



WATER RESOURCES MANAGEMENT AS A FACTOR OF
REGIONAL STABILITY, WITH REFERENCE TO THE
CASE OF CENTRAL ASIA

Submitted by

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***“The water problems facing our world need not be
only a cause of tension; they can also be a catalyst for
cooperation...
If we work together, a secure and sustainable water
future can be ours.”***

Message of Former United Nation's Secretary General Kofi Annan on the World

Water Day observed 22 March, 26/02/2002

Abstract

It is commonly argued that water security will shape the course of the 21st century. The interconnection between the availability, access and distribution of natural resources, political and economic stability, community prosperity and the potential for conflict are indisputable. Water was once considered as an abundant resource, whereas now is increasingly seen as a scarce one, which ought to be managed judiciously. Consequently, water and water supply systems are being used both as an excuse and a vehicle for tensions and disputes, since competition for limited resources can lead nations to find that access to water pertains to sensitive matters of national security. The current dissertation paper will try to demonstrate that, even though water resources can foment regional conflict, they are not the sole impetus for the emergence of the latter. Rather, cooperation on water resources management seems to win the game of benefits, and, in most cases, the establishment of multilateral or bilateral treaties prevail. However, even if the states manage to create a regulative, monitoring and cooperative framework, they fail to comprehensively conform to that and self-restrain. Furthermore, the theory of Integrated Water Resources Management (IWRM) will be outlined, while demonstrating that its elements have the ability to assist to the stabilization and development of certain problematic regions- though this assistance is rather “à la carte”.

Last but not least, the proposed dissertation will analyse the case study of Central Asia region. This particular area is of great research interest, due to its nature: The territory comprises of the democratic states of Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan, and Uzbekistan. Those states tend to securitise water-related issues, motivated by national concerns over economic development, the need to control ethnic tensions and social uprisings, as well as the desire to manage environmental degradation and population growth. Most major environmental issues in Central Asia are related to the allocation, use and protection of the quality of water resources. A regional approach to protecting these resources is essential, as the region is connected through cross-boundary rivers, lakes and seas. The proposed dissertation aims to apply the aforementioned theories in order to explain the issues of this area, while seeking for potential solutions that could provide a more sustainable and peaceful future to the area.

Keywords

International Security, Water Conflicts, Integrated Water Resources Management, Regional Security, Central Asia.

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List of Abbreviations

CA	Central Asia
ICWC	Interstate Commission for Water Coordination
IHP	International Hydrological Programme
ISARM	Internationally Shared Aquifer Resources Management
IWRM	Integrated Water Resources Management
IWT	Indus Water Treaty
MENA	Middle East and North Africa
SDGs	Sustainable Development Goals
UN	United Nations
UNCED	United Nations Conference on Environment and Development
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
UNESCO	United Nations Educational, Scientific and Cultural Organisation

UNFCCC	United Nations Framework Convention on Climate Change
UNSD	United Nations Statistics Division

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Author

Papathanasiou Anastasia

Introduction

« Nous oublions que le cycle de l'eau et le cycle de vie sont un. »

(We forget that the cycle of water and the cycle of life is one)

Jacques Yves Cousteau

The Industrial Revolution, a 300-year period during which humans established dominance within nature, was defined by many distinctive features. The cascade of powerful, transformative technologies and the interdependence between happiness and consumption, among others, invigorated the rapid transubstantiation of natural resources into private property and other commodities. Industrial man, imbued with motivation and capability, seized the opportunity to transform nature into material.¹ But the lust for the latter did not come with no consequences for the former. Back in 1948, Fairfield Osborn underlined the crucial role of diminishing productive lands (due to either «slash and burn practices», intensive agriculture or the establishment of industrial areas) and increasing population pressures as one of the primordial causes that would make individual nations project hostile attitudes and destabilise international order.²

The growing environmental toll as a result of the process of industrialization lead inevitably to the gradual increase of research and policy's interest in the links between environmental change and security.

A potential revolutionary change in the world politics has been a series of de facto redefinitions of “international conflict”. Even though the term still includes the “good”, old-fashioned war (i.e. a violent confrontation between nation states through their own armed forces or proxies), some conflicts, regardless of the fact that two parties are not fighting each other, are also treated as threats to international status quo, security and, finally, peace.

¹ Matthew, Richard A, *Man, the state and nature: rethinking environmental security* in Dauvergne, Peter (ed.), *Handbook of Global Environmental Politics*, Edward Elgar Publishing Limited, UK, 2005, p. 127

² Osborn, Fairfield, *Our Plundered Planet*, Grosset and Dunlap, New York, 1948, p. 200-201. **Fairfield Osborn Jr.** was a conservationist and a longtime president of the New York Zoological Society. His work *Our Plundered Planet* became very influential in the early Environmental Movement and inspired a Malthusian revival during the decades of 1950 and 1960.

Environmental security was not considered as a part of mainstream international security studies in the early 1980s, yet it is hard to imagine it being excluded from the modern literature. From the 1970 onwards, as the nuclear relationship between the nation- states then superpowers³ matured, the original breadth carried by the term “**security**” began to re-emerge, and the pressure to widen the international security agenda away from the traditional military–political focus became more and more intense. Consequently, the subfield of environmental security expanded rapidly.

The emergence of the concept of environmental security has proportionate knock-on effect on the issue of armed struggles that are driven by the countries’ motives of occupying and managing natural resources. Environmental factors are rarely, if ever, the sole cause of violent conflict. Ethnicity, adverse economic conditions, low levels of international trade and conflict in neighbouring countries; all these are factors significantly correlated with each other, along with natural resources. However, it is clear that the exploitation of natural resources and related environmental stresses can become significant drivers of violence. Disputes over the ownership, use and extraction of them often play a disruptive role in peace, especially for fragile states of the developing world, where different natural resources are vital for their economies, thus the likelihood of violent conflict within their territories or between neighboring countries rises. There is growing recognition among researchers and decision-makers that in many of the aforementioned states, disputes over these resources have fed into, and underpinned, violent conflict and instability. Research suggests that 40–60 per cent of civil wars over the past 60 years have been triggered, funded or sustained by natural resources.⁴

The proposed dissertation chooses to focus on the security implications of one of the most vital natural resource; the one that shapes the history, the culture and the economies of countries around the world: **water**. Water was once considered as an abundant resource, whereas now is increasingly seen as a scarce one. The urgent need of resolving the problem of water access, usage and exploitation is more eminent

³ I.e. the United States of America- hereinafter referred to as USA- and the Union of Soviet Socialist Republics - hereinafter referred to as USSR or Soviet Union.

⁴ United Nations Environmental Program (UNEP) *From Conflict to Peacebuilding – The Role of Natural Resources and the Environment*, United Nations Environmental Program, Nairobi, Kenya, 2009, p.8.

among countries that share water resources. New patterns of relationship between riparian countries are characterized by water scarcity, climate change, extended pollution, and intense competition to develop modern infrastructure on transboundary aquifers, such as the advanced engineering technologies applied to build mega-dams in different regions (e.g. Aswan in Egypt, GAP in Turkey, Sardar Sarovar in India). Those relationship patterns are gradually revealing a rather aggressive, conflictual nature of theirs. The countries do not hesitate to use water and water supply systems both as an excuse and as a vehicle for tensions. The competition for limited resources can lead them to find that access to water pertains to sensitive matters of national security. Uncertainties in predicting the exact space-time of the appearance of water conflicts do exist; and, while violent disputes over transboundary water may actually be rare, political conflicts of interest over shared water resources are not. This is the case particularly in occasions where the relationship between riparian countries is already tense for other economic and political reasons and where riparian countries depend on shared international rivers or lakes to meet most of their domestic demands, like India-Pakistan on the Indus River and other rivers and China- India on the Brahmaputra River. Between 1900 and 2001, 17 water disputes with military force used occurred⁵.

Even though transboundary aquifers can pose potential for conflict, they can also open the window for cooperation. That cooperation need to be substantive, soothe the acute feelings of mistrust among the countries and be based on mutual understanding and the application of effective measures for managing water resources. But, first and foremost, requires commitment to the policies adopted.

The aim of the proposed dissertation is to portray that the integrated management of water resources⁶ can significantly add to the efforts conducted by the players of the international system (directly or indirectly interested parties) to normalize bilateral and/or multilateral relations, promote peace-building processes with durable results and ensure the- economic, environmental, societal and political-sustainability of a given region. However, tangible and dynamic changes shall be able

⁵ Dinar, Shlomi, *Scarcity and Cooperation along International Rivers*, Global Environmental Politics, Vol.9, Issue 1, February 2009, p. 109

⁶ i.e. **The Integrated Water Resources Management Theory** (for further analysis read Part I, Chapter 2 of the present dissertation).

to work in practice, not just in the analysis that have been outlined in dry theoretical schemes by scholars. Hence, the case study of Central Asia's region was selected to serve the purpose of the proposed dissertation.

Water has been a major cause of conflict in Central Asia for a long time in the history of the region. The root of the problem is considered to be the disintegration of the resource-sharing system imposed on the region until the collapse of «real socialism» in 1991 by the Soviet Union. By the end of the 1990s, that system had stopped functioning, and a plethora of bilateral and regional agreements and resolutions concluded in that decade could not bring the desirable results, let alone fix it. The security environment is bleaker, while the concerns of inadequate infrastructure, poor water management and obsolete irrigation methods remain unaddressed. Government officials appear disinclined to cooperate on any of the region's main problems; suspicion, security dilemmas and icy relations could describe the situation. International partners, such as the former motherland Russia, the European Union and the United States of America claim that they are incapable of interfering and effectively assisting in this matter, until the countries cease to be fixated on a narrow interpretation of national interests. Simultaneously, attempts at comprehensive regional solutions have foundered on cageyness.

Nonetheless, for all its complexity, the water issue could be resolved. It is an objective problem, and equitable distribution and a concomitant energy exchange can produce tangible benefits for all. As a Swiss water specialist observed, “water can be a driver of conflict, but it can also be a driver of peace”⁷. For this reason, the proposed dissertation attempts to examine whether the implementation of the Integrated Water Resources Management policies and methods could give these states an opportunity to alter the current detrimental status quo and move forward to a more sustainable future.

Much of the current research has focused specifically on the linking of environmental changes and violent conflict. As a consequence of rising environmental distress across the world, researchers and institutions have attempted to define the links between the environment and security. However, that exact appearance of

⁷ International Crisis Group, *Water Pressures in Central Asia*, Europe and Central Asia Report N°233, Brussels, Belgium, 11 September 2014, p. i

environmental and, especially, water security studies has divided those who debate the water -environment-security relationship and questioned the way scholars should define security; i.e. in a broad or narrow manner.

The water-conflict nexus is an area that continues to interest the academia and policy literature, as well as the mass press. The lack of global-scale, quantitative tools for evaluating interactions over shared water resources ascertains that individual case studies are the ones that provide the foundation for the majority of the current literature and while global evaluations are rare. As Yoffe and al. argue, existing work excludes examination of cooperation, spatial variability, and precise definitions of conflict, as it tends to entail case studies originating mostly from volatile areas; and, while literature occasionally stresses several biophysical, social, economic or political indicators for conflict, such as proximity, government type, aridity, and rapid demographic changes, comprehensive methodologies for evaluating them are rarely offered.⁸

What differentiates the proposed dissertation and the scholar research conducted so far is the approach applied to the water-security nexus and particularly to how this is identified in Central Asia. While trying to address the link between water and peace, many researches either only focus on conflict prevention and management, or try to resolve the issue on the grounds of Water-Energy-Food nexus or on the concept of hydro-hegemony. The presented dissertation, as previously mentioned, tries to implement the aims of sustainability **through** a lens of conflict prevention. As it is intensively underlined, when basins and streams run dry, tensions flare – between communities, and across borders. Thus, a complex problem requires simple, flexible and systematic solutions.

Following the aforementioned brief introduction to the reasoning that lays the foundation of the proposed dissertation, one could perceive the interdisciplinary nature of global water politics and its unique- though ambiguous for a significant amount of scholars - role in international security studies. This complexity necessitates holistic and overarching approach, accompanied by modern and innovative means; those means shall be in accordance with any development in the

⁸ Yoffe, S., G. Fiske, M. Giordano, M. Giordano, K. Larson, K. Stahl, and A. T. Wolf , *Geography of international water conflict and cooperation: Data sets and applications*, Water Resources Research, Vol. 40, 2004, p.1

fields of science, law and politics. Furthermore, the case of Central Asia provides a sound example for the examination of relevant theories, policies, methods and techniques applicable (or to be applied), as water has long been a major “agent” of conflict among those countries.

Methodology

The proposed dissertation is a literary research paper. Its purpose is to highlight the significance of intra and interstate cooperation concerning water resources management, in order to mitigate violent conflicts that are driven by motives like water and build strong water relationships between the interested parties.

For the literature review, this research delved into primary and secondary sources. The former included international and regional hard and soft law documents (conventions, declarations etc.), European Union's legal acts, relevant action- plans, whereas the latter included books, edited books, scientific journals, articles, essays etc. For this research, there were no ethical problems, as all the information were accessed from the public domain, confidential information were not used and no special permission was required.

The first part will analyse the international security- water conflicts nexus and will describe the Integrated Water Resources Management Theory, as a concept promoting sustainable development and, potentially, supporting peace-building efforts and plans.

For the second part, the research will adopt a case study approach, as it will examine the region of Central Asia and its particularities. It will indicate that reforming public institutions and strengthening governance in intrastate level, while fostering deep cooperation and the establishment of good neighbourly relations between the countries in the region are pivotal for conflict prevention/resolution (the prevention of future upheavals).

The research will provide assessments about the arguments discussed and proposals for future endeavours that could prove effective in Central Asia's area.

Research Questions

The main research questions of the proposed dissertation are three. Firstly, whether or not water resources can function as a factor of regional instability, triggering substantial conflicts. Secondly, could policies based and/or influenced by the integrated water resources management theory be proved as a sustainable solution and provide a secure environment for cooperation and development in highly problematic areas? Lastly, the examination of the current situation in the Central Asian region raises the question as to whether potential measures to prevent future upheaval in the area exist. If the response to the latter is affirmative, which is the nature of those measures?

Part I: International Security, Water Conflicts and Water Resources Management

*“Nations fight over oil, but valuable as it is, there are substitutes for oil.
There is no substitute for water. We die quickly without water, and no
nation’s leaders would hesitate to battle for adequate water supplies”*
Simon Paul, 1998⁹

Chapter A: Water Resources and International Security

I. 1. 1. International Environmental Security

The Institute of Environmental Security has defined **environmental security** as: “The current and future availability (determined by the factors of supply, accessibility and management) of life supporting ecosystem services and goods for human needs and natural processes which contribute to poverty alleviation and conflict deterrence”¹⁰. In general, while other permutations have been offered, the concept of environmental security tends to “link environmental degradation and the associated scarcity of resources with human conflict at individual, group, and state levels”¹¹, and it refers to the area of research and practice that addresses the linkages among the environment, natural resources, conflict and peacebuilding. On the contrary, **environmental insecurity** could be framed as “the

⁹ Simon, Paul, *Tapped Out: The Coming World Crisis in Water and What We Can Do About It*, Welcome Rain Publishers, New York, USA, 1998. Paul Simon is a former member of the United States Senate, and now director of the Public Policy Institute at Southern Illinois University at Carbondale. In 1988, he unsuccessfully sought the Democratic Party’s nomination for the Presidency of the United States of America.

¹⁰ Hecker, Jeanna Hyde, *Peace and Sustainable Development through Environmental Security: A Methodology for Environmental Security Assessments*. Institute for Environmental Security, The Hague, The Netherlands, 2011, p.12

¹¹ Hall, Matthew, *Exploring Green Crime: Introducing the Legal, Social and Criminological Contexts of Environmental Harm*, Palgrave Macmillan., Basingstoke, UK, 2015, pp. 44-45.

supply of, accessibility to or management of environmental services and goods indicate change, are perceived as changing or are expected to change in ways that will negatively impact the current and future availability for human needs and natural processes.”

