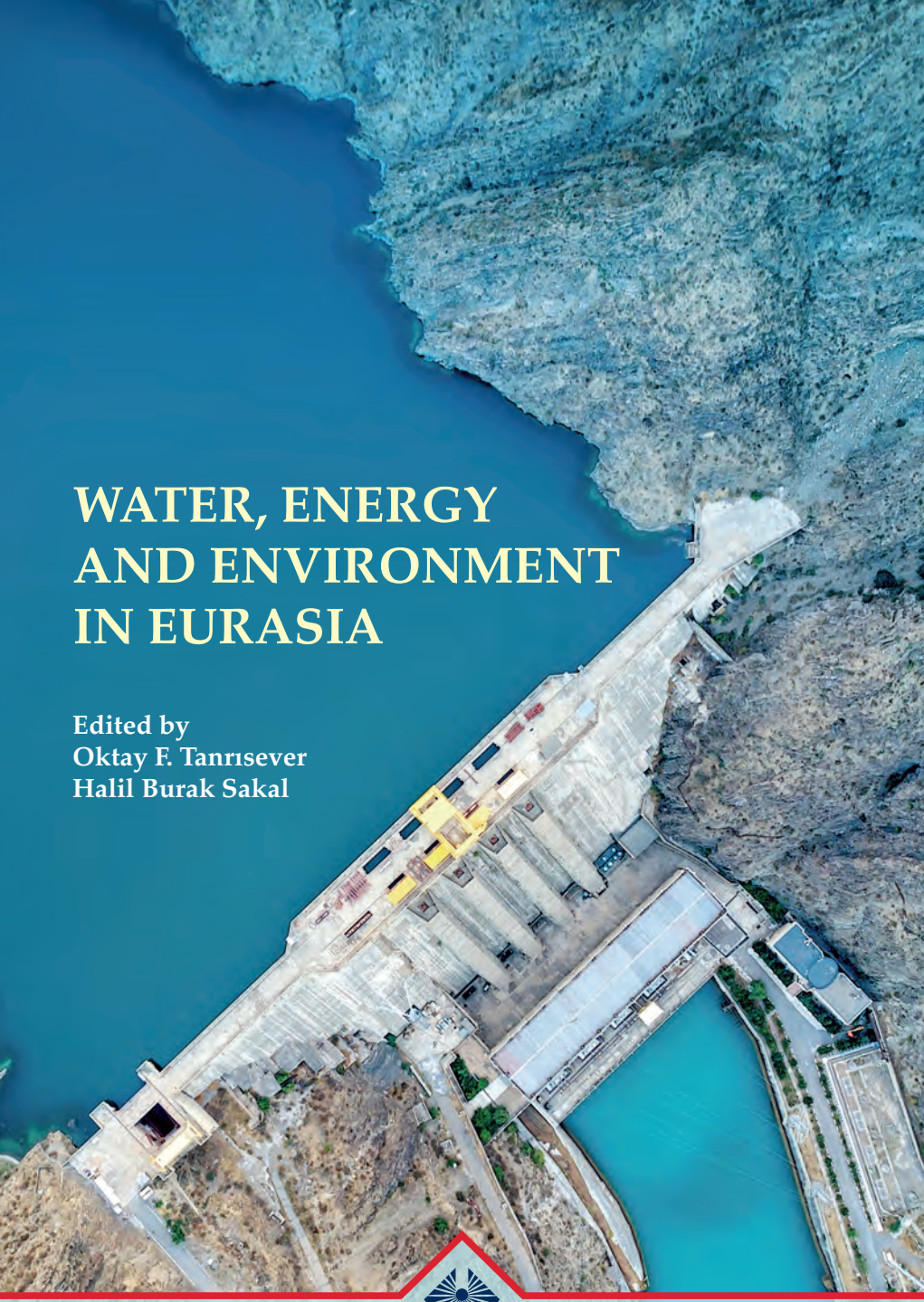
WATER, ENERGY AND ENVIRONMENT IN EURASIA

Edited by
Oktay F. Tanrısever
Halil Burak Sakal



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Part 3. Regional Level of Analysis

Introduction

Oktay F. Tanrısever, Halil Burak Sakal

Sustainability is a key challenge for all countries in all regions of the world. Climate change based on human activity makes the sustainable pursuit of water, energy and environmental policies even more challenging. In fact, the increased mobility of people and commodities, the increase in industrial and agricultural production as well as the growing volume of regional and international trade necessitate the greater uses of energy. Besides, the human beings have come up with many diverse and effective ways of generating energy for economic and daily life activities involving the exploitation of various types of fuels. The earth's energy resources are scarce, however, and energy generation activities are placing increasing pressure on the environment. Water lies between energy and the environment, being linked to them both as a crucial component of the environment and an important energy source.

