, lack of governance, etc. are added to climate change, the situation can turn to a major crisis as it happened in 2007.²⁹

The impact of the climate change in this case is obvious; however, it is linked with the bad water management and a lack of readiness for crisis response. In this case, the impact on the population and economy was very serious. The Greek government reacted slowly and incorrectly and created tension and even riots. After the crisis, the Greek government started to prepare for a similar crisis in the future.

Bulgaria-The Floods

According to the Ministry of Environment and Water of Bulgaria, floods have become a huge problem for Bulgaria.³⁰ In the last ten years, Bulgaria has suffered thirteen of the fifteen biggest floods since 1900. This is a huge, drastic increase in floods caused by climate change and bad water management. The cost of the floods from 1900 to 2001 was 120, 415, 550lv which is a 60, 207, 775 euro and twenty people dead. At the same time, just for 2005, the cost for floods is 620 million euro, twenty-four people dead, and 12,000 people impacted by lost property or being temporary displaced.

In 2014, Bulgaria suffered three big floods with eighteen people dead and a cost, which is still not official, but forecast between 350 to 400 million euro (390 672 666 according to a Minister Vuchkov—Minister of Interior in a speech at the Bulgarian parliament on 30 January 2015). This year, 2015, Bulgaria has already experienced two floods, in February and April, for which there is no data yet.

If the cost for the 2005 and 2014 floods is combined, there is more than a one billion euro loss and forty-two people dead, versus 60 207 775 euro and twenty people

dead for the previous 111 years. The increase of 16.78 times for the cost and 2.1 times for the casualties just for a ten-year period is a big indicator of what is going to happen in the near future.

In conclusion, because of the climate change and bad water management, the impact in the form of floods to Bulgaria will be dramatic. If the people, and especially the government do not start building new infrastructure and repairing or replacing the old, the floods will destroy more and more in the future.

Furthermore, the floods do not follow the boundaries which creates a transboundary problems. A good example of this would be the floods in 2005, 2014, and 2015. The governments of Turkey and Greece are blaming Bulgaria for flooding their countries because of bad water management; however, each of these countries signed an agreement after the floods of 2005, to work together and build infrastructure for prevention and protection from the floods.

The year 2014 was full of unusual weather. Bulgaria was flooded three times in May, August, and December. Of course, Greece and Turkey were also impacted by these floods. Even after almost nine years between these big disasters, the water management between the three countries had not changed a lot, which was the main reason for the floods. There were very heavy rains for a short period, but the river and dam management was not accurate and the preparation for these disasters was very inadequate.

After the floods in 2005, Bulgaria, Greece, and Turkey had an agreement to build dams on the Maritza and Tundja basins to decrease the impact of the floods. Obviously, the purpose of the agreement was not achieved and nothing was built. The biggest problem was who would pay the bill. The economic crises from 2008 was partially to

blame for this, but the impact was more than the money; there were casualties and people lost their homes and occupation.

Migration

This is not the new problem for this region. From a historical prospective, the migration of people is happening all the time, there are just different stressors and reasons to migrate:

Environmental Refugees

In the wake of environmental breakdown, a new phenomenon is emerging, that of 'environmental refugees'. These are the people who feel obligated to leave their homelands because of declining means of livelihood, which in turn stems from environmental degradation. The immediate cause may often appear in the form of military activity. But underlying cause may have more to do with deterioration of the local natural-resource base and its capacity to support the citizenry.³¹

Now Bulgaria, Greece, and Turkey have a new problem with migration, a lot of people from different places in the world want to cross their borders to enter the EU. The people want to live a better and happier life, and in a lot of cases, it is just because there is a war or conflict in their countries and they have to run. There are numerous examples: people from Syria, Afghanistan, Iraq, Libya, Sub-Saharan African countries, and many others.

Bulgaria established a State agency for refugees,³² and built many new refugees' camps. The problem is that the Bulgarian authority was not ready for this large human wave and the costs. The Bulgarian government decided to build an infrastructure for border protection in 2013 on the Bulgarian-Turkish border. The main idea was to reduce the flow of refugees and immigrants through the border and to establish better control. However, the Turkish government did not agree with Bulgarian strategy with the

refugees. Inside Turkey there are more than two million refugees which put a lot of pressure on the government and society.

As EU members, Bulgaria and Greece have different responsibilities than Turkey. The two countries are the east-south and south border to the union. They have to protect their borders from external threats, and these threats sometimes come from Turkey.

One of the biggest problems is that along with the ordinary people coming through the border, individuals from terrorist organizations like Islamic State of Iraq and the Levant, and many others infiltrate the country, become a threat multiplier, and create conditions for future problems. Because of the number of the refugees arriving in area, the governments need more experts of different languages and cultures to recognize and filter the real refugees from the criminals and terrorists. Another problem was that Bulgaria had to build the refugees camps when the people were there waiting for food, shelter, and help.

Climate Change Scenarios

There are three scenarios developed from Ministry of Environment and Water of Bulgaria on how climate change will impact Bulgaria for the period from 2015-2035: optimistic, realistic, and pessimistic.³³ Each of these scenarios reflects future predictions of lack of water. They divided the country into a separate regions, with different issues from the water perspective. The initial assessment for the necessary investment in the water system of Bulgaria is from six billion euro, to cover the minimum expectation, to twenty-three billion euro to make the improvements necessary to comply with European standards.

First Scenario-Optimistic

For this scenario they use the Japanese model CGCM2, and they predict the increase in global temperature to 2100 with 1.7°C to 2.8°C which for 2035 is almost without changes. Because there is not a big change of temperature in this scenario, the influence to the environment will be small, and it will not produce a new threat or increase the existing threat.

Second Scenario-Realistic

In this scenario, the temperature is expected to increase by 1.0°C to 1.5°C by 2021, and the average rainfall is expected to decrease by four to seven percent. Figures 8 and 9 present the scenario.

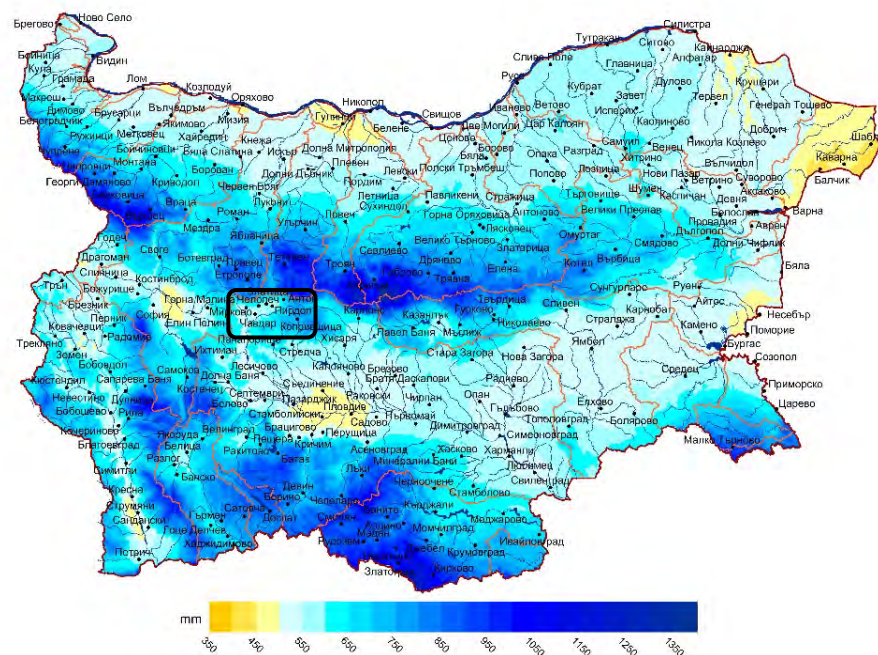


Figure 8. Second Scenario-Realistic, 2021

Source: РЕПУБЛИКА БЪЛГАРИЯ, МИНИСТЕРСТВО НА ОКОЛНАТА СРЕДА И ВОДИТЕ НА РЕПУБЛИКА БЪЛГАРИЯ, НАЦИОНАЛНА СТРАТЕГИЯ ЗА УПРАВЛЕНИЕ И РАЗВИТИЕ НА ВОДНИЯ СЕКТОР, 2012, Февруари 15, 2015 [Republic of Bulgaria, Ministry of Environment and Water, *National Strategy for Management and Development the Water Branch* (Sofia, Bulgaria: Republic of Bulgaria, 2012), accessed 15 February 2015, <http://www.moew.government.bg/?show=top&cid=569&lang=bg>], 24.

By 2035, the temperature is expected to increase by 2.3°C - 2.7°C , and the average rainfall is expected to decrease by nine to fourteen percent. Figure 9 shows this data, and obviously, water supplies are diminishing.

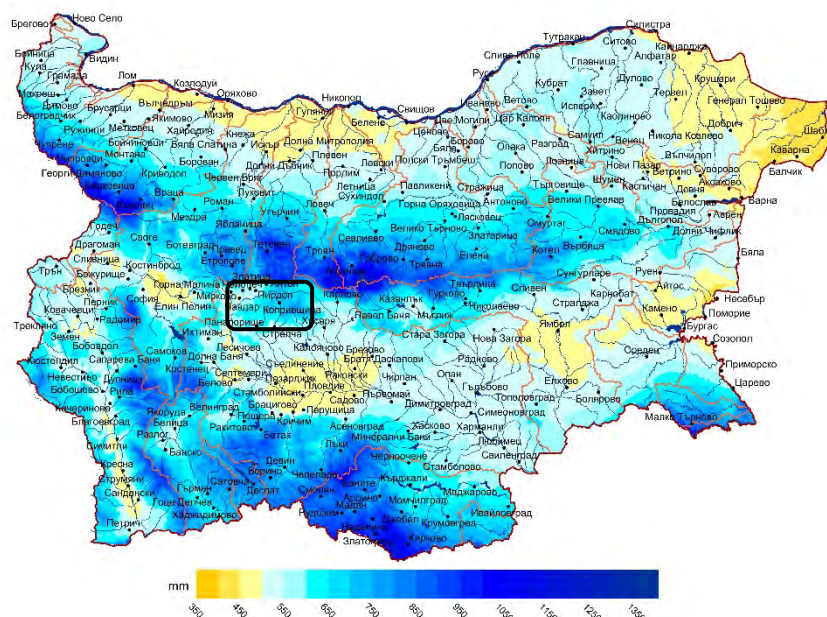


Figure 9. Second Scenario-Realistic, 2035

Source: РЕПУБЛИКА БЪЛГАРИЯ, МИНИСТЕРСТВО НА ОКОЛНАТА СРЕДА И ВОДИТЕ НА РЕПУБЛИКА БЪЛГАРИЯ, НАЦИОНАЛНА СТРАТЕГИЯ ЗА УПРАВЛЕНИЕ И РАЗВИТИЕ НА ВОДНИЯ СЕКТОР, 2012, Февруари 15, 2015 [Republic of Bulgaria, Ministry of Environment and Water, *National Strategy for Management and Development the Water Branch* (Sofia, Bulgaria: Republic of Bulgaria, 2012), accessed 15 February 2015, <http://www.moew.government.bg/?show=top&cid=569&lang=bg>], 24.