As mentioned in the *Introduction* part of this dissertation, environmental security became established – despite being controversial- as a part of the agenda while Cold War was coming to an end. During the Cold War era, the fundamental concern attached to ideological conflict along with the imminent threat of nuclear war tended to marginalize other security concerns. In the 1990s, environmental security has connected itself and contributed to other contemporary research and policy foci: food security, human security, societal/identity security and other types of security. Much of this literature remained within the predominant national security pre-‘90s frame, but some of it started challenging the emphasis on material capabilities and state-centric assumptions. These challenges enabled the creation of new studies whose discourses were emphasising the significance of culture and ideas as well as to referent objects for security other than the state itself.¹²

The rise of environmental concerns and took the form of steady processes unfolding over time, changing the knowledge, understanding and consciousness that supported existing practices. Security experts and policy makers began recalling the complex and continual interplay between natural geography and human security. There was no specific international crisis that moved environmental issues from a background variable to a foreground one, but rather a steady drip of new information and new scientific inputs; the creation of international conferences such as the United Nations Conference on the Human Environment in Stockholm, Sweden, in 1972¹³; the creation and development of hard and soft law, with political declarations such as the Rio Declaration on Environment and Development in 1992¹⁴ and the United Nations

¹² Buzan, Barry and Hansen, Lene, *The Evolution of International Security Studies*, Cambridge University Press, New York, USA, 2009, p.2

¹³ The *United Nations Conference on the Human Environment* (known as Stockholm Conference) was the first major United Nations conference that focused on international environmental issues and their connection with the human factor. The conference, held in Stockholm, Sweden, from June 5 to 16, 1972. For more information, read online the *Report of the United Nations Conference on the Human Environment*, available at: <http://www.un-documents.net/aconf48-14r1.pdf>

¹⁴ The *Rio Declaration on Environment and Development*, (known as Rio Declaration) is the outcome document of the 1992 United Nations Conference on Environment and Development (known as the “Earth Summit”), in Rio de Janeiro, Brazil. The Rio Declaration consisted of 27 principles intended to

Framework Convention on Climate Change (known as UNFCCC)¹⁵; and a rising public consciousness that grew sufficiently wide and deep to open a place for environmental security in policy debates and the international security studies literature.¹⁶ Especially, processes of organizing institutionalization, such as the joint organizing of a programme on Environmental Security in the 1980s by PRIO and the United Nations Environment Programme¹⁷, also assisted to situate environmental security as one of the first sectoral expansions of national security beyond the military one. In addition, Critical Security Studies theory has underlined that interstate war is far less real and threatening than environmental, food and economic security, and to a view of the vast majority of states as generating insecurity rather than stability and prosperity¹⁸.

The following examples will help illustrate the fact that the concept of environmental security emerged rather quickly from the new security issues' "well".

In the case of **the United States of America**, the debate on wide versus narrow concepts of security was of high importance for the American academic community.¹⁹ "New security issues" have entered official planning to different degrees. Environmental security was the primary example in academic rethinking of security, and was picked up by the policy side. The United States Defense Department created a position for a "Deputy under Secretary of Defense for Environmental Security", while similar modifications were made on the intelligence side in the National Security Council.²⁰ Numerous times the top policy makers of the Clinton administration recognized the security status of environment, mostly as a global level threat. Environment was considered as a threat and accepted as a security issue; nonetheless have gained a niche position and haven't conquered the top of the serious

guide countries towards the pathway to achieve sustainable development. For accessing the full text, visit: <http://www.un.org/documents/ga/conf151/aconf15126-1annex1.htm>

¹⁵ The UNFCCC is a "Rio Convention", one of three adopted at the "Earth Summit" in 1992, in Rio de Janeiro, Brazil. It entered into force on 21 March 1994. For more information, visit: <http://unfccc.int/2860.php>

¹⁶ Buzan, Hansen, *op.cit.*, p.55

¹⁷ PRIO/UNEP, *Environmental Security - A Report Contributing to the Concept of Comprehensive International Security*, Publication of the PRIO/UNEP Programme on Military Activities and the Human Environment, December 1988.

¹⁸ Buzan, Hansen, *op.cit.* p. 206

¹⁹ Florini, Ann M., and P.J. Simmons, *The New Security Thinking: A review of the North American Literature*, Rockefeller Brothers Fund, New York, 1998, as cited in Buzan and Woever, *op.cit.* , p. 295

²⁰ Ibid. p.39

security issues “list”.²¹ Bush administrations did not consider environment a security issue. Nonetheless, environment, and specifically climate change, featured prominently in the 2008 presidential election campaigns and the security agenda of Obama administrations. President Obama regarded climate change as such a national security issue, that an aggressive approach was needed to be adopted. Nowadays, under Trump administration, there is a consequential shift from the mitigation (and less adaptation) to climate change effects to the almost total denial of the phenomenon itself. The outcomes of this policy changes to bond between national security and environment degradation are remained to be seen and evaluated.

With the end of the Cold War, environment became articulated as security problem for **Europe**. The cross-sectoral linkages between different kinds of security and the interlocking chains of security concerns, as well as concerns over principles linking different conflicts, have so far been sufficient to tie together the different securitization concepts into a single network. For the **European Union**, “continent’s”²² major player in the international sphere and prominent supranational organization, environmental security is high on its policy- making agenda. As the European Union is considered a pioneer player in the international system for promoting environmental protection, it has some of the world's highest environmental standards, as its environment policy helps green the Union’s economy, protect nature, and safeguard the health and quality of life of people living in the European Union. During the 2002’s World Summit on Sustainable Development²³ at Johannesburg, South Africa, European Union was playing a leading role in the negotiations, official discussions and lobbying, towards promoting an integrated and cross-sectoral

²¹ Buzan, Hansen, *op.cit.*, pp.295-296

²² The quotation marks are used for the word *continent*, when referring to Europe, as the latter is actually a vast peninsula of the great Eurasian land mass (also called as “supercontinent”). By convention, it is separated from Asia by particular geographical points (e.g. the Urals and the Ural River in the east). Europe’s physical geography, environment and resources, human geography, and, especially, cultural history are considered separately from the rest of the Eurasian “supercontinent”. For more information, visit: www.nationalgeographic.org and www.britannica.com

²³ The *World Summit on Sustainable Development* (WSSD), held in Johannesburg during 26 August and 4 September 2002, was the biggest event of its kind organised by the United Nations to date. A major objective of the WSSD was to set out strategies for greater and more effective implementation of Agenda 21, negotiated in Rio ten years ago (thuswise this Summit is also known as Rio+10), than hitherto. The “Johannesburg Declaration on Sustainable Development”, which is a political declaration and the “Johannesburg Plan of Implementation”, which is the core document of the WSSD containing recommendations for accelerating the implementation of Agenda 21, are mirroring the will of the international community to move towards sustainable development. For more information, as well as accessing the full texts, visit: <https://sustainabledevelopment.un.org/milestones/wssd>

approach to the concept of sustainable development. Through a variety of binding and non-binding legal acts (regulations, directives²⁴, decisions, recommendations), the Union aims to address issues that are connected with climate change, environmental degradation and protection of natural places (e.g. Natura 2000 network²⁵). Moreover, the high density and small size of units within the European “continent” make many environmental issues intensively transboundary: e.g. the Danube dam, nuclear power plants in the former east, air pollution mostly blowing eastwards, and upstream pollution (such as that of Swiss medical giants) threatening downstream areas along the Rhine.²⁶

²⁴ **Directives constitute the main legislative instrument used in the European Union’s environmental policy.** This is mainly due to the fact that, even though they are binding as to the result to be achieved, the choice of the form and method in reaching the objective is left to Member States. The latter are the ones responsible of their (i.e. directives) transposition in their own national legal order (*Principle of the national procedural autonomy*).

²⁵ **Natura 2000** is a network of 26,000 protected natural areas, covering almost 20% of the EU’s land mass, where sustainable human activities can coexist with rare and vulnerable species and habitats.

²⁶ Buzan, Hansen, *op.cit.*, p.360

I.1.2 International Resource Conflicts

Inextricably linked to international environmental security issues are the conflictual issues arising from the competition of access, management and distribution of natural resources.

Despite the fact that for the majority of western societies, conflict over natural resources does certainly not belong to the list of everyday routine's struggles, that is definitely not the case for the people of developing world. In 2011, according to the United Nations Development Programme (hereafter UNEP) 41 countries experienced water stress – 10 of which are close to depleting their supply of renewable freshwater and must now rely on alternative sources.²⁷ The Sustainable Development Goals' Factsheet²⁸ provides more alarming percentages:

- should world's population reach 9.6 billion by 2050, the equivalent of almost three planets could be required to provide the natural resources needed to sustain current lifestyles;
- the vast majority of the people suffering from hunger live in developing countries, where 12.9% of the population is undernourished/ Sub-Saharan Africa is the region with the highest prevalence of hunger, as almost one person in four there is undernourished; Meanwhile, 1.3 billion tonnes of food are wasted every year;
- 1.3 billion people – one in five globally – still lack access to modern electricity, while 3 billion people rely on wood, coal, charcoal or animal waste for cooking and heating;
- Thirteen million hectares of forests are being lost every year.

The picture gets more complicated when access to these natural resources become the reason for a conflict or the mean to fuel a conflict. UNEP reported that, over the last 60 years, at least 40 percent of all internal conflicts have been linked to the exploitation of natural resources, whether high-value resources such as timber,

²⁷Available at: <http://www.undp.org/content/undp/en/home/sustainable-development-goals/goal-6-clean-water-and-sanitation.html>

²⁸ For more information, visit: <http://www.un.org/sustainabledevelopment/>

diamonds, gold and oil, or scarce resources like fertile land and water. Conflicts involving natural resources have also been found to be twice as likely to relapse. The concept of **resource security** arises from that exact situation: i.e. when national authorities perceive security in terms of access to energy and other resources sufficient to meet the state's needs. Subsequently, **resource war** is the war which aims to gain or retain control of resources perceived as essential to economic development and political power for a country or an alliance of powers.²⁹

*Conflict resources are natural resources whose systematic exploitation and trade in a context of conflict contribute to, benefit from, or result in the commission of serious violations of serious violations of human rights, violations of international humanitarian law or violations amounting to crimes under international law.*³⁰

Even if relevant literature in the area seldom attempts to specify the concept of natural resource, the World Bank Glossary defines **natural resources** as «materials that occur in nature and are essential or useful to humans, such as water, air, land, forests, fish and wildlife, topsoil, and minerals»³¹. Natural resources can be classified as either renewable or non-renewable. A natural resource qualifies as a renewable resource if it can be replenished over time by natural processes (with variations in their renewal process), at a rate comparable to its rate of consumption by humans or other users. Cropland, forests, and groundwater are among those resources. Non-renewable resources like oil, minerals, steel and aluminium are found in finite quantities, have a limited or fixed stock or reserves, it cannot be regenerated on a scale comparative to its consumption, and their value increases as supplies dwindle. The available supply of non-renewable resources may be replenished through recycling (e.g. recycling aluminium cans), but the overall supply remains relatively constant.³²

²⁹ Heywood, Andrew, *Global Environmental Politics in Global Politics*, Palgrave Macmillan, UK, 2011, p. 407.

³⁰ Global Witness, *The sinews of war*. Global Witness Publishing. Washington, D.C., 2006, p.1

³¹ World Bank, *Glossary. Development Education Program*, World Bank Group, 2016

³² Oregon State University, *Define the terms renewable resource and nonrenewable and give examples of each resource type that are related to forage production*, available at: <http://forages.oregonstate.edu/nfgc/eo/onlineforagecurriculum/instructormaterials/availabletopics/environmentalissues/resource>

With regard to the typology of natural resources, one could categorise them in the following:

- Drinkable Water
- Bodies of Water such as oceans, seas, lakes, and rivers,
- Fertile Land,
- Timber,
- Wildlife,
- Metals,
- Minerals,
- Stones,
- Hydrocarbons.

Undoubtedly, one type of resources may include one or many of the rest. For, example, possession of land inevitably leads to access to many other resources such as minerals and fossil fuels. Rivers, oil fields and pipelines frequently cross borders, which may contribute to tensions, but also could put a premium on cross-border cooperation.

The risk of conflict over natural resources steadily increased after the late 1950s with the beginning of decolonization processes, particularly in Africa and Asia. The insecurities to which environmental stress contributes in countries belonging to the developing world are all grounded in patterns of insecurity based on long-standing political and economic practices of exclusion and exploitation. Those patterns achieved to reshape the natural environment. For instance, the British Empire, one of the principal colonial powers, set up institutions in the southern part of Asian and African continent that gave some groups greater access to natural resources (such as water and arable land) than others. Political independence and multiple efforts for ground reforms have not been able to efface these inequalities from the fabric of those regions' socioeconomic life³³.

As the global demographic image continue to show the rise of population numbers, and the demand for resources continues to grow, there is significant potential for conflicts over natural resources to intensify. Demographic pressure and urbanization, inequitable access to and shortage of land, and resource depletion are widely predicted to worsen, with profound effects on the stability of both rural and

³³ Matthew, Richard, *op.cit.*, p 128.

urban settings. In addition, the potential consequences of climate change for water availability, food security, and the prevalence of disease, coastal boundaries, and population distribution are also increasingly seen as threats to international security, aggravating existing tensions and potentially generating new conflicts.¹¹ **Table 1** indicates the eighteen most prominent civil wars, which have been fueled by natural resources during the past twenty years.

Table 1: Recent civil wars and internal disputes fuelled by natural resources³⁴

Country	Duration	Resources
Afghanistan	1978-2001	Gems, timber, opium
Angola	1975-2002	Oil, diamonds
Burma	1949-	Timber, tin, gems, opium
Cambodia	1978-1997	Timber, gems
Colombia	1984-	Oil, gold, coca, timber, emeralds
Congo, Dem Rep. of	1996-1998, 1998-2003, 2003-2008	Copper, coltan, diamonds, gold, cobalt, timber, tin
Congo, Rep. of	1997-	Oil
Côte d'Ivoire	2002-2007	Diamonds, cocoa, cotton
Indonesia – Aceh	1975-2006	Timber, natural gas
Indonesia – West Papua	1969-	Copper, gold, timber
Liberia	1989-2003	Timber, diamonds, iron, palm oil, cocoa, coffee, rubber, gold
Nepal	1996-2007	Yarsa gumba (fungus)
PNG – Bougainville	1989-1998	Copper, gold
Peru	1980-1995	Coca
Senegal – Casamance	1982-	Timber, cashew nuts
Sierra Leone	1991-2000	Diamonds, cocoa, coffee
Somalia	1991-	Fish, charcoal
Sudan	1983-2005	Oil

³⁴ Adapted and updated from Ross, M., *The natural resource curse: How wealth can make you poor*, In I. Bannon & P. Collier (Eds.) *Natural resources and violent conflict*. World Bank. Washington, D.C., 2003

The relationship between the environment, natural resources, and conflict is multi-dimensional and complex. Nevertheless, UNEP, in its rather rich and informative report³⁵ on the role that natural resources play on conflict and peace-building cases, draws three key pathways:

a) **“Contribution to the outburst of conflict:** Attempts to control natural resources or grievances caused by inequitable wealth sharing or environmental degradation can contribute to the outbreak of violence. Countries that depend on the export of a narrow set of primary commodities may also be more vulnerable to conflict.

b) **Financing and sustaining conflict:** Once conflict has broken out, extractive “high-value” resources may be exploited to finance armed forces, or become strategic considerations in gaining territory. In such cases, the duration of conflict is extended by the availability of new sources of financing, or complicated by efforts to gain control over resource-rich areas.

c) **Undermining peacemaking:** The prospect of a peace agreement may be undermined by individuals or splinter groups that could lose access to the revenues generated by resource exploitation if peace were to prevail. Once a peace agreement is in place, the exploitation of natural resources can also threaten political reintegration and reconciliation by providing economic incentives that reinforce political and social divisions.”

Conflict management and resolution is proven to be a more and more difficult «task», as a result of the growing demand for natural resources, along with the increasing complexity of conflicts. Those complications are even evident in the literature area. There are polar-opposite conclusions among scholars and policy makers: on the one hand, those who see relative abundance as problematic for socioeconomic development, good governance and peace; on the other hand, and those who see environmental scarcities as the «causal mechanism» behind violent conflict. As mentioned previously, since natural resources are necessary for life and growth, it is not surprising that resource scarcity, environmental degradation, and unsustainable consumption sometimes contribute to or cause violent conflict. Nonetheless, in a world of globalization, there is also more incentive for neighbouring

³⁵ United Nations Environmental Program (UNEP), *op.cit.*, 2009, p.8

states and communities to work together to establish peace. There are ways to address natural resource issues that will prevent, manage, or resolve such conflicts, as it is understood that this mission serves the common, regional good.

In addition, it is worth mentioning that the sustainable and efficient management of natural resources is now an imperative for the achievement of at least twelve out of the seventeen United Nations Sustainable Development Goals (SDGs). The implementation of each and every of those goals' targets shows one thing: that the restore and maintenance of the good condition of the natural resource is vital for the adequate nourishment of current and projected populations and the provision of a better quality of life in the years to come; what the heart of sustainability consists of.

I.1.3 Water Security: A catalyst for water conflicts or basin-wide cooperation?