To reduce the impact on the environment and to increase the level of livability on the planet, humans need to develop better and more sustainable ways of using water, energy and environmental resources. While the efficiency of traditional techniques is being continuously increased in energy generation, new and emerging technologies and innovations promise more significant energy production, requiring less effort and fewer investments. That said, engineering solutions and approaches to the resolution of the water, energy and environmental issues

the world is facing today are just one side of the coin, as political and economic approaches are also necessary if we are to gain a comprehensive and all-encompassing understanding of the situation. This book presents a political and economic approach to water, energy and environmental problems while taking into account the knowledge built on engineering solutions and methods.

The main subject of this volume is the inversely-related interdependencies of the Eurasian region's water, energy and environmental matters. The inversely-related interdependency between energy and the environment is more visible in water resources management since water is a central component of both the ecological system and hydropower production systems. In fact, increases in the use of energy and water resources tend to result in the intensification of environmental problems. The adoption of more effective environmental protection policies requires a reduction in energy production and consumption, and this inverse relationship makes achieving sustainability – a critical criterion in any long-term development strategy – an even more difficult target.

Eurasia is one of the regions that has been most affected by developments in the water, energy and environmental nexi. It is a vast region with tremendous variety in its geographic, climatic and environmental characteristics. While aridity and water scarcity are crucial problematic issues in some parts, floods and seasonal variances in precipitation are the bane of others, all of which are issues that can only be resolved through transboundary efforts and regional cooperation. Some parts of the region are rich in hydrocarbon reserves, while others lack such reserves, but are rich in water resources. The region can lay claim to one of the most devastating environmental disasters in history that resulted in the disappearance of the Aral Sea, recognized as one of the worst human activity-based problems

in the water, energy and environmental nexi in Eurasia. Needless to say, the effective management of environmental and water challenges of this region requires the development of a sustainable regional cooperation framework among the regional governments and peoples.

Throughout the Eurasian region, it is possible to observe growing interdependencies between the water, energy and environmental nexi in the post-Soviet period (Wegerich, 2009). The change in political boundaries since the collapse of the Soviet Union has increased the level and variety of intergovernmental relations, but also the intensity of political and economic tensions. Inherent problems and infrastructure issues pose increasing challenges to regional sustainability and development. The former Soviet-era interconnections and complex regional interdependencies related to various commodities, including oil, natural gas, electrical energy and food in Central Asia and the Caucasus, ceased to exist in the post-Soviet political setting. The growing economies, increasing populations and mounting regional conflicts intensified the search for energy and food security, placing stresses on water resources and the environment as a whole.

This book explores the challenges related to the growing linkages among the water, energy and environmental nexi in the mostly post-Soviet Eurasian region. The authors of this volume focus in particular on Central Asia, the Caucasus and the Balkans. While the Central Asian countries of Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan and Uzbekistan, and the Caucasian countries of Georgia, Armenia and Azerbaijan, are former Soviet republics, Turkey and Bulgaria both bordered the former Soviet Union, and so today share water resources and a common environment with the post-Soviet nations. For analytical purposes, therefore, this book considers Eastern Europe and Turkey to be adjacent to Eurasia, even though they

are more connected to Europe and the Middle East in terms of their water, energy and environmental relations.

All these countries have energy interconnections in the form of pipelines and electricity transmission lines that date back to the Soviet era. The water, energy and environment policies and relations among and between these countries entered a new era after the dissolution of the Soviet Union, with the inherent legal, institutional, infrastructural and physical connections in the presence of non-centrally-planned economies and new forms of political systems.

Although the nexus approach is widely recognized in international academic literature as a sound explanatory conceptual framework for studies of the relationships between water, energy and the environment in general, scholarly works on the nexi of water, energy and the environment in Eurasia are relatively rare, and those that have been penned cover only specific subregions of Eurasia, such as Central Asia (Kostianoy et al., 2018) rather than Eurasia as a whole. Scholarly analysis of this topic is critical since existing literature focuses either on the energy or environmental dimensions, or embraces engineering-based technical approaches and solutions. This book has a broader spatial coverage and takes a political-economic approach to the nexus issue, based on the understanding that Eurasia's water, energy and environmental problems are interrelated, notwithstanding their Soviet past and former or current political and economic dynamics.