Last Scenario-Pessimistic

In this scenario, the temperature is expected to increase by almost 3.4°C - 5.0°C , and the average rainfall is expected to decrease by fifteen to thirty percent. Figure 10 presents this data, and the average rainfall is the lowest from the three scenarios.

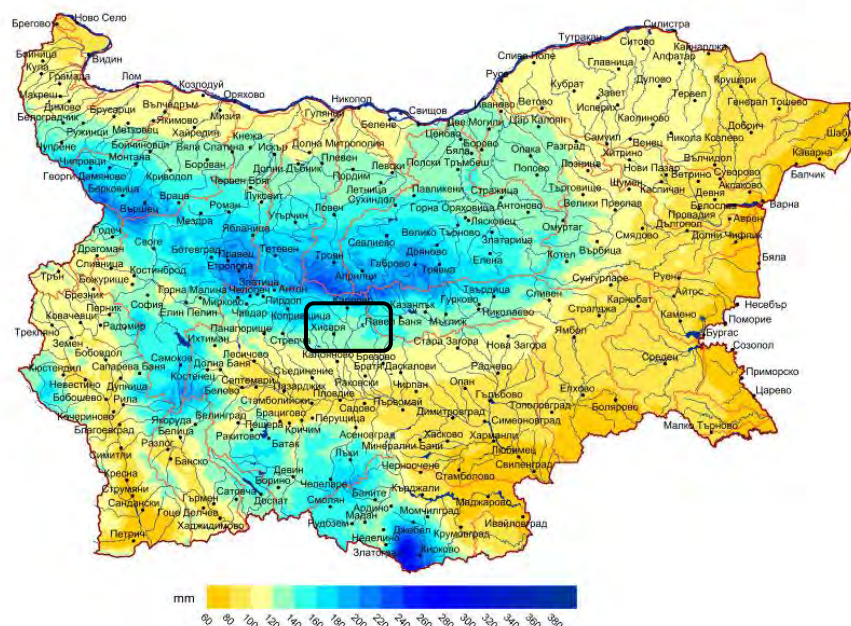


Figure 10. Summer Season, 2035

Source: РЕПУБЛИКА БЪЛГАРИЯ, МИНИСТЕРСТВО НА ОКОЛНАТА СРЕДА И ВОДИТЕ НА РЕПУБЛИКА БЪЛГАРИЯ, НАЦИОНАЛНА СТРАТЕГИЯ ЗА УПРАВЛЕНИЕ И РАЗВИТИЕ НА ВОДНИЯ СЕКТОР, 2012, Февруари 15, 2015 [Republic of Bulgaria, Ministry of Environment and Water, *National Strategy for Management and Development the Water Branch* (Sofia, Bulgaria: Republic of Bulgaria, 2012), accessed 15 February 2015, <http://www.moew.government.bg/?show=top&cid=569&lang=bg>], 25.

In these optimistic and pessimistic scenarios, the water level of the rivers Maritza, Tundja, and Arda are going to decrease dramatically from nine percent to thirty percent. The expectation for the population needs for water for the Maritza, Tundja, and Arda basins is expected to increase from eighty-five liters per day per person to 120 liter per day per person at the research region, which is a 21.14 percent increase which is shown in figure 11.

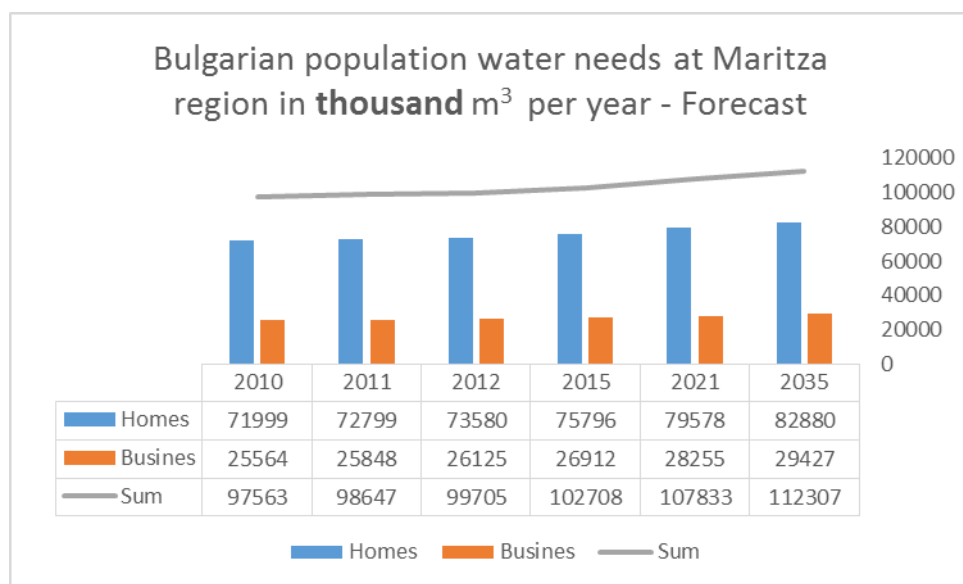


Figure 11. Forecast for Business and Population Needs of Water, 2015-2035

Source: РЕПУБЛИКА БЪЛГАРИЯ, МИНИСТЕРСТВО НА ОКОЛНАТА СРЕДА И ВОДИТЕ НА РЕПУБЛИКА БЪЛГАРИЯ, НАЦИОНАЛНА СТРАТЕГИЯ ЗА УПРАВЛЕНИЕ И РАЗВИТИЕ НА ВОДНИЯ СЕКТОР, 2012, Февруари 15, 2015 [Republic of Bulgaria, Ministry of Environment and Water, *National Strategy for Management and Development the Water Branch* (Sofia, Bulgaria: Republic of Bulgaria, 2012), accessed 15 February 2015, www3.moew.government.bg/files/file/Water/IVodi/NSURVS/Strategiq/Vodna_Strategia.doc], annex 1, table 1.3.1., 14.

The population from the three countries living in that area will decrease by about nine percent by 2050: Bulgaria-thirty-five percent; Greece-constant; and Turkey-plus fifty percent as shown in figure 7. From the graphic, it is obvious that the population of Turkey will become the biggest one at that basin by 2050, but in the same territory. These people will need more food, water, space to live and work. This means more food production, energy, and town and village growth. All this suggests a need for more water; however, the climate change forecast is for less fresh water, which means a shortage of water.

Table 4. Forecast for Water Extraction (without Nuclear Power Plant),
2015, 2021, and 2035

№	Basing	Natural resource of ground water, in million m ³	Used water, 2015		Used water, 2021		Used water, 2035	
			Quantity, million m ³	Percentage from resource, %	Quantity, million m ³	Percentage from resource, %	Quantity, million m ³	Percentage from resource, %
1.	East-belomorie area:							
1.1.	Resource for the period 1974-2008.	6014	2020	33.5	2025	33.7	2030	33.8
1.2.	Resource for the period 1961-2008.	5452	2020	37	2025	37.1	2030	37.2
1.3.	Resource for the period 1974-2008 reduce with 15%	5229.56					2030	38.8
1.4.	Resource for the period 1961-2008 reduce with 15%	4740.87					2030	42.8
1.5.	Resource for the period 1974-2008 reduce with 35%	4454.81					2030	45.57
1.6.	Resource for the period 1961-2008 reduce with 35%	4038.51					2030	50.27

Source: РЕПУБЛИКА БЪЛГАРИЯ, МИНИСТЕРСТВО НА ОКОЛНАТА СРЕДА И ВОДИТЕ НА РЕПУБЛИКА БЪЛГАРИЯ, НАЦИОНАЛНА СТРАТЕГИЯ ЗА УПРАВЛЕНИЕ И РАЗВИТИЕ НА ВОДНИЯ СЕКТОР, 2012, Февруари 15, 2015 [Republic of Bulgaria, Ministry of Environment and Water, *National Strategy for Management and Development the Water Branch* (Sofia, Bulgaria: Republic of Bulgaria, 2012), accessed 15 February 2015, www3.moew.government.bg/files/file/Water/IVodi/NSURVS/Strategiq/Vodna_Strategia.doc], annex 1, table 2.3.1, 27.

For the two scenarios from table 4 it is obvious that there is an incensement of the percentage of water used in Bulgaria. The worst case scenario is that the water used is almost fifty percent more. At that time, the population of Greece and Turkey will be bigger than Bulgaria and it will create tensions

“Без прехвърляне на водни количества от други басейни Източнoбеломорският район е със среден воден стрес (33.8%-37.2%),”³⁴ This sentence means that the water stress is medium, 33.8 to 37.2 percent. However, this calculation is without the added changes of fifteen and thirty-five percent caused by climate change. When the calculation was made adding the pesemistic and optimistic scenarios, the calculation shows 38.8-42.8 percent for optimistic and 45.57-50.27 percent for pessimistic. In both cases, the stress level will increase from low to moderate.

Conclusion

In conclusion, it is determined that water security can be a source of future conflicts; more precisely, a shortage of water or floods, that can cause state failure and increase regional tensions. Furthermore, water can be used as a weapon and can be a source of violent conflicts. Water directly influences population, economy, energy, peace, and political stability.

Achieveing peaceful solutions must come through the use of international institutions, international agreements, establishing better dispute mechanisms, and new technologies to reduce the loss and increase the effectiveness of water use. This means that with better agreements and better water resource management conflicts can be avoided.

The influence of the rivers for the region is incredible. These rivers are important because the water supplies in the region are supported and sustained with their water. For the majority of this part of the world, the rivers here are used as natural borders between the states; however, this can become a tipping point for the region too.

There are number of agreements between neighboring countries, but they have to be updated in accordance to the new realities. Bulgaria changed her status in 2007 and became a member of the EU, but there are no new agreements between Bulgaria and Turkey. According to the EU council, Turkish transboundary water management has to be improved in the short-term, which is an indicator of the problem with the other two countries, which are EU members. Moreover, the problems with the floods between Bulgaria, Greece, and Turkey deserves special attention because it is not yet solved.

The population from the three countries living in the area will decrease by nearly nine percent by 2050: Bulgaria minus thirty-five percent, Greece will be almost constant, and Turkey plus fifty percent. The population of Turkey will become the largest in that basin by 2050, but the problem is that the territory is the same. Because this is the richest area of Turkey, the migration can add more people to the region. These people will need more food, water, space to live and work. This requires more food production, energy, and town and village growth. All of these will need more resources and water.