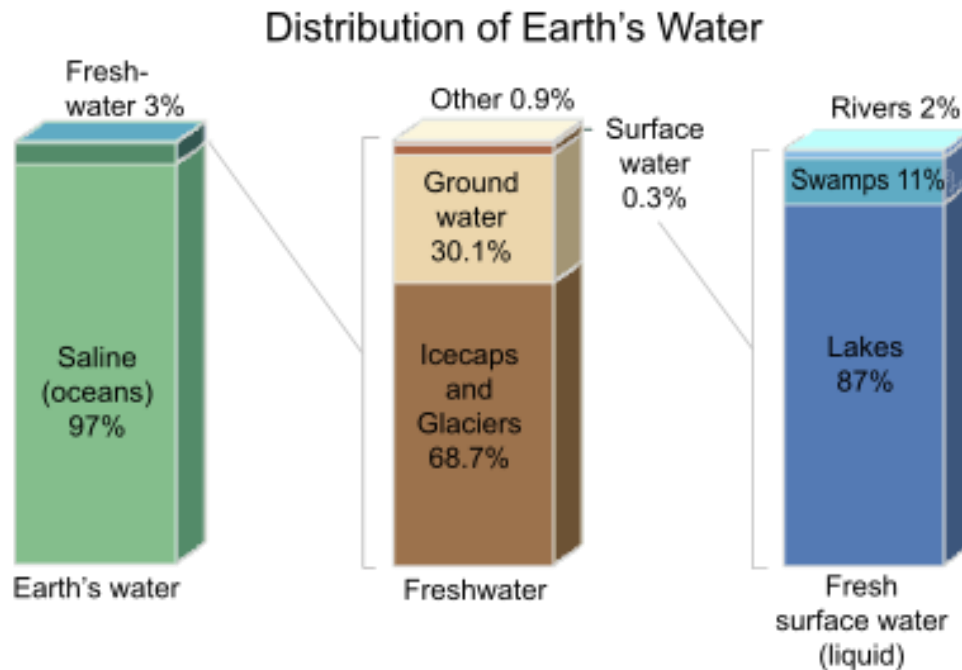
I.1.3.a. General Framework

Trying to imagine human existence without a sufficient amount of water leads to the creation of a dystopian world. Water has always been- and will remain so- a key factor for humankind; from meeting basic, everyday needs to modern industrial development and from the exercise of sociocultural and religious activities to the support of national economies.

Human consumption of water used to be as if it were an inexhaustible natural resource. Water covers more than 70 percent of Earth's surface; however, 97 percent of that percentage is salt water, thus unsuitable for drinking or cultivating crops. Any technologies that could be used to desalinize are expensive to acquire, develop and maintain, beyond the reach of the majority of countries in the developing world. Of the remaining 3 percent of fresh water, 2 percent is inaccessible as it is either locked in snow or ice (e.g., glaciers), leaving less than 1 percent available for supporting the necessary requirements that people have to complete their everyday tasks, from human conception to use of water for agricultural purposes³⁶. The following figure (*Figure 1*) portrays exactly the aforementioned distribution of water resources.

³⁶ Arsenault, Chris, "Risk of Water Wars Rises with Scarcity." Aljazeera, August 26, 2012, available at: <http://www.aljazeera.com/indepth/features/2011/06/2011622193147231653.html>; Israel, Brett, "How Much Water Is on Earth?" LiveScience, September 9, 2010, available at: <https://www.livescience.com/29673-how-much-water-on-earth.html>; US Geological Survey. 2015. "How Much Water Is There On, In, and Above Earth?" USGS Water Science School, United States Geological Survey, United States Department of the Interior, available at: <http://water.usgs.gov/edu/earthhowmuch.html>.

Figure 1. Distribution of the Earth's Water (Source: Timothy Bralower)



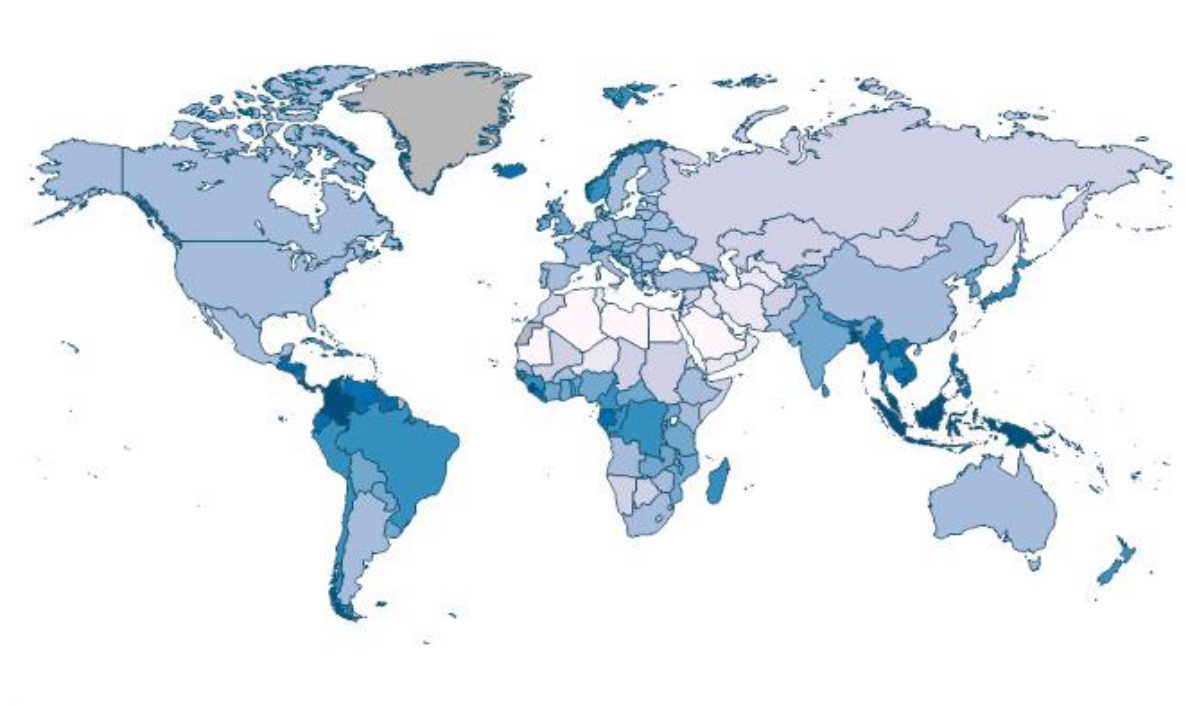
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Moreover, freshwater is not evenly distributed on the Earth's surface. ³⁸ or the world's poorest developing countries are located near areas that do not have sufficient water supplies. And, in case those countries possess quite sufficient amount of the latter, that privilege is outweighed because they suffer regional or zonal shortages.³⁸ In order to understand how uneven the freshwater's distribution really is, one should study rainfall maps. The following map (**Figure 2**) shows how average precipitation in depth (mm per year) varies by country. The shade of the country corresponds to the magnitude of the indicator. The lighter the shade, the lower the value, which makes them semi-arid or arid.

³⁷ Available at: <https://www.e-education.psu.edu/earth103/node/701>

³⁸ Vajpeyi Dharendra (ed.), *Water Resource Conflicts and International Security- a global perspective*, Lexington Books, USA, 2012, p. 1

Figure 2. Average precipitation in depth (mm per year) (Source: FAO)

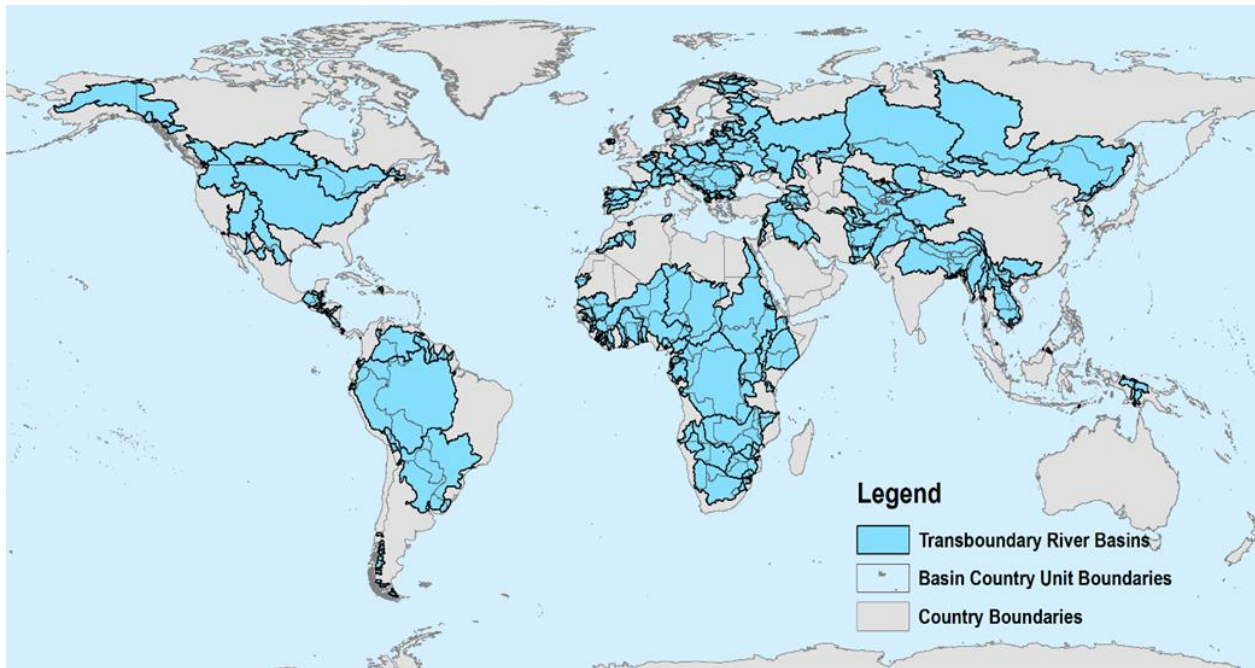


Transboundary aquifers are a key subject to water security and regional conflict resolution. The world's transboundary river basins span 151 countries, include more than 2.8 billion people (around 42 percent of the world's population), cover 62 million km² (42 percent of the total land area of the Earth), and produce around 22 000 km³ of river discharge each year (approximately 54 percent of the global river discharge).³⁹ The map of **Figure 3** delineates the global expansion of transboundary river basins. In combination with **Appendix A** (which is more analytical in terms of geographical depiction and general relevant elements), underline not only the importance of the latter for the overall existence of the countries that they flow through, but also their role in maintaining peace within a given region, as their exploitation from state A has direct and major effects on the quality and quantity of water that the state B has in his possession, and their own ability to take full advantage of it.

Conflicts and cooperation efforts worm their way into nations, along with the river themselves.

³⁹ <http://twap-rivers.org/>

Figure 3. The Global Transboundary River Basins (Source: <http://twap-rivers.org/>)



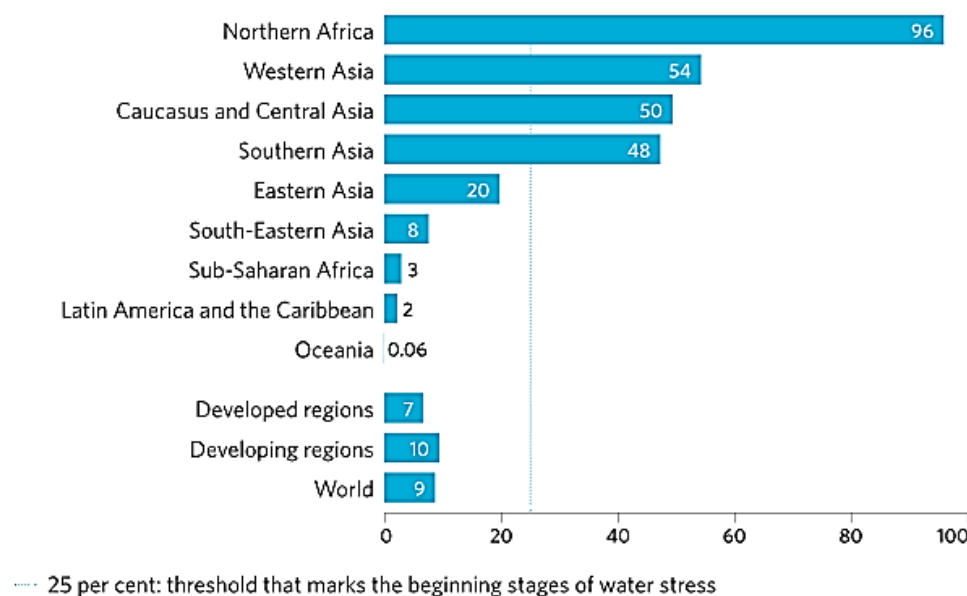
Water security is defined as the capacity of a population to safeguard sustainable access to adequate quantities of acceptable quality water for sustaining livelihoods, human well-being, and socio-economic development, for ensuring protection against water-borne pollution and water-related disasters, and for preserving ecosystems in a climate of peace and political stability⁴⁰. Tackling water security requires reliable access to sufficient supplies using adequate and affordable water resources management.

⁴⁰ This definition of Water Security is based on the one provided in UNESCO's International Hydrological Programme's (IHP) Strategic Plan of the Eighth Phase (UNESCO-IHP, (Draft) *Strategic Plan of the Eighth Phase of IHP* (IHP-VIII, 2014-2021), UNESCO-IHP, Paris, France, 2012a.), endorsed at the 20th Session of the UNESCO-IHP Intergovernmental Council (UNESCO-IHP, *Final Report. 20th Session of the Intergovernmental Council. Paris, 4-7 June, 2012*, UNESCO, Paris, France, 2012b.).

Nowadays, 2.5 billion people worldwide lack access to basic sanitation and almost 800 million people lack access to water, many hundreds of millions of them in sub-Saharan Africa and South Asia.⁴¹

Since water covers nearly three fourths of the globe, we tend to think of it as an abundant resource. In fact, drinkable water can be very scarce. Drought affects almost every continent and appears to be growing worse. The National Center for Atmospheric Research conducted a research, which has shown that, since 1970, the percentage of the Earth's land area stricken by serious drought has more than doubled. In addition, water becomes scarce through pollution or restricted access.

Figure 4. Level of water stress: freshwater withdrawal as a proportion of available freshwater resources, around 2012 (percentage) (Source: UNSD)



The graphic of **Figure 4** demonstrates the differentiation in the water stress levels across the 9 main regions of the worlds. As previously mentioned, Africa and Asia bear the burden of fresh water scarcity, thus being unable to cover their basic

⁴¹ United Nations, The Sustainable Development Goals Report 2016, New York, USA, 2016, p.22.

needs. This is also a factor that contributes to the «anchoring» of their development potential to colonial living standards and below poverty percentages for their people.

The largest user of water in the world is considered to be food production. The latter is responsible for 80–90 percent of consumptive water use both from surface and ground-water. About 8 percent of global water withdrawal is used to generate electricity accounts, as energy is lifeline for transport and fertilizes crops. Simultaneously, food production and supply chains are responsible for approximately 30 percent of total global energy demand. Nowadays, crops are being used to produce alternative forms of energy, like biofuels. Recent estimates show that by 2050, world population would rise to 9.2 billion. That would lead to a 70 percent increase in demand for food and a 40 percent rise in demand for energy. As per another estimate, by 2030, the world would confront a water supply shortage of about 40 percent⁴². Cape Town, the second-most populous urban area in South Africa, could also become famous for being the first major city in the world to run out of water, as it is estimated that by March 2018, the water shortage will reach its limits.

1.1.3.b. Water Conflicts

In recent year, it has been observed that increasingly water resource problems, which cross state boundaries have scaled up. Water conflicts could become more likely between users as their water security becomes threatened. Those aforementioned problems are accompanied by the subsequent cross-boundaries disputes.

IR scholars keep reminding international community that, although international anarchy is a powerful permissive condition, states only go to war to advance their interests when they can, and this is, in turn, determined largely by their power capabilities. By the beginning of the 1990s, it was impossible to ignore the new issues that were contributing to violence all over the world. Among those, water related management issues.

⁴² Bindra, Satya. P.et al., *Sustainable integrated water resources management for energy production and food security in Libya*, Elsevier Ltd., Procedia Technology, Vol. 12, 2014, p. 748.

«Rivers have a perverse habit of wandering across borders...and nation states have the perverse habit of treating whatever portion of them that flows within their borders as a national resource at their disposal»⁴³. This resulting interdependence on shared water resources has the potential to lead to conflict as riparian nations compete to secure their rights to use and access to the rivers' flows. As seen by the maps of **Figure 3** and **Appendix A**, 145 nations currently share 263 international river basins in the world. Water resources become increasingly scarce in these regions of the world; and the risk of conflict erupting between competing riparian countries is expected to intensify.

«The red flag for water-related tension between countries is not water stress per se, but rather the unilateral exercise of domination of an international river, usually by a regional power»⁴⁴

For instance, water issues are evidently present in the **Middle East** region, particularly in the –historically named- Levant and Mesopotamia area, as **Figure 5** clearly depicts. Middle East is considered as the most water-poor region in the world; 9 out of 14 nations are already experiencing severe water scarcity.⁴⁵ The abiding problem of water resources pose a significant threat to regional security; even though they add to the difficulty of handling military-political matters, they are not determining them. Consequently, emerging non-traditional security issues have been absorbed into the existing framework of interstate rivalries and conflicts. For instance, among the geopolitical triangle formed by Iraq, Syria and Turkey, or the one by Israel, Syria and Jordan, there seems to be absence of an attempt to separate their opinions and controversies about water resources from the power and ideological rivalries that already characterize their relations as hostile.⁴⁶ It is evident that water

⁴³ Waterbury, John, *Hydropolitics of the Nile Valley* (1978), Syracuse University Press, Syracuse, New York, USA, 1979.