Fortunately, there is a wealth of academic literature on water, energy and environmental issues in Eurasia, among which the major works can be categorized in terms of their focus on water, energy and the environment, or the geographical subregions of focus. That said, the geographical foci of these studies cannot be considered to be even among the sub-regions of Eurasia, as there is a clear majority of academic studies on

Central Asia's water, energy and environmental problems over those of the Caucasus and other parts of Eurasia.

As noted above, academic literature on the water, energy and environmental issues of adjacent parts of Eurasia, such as Eastern Europe and Turkey, is critical, as these studies partially employ the nexus perspective that is widely used in academic literature on water, energy and environmental issues in Europe. For example, one noteworthy publication, being Annika Kramer, Aysegul Kibaroglu and Waltina Scheumann's edited volume *Turkey's Water Policy: National Frameworks and International Cooperation* (Heidelberg: Springer, 2011) outlines the key issues in Turkey's water policy in which some chapters employ the nexus approach. Unfortunately, this publication falls short of identifying the linkages between the energy and environmental dimensions due to its primary focus on the water and environment relationship, with less emphasis on the energy issue.

The research paper of Campana et al. entitled "Science for Peace: Monitoring Water Quality and Quantity in the Kura-Araks Basin of the South Caucasus" focuses on the relationship between the quality and quantity of water, and the common problems related to quantity, quality and water allocation in the basin (Campana et al., 2008), but disregards Turkey in its analysis, as well as the linkages between the energy and environment dynamics, to a large extent. Similarly, Ghazaryan's chapter entitled "Resource Management Problems in South Caucasus Region" (2009) focuses on the governance aspect of water resources in the South Caucasus, but similarly, fails to establish or analyze the connections between water, energy and the environment from a systemic perspective. Dukhovny and Schutter's (2011) comprehensive book *Water in Central Asia* deals with all water problems in the region, but overlooks the linkages of energy and the environment and similar dynamics in

Central Asia, as well as in other parts of the post-Soviet Eurasian geography.

There are several other noteworthy publications on water, energy and the environment in Eurasia. For example, the article entitled "Dryland belt of Northern Eurasia: contemporary environmental changes and their consequences" by Groisman et al. focuses on part of Eurasia in its comparison of the drylands in the south and the forest lands in the north in terms of environmental changes and their impacts. This article, however, ignores the energy aspect of the problem (Groisman et al., 2018). In a similar vein, Stucki and Sojamo (2014) examine the water, energy and security nexus in Central Asia, emphasizing the security aspect of the local, national and international linkages between water and energy. The authors concentrate on water and energy security in Central Asia, although the environmental aspect remains largely overlooked in this very important study.

Although the body of related academic literature is rich in terms of scholarship quality and its coverage of sub-regions and countries, the new challenges related to the growing interconnections between water, energy and environment issues require a re-examination of the changing dynamics between them. This volume seeks to contribute to academic literature by emphasizing the importance of the nexus approach in explorations of water, energy and environment issues throughout the Eurasian region.

In general, the chapters in this book assume the presence of an evolving regional complex in Eurasia including the five Central Asian states of Kazakhstan, Kyrgyzstan, Turkmenistan, Uzbekistan and Tajikistan; the three Caucasian countries of Georgia, Armenia and Azerbaijan; and finally Turkey, as well as some of the neighboring countries with close connections to the water, energy and environmental resources of this region.

The nexus approach is often conceptualized as a more comprehensive response to the challenges encountered when covering the state, civil society, the private sector and those responsible for environmental sustainability and productivity in an inclusive analytical framework. Although water is the central nexus element, the nexus is not the same as Integrated Water Resources Management (IWRM). According to the Global Water Partnership, IWRM is "a process which promotes the coordinated development and management of water, land and related resources, to maximize the resultant economic and social welfare in an equitable manner without compromising the sustainability of vital ecosystems" (Global Water Partnership, 2011), and is a redefinition of a concept first suggested in the 1960s (Giordano & Shah, 2014). At an international level, it first entered the agenda of the World Summit on Sustainable Development in 2002 (Rogers & Hall, 2003). Some studies in literature have attempted to merge the nexus approach with the IWRM approach. Benson et al. argue that the primary concerns and goals of the IWRM and the nexus approach coincide, to a significant degree, although the IWRM has been more dominant as international bodies have adopted it as a direction for development (Benson et al., 2015).