Water resource management is the only tool that can be used to influence the effects of the climate change and lack of fresh water. Best practices which were already tested in a few European cites can be used. The water can be transferred, redirected, collected or slowed down. Dams systems can be built or the water can be transferred

through canals or other water links. The level of the water on the dams can be regulated as a preventive measure against floods.

Deforestation has direct impact from and to climate change, and increase the effects of it (like floods, land erosions), and drastically reduces the level of underground and surface water. Greece and Turkey have more problems with deforestation than Bulgaria, which can lead to the conclusion that they are more vulnerable. All three countries defined deforestation as a problem, and there is a political will to protect the forest and decrease the impact of the climate change.

History shows that the tensions between the countries was, and is, going to be based on two factors. The first factor is their cultures, which are based on their history. The second factor is resources. These two factors will have a direct impact on future decisions linked to climate changes in the region. A good example that history matters, are the relationships between Greece, Cyprus, and Turkey. The biggest impediment to Turkey being part of the EU is Greece and Cyprus. They had and still have a lot of problems that are disputable.

¹ UN Water, "Water Security," 7 October 2014, accessed 15 October 2014, <http://www.unwater.org/topics/water-security/en>.

² Director of National Intelligence. ICA 2012-08, "Global Water Security: Intelligence Community Assessment," Office of the Director of National Intelligence, Washington, DC, 2 February 2012, iii.

³ Ibid., 1.

⁴ Brundtland, 12.

⁵ Ibid.

⁶ International Network of Water-Environment Centres for the Balkans, “Maritza-Evros-Meric Sub-Basin With Arda and Ergene Rivers,” accessed 13 October 2014, http://www.inweb.gr/workshops2/sub_basins/13_14_15_Evros_Ardas_Ergene.html.

⁷ International Network of Water-Environment Centres for the Balkans, “Tundja/Tunca River Sub-Basin,” accessed 13 October 2014, http://www.inweb.gr/workshops2/sub_basins/16_Tunja.html.

⁸ International Network of Water-Environment Centres for the Balkans, “Maritza-Evros-Meric Sub-Basin With Arda and Ergene Rivers.”

⁹ Ibid.

¹⁰ Aysegül Kibaroglu, Axel Klaphake, Annika Kramer, Waltina Scheumann, and Alexander Carius, F+E Project No. 903 19 226, *Cooperation on Turkey’s Transboundary Waters* (Adelphi Research and German Federal Ministry for Environment, Nature Conservation and Nuclear Safety, October 2005), 35.

¹¹ Ibid., 1.

¹² Ibid., 5.

¹³ World Population Review, “Bulgaria Population 2015,” last modified 5 January 2015, accessed 23 April 2015, <http://worldpopulationreview.com/countries/bulgaria-population/>.

¹⁴ Director of National Intelligence. ICA 2012-08, “Global Water Security: Intelligence Community Assessment,” i.

¹⁵ Intergovernmental Panel on Climate Change, *Climate Change 2014 Impacts, Part B*, 1296.

¹⁶ Ibid.

¹⁷ Ibid., 1302.

¹⁸ Colonel Wendell C. King, *Understanding International Environmental Security: A Strategic Military Perspective* (Atlanta, GA: U.S. Army Environmental Policy Institute, November 2000), 52.

¹⁹ РЕПУБЛИКА БЪЛГАРИЯ, МИНИСТЕРСТВО НА ЗЕМЕДЕЛИЕТО И ХРАНИТЕ, НАЦИОНАЛНА СТРАТЕГИЯ ЗА РАЗВИТИЕ НА ГОРСКИЯ СЕКТОР В РЕПУБЛИКА БЪЛГАРИЯ ЗА ПЕРИОДА 2013-2020г., НОЕМВРИ, 2013г [Republic of Bulgaria, Bulgarian Ministry of Agriculture and Food, *National Strategy for Forestry Sector Development 2013 -2020* (Sofia, Bulgaria: Republic of Bulgaria, November 2013), accessed 28 September 2014, www.strategy.bg/FileHandler.ashx?fileId=4209].

²⁰ Mongabay, “Deforestation Archive, Greece,” accessed 9 May 2015, <http://rainforests.mongabay.com/deforestation/archive/Greece.htm>.

²¹ Centre for Climate Adaptation, “Forestry and Peatlands, Greece,” accessed May 9, 2015, <http://www.climateadaptation.eu/greece/forestry-and-peatlands/>.

²² Mongabay, “Deforestation Archive, Turkey,” accessed 9 May 2015, <http://rainforests.mongabay.com/deforestation/archive/Turkey.htm>.

²³ Republic of Turkey, Ministry of Environment and Urbanization, *Republic of Turkey Climate Change Strategy 2010-2020* (Ankara, Turkey: Republic of Turkey, 2010), accessed 20 April 2015, http://www.dsi.gov.tr/docs/iklim-degisikligi/ulusal_iklim_de%C4%9Fi%C5%9Fikli%C4%9Fi_strateji_belgesi_eng.pdf?sfrsn=0, 19.

²⁴ Katinka Barysch, Policy Brief, “Turkey and the EU: Can Stalemate be Avoided?” Centre for European Reform, London, December 2010, accessed 20 April 2015, http://www.cer.org.uk/sites/default/files/publications/attachments/pdf/2011/pb_turkey_eu_barysch_dec10-182.pdf.

²⁵ Republic of Turkey, *Defense and Security Policy of the Turkish Republic* (Ankara: Republic of Turkey, 2011), accessed 9 May 2015, http://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=3&cad=rja&uact=8&ved=0CCwQFjAC&url=http%3A%2F%2Fwww.cidob.org%2Fen%2Fcontent%2Fdownload%2F30264%2F359449%2Ffile%2F241-248_ANEXO_POLITICA%2BDEFENSA%2BDE%2BTURQUIA_ANG.pdf&ei=LSzEVPbUBIf3yQTmj4LwAw&usg=AFQjCNHCyEyNUEkMyJfLK480nNy_dcRpQQ&bvm=bv.84349003,d.aWw.

²⁶ Google, “Security,” accessed 23 April 2015, https://www.google.com/?gws_rd=ssl#q=security+definition.

²⁷ Dictionary.com, “Threat,” accessed 23 April 2015, <http://dictionary.reference.com/browse/threat>.

²⁸ Itri Atay, “Water Resources Management in Greece: Perceptions about Water Problems in the Napflion Area” (Department of Human Geography, Stockholm University, Stockholm, Sweden, November 2012), 42.

²⁹ Ibid.

³⁰ проф. д-р Антон Попов, АНАЛИЗ И ОЦЕНКА НА РИСКА И УЯЗВИМОСТТА НА СЕКТОРИТЕ В БЪЛГАРСКАТА ИКОНОМИКА ОТ КЛИМАТИЧНИТЕ ПРОМЕНИ; ОПЕРАТИВНА ПРОГРАМА ОКОЛНА СРЕДА 2007-2013 [Anton Popov, Ph.D., *Analyze the Risk and Vulnerability of Bulgarian Economy from the Climate Change; Operational Program Environment 2007-2013* (Sofia, Bulgaria: Republic of Bulgaria, 2007), 128-130, accessed 23 April 2015, http://www.moew.government.bg/files/file/Press/Konsultacii/2014/Obshta_chast.pdf].

³¹ Norman Myers, “The Environmental Discrimination to Security Issues,” *The Environmentalist* 6, no. 4 (1986): 253.

³² Republic of Bulgaria, State Agency for Refugees of Republic of Bulgaria, accessed 23 April 2015, <http://www.aref.government.bg/index.php?cat=8>.

³³ РЕПУБЛИКА БЪЛГАРИЯ, МИНИСТЕРСТВО НА ОКОЛНАТА СРЕДА И ВОДИТЕ НА РЕПУБЛИКА БЪЛГАРИЯ, НАЦИОНАЛНА СТРАТЕГИЯ ЗА УПРАВЛЕНИЕ И РАЗВИТИЕ НА ВОДНИЯ СЕКТОР, 2012, Февруари 15, 2015 [Republic of Bulgaria, Ministry of Environment and Water, *National Strategy for Management and Development the Water Branch* (Sofia, Bulgaria: Republic of Bulgaria, 2012), accessed 15 February 2015, <http://www.moew.government.bg/?show=top&cid=569&lang=bg>], annex 1, 22-26.

³⁴ Ibid., 28.

CHAPTER 3

METHODOLOGY

The global threats created by climate change will influence everyone. The Balkan Peninsula, where the research is focused, is a crossroad between Asia, Africa, and Europe. The rivers which spring in Bulgaria feed Greece and Turkey. Furthermore, the boundary between Greece and Turkey is the Maritza River which is very important for the agriculture, industry, and most importantly for the people to produce drinkable water. Because of that the water management is very important for the future of the region.

The author will focus on how climate change can create security threats between Bulgaria, Greece, and Turkey. The research will cover the following areas: water security, water resource management, social politics, history, economy, military threats, and population. What will be the impact of climate change on the Balkan Peninsula, and how is it creating a security threat? It is going to have a huge impact on these three nations and how these nations will react or interact with each other.

The focus will be to recommend measures that can be taken to avoid or decrease the effect of climate change, specifically on water resources. The assumption is that the research effort will focus on surface rather than groundwater, specifically the Maritza and Tundja Rivers, and how poor water management of these rivers will create security threats.

Data Collection

For the purpose of the research, data will be collected from various sources. They will be primary and secondary sources. The first primary source for the purpose of this

research will be the International Panel on Climate Change, *Climate Change 2014 Impacts*. “The IPCC was established by the World Meteorological Organization (WMO) and the United Nations Environment Programme (UNEP) in 1988, with the mandate to provide the world community with the most up-to-date and comprehensive scientific, technical, and socio-economic information about climate change.”¹

The other primary sources will be documentation from these three nations: Bulgaria, Greece, and Turkey. Websites, government, and ministries that are responsible for research in this area will be used. The secondary sources will come from non-governmental organizations, to include web based information and other sources related to the research.

Analysis

A mixed methodology will be used to analyze the collected data because of the nature of the research. It is a mix of data analyses and the behavior of the people which cannot be measure directly. For example:

The essential goal of mixed methods research is to tackle a given research question from any relevant angle, making use where appropriate of previous research and/or more than one type of investigative perspective.

Sometimes referred to as mixed methodology, multiple methodology or multi-methodology research, mixed methods research offers you the best of both worlds: the in-depth, contextualized, and natural but more time-consuming insights of qualitative research coupled with the more-efficient but less rich or compelling predictive power of quantitative research.

These approaches are far more comprehensive than attacking a problem from only one point of view and, with the emergence of strategies and tools for blending these different types of data, allow for the crossing of disciplinary boundaries like never before.²

¹ Intergovernmental Panel on Climate Change, *IPCC - Climate Change 2014 Impacts, Adaptation, and Vulnerability Part B*, 1276.

² Dedoose, “What is Mixed Methods Research?,” accessed 3 November 2014, <http://blog.dedoose.com/2012/10/what-is-mixed-methods-research/>.