⁴⁴ Wolf, A.T., *Water Wars and Other Tales of Hydromythology*. In *Whose Water Is It? The Unquenchable Thirst of a Water-Hungry World*, edited by McDonald B. and Washington D. Jehl., National Geographic, 2003.

⁴⁵ McDonald, B., and Jehl, D. (eds), *Whose water is it? The unquenchable thirst of a water-hungry world*, National Geographic, Washington, DC, 2003, p.58

⁴⁶ Buzan B. and Woever Ol., *Regions and Powers, The Structure of International Security*, Cambridge University Press, Cambridge, UK, 2003, pp. 211-212, 217.

disputes continue to be locked into already existing interstate politics. Unlike the first of the abovementioned geopolitical triangles (i.e. Syria- Turkey- Iraq), where water issues affected only a relationship of a secondary level, in the Levant they lied at the heart not only of Israel-Palestine relations (mostly about shared aquifers), but also of Israel's relations with its neighbours (i.e. Jordan, Syria and Lebanon) and Jordan's itself with Syria⁴⁷. Particularly, for Israel, Palestine, and Jordan, water rights could easily be constructed as an existential issue Especially for Israel- Palestine relation, it is worth mentioning the following example: In February 1996, Israel, Jordan, and the Palestinians agreed on a Declaration of Principles for Cooperation on Water-Related Matters⁴⁸. Whether this could solve the very difficult long-term problems about

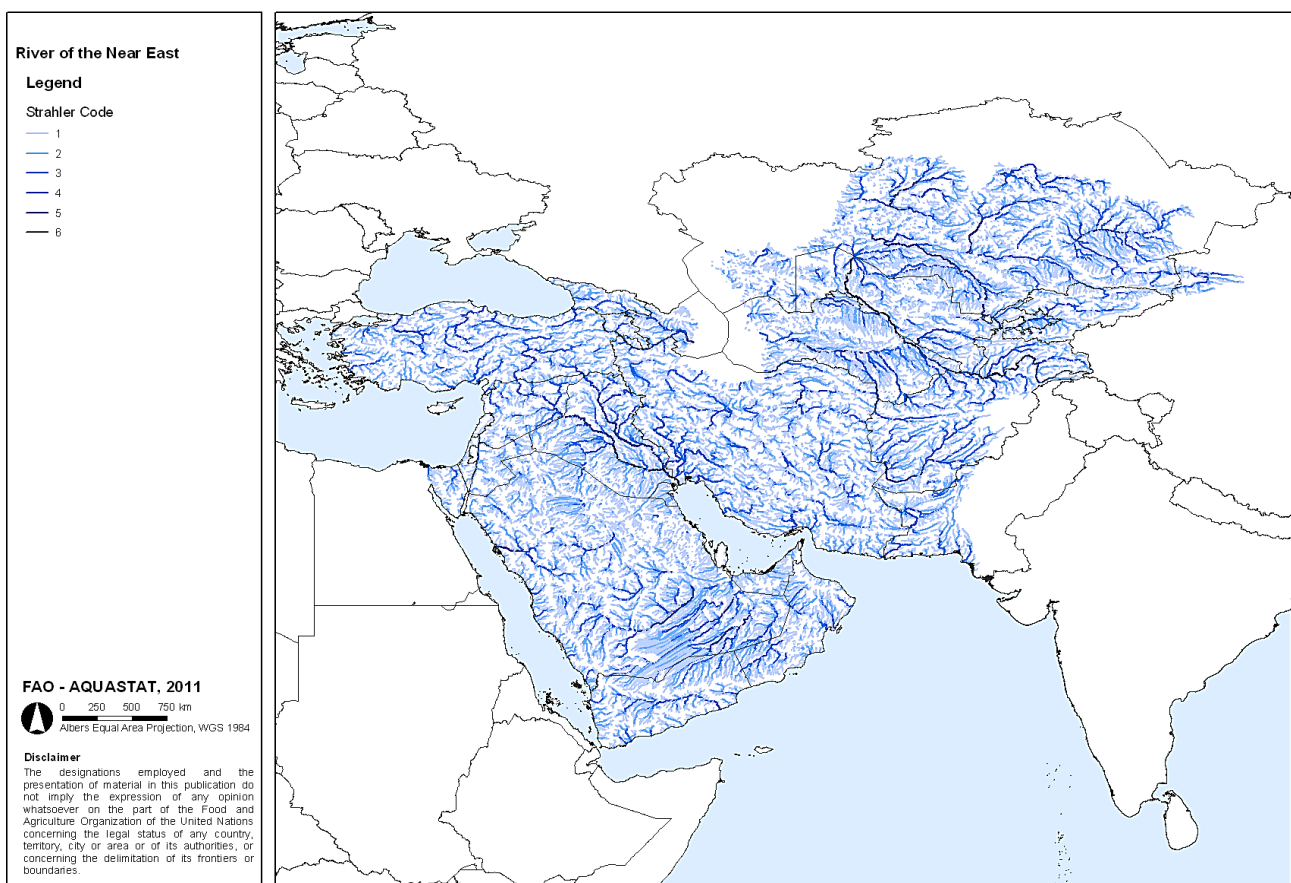
⁴⁷ *Strategic Survey*, International Institute for Security Studies, London, 1991-2002, pp.270-1, as cited in *ibid.* (Buzan B. and Woever Ol)

⁴⁸ For the full text of the Declaration , visit:

<http://www.mfa.gov.il/mfa/foreignpolicy/peace/guide/pages/declaration%20on%20principles%20for%20cooperation%20on%20water.aspx>

sharing the region's limited supplies of river and ground water remained to be seen. Water rights issues complicated both Israel's withdrawal from Lebanon and its negotiations with Syria over returning the Golan Heights (both significant sources of Israel's current water supply), not to mention the creation of a separate Palestinian State.

Figure 5. River flows of Turkey, Middle East, Gulf States and Central Asia. (Source: FAO-AQUASTAT)



Nonetheless, water may not be the sole trigger factor in starting an armed conflict between states with a history of distrust and severe tensions. As Aaron Wolf

puts it⁴⁹, water may and can be a tool, target or victim of warfare, but up until now it has not been the unique cause. Water disputes as *a shadow issue* could be used as a pretext for conflict. Other factors, such as territorial disputes (India-Pakistan; China-India), ethnic tensions (Central Asia) and other power equations (as explained previously with the case of Middle East) might be the real reasons to justify conflicts.⁵⁰ In these cases, the political elites tend to «*weaponise water*» in order to fulfil their national interests in other fields, such as trade, military or even support in international or other regional political fora/

1.1.3.c. Road (or Avenue?) to Water Cooperation

There is one thing that needs to be highlighted at this point: *It is not shortage or lack of water that leads to conflict, but how water is governed and managed.* De Stefano, Edwards, De Silva, and Wolf⁵¹ found 38 ‘acute’ disputes (those involving water-related violence) between 1948 and 2008; of those, 31 were between Israel and one or more of its neighbours, although none of the violent events occurring after 1970. Yet most of the cases identified by De Stefano et al. were either

1. political tensions or instability rather than true acts of war, or
2. involved using water as a tool, target, or victim of armed conflict.

It is important to note that even though water-related violence still exists, and the perceived and actual risk of future conflict over water exists, interactions over water resources to date are largely cooperative. The Wolf, Yoffe, and Giordano⁵² study titled «Basins at Risk» catalogued over 1800 events involving water conflict and cooperation between nations from 1948 to 2000. They concluded to the fact that cooperative events outnumbered conflictive events by over two to one. Furthermore,

⁴⁹ Wolf, A. T., *Shared Waters: Conflict and Cooperation*, Annual Review Environmental Resources, Vol. 32, 2007, p.244.

⁵⁰ Vajpeyi. Dhirendra, *op.cit.*, p.223.

⁵¹ De Stefano, L., Edwards, P., De Silva, L., & Wolf, A. T., *Tracking cooperation and conflict in international basins: Historic and recent trends*. Water Policy, Vol. 12, No. 6, USA, 2010, pp. 871–884.

⁵² Wolf, A. T., Yoffe, S. B., & Giordano, M., *International waters: Identifying basins at risk*, Water Policy, Vol. 5, No1, USA, 2003, pp. 29–60.

there is an extensive history of formalized water cooperation, as over 650 treaties related to water have been signed since 1820.⁵³

Parallel to water treaties themselves, international laws and principles are reinforced by a number of multilateral environmental agreements (MEAs) that may not have water as their primary objective but that affect water access and quality.

London Water Research Group, building on the work of *Zeitoun and Mirumachi*⁵⁴ and *Zeitoun and Warner*⁵⁵, makes the important contribution that transboundary water relations are more complex than individual interactions, and are often both conflictive and cooperative at the same time. Moreover, they point out a rather provocative assumptions: that not all conflicts are «bad», as conflict is often the method for disputes to be addressed. The other side of the coin is that not all forms of cooperation are «good», as power imbalances are often solidified in agreements.

Therefore, that form of interdependence does not inevitably promote a relationship of vulnerability between riparians countries. They may facilitate a type of relationship in which neither riparian may act without some type of coordination with the other party⁵⁶. As water resources are shared among the countries, and are crucial for their economic and political sustainability, accordingly parties may attempt to cooperate and eventually negotiate an agreement so as to utilize this vital resource⁵⁷.

This is most lucid in the case of India and Pakistan, where by some accounts the two countries should have gone to war over the Indus waters. Instead, after nine years of negotiations, they concluded an Agreement over the utilisation of Indus River in 1960. World Bank facilitated by financial incentives and co-signed The Indus Waters Treaty (known as IWT)⁵⁸. Both riparians needed water urgently, in order to maintain existing works and tap the irrigation potential in the basin. In particular, “by

⁵³ Oregon State University *Transboundary Freshwater Dispute Database* (TFDD), 2016, available at: <http://www.transboundarywaters.orst.edu/>

⁵⁴ Zeitoun, M., & Mirumachi, N., *Transboundary water interaction I: Reconsidering conflict and cooperation*, International Environmental Agreements: Politics, Law and Economics, Vol. 8, No 4, 2008, pp. 297–316..

⁵⁵ Zeitoun, M., & Warner, J., *Hydro-hegemony-a framework for analysis of trans-boundary water conflicts*, Water Policy, Vol 8, No 5, 2006, pp. 435–460.

⁵⁶ Burton, John, *World Society*, Cambridge University Press, Cambridge, UK, 1972.

⁵⁷ Deudney, Daniel, *Environment and Security: Muddled Thinking*, The Bulletin of Atomic Scientists Vol. 47, No3, 1991, pp. 23–28.

⁵⁸ For accessing the full text of the Treaty, visit: <https://siteresources.worldbank.org/INTSOUTHASIA/Resources/223497-1105737253588/IndusWatersTreaty1960.pdf>

signing the Indus Waters Treaty, both countries were able to safeguard their long-term water supplies”.⁵⁹ However, it should be mentioned that, the latest round talks⁶⁰ between India and Pakistan on Indus Water Treaty in September 2017 concluded without reaching an agreement over the technical issues of the Kishenganga and Ratle hydroelectric power plants within the framework of the Treaty.⁶¹ Even though World Bank reassured that the amicable spirit of their cooperation, it is evident that other sources of bilateral disputes are interfering in the process of mutual cooperation, thus detaining the efficient implementation of common water related management projects.

Scarcity, therefore, may and can provide the basic impetus for cooperation between states.

Sustainable water resource management for enhanced energy production and food security is a rather complex procedure. In 1996, World Water Council alerted that the wars of the 21st century will be for water, “unless we change the way we manage water”. Indeed, water is a key driver of economic and social development and has a basic function in maintaining the integrity of the natural environment. Bearing in mind that water is only one of a number of vital natural resources, water issues shall not be considered as isolated ones. Both public & private sector managers, have to make difficult but necessary decisions on water allocation. It requires to properly apportion the diminishing supplies between ever-increasing demands. Demographic and climatic changes, among others, further increase the stress on water resources⁶². Traditional fragmented approach is no longer viable. It needs a comprehensive and more holistic approach to water management including, but not excluded to, the significant issue of energy production & food security.

⁵⁹ Alam Z. Undala, *Questioning the water wars rationale: a case study of the Indus Waters Treaty*, The Geographical Journal, Vol. 168, No. 4, December 2002, p.347.

⁶⁰ They were held on a Secretary level.

⁶¹ *No agreement reached at Indus Water Treaty talks: World Bank*, Times of India, September 16, 2017, available at: <https://timesofindia.indiatimes.com/india/no-agreement-reached-at-indus-water-treaty-talks-world-bank/articleshow/60707434.cms>

⁶² Bindra, Satya. P. et al, *op. cit.*, p. 748.

Chapter 2: The Integrated Water Resources Management Theory

I. 2.1 Outline

“Water world” has embraced very few ideas and recommendations as quickly, enthusiastically and universally as the theory of Integrated Water Resources Management (hereafter IWRM).⁶³

Literature provides a rather broad spectrum of interpretations concerning IWRM. For the purposes of the proposed dissertation, the definition given by Global Water Partnership (hereafter GWP) is considered as the most understandable, yet accurate. According to GWP:

«IWRM is a process which promotes the coordinated development and management of water, land and related resources, in order to maximize the resultant economic and social welfare in an equitable manner without compromising the sustainability of vital ecosystems. »⁶⁴

So, what does that theory really suggest?

First of all, it is essential to summarise at this point the current global situation. Decision-makers, whether they work in public or private sector, have to decide over crucial issues of water allocation. They have to apportion diminishing supplies between ever-increasing demands. Drivers such as demographic and climatic change further increase the stress on water resources. That happens because the consequences of climate change are relentlessly affecting the availability of water in both quantity and quality. Meanwhile, population growth and other demographic changes –especially urbanization–, along with agricultural and industrial expansion

⁶³ Dietrich Borchardt, Dietrich, Ibis, Ralf B., Bogardi, Janos, J. (eds.), *Integrated Water Resources Management: Concept, Research and Implementation*, Springer International Publishing Switzerland, 2016, p.4.

⁶⁴ Global Water Partnership, *Integrated Water Resources Management*, Technical Advisory Committee, Background Papers No. 4, Stockholm, Sweden.2000, p.22.

following changes in consumption and production patterns increase the demand for water. Furthermore, within many developing countries, decision-makers are observing that it is not adequate enough to implement only supply-side solutions, in order to address the ever increasing demands from demographic, economic and climatic pressures. For countering the challenges of inadequate supply, waste-water treatment, water recycling and demand management measures are among the methods that are being introduced.⁶⁵

Those elements result to the realization that the traditional fragmented approach is no longer viable; it is necessary to adopt a more holistic approach to water management. As a result some regions are now in a perpetual state of demand outstripping supply and in many more regions that is the case at critical times of the year or in years of low water availability.

This is the rationale for the Integrated Water Resources Management (IWRM) approach that considered as a broadly accepted key tool for effective management of the world's limited water resources and for coping with conflicting demands. It is a coordinated, goal directed process for regulating the development and usage of river, lake, ocean, wetland, and other water assets. It involves applying interdisciplinary knowledge, while assessing the inputs from diverse stakeholders to devise and implement efficient, equitable and sustainable solutions to water and development problems associated with food security and energy production (Water-Energy-Food nexus). Global overrising interdependence of water, energy, food resources nurtures concerns over security, as these resources are tightly interrelated and necessary to sustain life on planet Earth.

The core principle of IWRM is the environmentally sustainable use of water, as it is proclaimed that integration occurs at all levels and for all aspects. Its goal is to gradually maximise the benefits of water resources use over time. For instance, IWRM includes integrated economic, social and environmental management⁶⁶, integrated sectoral management, as well as integrated land- water management. Usually, it is recommended that the decision-makers shall apply IWRM policies on a water catchment basis. The latter is the natural management unit, encompassing all

⁶⁵ United Nations, *International Decade for action "Water for life" 2005-2015*, available at: <http://www.un.org/waterforlifedecade/iwrm.shtml>

⁶⁶ It is rather useful to remind at this point that Economy, Society and Environment are considered as the three main pillars of Sustainable Development.

significant interactions in a water body. It focuses more on a comprehensive approach within the water sector, while providing the tools for implementation. By that way, it assists the sustainable growth and protection of essential environmental services. Meanwhile, coordination between local and national/federal governments, and among various departments and sectors is more substantial and less bureaucratic; exactly what is needed to curb damaging externalities and reduce waste, while sustainably harnessing the given resources. Many efforts to address water challenges also have significant potential to generate climate change benefits on both mitigation and adaptation.⁶⁷

The IWRM principles include three fundamental elements:

- i. the integration of different sectors and different uses and users of water,
- ii. the balancing of three pillars of Sustainable Development; i.e. economic, social and environmental ones, and
- iii. the participation of interested stakeholders in decision-making, while empowering the role of women.⁶⁸

The practical interpretation of those principles includes the following dimensions, the precise knowledge of which within a region is an indispensable prerequisite for any management attempt:

- | | |
|---------------------|--|
| 1. Water quantity | 6. Public information and participation |
| 2. Water quantity | 7. Capacity Development |
| 3. Water demand | 8. Decision support |
| 4. Climate change | 9. Integrated land and water management |
| 5. Water governance | 10. Pathways to sustainable water management ⁶⁹ |

⁶⁷ Vogtmann, Hartmut and Dobretso, Nikolai (eds), *Transboundary Water Resources: Strategies for Regional Security and Ecological Stability*, Springer Science & Business Media, NATO Science Series, IV. Earth and Environment Sciences, Vol 46, The Netherlands, 2006., p.9.