Another approach to water and environmental problems is "water governance", being "a complex process that considers multi-level participation beyond the state, where decision making includes not only public institutions, but also the private sector, civil society and society in general" (Tortajada, 2010, p. 298). Similar to the nexus approach, water governance embraces political, economic and social processes and institutions, although the nexus approach is about compromise and trade-offs, as well as the cooperative frameworks of water, energy and environmental resources in a given region. The nexus approach embraced in this book, on the other hand,

takes into consideration the issues and problems of the environment, along with water use, pollution, energy generation, production and transfers.

At this point, it is important to note that there is no single "nexus", but rather a range of "nexi". There are various conceptualizations of the nexus approach in literature, in which it is used both as an analytical tool for academic research, and as a governance framework linked to sustainability issues. The nexus approach in governance often relies on multisectoral and multistakeholder processes on multistate or regional levels (Keskinen et al., 2016). Food systems are often included in nexus analyses, as agriculture is highly reliant on irrigation systems and the reservoirs created primarily for hydropower generation (Granit et al., 2014; Hamidov et al., 2022; Jalilov et al., 2018).

The water-energy nexus, which is central to our book, is another common topic of interest in academic literature (Ackerman & Fisher, 2013; Biswas, 2008; Gleick, 2014; Hussey & Pittock, 2012; Sovacool & Sovacool, 2009). This conceptualization emphasizes that water and energy depend on each other at a system level (Dodder, 2014). From this perspective, energy is required for such processes as the capturing, pumping, transfer and treatment of water, while water is consumed for mining, hydraulic fracturing, refining oil and gas, power plant cooling and hydroelectricity generation (Cooley & Donnelly, 2014; Hussey & Pittock, 2012). Many of the thermoelectric power plants built during the Soviet era use large volumes of water for cooling systems, while the more updated systems use water more efficiently (Dodder, 2014).

The nexus approach enables researchers to explore the relationships between the different dynamics that shape the complex relationship between water, energy and the environment. In fact, the large quantities of water used in the lifecycle of energy (oil, electricity, bio-energy) raises issues of sustainable

water and energy production, water degradation and pollution, as well as ecosystem damage (Wu et al., 2008). Agricultural activities also have a large water footprint (Hoekstra et al., 2011; Hoekstra & Mekonnen, 2012). Globally, agriculture uses 70 percent of all freshwater withdrawn in the world. As a general observation, it can be stated that the Central Asian republics of Uzbekistan, Turkmenistan, Kyrgyzstan and Tajikistan, and the South Caucasus nation Azerbaijan are serious water users. According to the World Bank's World Development Indicators, last updated in 2022, these countries withdraw over 90 percent of their freshwater resources for agricultural processes (World Bank, 2022).

Needless to say, water, energy and environmental policies are politically and economically interconnected, with policies aimed at developing one sector increasing the burden on others (Allan et al., 2015). Development strategies and market mechanisms, if left unregulated, may have considerable impacts on the environment. Researchers have reported on the significance of climate change in assessments of the nexus (Welsch et al., 2014). The adverse impacts of water shortages and climate change may be reversed through better water and environmental policies (World Bank, 2016).

The trade of electricity and the interconnections between regional electricity distribution networks have a strong influence on the international political economy of energy, as well as the nexi of water, energy and the environment. Hydroelectricity is a critical element in the water and energy nexus (Oud, 2002). In most Eurasian countries, hydroelectricity is seen having the potential to boost economic activity and ensure growth, especially in hydrocarbon-poor countries (Bartle, 2002). On the other hand, large dams and hydropower plants can have significant negative impacts on the environment in these regions (Berga et al., 2006). It is argued in literature that

environmental concerns must be taken into consideration when supplying people with energy and electricity (Egré & Milewski, 2002). After the environmental necessities are met during electricity generation, the benefits of integrating renewable power production can be considered, and the nexus approach can be seen as a key analytical tool for the identification of the factors necessary for the achievement of sustainable and equitable investments in water, energy and environmental resources. In this respect, the nexus approach allows political, administrative, economic and socio-economic dynamics to be conceptualized in a more meaningful and comprehensive way.

This book as a whole seeks to answer the following key questions: What are the major conceptual issues with regards to the water, energy and environment nexus? What are the key challenges and drawbacks faced by the countries in the Eurasian region in responding to the nexus issues? How can regional cooperation be developed so as to mitigate nexus-related sustainability problems? What are the future implications of the current challenges in the regional and global environment?

The book is presented in three parts that address these questions systematically in terms of the employed conceptual framework and levels of analysis. The first part focuses on the conceptual framework for exploring the key issues and theories on the water, energy and environment nexus. The second part concentrates on individual countries in Central Asia and the Caucasus and Turkey. In the third part, the book discusses the regional and international aspects of water, energy and environmental issues in Eurasia.