CHAPTER 4

Climate change is influencing the globe, and it creates a lot of instabilities and threats. Climate change is not a direct threat but it is a threat multiplier:

Climate change poses another significant challenge for the United States and the world at large. As greenhouse gas emissions increase, sea levels are rising, average global temperatures are increasing, and severe weather patterns are accelerating. These changes, coupled with other global dynamics, including growing, urbanizing, more affluent populations, and substantial economic growth in India, China, Brazil, and other nations, will devastate homes, land, and infrastructure. Climate change may exacerbate water scarcity and lead to sharp increases in food costs. The pressures caused by climate change will influence resource competition while placing additional burdens on economies, societies, and governance institutions around the world. These effects are threat multipliers that will aggravate stressors abroad such as poverty, environmental degradation, political instability, and social tensions – conditions that can enable terrorist activity and other forms of violence.¹

This quotation from U.S. *Quadrennial Defense Review* 2014, gives a concise picture of how climate change acts as a threat multiplier and is influencing the globe.

This is another example of how the military sees the threats that can create a conflict because of the climate change. Figure 12, shows how climate change functions as a threat multiplier and how it influences the natural resources, and every aspect of countries.

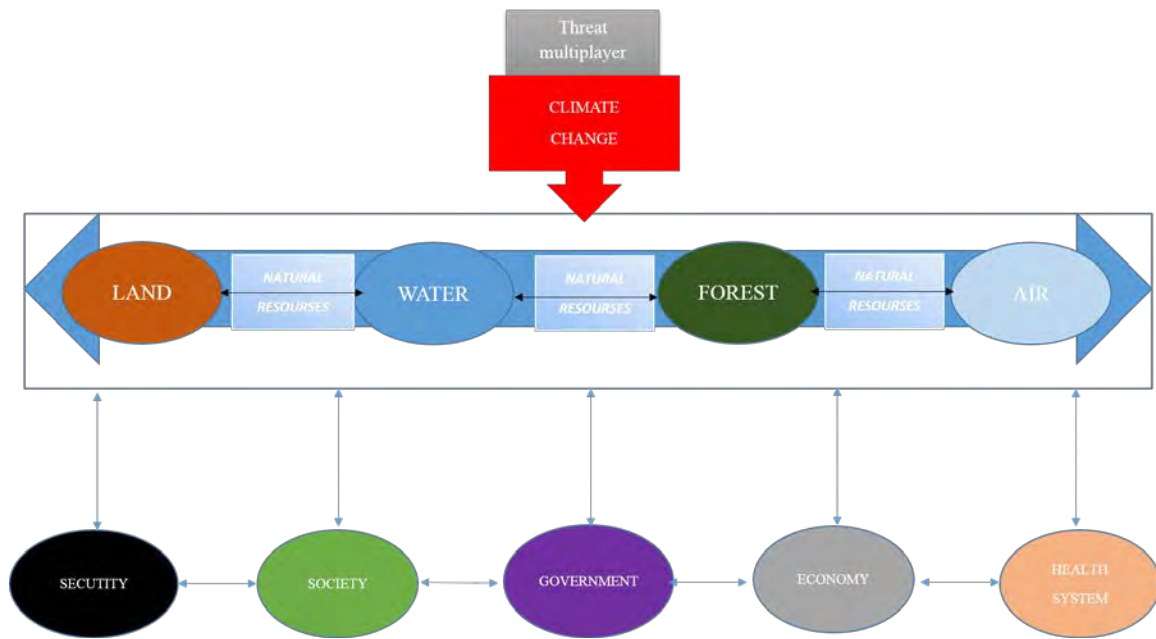


Figure 12. Climate Change as a Threat Multiplayer

Source: Created by author.

This study will analyze and show how climate change and poor water management can influence the three countries and create a security threat. The analysis on the affects of climate change and water management and their links to balance of power between Bulgaria, Greece, and Turkey. The balance of power has a direct link with the balance of sharing and using resources. Water is a resource that one may share or may be forced to share. This is the most distinguished difference, to share or to be forced to share. The people can use appropriate and fair resource management to support this balance or the situation can force them to do that. This is the area where one can link and search for security threats to the system.

The perfect situation for a balance has not happened for a long period of time. A lot of factors can influence this stable situation and make it unstable. It can be population growth or decline, discovery of new resources, decline of existing resources, change in the environment, change the social system, ethnical homogeneity, and many others.

The change to the environment is the foundation of all other changes. Climate change as a threat multiplier indirectly changes the balance of resources which leads to change in the environment. The crucial resource for the system is water.

One can define the resources from a country perspective. The country has the natural resources shown on figure 12, and human resources which is population. Using the natural resources that are produced or taken from the country's land, can sustain an exact amount of population. A simple formula showing how all components are linked is offered:

$$D = fA + fB + fC$$

Where D – population;

A – water;

B – land;

C – forest.

The air is not included because it has a global influence and it is not part of the research.



Figure 13. Relation between Natural Resources and Population

Source: Created by author.

This formula and figure 13 show the links between the components and provide a good understanding of how the system works. Now the problems to the system that can create instability and vulnerability can be defined. Each of the components can be a problem and each of them can be influenced from outside stressors, depending on the situation. This figure is looking like a pill, and it is working as a pill. When the system is balanced and working it makes the country healthier.

What will be the Influence of a Lack of Drinkable and Fresh Water, in the Southeastern Part of Balkans?

To answer this question there will be an analysis of how the system works and what the influence of the lack of water will be. One of the biggest factors is the population, and it is influencing the whole system. There are a few scenarios; first, when the population is growing; second, when the population is stable; and third, when the population is declining. In all of these scenarios, there is one thing that is a factor, it is a

human civilization progress. It can be positive and negative for each of these scenarios. In this thesis, each country is linked with one of these scenarios. In chapter 2, figure 7 showed that the population forecast for the research area is: the population of Greece is almost constant; the population of Bulgaria is declining by thirty-five percent; and the population of Turkey is growing by almost fifty percent by 2050. The total population change from the three countries living in that area will decrease by about nine percent.

Figure 14 shows the influence of the population growth or decline, and it is obvious that it is directly linked with the other components. The change of the population is directly linked with the natural resources. When the population is growing, the need of resources is growing too: more water, more food, more wood, and more space to live and work. On the other hand, when the population is declining, less resources are needed, but there is also a smaller labor force to sustain the country, to produce the resources and welfare, and last to sustain the existing infrastructure.

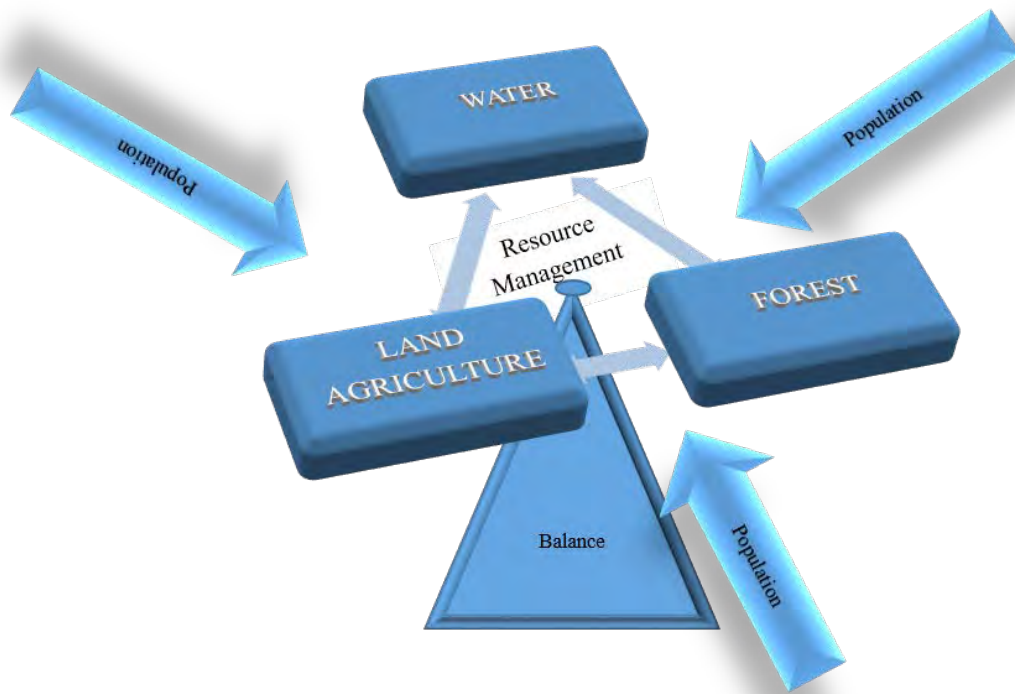


Figure 14. Influence of Population Change to Natural Resources System

Source: Created by author.

This creates an imbalance in the system and frictions to the other systems that are linked. The balance can be restored with appropriate resource management, but the effects are slow, and it is time and resource consuming to adapt to the new environment.

What is the meaning of the data from the population forecast? The data shows that each country has a different issue. For Bulgaria,² it is declining and the problems and challenges are a smaller labor force to grow the economy, produce welfare, and to sustain the existing infrastructure. For Greece,³ it is almost constant, but the problem here is the

rising tourist flow and need of water. For Turkey,⁴ is the population growth of fifty percent, which means that they need more resources to sustain this population.

Next is the influence of the change in natural resources. The natural resources this study is analyzing are water, land, and forest. They are existing as a natural system that is balanced by itself. However, the human influence cannot be avoided, because it is directly linked to the system sustainability. Humans influence the natural resource system directly and indirectly. Direct influence is when humans change or shape the environment for their own purposes, taking resources in a quantity that cannot regenerate by themselves. Indirect influence is when human society is polluting the nature, which influencing the system connection and the final effect is the climate change.

All these direct and indirect influence create instability to the natural system, causing inbalance, and creating a conditions for collapse. Deforestation is one of the components. When the forest is destroyed, this reduces the water quantity and quality, creates desertification to the land, air quality gets worse, and floods and landslides increase.

The next influence discussed is water. Water has the most direct and indirect influence. When the water quantity and quality is declining it has a direct link to the other components. When the water quantity is declining directly, it is followed by loss of arable land/desertification to the land, loss of forest, and decrease in the population that can be sustained in the area or decries the qualities of life.

Last, but not least is the land. When the arable land is declining it leads to declining food production and agriculture, less forest, less water and accelerating the

process of land desertification. These again lead to decrease in the population that can be sustained in the area or decryes the qualities of life.

All this scenarios have a climate change influence. Figure 15 show relationships of the system. The climate change is changing the environment and the existing conditions that sustain the system balance. It is not direct threat but it is create conditions for an instability of the system and the countries.



Figure 15. Influence of Climate Change to Natural Resources System

Source: Created by author.