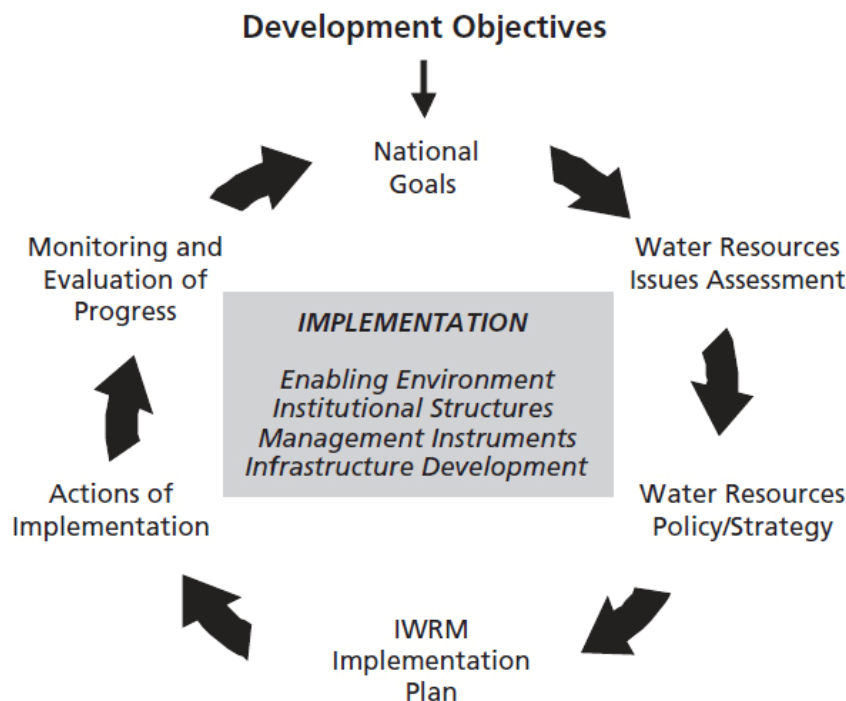
⁶⁸ Dietrich Borchardt et al., *op. cit.*, p.7

⁶⁹ *Ibid.* p.10

For example, water scarce regions are in the urgent need of integrated concepts for reducing water demand and using water more efficiently. Meanwhile, it is important to take into account the complex land-water interactions. In that case, a long-term cost efficient management and the protection of water resources could only be achieved if interdisciplinary cooperation and close collaboration between applied science and practice.⁷⁰

Accordingly, in order to better understand the way IWRM's policies actually promote the aforementioned principles, the following graphic **Error! Reference source not found.** describes the stages through which the competent authorities and stakeholders plan and develop the implementation of IWRM principles. Its cyclic process, and the continuous following-up and assessment of actions can lead to successful results and strengthen the capacity building of countries that have been using poor management methods and techniques.

Figure 6. Stages in IWRM planning and implementation (Source: United Nations)



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⁷⁰ *ibid.* p. 21

⁷¹ Available at: <http://www.un.org/waterforlifedecade/iwrm.shtml>

The general framework for IWRM mandates the cross-sectoral integration between the different water use sub-sectors, i.e. usage for covering human needs, food production, nature and industry. The means of implementation of IWRM policies are the enabling environment, institutional roles and management instruments.

1. The enabling environment is essentially national, provincial or local policies and the legislation that constitutes the “rules of the game” and enable all stakeholders to play their respective roles in the development and management of water resources. A well-functioning enabling environment is necessary in order to ensure the rights of the former (individuals as well as public and private sector organizations and companies). And their full engagement in various fora and mechanisms, including information and capacity building, which are created to establish the “rules of the game” and to facilitate and exercise their participation. Also, it protects public assets such as intrinsic environmental values.⁷²
2. The development of institutionalism is not only the creation of formally constituted organizations (e.g. service agencies, authorities or consultative committees). Most importantly, it involves consideration of a whole range of formal rules and regulations, customs and practices, ideas and information, and interest or community group networks, which together provide the institutional framework or context within which water management actors and other decision-makers operate. Furthermore, the key issue of effective co-ordination mechanisms prevents the unsuccessful merging of responsibilities or agencies, without remarkable performance improvements.⁷³
3. The management instruments for IWRM are like a fully-equipped «tool box»; its appropriate and targeted methods enable and support decision-makers to make rational and informed choices between alternative actions. These choices should be in accordance with agreed policies, available resources, environmental impacts and the social and economic consequences. Systems analysis, operations research and

⁷² Global Water Partnership, *op. cit.*, p. 33

⁷³ *Ibid.* p. 45.

management theory provide a wide range of quantitative and qualitative The latter, combined with a comprehensive knowledge of economics, hydrology, hydraulics, environmental sciences, sociology and other disciplines pertinent to the problem in question, are used for defining and evaluating alternative water management plans and implementation schemes. As Global Water Partnership notes in its «IWRM» paper: “The art of IWRM is about knowing the available elements of the “tool box” and selecting, adjusting and applying the mix of tools appropriate to the given circumstances.”⁷⁴

⁷⁴ *Ibid.* p. 51.

I.2.2 Institutionalisation of the IWRM

As it is already mentioned, IWRM is an empirical concept. Initially, it was developed from the on-the-ground experience of practitioners on the field. Despite the facts that many elements of the concept were known for several decades, IWRM gained momentum with the adoption of the Dublin principles at the United Nations Conference on Environment and Development in Rio de Janeiro in 1992.⁷⁵ One of the fundamental outcome documents of that Conference, Agenda 21 is a comprehensive plan of action to be taken globally, nationally and locally by organizations and stakeholders, in order to achieve sustainable development at all levels. The 18th Chapter of Agenda 21 explicitly refers to the Integrated Water Resources Management as one of the basic programme areas, whose implementation can reassure the sustainability of water aquifers, especially of the transboundary ones.⁷⁶

This major institutional upgrade of IWRM was followed by the Johannesburg Plan of Implementation, ten year later. As one of the outcome documents of the World Summit on Sustainable Development (Johannesburg Summit, also known as “Rio +10”- 2002), it was one of the most prominent events that endorsed IWRM as a pathway for resolving water problems. It aims to reconfirm that integrated management of shared water resources through transboundary cooperation involving the riparian states is a major key component for achieving sustainable development⁷⁷.

The next step forward for further establishing IWRM as an essential mechanism for water allocation, usage, and exploitation comes almost 10 year later. 2015 marks a milestone for water in development generally, and for Integrated Water Resources Management (IWRM) in particular. It started with the launch of the report “Global Risks 2015” at the World Economic Forum that identified “water crises” at the top global risk in terms of impacts (eighth in terms of likelihood). In September

⁷⁵ In 1992, the International Conference on Water and the Environment was held in Dublin, Ireland. The output from this conference was a declaration regarding water, which was commended at the United Nations Conference on Environment and Development (UNCED) that was held in Rio de Janeiro in June that year. For the full document of the Declaration, See **APPENDIX B**

⁷⁶ See **APPENDIX C**

⁷⁷ A/CONF. 199/20, *Report of the World Summit on Sustainable Development, Johannesburg, South Africa, 26 August - 4 September 2002*, United Nations, New York, 2002.

the UN General Assembly adopted the 17 Sustainable Development Goals (the SDGs), with 169 specific targets, to guide the world's development agenda through 2030⁷⁸. The SDG 6 calls the world to “Ensure availability and sustainable management of water and sanitation for all”. One of the six targets to be achieved under this goal is “By 2030, implement integrated water resources management at all levels, including through transboundary cooperation as appropriate”. That target includes indicators like the degree of integrated water resources management implementation (scale 0 up to 100) and the proportion of transboundary basin area with an operational arrangement for water cooperation; indicator that help measuring the effectiveness of the SDG and creating a solid database for planning the after 2030 period of international actions.

Despite its wide acceptance, IWRM –as any other theory of policy-making proposal- has been under trenchant criticism on many occasions. Dietrich Borchardt et al. mention that the concept of IWRM lends itself to many interpretations. Therefore, it doubts as to its apparent “success”. Some critics, mostly from the academia, are considering IWRM as a set of principles-even brand-that does not provide a clear methodology to support actual problem solving. Also, most policy makers and practitioners view IWRM as a philosophy and process that provides an integrated approach to complex issues that need to be reconciled across sectors, across levels and across stakeholder interests, taking a problem-driven approach embedded in integrated thinking.

However, as the popularity of IWRM seems to continue unabatedly, at least as a slogan in the international water discourse, the calls for implementation of IWRM continue, making it almost a mandate for the «water world». With the world having adopted the SDG target on IWRM, the need to look forward, reconcile views and form alliances across civil society, public, private and academic actors towards a commonly agreed approach and set of actions that can be monitored is more and more evident.⁷⁹

⁷⁸ A/RES/70/1, *Transforming our world: the 2030 Agenda for Sustainable Development*, United Nations, New York 21 October 2015.

⁷⁹ Dietrich Borchardt et al., *op. cit.*, p. vi.

I.2.3 Contribution to regional stability

In this chapter, it has already been emphasized that history and various case studies has shown the necessity to replace the traditional fragmented approach of water resources management with more holistic system view approaches. The IWRM is an approach that has been widely accepted internationally as the way forward for efficient and equitable management of water and related resources.

How can IWRM contribute to the stability of a given region, thus decreasing the probability of intense disputes among the riparian parties- or even those who have no access to water resources and depend on other parties for the fulfilment of their needs?

First of all, given the absence of an efficient system of water allocation, countries tend to opt for the pathway of unilateral management of transboundary water resources, as they view them as their sovereign right, exercised as such, thus excluding any other interested or directly affected party.

IWRM policies propose the process of determining the value of water to various stakeholders. A market value could enhance the participation of latter in decision-making and contribute to resolving conflict. For instance, when markets do not fully capture the total value of water, other mechanisms shall be used to allocate water to the highest value uses and users. In addition, market mechanisms (e.g. trading systems and/or full cost pricing through valuation) could be improved in conjunction with the formulation of appropriate regulatory systems. The above noted tools would not only ensure that existing water supplies are allocated in a sustainable fashion to the highest-value uses but would also enable water managers to determine when the users are willing to pay the costs of investing in additional water-dependent services. As a result of intrinsic attributes of the resource and due to the way it has been managed historically, not all water values (including social and environmental values) are or indeed can be reflected in market prices. Thus, full cost pricing tools through valuation and enhanced water trading are needed to complement and correct the faulty market valuation processes.

Conflict resolution mechanisms may be used to facilitate competing users (such as upstream and downstream countries) in their efforts to share water resources. A rich collection of conflict management techniques, involving both consensus building, conflict prevention and conflict resolution, is available to assist stakeholders in their negotiations. Decision-makers could integrate their expertise and experience more widely in the water sector. Empirical research is required to evaluate and learn from the experience so far gained (e.g. in USA, Australia) in attempts to resolve conflicts between upstream and downstream countries and between different sectoral interests.

Moreover, conflicts among neighboring upstream users and downstream users tend to be pervasive and usually result in undue delays in the implementation of water resources development projects⁸⁰. Currently, such conflicts may be resolved through political negotiations (or the involvement of the judiciary, if they have penetrated the national territorial boundaries). However, experience shows that the involved parties often use such negotiations to postpone agreements on water sharing. It is important to emphasise that resolving upstream-downstream conflicts requires acceptable estimates of water resource availability over time, taking into account return flows and the effects of catchment development on evaporation losses and run-off. One way to resolve such conflicts is to involve water users and other stakeholders who will be affected by the water resources development project. As a safeguard for parties negatively affected by the status quo, governments should also always have a default compulsory jurisdiction function for conflict adjudication. Unless governments have such powers the parties benefiting from the status quo have no incentives to enter negotiations or accept mediation to solve the allocative conflicts from which they derive a benefit.

The fact that not all services provided by water and water- related ecosystems can be valued in an objective and quantitative manner, independent of the value systems of those involved is another direct link conflict resolution techniques. In the presence of a market, the agreed price is an indicator of the value of the good or service and serves to prevent conflicts. In the absence of a market, values can be approximated through explicit valuation techniques that transform attributes into their

⁸⁰ As mentioned previously in the proposed dissertation, Chap. 1, p. 21-22.

monetary units, or they can be determined implicitly through conflict resolution methods (i.e. every agreement reached also implies an agreed value of the goods and services provided in the uses considered in the conflict).⁸¹

⁸¹ Global Water Partnership, *op.cit.*, pp.56-57.

Part II: Case Study- The region of Central Asia

*«If we want things to stay as they are, things will have to change. »
Tancredi, character in di Lampedusa's The Leopard (1958)*

Chapter 1: The «Water Identity» of Central Asia

II.1.1 Introduction

In 1991, the dissolution of the Soviet Union resulted in the emergence of 15 new states, among them the five independent republics in Central Asia.

Central Asia lies between the Ural Mountains to the north and the Hindu Kush to the south, and between the Caspian Sea to the west and the Tien Shan mountain system (near the border with China) to the east. The region covers 4 million km² (10 percent of the Asian continent and twice the combined areas of France, Germany, Great Britain, Italy, and Spain). It stretches 2,400 km from west to east and 1,280 km from north to south. The territory comprises Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan, and Uzbekistan (**Appendix D**). The combined population is about 65 million. The fundamental element of each country are presented in **Table 2** show their dynamic and the fragile balance of power, as the economic growth of certain countries leads to the prevalence of hydro-hegemonic behavioural patterns.



Figure 7. Global overview of Central Asia

Table 2. Central Asia: Basic Facts (2016 est.) (Source: World Bank)

Country	Total Area	Total Population	Total GDP (current US\$)
Kazakhstan	2.7 m. sq. km	17.797.032 million	\$137.278 billion
Kyrgyzstan	199.951 sq. km	6.082.700 million	\$6.551 billion
Tajikistan	144.100 sq. km	8.734.951 million	\$6.952 billion
Turkmenistan	488.100 sq. km	5.662.544 million	\$36.18 billion
Uzbekistan	447.400 sq. km	31.848.200 million	\$67.22 billion

During the Soviet Union era, these states were a major source of petroleum and agricultural products, particularly cotton. Simultaneously, they were engaged in cooperation over transboundary waters in the Aral Sea basin, considering the role of water in providing development outcomes, including hydropower and agriculture products, in what is termed the water, energy and food nexus.

The map of **Figure 8** demonstrates the vast geographical area of Eurasian continent that Soviet Union covered, as well as the independent state-to-be Soviet administrative divisions. As previously explained in the “Introduction” section, the proposed dissertation considers that the Central Asian region comprises of the Republics of Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan and Uzbekistan (as **Figure 7** and **Appendix D** portray). The USSR’s collapse fundamentally changed the strategic configuration of the wider Central Asian region, although the implications of this geo-strategic upheaval could not be predicted with any certainty at that time. The term “wider Central Asia” is used to indicate the areas of Russia, China and Afghanistan, which border the core Central Asian states and share sizeable ethnic minorities with them.