In the first chapter, Sakal and Tanrisever outline the book's conceptual framework by focusing on the academic literature on various aspects of the water, energy and environment nexus at a systemic level, suggesting that water, energy and environmental dynamics rely on each other. The first chapter, in this

respect, reviews the nexus approach and its impacts on policymaking in the Eurasian region. The authors argue that the nexus approach, as an analytical tool, supports scientific research and is being increasingly embraced not only as an analytical framework by researchers, but also as a governance framework by politicians and decision-makers in the Eurasian region.

In the second chapter, Kushanova, Kurbanov and Franco discuss the water, energy and food security nexus in Turkmenistan, arguing that Central Asian countries are particularly vulnerable to the risks of climate change, in a country like Turkmenistan, which is predominantly desert, water and arable land are scarce and valuable commodities. The authors focus on the reconstruction of the traditional sardob water reservoirs and their modernization with solar-powered pumping stations as a case study.

The third chapter focuses on the water and electricity nexus in Turkey, where hydropower is emphasized as a key target in Turkey's economic development plans, being considered as a possible solution to the rising electricity demand in Turkey's rapidly industrializing and urbanizing socio-economic system. Tüney argues that hydropower contributes to Turkey's efforts to reduce its energy dependency on other countries while being carbon-free, cheap and clean. In Turkey, as this chapter shows, the construction of large dams has been one of the focal points in the country's development strategy.

In the fourth chapter, Güler discusses the characteristics of water and energy security issues in Armenia. This chapter aims to clarify the role of hydropower in the energy security of Armenia. Armenia possesses significant water resources and considerable precipitation to feed those resources, but no fossil fuel resources like its Tajikistani and Kyrgyzstani counterparts in Central Asia, and so must depend on foreign resources. In this

context, hydropower stands as the most significant domestic resource for Armenia.

The fifth chapter analyzes the hydropolitical conflicts in Central Asia using Rogun Dam as a case study. Tanrisever and Sakal seek to identify the opportunity structures available to the conflicting parties of Tajikistan and Uzbekistan through a mixed methodology involving the use of quantitative and qualitative data about hydropower resources, as well as the water resources devoted to agricultural use. The chapter argues that Uzbekistan's change in position on this issue from being conflictual to more conciliatory can be understood from the hydropower resource data, as well as the water resources for agricultural use, and the relevant countries' policy options and peaceful settlement alternatives.

In the sixth chapter, Kurt analyzes the Maritsa River Basin and its beneficiary countries of Turkey, Greece and Bulgaria from three main perspectives: water quality, agricultural activity and energy benefit. The chapter also gives place to bilateral agreements and the flood problems faced by Turkey in the Maritsa region, and puts forward some possible solutions. The chapter argues that water supply and demand issues can be resolved through transboundary coordination and cooperation among the countries involved.

In the seventh chapter, Abdullaev and Rakhmatullaev discuss water security and climate change in Central Asia. Building the chapter on the understanding that there is a need for global recognition and acceptance of the importance of the interlinkages between water, energy, food and the environment for national development and prosperity. The economies of the arid Central Asian countries are growing and integrating with the global value chains, yet the transition from a centralized to more market-oriented economy is not yet complete. As the

authors discuss, these countries have declared their commitment to global climate change agreements and sustainable development goals. The main goal of this chapter is to provide a comprehensive assessment of the main issues and perspectives related to the irrigation, energy, agriculture and water sectors in the context of water-secure economies and risk management under potential climate change projections.

In the penultimate chapter, Reznikova, Sarikenova and Melian focus on water and the environment in the shared basins of Central Asia. The authors show that the Central Asian countries are continuing to develop legal frameworks for water resources management, including those related to water quality, since independence. The majority of water quality standards currently in use in Central Asia are based on the Soviet system. Besides, the characteristics and the classification system of these water quality standards fail to comprehensively demonstrate the status of the water quality in water bodies in an accessible way for all water users in Central Asia. Based on the comprehensive interviews with regional experts on water quality management, the chapter examines the main barriers to the implementation of legislation aimed at transitioning to a new classification system related to water quality in Kyrgyzstan, Tajikistan, Turkmenistan and Uzbekistan. Finally, space in the chapter is spared for an analysis of the current water quality provisions and for the presentation of recommendations for the countries in the region.

The book closes with a concluding chapter in which the key findings of each chapter are identified and discussed in line with the overall perspective of the book.

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