Summary for Each Country

Bulgaria: population is declining by thirty-five percent, need of water is increasing by twenty-one percent, and the water resources are declining by fifteen percent. From chapter 2, figure 7, it is obvious that the population of Turkey will become

the biggest one in the basin after 2050. The population growth is predicted to be fifty percent, but in the same territory with fewer water supplies. More people will need more food, water, space to live and work. Because of the human progress the forecast for the population need of water is showing that they will growing by twenty-one percent by 2035. For Greece, the population is not growing or declining significantly, but there will be fifteen percent less water, more tourists, and more need of water. The forecasts for tourism varies from 3.8 percent to almost 10 percent growth to 2024”⁵

The tourism industry in Greece accounts for approx. 16% of GDP. Within Europe, the country has over 3% of international tourist arrivals. The proportion of foreign holidaymakers is very high, at almost 75% (5).

Tourism constitutes one of the more important economic activities in Greece. In 2003, Greece welcomed approximately 14 million tourists (excluding cruises). The major portion (90%) came from Europe and 70% from EU countries. In 2003, the accommodation capacity was approximately 650,000 beds in more than 8,500 hotels. Compared to 1996, the number of hotel beds in 2003 increased by 20%. About 60% of the total bed capacity (hotels) is located on the islands (1).

Vulnerabilities-Greece

Taking into account its high ratio of international tourists and the high proportion of employment (20%) from tourism, Greece will be one of the losers from climate change.

Other problems are shortages of water, that restrict the operation of tourist facilities (swimming pools, golf courses), and increasing risk of forest fires in many areas. The return of malaria to the southern Mediterranean region also cannot be ruled out (5).⁶

All this shows how big the problem is going to be for Greece, and how bad the situation can become. It is much more complex that it appears.

The population in Maritza basin (Bulgaria, Greece, and Turkey) will decline by nine percent, but the people’s needs of water will increase with twenty-one percent, and Turkey is the worst scenario; more people, less water available, and more water needs. In

all that we can add and the floods, dries and extreme weather like hail, storms and even tornados which the climate change will make worse.

How will the Lack of Drinkable and Fresh Water, in the Research Area Create Security Threats?

Extreme Weather

From the three climate change scenarios⁷ for the region it is obvious that there will be more floods, more extreme drying, and storms are going to be more powerful. The expectation is the winters will become milder and the summers hotter. The periods for normal weather is going to decline versus the periods with extreme weather. The pace for the change is going to be very quick.⁸

Chapter 2 showed the price of floods for Bulgaria and how these events increased over the last ten years. The cost of the floods increased seventeen times and the casualties 2.1 times. This is a tremendous increase, but the biggest problem is that it is a trans-boundary threat. The floods had the same huge effect in Greece and Turkey. Even, where there were existing systems and agreements for early warning and prevention of the floods, the results were devastating.⁹

The floods are not the only problem. The droughts between the floods are dangerous and the cost to agriculture and the economy is large. The prediction for the future is almost to double the dry days per year for the target area. On one hand, there will be water decrease by 15 percent per year, which for the summer is going to almost 35 percent, while the need for water will increase by twenty-one percent. Furthermore, the time period between the rains is longer.

The problem is that the governments are not targeting the root of the issue, they target the symptoms. To have an early warning between the neighboring countries is really important because it saves lives, but it does not protect the property and infrastructure from the floods. The historical examples make it really obvious that this was happening again, and again, and according to the climate change scenarios it will continue to happen for the future. Also, for the dry periods more water will be needed, but if there is not enough water, the problem is going to become bigger.

Health System

The health system is going to be impacted too. Climate change creates direct and indirect threats to the health system. The lack of water or bad quality water will increase disease, which will put pressure on the health system and will increase the cost.

Water resources have a direct link with the health system. As mentioned previously in figure 13 when comparing the situation to a pill, when everything is functioning properly, the system is healthy. The lack of water or too much water creates a threat to the population. It produces stress for the people and the stress causes or is the reason for a lot of disease.

During the dry season, the air will be full of dust, because of a lack of rain. This will increase the allergies, lung related problems, and many other respiratory problems. The cost to the system cannot be predicted exactly, but it is obvious that when the population lives in an unhealthy environment, the health system will be under big pressure, and health care costs are going to increase.

Migration

The other big threat is the migration that climate change is going to force. Chapter 2 showed the migration flow from Turkey and Greece through Bulgaria. The majority of the migration was caused by the war in Syria, but it was not the only reason. There are a lot of people that were not moving because of war or other conflict, they move because life cannot be sustain in their countries, because of the climate change, and the absence of minimum resources. In the majority of cases this resource is water. They should be called climate change refugees, not migrants.

It is obvious, that for the future there is going to be a huge migration pressure from many regions because of lack of resources; and more specifically, lack of water. Population will move to the regions which can offer more. The growing population, lack of water, and growing needs for it, can push the people to migrate. Of course, this is a very dangerous situation and it will create a lot of tension, even driving governments to react.

For the case of Bulgaria, Greece, and Turkey, the tension is growing because Bulgaria and Greece are EU members and Turkey is not. The EU members have fully implemented the EU laws, and have agreements under the EU and they are strictly part of it. There are even people migrating from one EU country to another; they already are part of the system and the influence is not the same.

Turkey is not part of the EU, but they have applied for membership. Chapter 2 discussed that the negotiation started in 1987 and stopped in 2006. This created new tensions and pressure to the system. The border has to be secured differently, not like

between the EU member countries. The water agreements are not synchronized with the EU, and this was one of the key issues during the negotiations.



Figure 16. Balance of Power between Bulgaria, Greece, and Turkey from EU Perspective

Source: Created by author.

Figure 16 shows the balance of power of the case. Of course, the balance of power cannot be in two dimensions, but for the purpose of visualization it is much more understandable. When the migration issue is added, one can see that the balance is shifting or the system is becoming unstable as shown in figure 17.

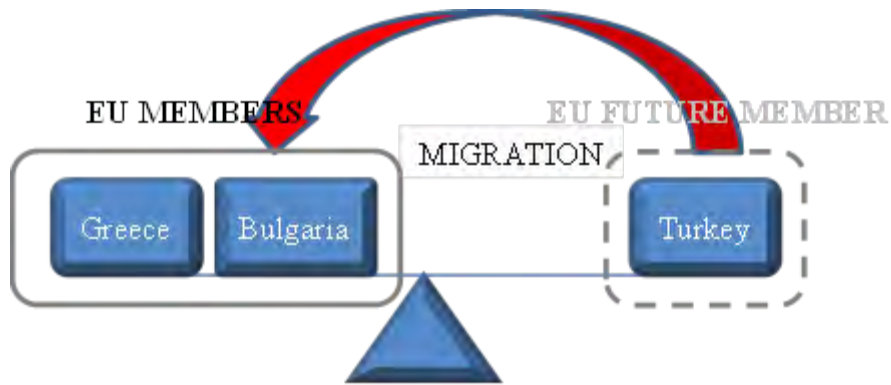


Figure 17. Migration as a Balance of Power Stressor

Source: Created by author.

From the Turkish perspective, this problem was introduced in chapter 2, history. They have to decide which way to go, to be an EU member, or to be a regional leader to the Middle East. Both ways have positive and negative impacts, but they cannot be combined, at least from the author's perspective.

The population is growing and there is a lack of space and resources, in this case a lack of water. This influences the whole system and makes things worse. When this is analyzed, one sees that the space is constant, the water is declining which is leading to the less or different food production, and the population is growing. All these factors will push the population to act or they can influence the local, or even national government to act.

This is a really simple formula of the perfect storm. How can it be avoided? Taking preemptive actions and targeting the problem now, will provide the ability to influence, avoid, or reduce the future problem that is going to accrue in the next fifteen to twenty years. Good water and resource management can help greatly.

Does Bulgaria Apply Proper Water Management Systems and how this is going to Influence Greece and Turkey?

Next, the balance of power between Greece, Bulgaria, and Turkey and how these are linked with resource management will be analyzed. When examining the balance of power between the three countries, it is obvious that it is not a simple and one dimensional question. Figure 18 can be used to show the balance.

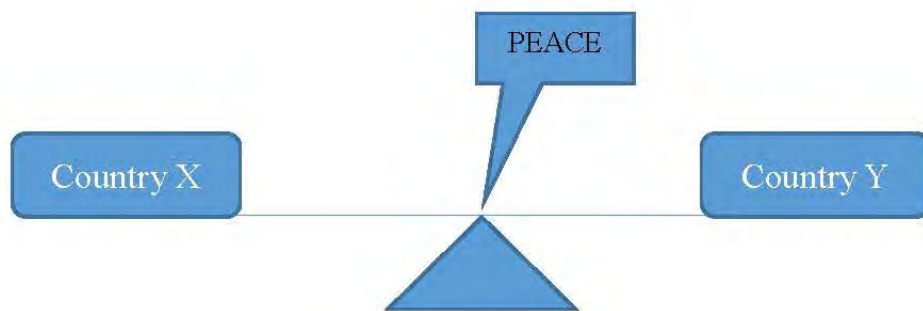


Figure 18. Balance between the Two Countries

Source: Created by author.

Figure18 shows that there is balance between these two countries that is dependent on only these two countries. When there is a balanced situation, it is called peace. How can the balance be sustained? Usually, it is based on the relationship, and agreements between the countries, and if one of them decides to change something it will directly change the balance and create instability. If one looks at what each of the three countries based the balance of power on, it looks like each country has to achieve separate agreements with the others. This is presented in figure 19.

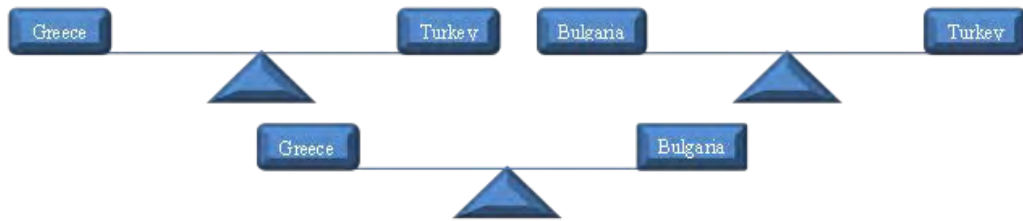


Figure 19. Balance of Power from each Country's Perspective

Source: Created by author.

The balance of power between Bulgaria, Greece, and Turkey is not two dimensional. Figure 20, depicts the way they actually balance. The diagram shows a disk on the edge and the three countries balancing to keep it in stable. It is the most easy way of visually presenting the overlap of the influence, the problems, and the risk in the middle.

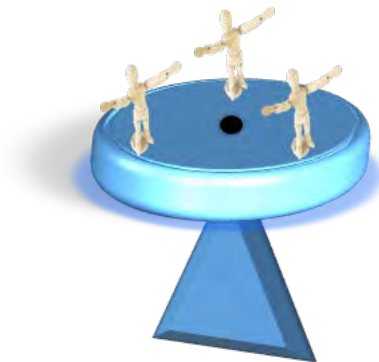


Figure 20. Three Dimensional Balance of Power

Source: Created by author.