Figure 8. Soviet Union Administrative Divisions, 1989 est. (Source: Universities of Texas Libraries)

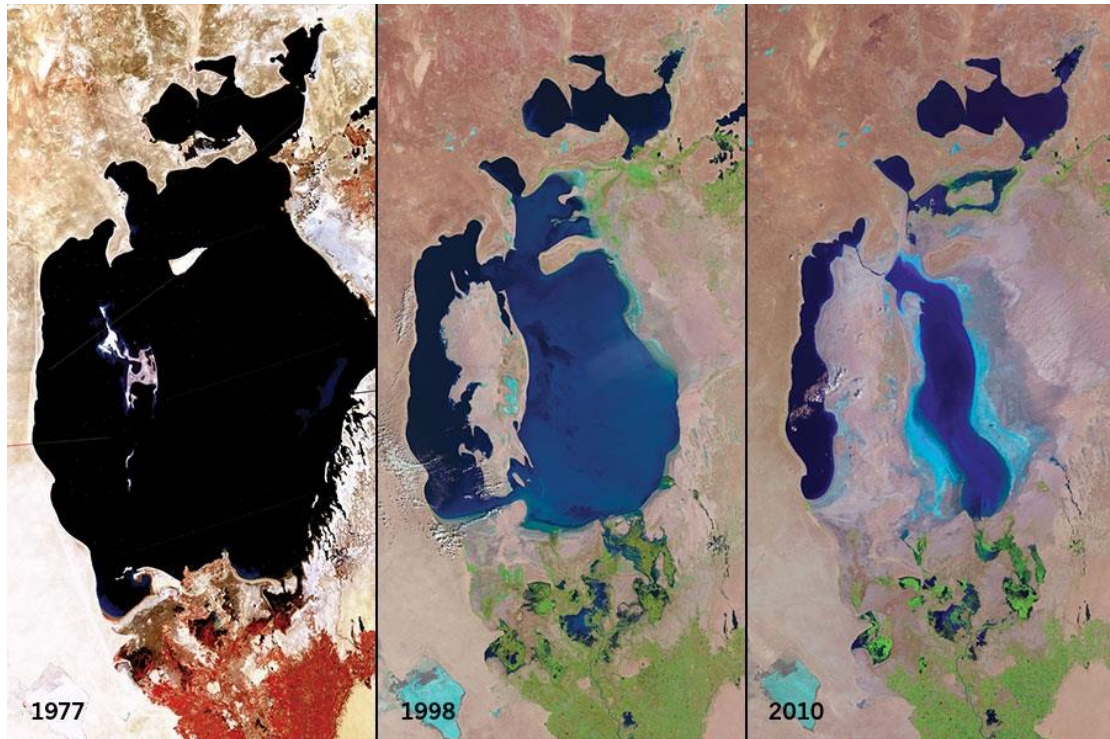


As a region, Central Asia is subject to a number of major environmental concerns, including the desiccation of the Aral Sea. **Figure 9** portrays in a rather shocking way the swift disappearance of the Aral Sea, which has been regarded as one of the worst human-made disasters of the twentieth century.

Other environmental challenges are the depletion and degradation of river and irrigation waters, and the consequences of Soviet and Chinese nuclear weapon testing at Semipalatinsk (now known as Semey) and Lop Nor, respectively. However, riverine water, particularly when linked with irrigated land, is perhaps the only regional environmental issue that demonstrates a “probable linkage between environmental degradation and the outbreak of violent civil or interstate conflict”.⁸²

⁸² Sarty, L., *Environmental Security after Communism: the Debate* In DeBardeleben, J., and Hannigan, J. (eds), *Environmental Security and Quality after Communism: Eastern Europe and the Soviet Successor States*, Westview Press, Boulder, USA, 1995, p.19.

Figure 9. Gradual degradation of Aral Sea (Source: Nature.com)



II.1.2 Water in Central Asia

Central Asia is generally an arid region. Steppe and desert cover over 75 percent of the land area, but the high mountain ranges along the southern, eastern, and north-eastern borders play a key role in making the region suitable for farming.

As the region is within arid and semi-arid global vegetation zones, agriculture is made possible only by irrigation, which demands sophisticated water distribution systems. More than 3500 years ago, the “Mesopotamia” of Central Asia was populated by developed hydraulic societies with refined irrigation systems that provided water for millions of hectares. At the end of the 19th century, after the Russian conquest, new irrigation technologies were introduced in order to cultivate cotton on a larger scale. The once seemingly inexhaustible Central Asian water resources started diminishing in the 1960s, when a rapid increase in the demand for water resources caused the dramatic depletion of river flows and ground water reserves, as well as the degradation of water and soil quality. The desiccation of the Aral Sea (**Figure**), is the most tangible result of dysfunctional water management policies.⁸³

During the Soviet Union period, the supply of water from upstream states (now sovereign republics) was compensated for through energy provision in the other direction. Water resources were an exclusive state property and therefore provided as a “free good”⁸⁴. The Soviet Union determined the water allocation quotas between its different states. Charges were only for the development and maintenance of water supply schemes and not for the amount of water consumed.⁸⁵

The main issue of the Soviet model of water allocation in Central Asia was that it was fixed by water quotas from Moscow, favoring downstream countries at the

⁸³ Mosello, Beatrice, *Water in Central Asia: a prospect of conflict or cooperation?*, Journal of Public and International Affairs, Vol. 19, 2008, p. 152

⁸⁴ Klötzli, S., *The Water and Soil Crisis in Central Asia: A Source for Future Conflicts?*, ENCOF Occasional Paper No. 11, Center for Security Policy and Conflict Research Berne, Swiss Peace Foundation, Zürich, Switzerland, 1994; World Bank, *Water and Energy Nexus in Central Asia: Improving Regional Cooperation in the Syr Darya Basin*, World Bank, Washington, DC, 2004.

⁸⁵ Björklund, G., *The Aral Sea: water resources, use and misuse*, In: K. L. Kiessling (Ed.) *Alleviating the Consequences of an Ecological Catastrophe*, Swedish UNIFEM, Stockholm Committee, 1999, pp. 42–50.

expense of upstream countries. In practice, USSR government tried to cut a fair deal between countries by exchange of resources. For instance, water-rich states (Kyrgyzstan and Tajikistan) supplied states with more developed agriculture and industry (Kazakhstan, Uzbekistan and Turkmenistan). Those states, in exchange, supplied Kyrgyzstan and Tajikistan with electricity, gas and coal. The growing of cotton, or “white gold” as it is referred to in Uzbekistan, exploded during the U.S. Civil War, when the North’s tight trade blockade on the South forced Russian textile manufacturers to look to Central Asia for fertile growing areas—relying on the seemingly unlimited supplies of irrigation water from the Aral Sea—and the Czar’s empire inevitably expanded to assist the industrialization of modern Russia.⁸⁶ According to Duishen Mamatkanov, Director of the Institute of Water Problems and Hydropower of the Kyrgyz Academy of Sciences, the Soviet Union restricted agriculture in upstream states Kyrgyzstan and Tajikistan to maximize cotton output in downstream states.⁸⁷ Furthermore, Soviet model of water allocation in Central Asia, as any other part of the state economy, was centralized, which meant that the State covered all costs, such as maintenance of dams, reservoirs and irrigation system.

After the demise of the Soviet Union in 1991, the Central Asian republics not only gained full independence, but also full responsibility for the devastating water crisis. The consequent change in the management of natural resources in Central Asian states triggered the increase of competition for water at an alarming rate, adding tension to what continues to be an uneasy political region. Slovenly and irresponsible planning under the Soviets in managing water resources is one of the crucial issues, which has proved intractable in the post-Soviet era. Scarcity of water resources, poor management, and the absence of agreed-upon arrangements to share water have generated ethnic, economic, and political tensions, environmental degradation, health issues, and overall stagnation in the region .⁸⁸

Therefore, the water issue takes on special importance in Central Asia. At over four million square kilometers, the post-Soviet states of Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan, and Uzbekistan cover an area larger in size than India,

⁸⁶ Charles William Maynes, *America Discovers Central Asia*, *Foreign Affairs*, March/ April 2003.

⁸⁷ Interview, *Central Asia: Water and Conflict*, International Crisis Group Asia Report No 34. 20 February 2002, p. 7.

⁸⁸ Vajpeyi Dhirendra (ed.), *op. cit.* , 16

Pakistan, and Bangladesh combined, and are home to approximately 65 million people. More than 6,000 rivers (over 10 km long) originate in the mountains. While examining **Figure 10**, one can notice that the majority of fresh water pours from runoff from the high mountain ranges of Pamir and Tien Shan in the Eastern part of Central Asia, which feed the two main rivers of the region, the Amur Darya and Syr Darya. Major transboundary rivers in the region – and the most important water sources for the Aral Sea Basin – the Amu Darya and the Syr Darya, are at the centre of the disputes. The Amu Darya, the biggest river in Central Asia in terms of water availability, is formed by the Panj River in Afghanistan and the Vakhsh River in Tajikistan, continues into Uzbekistan and Turkmenistan and ultimately into Uzbekistan, before emptying into the Aral Sea. The Syr Darya, the longest river in Central Asia, with a length of 3,019 km, has its source in the Tien Shan Mountains in Kyrgyzstan and flows westward toward Uzbekistan through the Fergana Valley, continuing into Tajikistan before it re-enters Uzbekistan and ultimately empties into the Aral Sea. The vast Turan lowlands stretch out between these rivers. There are densely populated oases located mainly along the upper and middle reaches and the irrigated areas in the lower reaches and deltas. These areas are surrounded by deserts that are moving as a result of natural processes that sometimes change the direction of rivers.

In the past there have also been human interventions that have been destructive to rivers. Water resources are predominantly transboundary in nature. Most of the region's surface water resources are generated in the mountains in Kyrgyzstan, Tajikistan, and Afghanistan. These waters flow into the two main rivers to countries downstream – Kazakhstan, Turkmenistan, and Uzbekistan – which are a part of the Aral Sea Basin. Water resources are critically important to the region's economy, its people, and the environment. Irrigation, for example, is vital for agricultural production and most of the population of Tajikistan, Turkmenistan, and Uzbekistan depend directly or indirectly on irrigated agriculture. Water is also important for energy production – hydropower energy satisfies more than 90 percent of the total electricity needs in Kyrgyzstan and Tajikistan, and is also an export commodity. The competing demands of agriculture in downstream countries and

hydropower generation in upstream countries fuel serious political disputes in the region, putting water at the heart of regional security and stability.⁸⁹

Figure 10. Physical map of Central Asia (Source: freeworldmaps.net)



During the post-independence era, the aforementioned competing interests in and demands upon the water resources from the Amu Darya and Syr Darya basins by the “Stans” have become increasingly evident. The latter signed in 1992 the **Almaty Agreement**⁹⁰, which regulates water allocation in the region. Despite the emergence of new national boundaries and new regional challenges, the Soviet-inspired water resources management system, with its existing water quotas were left largely intact. The Agreement outlined the main principles, which corresponded to international practice, among others: equality of rights to use and responsibility of the State for transboundary water resources⁹¹ ; obligation to respect the agreed procedure and rules

⁸⁹Iskandar Abdullaev, Shavkat Rakhmatullaev, *Setting up the agenda for water reforms in Central Asia: Does the nexus approach help?* Environmental Earth Sciences, Vol. 75, p. 871.

⁹⁰ Agreement on cooperation in joint management, use and protection of water resources of inter-state sources (Almaty agreement, 1992). For full text, please read **APPENDIX J**.

⁹¹ Ibid. ar. 2

for the use and protection of transboundary water resources⁹² ; obligation to avoid actions that would affect the interests of other Parties and would be able to harm them⁹³, etc. The fact that the spasmodic adoption of the Agreement followed almost immediately after the collapse of the Soviet Union reveals its strengths and weaknesses.

The Central Asian Republics affirmed their rights to control land, water, and other natural resources within their territories, not only for agriculture production but also for energy purposes, resulting in unilateral development paths. The upstream countries have argued that water should be treated as a commodity and therefore paid for by the downstream countries. In contrast, the downstream countries have adopted the internationally accepted position that water in an international river is a common good, thus shall be shared by all benefited riparian countries⁹⁴. Evidence of these policy signals in the nexus pre- and post-independence are seen in the form of the declining Aral Sea and with drought and low levels of reservoir storage creating shocks and setbacks for the economies in the region. Moreover, there are several other shortcomings of the Agreement, such as: no clear definition of the territory domain of Agreement, no provisions regarding access to information on status of water resources, etc. But, these legal defects should be put aside, and the account must be taken of the fact that the Agreement was just a mechanism for **maintaining the ex-Soviet system**.

Agriculture, as it has been already noted, is the cornerstone of the region's economy, and thirsty crops such as cotton and rice require intensive irrigation. Moreover, irrigation systems have decayed so severely that half of the water never reaches the fields, and several years of drought have further cut available water by a fifth even as demand continues to soar. The problems related to increasing water demand and declining water supply have been further compounded by rising nationalism, as well as strong security dilemmas and political and economic competition among the five Central Asian states. As a result, they have been unable-

⁹² Ibid. ar. 3

⁹³ Ibid. ar.4

⁹⁴ Linn, J. F. (2008) *Water-Energy Links in Central Asia: A Long-Term Opportunity and Challenge* (Washington, DC: Brookings Institution) 2008, p

though primarily unwilling- to find a viable regional approach to replace the Soviet system of water management.⁹⁵

Water is a central element in the nexus and hence collaboration on water issues is of utmost importance for reaching development outcomes in water-energy-food sectors. Such system integration was partly achieved during the Soviet Union when focus was on development outcomes from the use of the transboundary water resources⁹⁶ However, an externality of this outcome-oriented focus was severe environmental degradation due to mismanagement of water resources and other environmental assets. For example, over 90% of the Aral Sea basin water flow is withdrawn for irrigation⁹⁷. By 2007 the surface area of the Aral Sea had decreased to 10% of its original area; the salinity of the remaining southern part is now three times that of normal seawater⁹⁸. Today, is a permanent “Dead Sea”: once the fourth largest lake in the world, yet today a toxic wasteland where salt and dust storms regularly whip up, already forcing the removal of two million inhabitants of autonomous Karakpakstan within Uzbekistan.

⁹⁵ Mosello, Beatrice, *op.cit.* , p 152-153.

⁹⁶ Wegerich, K. (2011) *Water resources in Central Asia: regional stability or patchy make-up?* Central Asian Survey, Vol. 30 Issue 2, 2011, pp. 275–290.

⁹⁷ Aquastat (2011) Available at

http://www.fao.org/nr/water/aquastat/countries_regions/fussr/index5.stm

⁹⁸ CA Water Info (2011) *Reservoirs and flow regulation*. 2011, Available at http://www.cawater-info.net/amudarya/reservoir_e.htm

Figure 11. Water Resources in the Aral Sea Basin (Source: CAWater-Info)



Chapter 2: Water conflicts in Central Asia

The most likely scenarios are international disputes over transboundary waters. Existing event datasets on international river basin conflict and cooperation indicate that international disputes over water issues are quite common. But none of these disputes has thus far escalated into a militarized interstate dispute in a form that would, according to common definitions, qualify as a war.

Nonetheless, many observers expect that the outbreak of future militarized interstate disputes remains a strong possibility. The strongest “candidates” in this respect are international catchments shared by poorer, less democratic, and politically less stable countries, governed by weak international water management institutions and exposed to severe climatic changes. Since the Central Asia, with its river basins of Syr Darya and Amu Darya, the Aral Sea Basin and areas like the Fergana Valley, corresponds quite well to these characteristics, it is a critical test case.

Hence literature shows, *ex post*, international water allocation problems and institutions in the Central Asia and, *ex ante*, whether climatic changes are likely to make existing international tensions worse in future. Based on hydrological data and other information, the currently existing international water management institution in the places like Syr Darya has seemed to fail. The biggest concern in this respect is Kyrgyz Uzbek relations, which could deteriorate further because the Uzbek population and agriculture in the Syr Darya catchment are particularly vulnerable to climate change-induced shifts in runoff. Such shifts are likely to occur only in the medium to long term. The latter provides to the riparian countries the opportunity to set up an effective international framework for water allocation and prevention of climate change induced geohazards.

Global warming is already being felt in Central Asia, with melting glaciers in Tajikistan and Kyrgyzstan and rising temperatures and water shortages in the downstream countries that will have a real impact on agricultural practices: those will likely inflict damage on arid soils, harm plant productivity of intense irrigation farming like cotton, the “white gold” of the Stans, and, in combination with periods of abnormally dry weather sufficiently prolonged, the lack of water will cause a serious hydrologic imbalance in the affected area.

By implication, a climate change-induced militarized interstate dispute over water resources in Central Asia seems rather unlikely, as it will be used as a tool to exacerbate border tensions and will force people to undesired movement and migration, thus leading to more ethnic blending; social tensions from rising temperatures may raise the risk and harden the states positions over negotiation's table in this regard.⁹⁹

Water will probably not be a cause of armed conflict in the near future for Central Asia. Although water resources are increasingly important factor in the strained relations between the five states and an important contributor to local conflicts. Water shortages are already inhibiting economic growth and limiting opportunities in rural areas. Greater effort is needed to manage and use water more efficiently in Central Asian or the five republics will find themselves struggling to survive.

⁹⁹ Bernauer, Thomas, Siegfried, Tobias *Climate change and international water conflict in Central Asia*, Journal of Peace Research Vol. 49 No 1, 2012, pp. 227–239

Chapter 3: Appliance of IWRM policies

As it has already been highlighted, the water resources in CA cross political borders and link the countries physically together. Nonetheless, cooperation solely from a standpoint of sharing water resources could lead to increase tension, as there would be no mechanism for sharing of the benefits from cooperation in the nexus. An alternative path is therefore to manage and develop the transboundary river basin from the perspective of sharing the benefits generated from power generation and agricultural production, through market mechanisms provided by the emerging regional integration frameworks. Such an outcome-oriented approach to managing transboundary water resources has the ability to provide the necessary political will for change.¹⁰⁰

Much of the relevant literature has analysed the water management situation; most of it suggested introducing principles of Integrated Water Resources Management to resolve existing tensions. Similarly, the Interstate Commission for Water Coordination (ICWC) comprised of heads of water authorities of Central Asian countries has been promoting the importance of IWRM implementation in the region since the collapse of the USSR

Central Asian countries were familiar with the IWRM approach, as some of its elements have been practiced for irrigated agriculture development in the region during the Soviet time. For instance, during 1960 and 1970 hydrographic institutional set up, coordination between different water users across multiple levels of water hierarchy, water conservation, and consolidated records for all types of waters uses were applied for the development of virgin lands in the Golodnaya Steppe. The new economic and financial conditions of the 1990s, and restructuring of the agrarian sector, demanded an updated vision of IWRM to support reforms.