In the middle of the diagram is the center of gravity. This is the most important part of that figure, the center of gravity between the three countries. If they want the situation to remain stable and in balance, they have to have a unified center of gravity.

Each country has its own center of gravity, but to solve this complex problem they have to be united and to work and balance together. To achieve a stable condition is a matter of balancing power and sharing resources.

The existing water management in Bulgaria is not as sufficient. There is a lot of reasons :

1. A majority of the systems were built before 1980 and it is not efficient to repair; it should be replaced.
2. It is difficult to establish efficient water management when the system is old.
3. The dams and the banks need to be repaired.
4. Floods every year are damaging the existing infrastructure and it is difficult and expensive to fix.
5. The loss of the water in the system in some places is more than sixty percent.
6. The cost for new system is really high.

Even with all these problems, the Bulgarian government efficiently manages the existing system. The root of the problem is the political will from the three governments. How does one convince the political leaders to sign a new agreements, which are corresponding with the new realities, and how to convince them to spend the cost for the solutions? Chapter 2 showed the government of Greece and Turkey blaming Bulgaria for the floods, because of poor water management. The management of the water in Bulgaria is not the best, but it is still exists and is improving every year. Chapter 2 showed that the

Ministry of Environment and Water of Bulgaria already made the calculation of how much the system is going to cost to be built; from six to twenty three billion euro.

If Bulgaria has to pay the price alone to protect the population and infrastructure to the downstream of Maritza and Tundja, it will take a long time, not because the Bulgarian government does not want to, but just because of the limited funds. During this period, floods, drought, and extreme weather is continuing to happen and create even more damage. This scenario is going to increase the tensions between the countries and create risk for their citizens.

Will the Historical Tensions in this Area Increase the Impact of Climate Change?

History is a tool to learn from the previous cases and to judge and make an adjustments for present and future behavior. That can even be linked with the lessons learned from the military perspective and how important it is. What was learned from the short history in chapter 2? The Balkans always were and will be, a crossroad from Europe to Asia, the Middle East, and Africa. The history of the Balkans is full of violence, associated transitions of power, and shifts in political influence. A lot of historians even use the metaphor “Powder keg of Europe,” sometimes alternately known as the “Balkan Powder Keg,”¹⁰ to describe the region. For the last 100 years there were more than eight conflicts, including four major wars, and four small-scale local conflicts.

Bulgaria, Greece, and Turkey share a lot of history and unresolved problems. The tension between Greece and Turkey over Cyprus is an example of how allies can have problems. The two countries were NATO members, but this has not stopped them from having conflict. The Aegean Dispute between Turkey and Greece is a useful example.

This was not strictly conflict for the resources and oil, but this was the main reason. The two countries were on the edge of full-scale war.

From the history in chapter 2, there were other examples of how the balance of power changed with the end of the conflicts. The biggest examples were the two Balkan wars. In the First Balkan War, all Balkan league countries were united against the Ottoman Empire, and they won. However, for the Second Balkan War, the Balkan states, this time with the addition of Romania, aligned against Bulgaria over territorial disagreements resulting from the first war. The outcome was inevitable. Figure 21, presents the change in the balance of power.

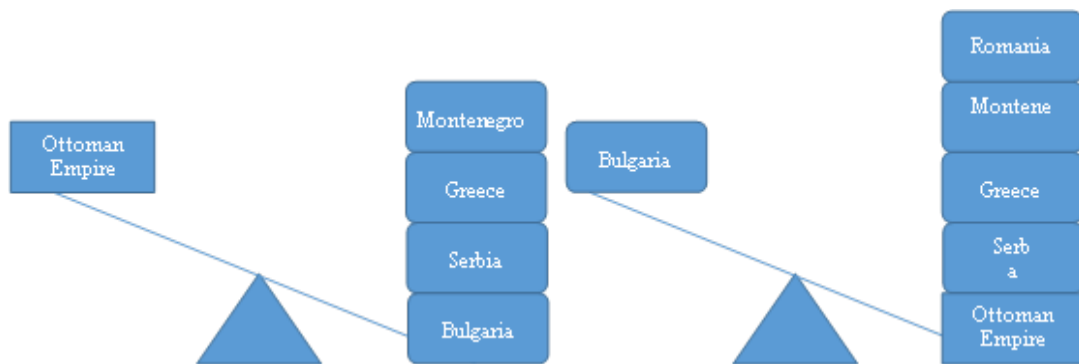


Figure 21. Change of the Balance of Power at the First and Second Balkan Wars

Source: Created by author.

From the history perspective one can conclude that the main lessons learned from the conflicts is that resources and balance of power were, and will be reasons for a conflict. Many historians used the ethnical tensions as a reason for conflicts, but from the

author's perspective, it is not the root of the problem; it is mostly as a symptom of the problem. Every time there is a lack of resources, especially water, usually the impact is to the weakest point of the society; minorities, poor people, and uneducated people.

The other fact is that the conflict did not solve the problems, even made them worse in the long-term. The cost of the conflict is too high: human losses, devastation, and instability. Finally, after the conflict there, the people and the society start to rebuild their countries and eventually fix the problem. Nobody can calculate what the real cost is before, during, and after the conflicts.

Conclusion

Climate change as a threat multiplier and will create an unstable environment with a lack of the most important resource, water. The tension between the countries is going to increase because:

1. The water supplies will decrease by fifteen percent by 2035;
2. The floods and drought will be more often and more extreme;
3. Arable land is going to decrease,
4. Food production is going to decrease;
5. Need for water is growing by twenty-one percent by 2035;
6. The population of Turkey will grow by fifty percent with the same territory;
7. The expectation to the Greece tourism is to grow with 3.8 to ten percent and they will need more resources, specifically more water;
8. The impact to the health system to the three countries.
9. The population of Bulgaria for that area will decrease by almost thirty-five percent which will create a problems to sustain the existing water infrastructure;

All of these link to climate change, and particularly to the water. The water will impact all parts of the system, and will directly or indirectly create a security threat to the region. The only efficient and peaceful way to avoid the conflicts is to establish proper water management in and between the countries and to create conditions for stable and prosper future.

The Win-Win strategy must be targeted because the Win-Lose or Lose-Lose will create new problems and more tensions for the losing countries. The understanding should be a focus to find a successful solution where everyone is a winner. Resource sharing and the balance of power between the countries are critical. The negotiation strategy has to find good and appropriate solutions for everybody.

The benefits for each country that can be from using the Win-Win strategy are:

For Bulgaria:

1. Sharing the cost to build the water system.
2. Decreasing the tension and probability for a conflict with Greece and Turkey.
3. Decreasing the migration pressure.
4. Decreasing the pressure to the health system.
5. More jobs to build and sustain the water infrastructure.
6. Decreasing the cost for the floods and dries.
7. Agricultural benefits; can sustain the agriculture even during the dry season.
8. Reduce the risk for the floods, casualties, and damages to the infrastructure.
9. Produce energy; reducing the greenhouse gas effect, throughout use of renewable resource, water.
10. Increase human security.

For Greece:

1. Reduce the risk for the floods, casualties and damages to the infrastructure.
2. Decreasing the cost for the floods and drought.
3. Agricultural benefits; can sustain the agriculture even during the dry season.
4. Decreasing the pressure to the tourism industry.
5. Decreasing the tension and probability for a conflict with Bulgaria and Turkey.
6. Increase the human security.

For Turkey:

1. Reduce the risk for the floods, casualties and damages to the infrastructure.
2. Decreasing the cost for the floods and dries.
3. Agricultural benefits; can sustain the agriculture even during the dry season.
4. Decreasing the pressure to the health system.
5. Decreasing the tension and probability for a conflict with Bulgaria and Greece.
6. Increase the human security.

Some of the benefits of having a peaceful solution to the problem cannot be measured directly; however, they are important enough, because it only creates more stabilities and prosperity for the region. There will be a lot of other unsolved problems, but when the population is living in a safe and secure environment, and can sustain themselves and their families, the problem does not look so big. If there is a will the people can find a way, to achieve it.

¹ Department of Defense, *Quadrennial Defense Review 2014* (Washington, DC: Government Printing Office, March 4, 2014), 8.

² Popov, 158.

³ Hellenic Statistical Authority, “Population Projections of Greece 2007-2050,” accessed 23 April 2015, http://www.statistics.gr/portal/page/portal/ESYE/BUCKET/A1602/Other/A1602_SPO18_MT_AN_00_2007_00_2050_10_F_EN.pdf.

⁴ Turkish Statistical Institute, “Population Projections, 2013-2075,” accessed 9 May 2015, <http://www.turkstat.gov.tr/PreHaberBultenleri.do?id=15844>.

⁵ World Travel and Tourism Council, “Greece,” Travel and Tourism Economic Impact, 2014, accessed 9 May, rochelle.turner@wttc.org, 11.

⁶ Centre for Climate Adaptation, “Tourism, Greece,” accessed 9 May 2015, <http://www.climateadaptation.eu/greece/tourism/>.

⁷ Republic of Bulgaria, Ministry of Environment and Water, *National Strategy for Management and Development the Water Branch*, annex 1, 22-26..

⁸ Popov, 47,48, 52.

⁹ Ibid., 128-130.

¹⁰ Wikipedia, “Powder Keg of Europe,” Wikipedia Foundation, accessed 3 May 2015, http://en.wikipedia.org/wiki/Powder_keg_of_Europe.

CHAPTER 5

CONCLUSIONS AND RECOMMENDATIONS

Suggestion

The author suggests that to decrease or even avoid the problem defined in chapter 4, a combined center between the three countries; Bulgaria, Greece, and Turkey, should be created specifically for the impact of climate change in this region. In Bulgaria, there is functioning a NATO center of excellence for crisis management and disaster response. “NATO Summits Declarations and the Strategic Concept emphasize the need for NATO to enhance its contribution to a Comprehensive Approach to crisis management, based on the recognition that military intervention alone cannot resolve or recover after a crisis or disaster.”¹

The suggestion is not to use it as a main center because there are a few problems. The biggest problem is to use this center to fix the local problem, because it is designed and focused to work after a disaster happens. The center is not to create regional preventive measures for the future. Finally, it is not established only for the purpose of climate change. If it is to be used as a main center, new agreements which involved all the NATO members should be established to regulate all of this.

For this reason, the establishment of a new center only between Bulgaria, Greece, and Turkey is proposed. The new center for Climate Change Adaptation and Mitigation (CCAM) between the three countries should be established, regulated, and funded from the neighboring countries. This should be an independent organization, with full support from the countries, focused on the climate change impact to the region. This combined center would advise and assist the governments with climate change issues.