In 2001, Swiss Development Cooperation suggested development of an IWRM that would reflect the specificities of the region, and testing it in a pilot project in the Fergana Valley. The IWRM-Fergana project was implemented by national

¹⁰⁰ Granit, Jakob et al., *Regional Options for Addressing the Water, Energy and Food Nexus in Central Asia and the Aral Sea Basin*, International Journal of Water Resources Development, Vol. 28, No 3, 2012, pp. 419-432.

teams from Kyrgyzstan, Tajikistan, and Uzbekistan, and coordinated by the Association of Scientific Information Center of Interstate Commission for Water Coordination and International Water Management Institute. The main purpose of the project was to contribute to more secure livelihoods, increased environmental sustainability, and greater social harmony, through improved effectiveness of water resources management using IWRM principles.

The findings of this study were useful in formulating a vision on the wide implementation of IWRM in the region. As Dukhovny, Sokolov, and Ziganshina explain:

“This vision promotes the following ideas:

- To ensure that water resources are managed more efficiently, management functions on water delivery, water demand and control (inspection) should be delegated to different institutions. The division of functions will create stimulus for minimization of unproductive water losses in water delivery and water demand.
- To avoid administrative pressure, water delivery institutions should be established along hydrographic units. The hydrographization in the entire Fergana Valley should be completed.
- Water demand management can be more efficiently implemented within territorial boundaries because social and economic activities as well as local authorities are structured within administrative units.
- The involvement of stakeholders and public into decision making process and water governance bodies should be bottom-up driven process to avoid professional/sectoral hydroegoism and participatory water management.
- Investments in infrastructure will be ineffective without adequate institutional reforms.
- Institutional changes without improvements of managerial instruments also will be ineffective. Economic mechanisms and financial instruments are needed to provide financial sustainability at the lower institutional levels, where final products are created by water uses.

- Water sector reforms and daily water management should be result-oriented. All changes (even institutional) should be assessed against water indicators e more drops of saved water per any action.
- There should be a proper balance between social equity, economic effects and ecological stability. To ensure this, there is need for special programmes on “water education” and creation of a new generation of water leaders.”¹⁰¹

However, the following key-factor need to be stressed : the appliance of IWRM policies and practices will do less, if there is no political will for change, lack of capacity building, perpetuation of people’s ignorance and inability to obtain the knowledge needed to “digest” and integrate the abovementioned techniques in their daily lives, let alone to become active and game-changing stakeholders. IWRM risks to be on the edge of purely theoretical tool, while “flirting” with elitism and falling into disuse.

¹⁰¹ Dukhovny, V.A., Sokolov, V.I., Ziganshina D.R., *Integrated Water Resources Management in Central Asia, as a way of survival in conditions of water scarcity*, Quaternary International Volume 311, 17 October 2013, pp. 181-188.

Conclusions

«There are no passengers on spaceship Earth. We are all crew.»¹⁰²
Marshall McLuhan

Global environmental politics constitute a relatively “new” dimension of the field of international relations, and politics in general; nonetheless, the consequences of environmental degradation are far from new. The 20th century was shaped by the new and more virulent forms of environmental degradation, which have aggravated practices of violence and insecurity that are traced back in human history; processes of economic development, colonialism, state building and ideological rivalry were linked primarily to environmental underpinnings of historical patterns of conflict and insecurity.¹⁰³ As it has already been stated, environmental security as the area of research and practice that address the linkages among the environment, natural resources (as actual or potential sources of wealth that occur in a natural state), conflict and peace-building processes.

A consolidating Westphalian state system has steadily pulled most other issues into its framework, for example water rights. In case like the MENA region, lack of water and severe degradation of soil usually led to outmigration from the area. The era of state borders makes this natural coping strategy difficult and people have to handle this situation in a different way.

The pertinent literature used to support the arguments presented in the proposed Master dissertation and related to global water resources illustrates some key points: the emerging role of water for environment and human development, along with the judicious use of transboundary rivers by riparian countries, are issues which will define political and economic relationships worldwide, particularly in the most water-stressed regions of the Earth. Water scarcity is popularly associated with inter-state conflict, yet the academic literature also touts scarcity as an important

¹⁰² Statement in 1965, in reference to *Operating Manual for Spaceship Earth* (1963) by Buckminster Fuller, as quoted by Vallero, Daniel A., *Spaceship Earth*, in *Paradigms Lost: Learning from Environmental Mistakes, Mishaps and Misdeeds*, Butterworth-Heinemann, UK, 2005, p. 367.

¹⁰³ Matthew, A. Richard, *In Defense of Environment and Security Research In Environmental Change and Security Project Report*, Issue 8, The Woodrow Wilson Center, Washington, DC, Summer 2002, p.115

variable for understanding cooperation over international freshwater. Besides, the role of water in shaping history, cultures and economies of countries is considered as vital.

And what about Central Asia?

Central Asia is a region that shares its boundaries, despair, sorrow, joy, and water resources. It faces big water-related challenges, among them water scarcity, degrading water quality and inefficient water use. .

Climate change may even aggravate the situation and , even though a climate change-induced militarized interstate dispute over water resources in Central Asia is unlikely, these challenges can be met only in a joint effort of all Central Asian states.

The inability and unwillingness of Astana, Ashgabat, Bishkek, Dushanbe and Tashkent to resolve cross-border water problems, as well as the blatant absence of Ashgabat from regional diplomatic tables, have created instability in their shared area. Strained ethnic relations, competition over water and land, corrupted government elites, failure to ensure basic services such as adequate supplies of water for households, agriculture and electricity not only are crippling socio-economic development, feeding political resentment and endangering livelihoods, but also are leading to conflicts that could risk rapid regional destabilization in this volatile part of the Eurasian continent. Any potential foreign donor aid should be targeted at mitigating the consequences of the above stated problems. Acute feelings of insecurity and resentment over energy issues are growing among people and have proved to be major catalysts in the downfall of successive Kyrgyz administrations. Similar upheavals in Uzbekistan and Tajikistan have been prevented due to mass migration and police-state tactics. Differences over upstream hydropower projects demand intensive attempts at resolution from all involved, lest the projects trigger a violent international dispute.

Relations between Kyrgystan, Tajikistan and Uzbekistan may prohibit a regional agreement at this time, but there the possibility that bilateral accords between Uzbekistan and the other two could pave the way for greater future cooperation.¹⁰⁴

¹⁰⁴ International Crisis Group, *op.cit.*, p.26

Despite its countries' instability, economic stagnation, well-established authoritarian regimes, political corruption, and deep-rooted ethnic tensions, most of the literature in the area agrees with the statement that the likelihood of a severe armed confrontation between these "Stans" is a very remote scenario, mainly due to the involvement and commitment of international organisations and multilateral institutions such as World Bank in helping these countries to negotiate. Several donors have played a crucial and constructive role in the Central Asian Republics. These agencies need support from the international community. Nonetheless, ethnic and economic tensions won't cease to exist and have the potential to create low intensity conflicts and political instability in this very strategic region.

New challenges in managing transboundary water will certainly emerge, particularly with the advent of increased variability due to climate change and the growing globalized economy. Parties should participate in conflict-resolution mechanisms and invest in institutional capacity with their neighbours, if they are willing to be properly prepared and adapt to new conditions. Systemic, holistic water management can provide the opportunity for more users to meet their basic needs and become economically resilient with respect to whatever new variables regarding management they face, thereby increasing water security.¹⁰⁵

Integrated Water Resources Management as a policy proposal has the ability to create a more conducive and less conflict-prone regional environment, in order to settle water resource conflicts.

So, does nature really nurtures civil violence?

In a politically compartmentalised world, seeing the bigger picture is difficult; however, it is gradually happening through the growth of global civil society and epistemic communities persuading governments and citizens that is actually in their own interests to "think global". In order to "think global", they should understand that the consequences of their actions know no boundaries and the "domino effect" characterises the nature of local environmental problems.

¹⁰⁵ International water conflict and cooperation: challenges and opportunities Jacob D. Petersen-Perlman, Jennifer C. Veilleux & Aaron T. Wolf

International community's endeavours to establish regimes that promote the effective and collective governance of water resources are multiple and in different levels of a pyramid that depicts the governance model. The implied aim of those initiatives is to prevent future conflictual situations, as the ones previously described, and bring all the interested parties together, in order to discuss and negotiate around the same diplomatic and political table, as equals (as provided for by the first chapter of the Charter of United Nations¹⁰⁶).

Increasing demand for water in the economic and social development of countries in the Middle East, Asia, and Africa; the dire need to efficiently manage water resources; several major environmental and human-generated factors such as urbanisation, industrialisation, climate change, and irrigational needs: all these have created almost a crisis situation in many countries and, therefore, intense competition to utilize available water resources. Especially the transboundary aquifers, which are shared by more than one country. Therefore, it is dire need to modernise infrastructure and the management of water resources as well as train a new generation of highly qualified technical specialists. The agreements would also set a modest precedent for other spheres in which cooperation is sorely needed and might help defuse tensions in the region, while improving the grim living conditions of most of its population¹⁰⁷.

The competent stakeholders need to study the effective examples of shared water management – and replicate them in other settings. We also need to invest in “hydro-diplomacy” and water-related mediation. Furthermore, broader efforts to implement SDG 6 will have a direct impact on national, regional, and even international, peace. Concerning IWRM, as is it has already been mentioned, its art is about knowing the available elements of the “tool box” and selecting, adjusting and applying the mix of tools appropriate to the given circumstances.”¹⁰⁸

As the United Nations Committee on Economic, Social and Cultural Rights has explicitly stated in its General Comment No 15, concerning the Right to Water: “The human right to water entitles everyone to sufficient, safe, acceptable, physically accessible and affordable water for personal and domestic uses. An adequate amount

¹⁰⁶ See **APPENDIX K**, *Charter of the United Nations*, available at: <http://www.un.org/en/sections/un-charter/chapter-i/index.html>

¹⁰⁷ International Crisis Group, *op.cit.*

¹⁰⁸ Global Water Partnership, *op.cit.* p. 51.

of safe water is necessary to prevent death from dehydration, reduce the risk of water-related disease and provide for consumption, cooking, personal and domestic hygienic requirements”.¹⁰⁹ Consequently, it is of paramount importance for all countries, and especially for the water-strained ones, that succumb to a shared- resources system, to develop the proper strong willingness, invest in the educational and technical know-how and so as to serve the needs of their citizens, demolish the walls of doubt and distrust and work in a cooperative framework of mutual interest, in order to sustain the livelihood of their existence.

¹⁰⁹ E/C.12/2002/11, *General Comment No. 15: The Right to Water (Arts. 11 and 12 of the Covenant)*, UN Committee on Economic, Social and Cultural Rights (CESCR), 20 January 2003.

References List

Books- Chapters in Books

Björklund, G., *The Aral Sea: water resources, use and misuse*, In K. L. Kiessling (ed.) *Alleviating the Consequences of an Ecological Catastrophe* Swedish UNIFEM Committee, Stockholm, 1999.

Buzan B. and Woever Ol., *Regions and Powers, The Structure of International Security*, Cambridge University Press, Cambridge, UK, 2003.

Buzan, Barry and Hansen, Lene, *The Evolution of International Security Studies*, Cambridge University Press, New York, USA, 2009.

Dietrich Borchardt, Dietrich, Ibisch, Ralf B., Bogardi, Janos, J. (eds.), *Integrated Water Resources Management: Concept, Research and Implementation*, Springer International Publishing Switzerland, 2016.

Florini, Ann M., and P.J. Simmons, *The New Security Thinking: A review of the North American Literature*, Rockefeller Brothers Fund, New York, 1998.

Hall, Matthew, *Exploring Green Crime: Introducing the Legal, Social and Criminological Contexts of Environmental Harm*, Palgrave Macmillan., Basingstoke, UK, 2015.

Heywood, Andrew, *Global Environmental Politics in Global Politics*, Palgrave Macmillan, UK, 2011.

I. Bannon & P. Collier (Eds.) *Natural resources and violent conflict*. World Bank. Washington, D.C., 2003.

Kirkpatrick, Colin, Lee, Norman (ed.), *Sustainable Development in a Developing World*, Edward Elgar Publishing, UK, 1997.

Loehman, Edna Tusak, Kilgour Marc D. (ed.), *Designing Institutions for Environmental and Resource Management*, Series: New Horizons in Environmental Economics, Edward Elgar Publishing, UK, 1998.

Matthew, Richard A, *Man, the state and nature: rethinking environmental security* in Dauvergne, Peter (ed.), *Handbook of Global Environmental Politics*, Edward Elgar Publishing Limited, UK, 2005.

McDonald, B., and Jehl, D. (eds), *Whose water is it? The unquenchable thirst of a water-hungry world*, National Geographic, Washington, DC, 2003.

Osborn, Fairfield, *Our Plundered Planet*, Grosset and Dunlap, New York, 1948.

Sarty, L., *Environmental Security after Communism: the Debate* In DeBardeleben, J., and Hannigan, J. (eds), *Environmental Security and Quality after Communism: Eastern Europe and the Soviet Successor States*, Westview Press, Boulder, USA, 1995.

Simon, Paul, *Tapped Out: The Coming World Crisis in Water and What We Can Do About It*, Welcome Rain Publishers, New York, USA, 1998.

Vajpeyi Dhirendra (ed.), *Water Resource Conflicts and International Security- a global perspective*, Lexington Books, USA, 2012.

Vallero, Daniel A., *Spaceship Earth*, in *Paradigms Lost: Learning from Environmental Mistakes, Mishaps and Misdeeds*, Butterworth-Heinemann, UK, 2005.

Vogtmann, Hartmut and Dobretso, Nikolai (eds), *Transboundary Water Resources: Strategies for Regional Security and Ecological Stability*, Springer Science & Business Media, NATO Science Series, IV. Earth and Environment Sciences, Vol 46, The Netherlands, 2006.

Waterbury, John, *Hydropolitics of the Nile Valley* (1978), Syracuse University Press, Syracuse, New York, USA, 1979.

Αραμπατζής, Γαρυφαλλος, Πολύζος Σεραφείμ (επιμ.) *Φυσικοί πόροι, Περιβάλλον και Ανάπτυξη* (συλλογικό), 1η έκδ., Εκδόσεις Τζιόλα, Θεσσαλονίκη, 2008.

Καλλία - Αντωνίου Α., *Θεσμικό Πλαίσιο για την Προστασία και Διαχείριση Υδατικών Πόρων*, Εκδόσεις ΖΗΤΗ, Θεσσαλονίκη, 2011.

Ξένος, Διονύσιος, *Οικονομία του περιβάλλοντος και των φυσικών πόρων*, Εκδόσεις Παπαζήση, Αθήνα, 2002.

Σκιαδάς, Παναγιώτης Ζ., *Η σχέση των υδάτινων πόρων με την εξωτερική πολιτική στη Μέση Ανατολή*, Εκδόσεις Gutenberg, Αθήνα, 2011.

Papers- Journals

Abdullaev Iskandar, Rakhmatullaev Shavkat, *Setting up the agenda for water reforms in Central Asia: Does the nexus approach help?*, Environmental Earth Sciences, Vol. 75, 2016.

Alam Z. Undala, *Questioning the water wars rationale: a case study of the Indus Waters Treaty*, The Geographical Journal, Vol. 168, No. 4, December 2002.

Thomas Bernauer, Thomas, Siegfried, Tobias *Climate change and international water conflict in Central Asia*, Journal of Peace Research Vol. 49 No 1, 2012

Bindra, Satya. P., Hamid, Abdel, Salem, Hussein, Hamuda, Khalifa, Abulifa Salem, *Sustainable integrated water resources management for energy production and food security in Libya*, Elsevier Ltd., Procedia Technology, Vol. 12, 2014.

De Stefano, L., Edwards, P., De Silva, L., & Wolf, A. T., *Tracking cooperation and conflict in international basins: Historic and recent trends*, Water Policy, Vol. 12, No. 6, USA, 2010.

Deudney, Daniel, *Environment and Security: Muddled Thinking*, The Bulletin of Atomic Scientists Vol. 47, No3, 1991.

Dinar, Shlomi, *Scarcity and Cooperation along International Rivers*, Global Environmental Politics, Vol.9, Issue 1, February 2009.