This combined center or CCAM has to have a few essential and critical responsibilities:

1. To assess and define the climate change impact to the region.
2. To define the risks and threats that climate change creates.
3. To create a long term strategy for adaptation and mitigation for the climate change.
4. To create a short-term strategy for immediate actions to avoid or decrease the impact of climate change.
5. The strategy should be linked with funding. To delegate authorities to apply for funding from the three governments, the EU, or the International Monetary Fund.
6. To synchronize the operations between the three countries before, during, and after the disaster happens, even being the lead element of that.
7. To delegate authorities to synchronize and work with the NATO center of excellence and EU structures.
8. To synchronize and propose big projects linked with the climate change adaptation and mitigation.
9. To advise and assist the three governments with decisions in accordance to the long and short-term strategies for climate change adaptation and mitigation.
10. To propose law synchronization or adaptation to the long-term strategy for climate change adaptation and mitigation.

From the author's perspective, there are two options for the structure of CCAM: parallel or centralized. Both types should have a science cell, strategic policy cell,

financial cell, legal or international and country's law cell, synchronization cell, and strategic communication cell.

The science cell (SC) will provide the science forecast based on the climate models, calculations and expected impacts of climate change. This cell should have experts from all areas linked with climate change impact.

The strategic policy cell (SPC) will provide a short and long-term strategy, based on the experts from the other cells. Their responsibilities will be to provide climate change adaptation action plans based on their strategy. They will organize a quick response sub center to lead during disasters. They will lead working groups for the strategies and link with the governments. They will provide periodic reports to the governments.

The financial cell (FC) will be responsible for the funding and expenditure part of the center. They have to organize the money flow and to evaluate the projects and the policies from a financial prospective.

The legal or international and country's law cell (LC), will be responsible for synchronizong projects with the local and international laws and to suggest law projects or law changes to the governments in accordance with the climate change strategies.

The synchronization cell (SyC) will be responsible for synchronizing the operation between the countries, or other governments, or non-government organizations. This cell should include representatives from each country.

The strategic communication cell (SCC) will be responsible for creating a narrative, for communicating with the governments and international community to

inform them of the future plans, and to shape the environment to achieve the goals. Now the advantages and disadvantages for the second type of structure will be presented.

Parallel

The parallel structure of the center of excellence is shown in figure 22. It is a proposal of how to organize the structure of this center. The organization in this case will not be centralized and is going to depend on each country for the type of expertise they will sustain or need. The only mandatory part of that, is to have a representative to the synchronization cell of the center of excellence. The biggest advantage is that gives the countries a lot of freedom with their decisions and how to allocate resources after that. The biggest disadvantage is that the process is going to be very slow and for each decision one has to wait for political support and funding from each government separately.

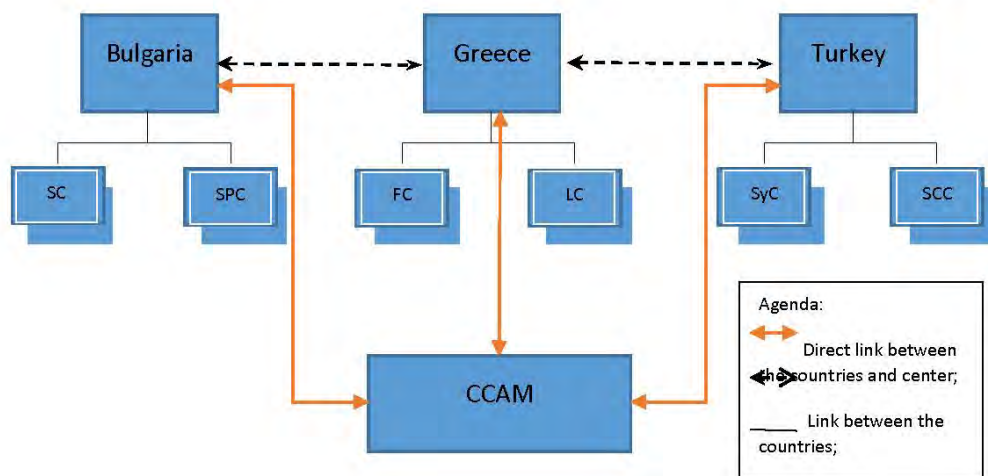


Figure 22. Proposed Parallel Structure for the Center

Source: Created by author.

Centralized

The biggest disadvantage is that the countries will have less capabilities to influence the process directly. For the purpose of the project, the three countries have to delegate authorities to this center in accordance with the essential responsibilities suggested earlier of the chapter.

The biggest advantages are the autonomy of creating short and long-term combined strategies to the region, making decisions based on expert advice, and following the united interest of the region, not just for the one country only. To support the Win-Win strategy at expert level will be much easier and achievable, which will mean a quicker decision making process and targeting the root of the problem not the symptoms.

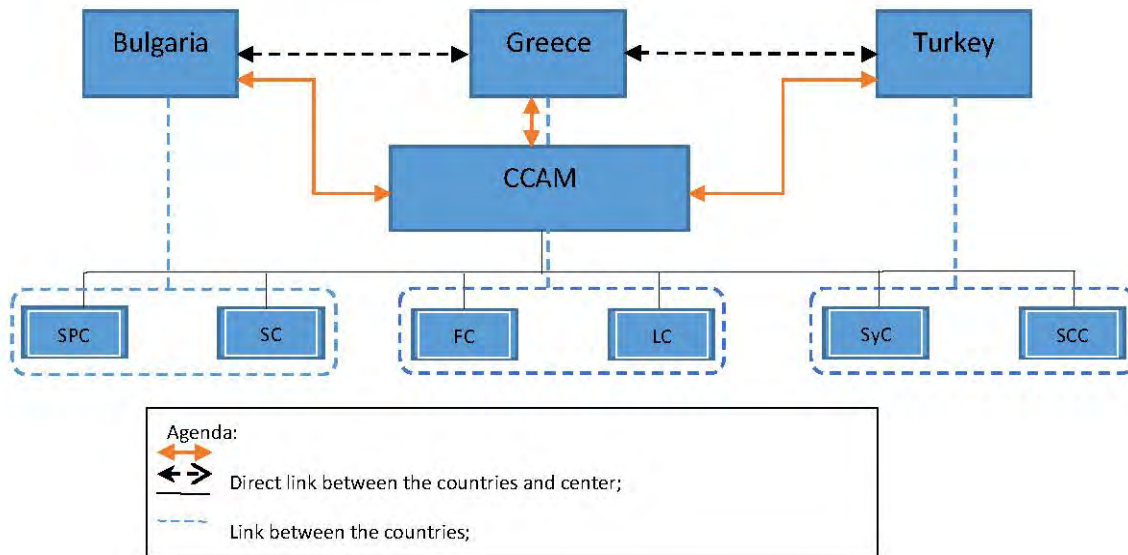


Figure 23. Proposed Centralized Structure for the Cent

Source: Created by author.

A third option would be to have a combination of parallel and centralized, in which one country can be the lead or each country could lead in a specific area or develop specialize units. Of course, all of that is dependent upon the agreements and national interrests.

Further Research

The author suggests future research in the areas of security forces, health system, refugees, and analysis of the Turkish and Greeks point of view. Each of these suggestions for future research can be modified in acordence with the specific case.

The first suggestion would be to answer the question, What type of security forces we need, because of the climate change? The focus of this question would be the changed environment influenced by climate change as a threats multiplier. Do the three countries need a new type of security force that can response to the new threats and be ready to function in this much more complex and dangerous environment? What types of new capabilities will this new security force need to have to respond to the new threats? Do they have to work together or would they function nation by nation?

The second suggestion would be to answer the question, Can the climate change destroy the national health system, and how this can become a security threat? The focus of this question would be how the national health system is influenced by climate change. How can the threats multiplied by climate change destroy the whole health system by changing the environment, reducing the resources, increasing disease, and migration pressure? How can this become a security threat, and if it is what will be the possible adecvat reaction?

The third suggestion would be to answer the question, How do the climate change refugees change the society of the countries and how this can become a security threat?

The focus of this question has to be on the analysis of where and when refugees can come, what is their nationality, culture, religion , and are they ready to be absorb into the society or not? What will the security implicationsfor this and how can the Balkan countries prepare themselves?

The last suggestion is to answer the question, How is climate change as a threat multiplyer going to create threats in the Balkan Penunsila from the Turkish or Greek perspective? The focus of this question has to be the Turkish or Greek points of view for this problem. The best option is to use just one of the counties and to compare with the others, based of the different perceptions of the problem, based on the diferent cultures, and religions.

Conclusion

Climate change, as a threat multiplier, will increase the level of threats all over the world. If action is not taken to adapt and mitigate these threats, they will increase every single year and start threatening our existence. The cost to rebuild or fix the damaged infrastructure will increase too, but most dangerous will be the human cost. Society will pay this price if the political leaders around the globe are not ready to implement new policies for adaptation and mitigation. The political, economy, educational, energy, health and security systems should start preparing, and building new capabilities and capacities for this future.

Climate is a global issue and the changes are global too, which means, there is no place in the world that the climate change will not affect. No matter in which continent

your country is, or how green your society lives, the change will affect you. The only way to decrease the damages and the casualties will be to start preparing the society, the country or the region to adapt, and to change for the new realities.

From all that is presented from chapter 1 to chapter 4, it is obvious that even if action is taken now, the climate change will still have affects for at least the next 100 years. The real change back to normal climate levels is going to happen after 100 years. Chapters 2 and 4 showed how the three governments of Bulgaria, Greece, and Turkey define the climate change as a real threat for their countries at the strategic level, but after that in operational and lowest level they do not target the problem, they target the symptoms.

Even when the problem is defined correctly, if you are not targeting its roots, the problem is growing, increasing, and become bigger and bigger. Finally, the price to fix it will be much higher and it will increase proportionally to the threats.

The political will to change and adapt to this new environment is the most important. As Americans say, if there is a will there is a way. The political leaders have to lead the society, to inform them of the threats, and to unite the nations and regions to deal with that. There is no simple answer to the complex problems, they have to be studied to find their roots.

The agreements between the countries, the will to share resources equally, and to work together is the key for successes. To unite different cultures and countries which has different histories, culture and languages is a challenge, but it is not impossible. The EU is a good example of that.

To summarize, the climate change as a threat multiplier will change the environment of the Balkan Peninsula, and it will be followed by a resource crisis. The biggest threat is water scarcity. Reduced water resources will have a tremendous impact on the three countries, their economies, and societies will react to the stress and it is the governments' responsibility to avoid the conflict. The only peaceful solution is to work together for the good of the three nations.

¹ Crisis Management and Disaster Response Center of Excellence, "About Us," accessed May 10, 2015, http://cmdrcoe.org/About_us/2.html.

BIBLIOGRAPHY

Books

Brundtland, Gro Harlem. *The Global Water Crisis: Addressing an Urgent Security Issue*. Edited by Harriet Bigas, Tim Morris, Bob Sandford, and Zafar Adeel. Hamilton, Canada: UNU-INWEH, 2012.

Dabelko, Geoffrey D. *Global Environmental Change and Human Security*. Edited by Richard Matthew, Jon Barnett, Bryan McDonald, and Karen O'Brien. Cambridge, MA: The MIT Press, 2010.

Periodicals

Myers, Norman. "The Environmental Discrimination to Security Issues." *The Environmentalist* 6, no. 4 (1986): 251-257.

Government Documents

Department of Defense. *Quadrennial Defense Review 2014*. Washington, DC: Government Printing Office, March 2014.

Director of National Intelligence. ICA 2012-08, "Global Water Security: Intelligence Community Assessment." Washington, DC: Office of the Director of National Intelligence, 2 February 2012.

Kibaroglu, Aysegül, Axel Klaphake, Annika Kramer, Waltina Scheumann, and Alexander Carius. F+E Project No. 903 19 226, *Cooperation on Turkey's Transboundary Waters*. Adelphi Research and German Federal Ministry for Environment, Nature Conservation and Nuclear Safety, October 2005.

King, Wendell C., Colonel. *Understanding International Environmental Security: A Strategic Military Perspective*. Atlanta, GA: U.S. Army Environmental Policy Institute; November 2000.

_____. Ph.D., P.E., BSEE, Dean of Academics. "Water Security—A Matter of National Defense." U.S. Army Command and General Staff College, Fort Leavenworth, KS, undated.

Republic of Bulgaria, Ministry of Environment and Water. *Third National Action Plan on Climate Change, for the Period 2013-2020*. Sofia, Bulgaria: Republic of Bulgaria, May 2012. Accessed 23 April 2015. http://www3.moew.government.bg/files/file/Climate/Climate_Change_Policy_Directorate/THIRD_NATIONAL_ACTION_PLAN.pdf.

Republic of Turkey, Ministry of Environment and Urbanization. *Turkey's National Climate Change Adaptation Strategy and Action Plan*. Ankara, Turkey: Republic of Turkey, November 2011. Accessed 8 January 2015. http://www.dsi.gov.tr/docs/iklim-degisikligi/ulusal_iklim_de%C4%9Fi%C5%9Fikli%C4%9Fi_strateji_belgesi_eng.pdf?sfvrsn=0.

_____. *Defense and Security Policy of the Turkish Republic*. Ankara, Turkey: Republic of Turkey, 2011. Accessed May 9, 2015. http://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=3&cad=rja&uact=8&ved=0CCwQFjAC&url=http%3A%2F%2Fwww.cidob.org%2Fen%2Fcontent%2Fdownload%2F30264%2F359449%2Ffile%2F241-248_ANEXO_POLITICA%2BDEFENSA%2BDE%2BTURQUIA_ANG.pdf&ei=LSzEVPbUBIf3yQTmj4LwAw&usg=AFQjCNHCyEyNUEkMyJfLK480nNy_dcRpQQ&bvm=bv.84349003,d.aWw.

проф. д-р Антон Попов, АНАЛИЗ И ОЦЕНКА НА РИСКА И УЯЗВИМОСТТА НА СЕКТОРИТЕ В БЪЛГАРСКАТА ИКОНОМИКА ОТ КЛИМАТИЧНИТЕ ПРОМЕНИ; ОПЕРАТИВНА ПРОГРАМА ОКОЛНА СРЕДА 2007-2013 [Popov, Anton, Ph.D. *Analyze the Risk and Vulnerability of Bulgarian Economy from the Climate Change; Operational Program Environment 2007-2013*. Sofia, Bulgaria: Republic of Bulgaria, 2007. Accessed 23 April 2015. http://www.moew.government.bg/files/file/Press/Konsultacii/2014/Obshta_chast.pdf].

РЕПУБЛИКА БЪЛГАРИЯ, МИНИСТЕРСТВО НА ЗЕМЕДЕЛИЕТО И ХРАНИТЕ, НАЦИОНАЛНА СТРАТЕГИЯ ЗА РАЗВИТИЕ НА ГОРСКИЯ СЕКТОР В РЕПУБЛИКА БЪЛГАРИЯ ЗА ПЕРИОДА 2013-2020г., НОЕМВРИ, 2013г [Republic of Bulgaria, Bulgarian Ministry of Agriculture and Food. *National Strategy for Forestry Sector Development 2013 -2020*. Sofia, Bulgaria: Republic of Bulgaria, November 2013. Accessed 28 September 2014. www.strategy.bg/FileHandler.ashx?fileId=4209].

РЕПУБЛИКА БЪЛГАРИЯ, МИНИСТЕРСТВО НА ОКОЛНАТА СРЕДА И ВОДИТЕ НА РЕПУБЛИКА БЪЛГАРИЯ, НАЦИОНАЛНА СТРАТЕГИЯ ЗА УПРАВЛЕНИЕ И РАЗВИТИЕ НА ВОДНИЯ СЕКТОР, 2012, Февруари 15, 2015 [Republic of Bulgaria, Ministry of Environment and Water. *National Strategy for Management and Development the Water Branch*. Sofia, Bulgaria: Republic of Bulgaria, 2012. Accessed 15 February 2015. <http://www.moew.government.bg/?show=top&cid=569&lang=bg>].

РЕПУБЛИКА БЪЛГАРИЯ, СТРАТЕГИЯ ЗА НАЦИОНАЛНА СИГУРНОСТ НА РЕПУБЛИКА БЪЛГАРИЯ, прието от 41-то Народно събрание на 25 февруари 2011 г [Republic of Bulgaria. *National Security Strategy*. Voted from 41 National Assembly. Sofia, Bulgaria: Republic of Bulgaria, 25 February, 2011. Accessed 15 February 2015. <http://www.moew.government.bg/?show=top&cid=569&lang=bg>], annex 1, 22-26.

Online Sources

Centre for Climate Adaptation. "Forestry and Peatlands, Greece." Accessed May 9, 2015. <http://www.climateadaptation.eu/greece/forestry-and-peatlands/>.

_____. "Tourism, Greece." Accessed 9 May 2015. <http://www.climateadaptation.eu/greece/tourism/>.

Crisis Management and Disaster Response Center of Excellence. "About Us." Accessed 10 May 2015. http://cmdrcoe.org/About_us/2.html.

Dedoose. "What is Mixed Methods Research?" Accessed 3 November 2014. <http://blog.dedoose.com/2012/10/what-is-mixed-methods-research/>.

Dictionary.com. "Threat." Accessed 23 April 2015. <http://dictionary.reference.com/browse/threat>.

Google. "Security." Accessed 23 April 2015. https://www.google.com/?gws_rd=ssl#q=security+definition.

Government of Canada. "Canada's Action on Climate Change, Causes of Climate Change." Last modified 10 December 2013. Accessed 28 September 2014. <http://www.climatechange.gc.ca/default.asp?lang=en&n=65CD73F4-1>.

GRID-Arendal. "Trans-boundary River Basins of the Balkans." Accessed 20 October 2014. http://www.grida.no/graphicslib/detail/transboundary-river-basins-of-the-balkans-overview_80e1#.

Hellenic Statistical Authority. "Population Projections of Greece 2007-2050." Accessed 23 April 2015. http://www.statistics.gr/portal/page/portal/ESYE/BUCKET/A1602/Other/A1602_SPO18_MT_AN_00_2007_00_2050_10_F_EN.pdf.

International Network of Water-Environment Centres for the Balkans. "Maritza-Evros-Meric Sub-Basin With Arda and Ergene Rivers." Accessed 13 October 2014. http://www.inweb.gr/workshops2/sub_basins/13_14_15_Evros_Ardas_Ergene.html.

_____. "Tundja/Tunca River Sub-Basin." Accessed 13 October 2014. http://www.inweb.gr/workshops2/sub_basins/16_Tunja.html.

Mongabay. "Deforestation Archive, Greece," Accessed 9 May 2015. <http://rainforests.mongabay.com/deforestation/archive/Greece.htm>.

_____. "Deforestation Archive, Turkey." Accessed 9 May 2015. <http://rainforests.mongabay.com/deforestation/archive/Turkey.htm>.

- Park, Madison. "Obama: No Greater Threat to Future Than Climate Change." *CNN*, 21 January 2015. Accessed 4 May 2015. <http://www.cnn.com/2015/01/21/us/climate-change-us-obama/>.
- Republic of Bulgaria, State Agency for Refugees of Republic of Bulgaria. "Migration Information and Statistics." Accessed 23 April 2015. <http://www.aref.government.bg/index.php?cat=8>.
- Turkish Statistical Institute. "Population Projections, 2013-2075." Accessed 9 May 2015. <http://www.turkstat.gov.tr/PreHaberBultenleri.do?id=15844>.
- UN News Center. "Ban Ki-moon's Speeches: A Quick Guide to Statements on Key Issues on UN Agenda." UN News Service, 16 September 2014. Accessed 28 September 2014. <http://www.un.org/apps/news/infocus/speeches/>.
- UN Water. "Water Security." Last modified 7 October 2014. Accessed 15 October 2014. <http://www.unwater.org/topics/water-security/en/>.
- Wikipedia. "Human Evolution." Wikipedia Foundation. Last modified 17 May 2015. Accessed 28 September 2014. http://en.wikipedia.org/wiki/Human_evolution.
- _____. "Powder Keg of Europe." Wikipedia Foundation. Accessed 3 May 2015. http://en.wikipedia.org/wiki/Powder_keg_of_Europe.
- World Population Review. "Bulgaria Population 2015." Last modified 5 January 2015. Accessed 23 April 2015. <http://worldpopulationreview.com/countries/bulgaria-population/>.
- World Travel and Tourism Council. "Greece." Travel and Tourism Economic Impact, 2014. Accessed 9 May 2015. rochelle.turner@wttc.org.

Other Sources

- Atay, Itri. "Water Resources Management in Greece: Perceptions about Water Problems in the Napflion Area." Department of Human Geography, Stockholm University, Stockholm, Sweden, November 2012.
- Barysch, Katinka. Policy Brief, "Turkey and the EU: Can Stalemate be Avoided?" Centre for European Reform, London, December 2010. Accessed 20 April 2015. http://www.cer.org.uk/sites/default/files/publications/attachments/pdf/2011/pb_turkey_eu_barysch_dec10-182.pdf.
- Intergovernmental Panel on Climate Change. *Climate Change 2014 Impacts, Adaptation, and Vulnerability Part A: Global and Sectoral Aspects*. Edited by Vicente R. Barros and Christopher B. Field. New York: Cambridge University Press, 2014.

_____. *IPCC - Climate Change 2014 Impacts, Adaptation, and Vulnerability Part B: Regional Aspects*. Edited by Vicente R. Barros and Christopher B. Field. New York: Cambridge University Press, 2014.