Dukhovny, V.A., Sokolov, V.I., Ziganshina D.R., *Integrated Water Resources Management in Central Asia, as a way of survival in conditions of water scarcity*, Quaternary International Volume 311, 17 October 2013.

EU Commission and High Representative, *Climate change and international security: Paper to the European Council*. S113/8. European Council. Brussels, 2008.

Global Water Partnership, *Integrated Water Resources Management*, Technical Advisory Committee, Background Papers No. 4, Stockholm, Sweden, 2000.

Global Witness, *The sinews of war*. Global Witness Publishing. Washington, D.C., 2006.

Granit Jacob, Jägerskog Anders, Lindström Andreas, Björklund Gunilla, Bullock Andrew, Löfgren Rebecca, George de Gooijer & Pettigrew Stuart, *Regional Options for Addressing the Water, Energy and Food Nexus in Central Asia and the Aral Sea Basin*, International Journal of Water Resources Development, Vol. 28, No 3, 2012.

Hecker, Jeanna Hyde, *Peace and Sustainable Development through Environmental Security: A Methodology for Environmental Security Assessments*. Institute for Environmental Security, The Hague, The Netherlands, 2011.

Klötzli, S., *The Water and Soil Crisis in Central Asia: A Source for Future Conflicts?*, ENCOP Occasional Paper No. 11, Center for Security Policy and Conflict Research Berne, Swiss Peace Foundation, Zürich, Switzerland, 1994.

Linn, J. F., *Water-Energy Links in Central Asia: A Long-Term Opportunity and Challenge*, Brookings Institution, Washington, DC, 2008.

Mosello, Beatrice, *Water in Central Asia: a prospect of conflict or cooperation?*, Journal of Public and International Affairs, Vol. 19, 2008.

Wegerich, K., *Water resources in Central Asia: regional stability or patchy make-up?* Central Asian Survey, Vol. 30 Issue 2, 2011.

Wolf, A. T., *Shared Waters: Conflict and Cooperation*, Annual Review Environmental Resources, Vol. 32, 2007.

Wolf, A. T., Yoffe, S. B., & Giordano, M., *International waters: Identifying basins at risk*, Water Policy, Vol. 5, No1 , USA, 2003.

Yoffe, S., G. Fiske, M. Giordano, M. Giordano, K. Larson, K. Stahl, and A. T. Wolf , *Geography of international water conflict and cooperation: Data sets and applications*, Water Resources Research, Vol. 40, 2004.

Zeitoun, M., & Mirumachi, N., *Transboundary water interaction I: Reconsidering conflict and cooperation*, International Environmental Agreements: Politics, Law and Economics, Vol. 8, No 4, 2008.

Zeitoun, M., & Warner, J., *Hydro-hegemony-a framework for analysis of trans-boundary water conflicts*, Water Policy, Vol 8, No 5, 2006.

Reports

International Crisis Group, *Water Pressures in Central Asia*, Europe and Central Asia Report N°233, Brussels, Belgium, 11 September 2014.

PRIO/UNEP, *Environmental Security - A Report Contributing to the Concept of Comprehensive International Security*, Publication of the PRIO/UNEP Programme on Military Activities and the Human Environment, December 1988.

Strategic Survey, International Institute for Security Studies, London, 1991-2002.

United Nations Environmental Program (UNEP) *From Conflict to Peacebuilding – The Role of Natural Resources and the Environment*, United Nations Environmental Program, Nairobi, Kenya, 2009.

United Nations, *The Sustainable Development Goals Report 2016*, New York, USA, 2016.

World Bank, *Glossary. Development Education Program*, World Bank Group, 2016.

World Bank, *Water and Energy Nexus in Central Asia: Improving Regional Cooperation in the Syr Darya Basin*, World Bank, Washington, DC, 2004.

Official Documents

A/CONF. 199/20, *Report of the World Summit on Sustainable Development, Johannesburg, South Africa, 26 August - 4 September 2002*, United Nations, New York, 2002.

A/CONF.151/26 (Vol. I), *Rio Declaration on Environment and Development*, United Nations General Assembly, 12 August 1992.

A/CONF.199/20 - Johannesburg Declaration on Sustainable Development, 4 September 2002

A/CONF.48/14/ Rev.1, *Report of the United Nations Conference on the Human Environment*, Stockholm, 5-16 June 1972.

A/RES/70/1, *Transforming our world: the 2030 Agenda for Sustainable Development*, United Nations, New York, 21 October 2015.

Agreement on cooperation in joint management, use and protection of water resources of inter-state sources (Almaty agreement, 1992)

Charter of The United Nations and Statute of The International Court Of Justice, San Francisco, 1945.

Declaration on Principles for Cooperation on Water-Related Matters and New and Additional Water Resources Multilateral Peace Process in the Middle East, Multilateral Working Group on Water Resources, Oslo, February 13, 1996.

E/C.12/2002/11, *General Comment No. 15: The Right to Water (Arts. 11 and 12 of the Covenant)*, UN Committee on Economic, Social and Cultural Rights (CESCR), 20 January 2003.

FCC/INFORMAL/84/Rev.1 GE.14 - 20481 (E), *United Nations Framework Convention on Climate Change*, United Nations 1992

Plan of Implementation of the World Summit on Sustainable Development, United Nations, 4 September 2002.

The Indus Waters Treaty, 1960.

UNESCO-IHP, (Draft) *Strategic Plan of the Eighth Phase of IHP (IHP-VIII, 2014-2021)*, UNESCO-IHP, Paris, France, 2012.

UNESCO-IHP, *Final Report. 20th Session of the Intergovernmental Council. Paris, 4-7 June, 2012*, UNESCO, Paris, France, 2012.

Articles

Charles William Maynes, *America Discovers Central Asia*, *Foreign Affairs*, March/April 2003.

Γιαρένης, Ευγένιος Αρ., *Πόλεμος και Νερό- Πόλεμος για το Νερό. Ζητήματα Νομικής Προστασίας του Νερού κατά τη Διάρκεια των Ενόπλων Συγκρούσεων*, Ένωση Δικαστικών Λειτουργών Στρατιωτικής Δικαιοσύνης, ΠερΔικ 1/2007.

Στουρνάρας, Γεώργιος Κ., *Με το Νερό στον 21^ο Αιώνα*, Ελληνική Επιτροπή Υδρογεωλογίας, 19 Μαΐου 2017.

Internet sources

Arsenault, Chris, “*Risk of Water Wars Rises with Scarcity.*” Aljazeera, August 26, 2012, available at:

<http://www.aljazeera.com/indepth/features/2011/06/2011622193147231653.html>.

CA Water Info, *Reservoirs and flow regulation*, 2011, available at:

http://www.cawater-info.net/amudarya/reservoir_e.htm .

College of Earth and Mineral Sciences, The John A. Dutton e-Education Institute, available at: <https://www.e-education.psu.edu/earth103/node/701>

Israel, Brett, “*How Much Water Is on Earth?*” LiveScience, September 9, 2010, available at: <https://www.livescience.com/29673-how-much-water-on-earth.html>.

No agreement reached at Indus Water Treaty talks: World Bank, Times of India, Sep 16, 2017, available at: <https://timesofindia.indiatimes.com/india/no-agreement-reached-at-indus-water-treaty-talks-world-bank/articleshow/60707434.cms>

Official website of *Nature- International journal of science*, available at:

<https://www.nature.com/nature/>

Official website of the Encyclopædia Britannica, available at:

<https://www.britannica.com/>

Official website of the Food and Agriculture Organisation, available at:

<http://www.fao.org/home/en/>

Official website of the National Geographic, available at:

<https://www.nationalgeographic.com/>

Official website of the UNESCO-IHP ISARM Programme, available at:

<https://isarm.org/>

Official website of the United Nations Development Program, available at:

<http://www.undp.org/content/undp/en/home.html>

Official website of the United Nations Statistic Division, available at:

<https://unstats.un.org/home/>

Official website of the United Nations Treaty Collection, available at:

<https://treaties.un.org/>

Official website of the United Nations, available at: <http://www.un.org/fr/index.html>

Official website of the World Bank, available at: <http://www.worldbank.org/>

Official website of Transboundary Waters Assessment Programme, River Basins Component, available at: <http://twap-rivers.org/>

Oregon State University Transboundary Freshwater Dispute Database (TFDD), 2016, available at: <http://www.transboundarywaters.orst.edu/> .

Oregon State University, *Define the terms renewable resource and non-renewable and give examples of each resource type that are related to forage production*, available at:

<http://forages.oregonstate.edu/nfgc/eo/onlineforagecurriculum/instructormaterials/availabletopics/environmentalissues/resource> .

United Nations, *International Decade for action “Water for life” 2005-2015*, available at: <http://www.un.org/waterforlifedecade/iwrm.shtml>

US Geological Survey. 2015. “How Much Water Is There On, In, and Above Earth?”

USGS Water Science School, United States Geological Survey, United States

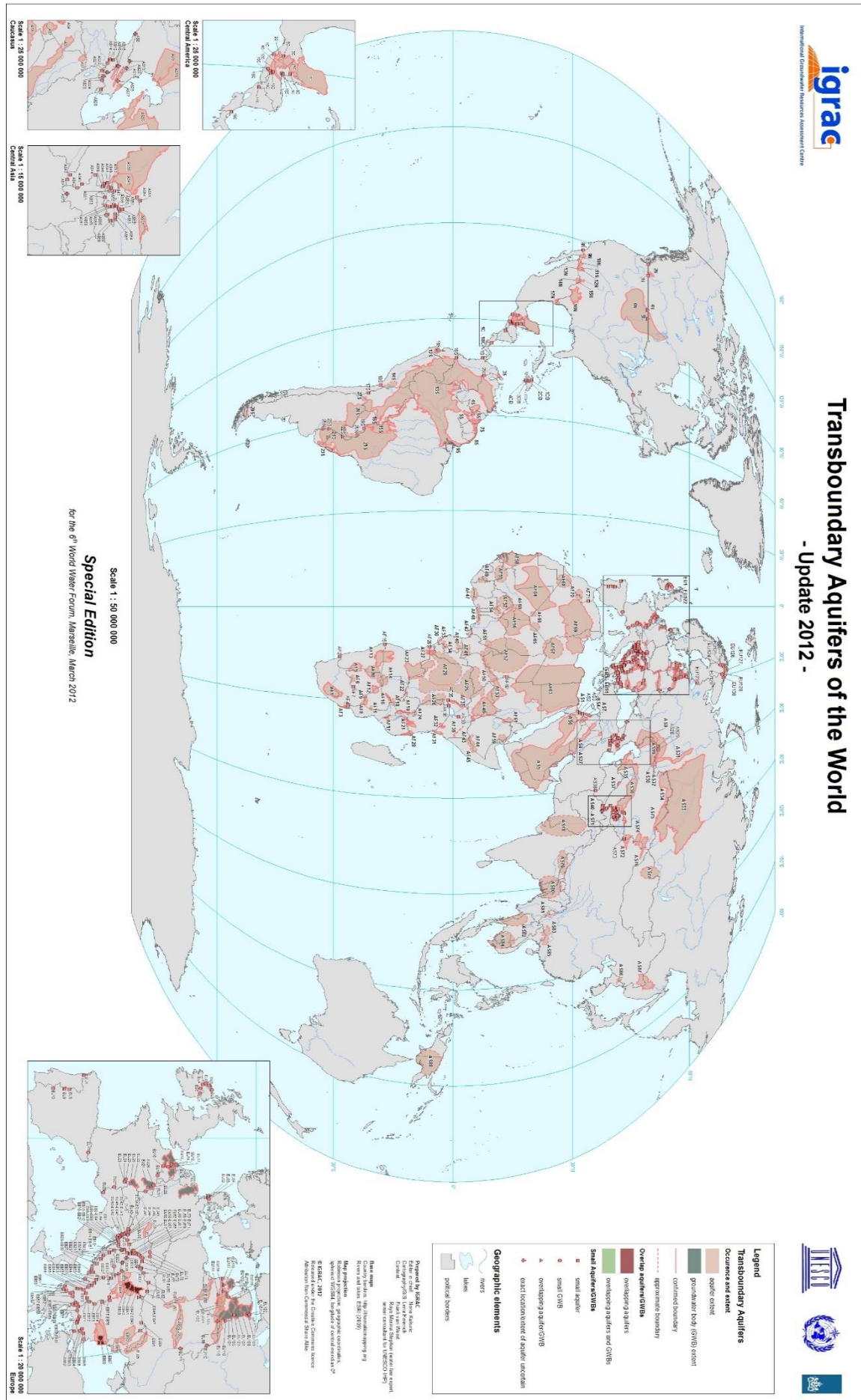
Department of the Interior, available at:

<http://water.usgs.gov/edu/earthhowmuch.html>.

APPENDICES

Source: UNESCO-IHP ISARM Programme

Source: UNESCO-IHP ISARM Programme



APPENDIX B: THE DUBLIN STATEMENT ON WATER AND SUSTAINABLE DEVELOPMENT

The Dublin Statement on Water and Sustainable Development¹¹⁰

Adopted January 31, 1992 in Dublin, Ireland

International Conference on Water and the Environment

Scarcity and misuse of fresh water pose a serious and growing threat to sustainable development and protection of the environment. Human health and welfare, food security, industrial development and the ecosystems on which they depend, are all at risk, unless water and land resources are managed more effectively in the present decade and beyond than they have been in the past.

Five hundred participants, including government-designated experts from a hundred countries and representatives of eighty international, intergovernmental and non-governmental organizations attended the International Conference on Water and the Environment (ICWE) in Dublin, Ireland, on 26-31 January 1992.

The experts saw the emerging global water resources picture as critical. At its closing session, the Conference adopted this Dublin Statement and the Conference Report. The problems highlighted are not speculative in nature; nor are they likely to affect our planet only in the distant future. They are here and they affect humanity now. The future survival of many millions of people demands immediate and effective action.

The Conference participants call for fundamental new approaches to the assessment, development and management of freshwater resources, which can only be brought about through political commitment and involvement from the highest levels of government to the smallest communities.

Commitment will need to be backed by substantial and immediate investments, public awareness campaigns, legislative and institutional changes, technology development, and capacity building programmes. Underlying all these must be a greater recognition of the interdependence of all peoples, and of their place in the natural world.

¹¹⁰ Available at: <http://www.un-documents.net/h2o-dub.htm>

APPENDIX B: THE DUBLIN STATEMENT ON WATER AND SUSTAINABLE DEVELOPMENT

In commending this Dublin Statement to the world leaders assembled at the United Nations Conference on Environment and Development (UNCED) in Rio de Janeiro in June 1992, the Conference participants urge all governments to study carefully the specific activities and means of implementation recommended in the Conference Report, and to translate those recommendations into urgent action programmes for water and sustainable development.

Guiding Principles

Concerted action is needed to reverse the present trends of overconsumption, pollution, and rising threats from drought and floods. The Conference Report sets out recommendations for action at local, national and international levels, based on four guiding principles.

Principle No. 1:

Fresh water is a finite and vulnerable resource, essential to sustain life, development and the environment

Since water sustains life, effective management of water resources demands a holistic approach, linking social and economic development with protection of natural ecosystems. Effective management links land and water uses across the whole of a catchment area or ground water aquifer.

Principle No. 2:

Water development and management should be based on a participatory approach, involving users, planners and policy-makers at all levels

The participatory approach involves raising awareness of the importance of water among policy-makers and the general public. It means that decisions are taken

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at the lowest appropriate level, with full public consultation and involvement of users in the planning and implementation of water projects.

Principle No. 3:

Women play a central part in the provision, management and safeguarding of water.

This pivotal role of women as providers and users of water and guardians of the living environment has seldom been reflected in institutional arrangements for the development and management of water resources. Acceptance and implementation of this principle requires positive policies to address women's specific needs and to equip and empower women to participate at all levels in water resources programmes, including decision-making and implementation, in ways defined by them.

Principle No. 4:

Water has an economic value in all its competing uses and should be recognized as an economic good.

Within this principle, it is vital to recognize first the basic right of all human beings to have access to clean water and sanitation at an affordable price. Past failure to recognize the economic value of water has led to wasteful and environmentally damaging uses of the resource. Managing water as an economic good is an important way of achieving efficient and equitable use, and of encouraging conservation and protection of water resources.

The Action Agenda

Based on these four guiding principles, the Conference participants developed recommendations which enable countries to tackle their water resources problems on a wide range of fronts. The major benefits to come from implementation of the Dublin recommendations will be:

APPENDIX B: THE DUBLIN STATEMENT ON WATER AND SUSTAINABLE DEVELOPMENT

Alleviation of poverty and disease

At the start of the 1990s, more than a quarter of the world's population still lack the basic human needs of enough food to eat, a clean water supply and hygienic means of sanitation. The Conference recommends that priority be given in water resources development and management to the accelerated provision of food, water and sanitation to these unserved millions.

Protection against natural disasters

Lack of preparedness, often aggravated by lack of data, means that droughts and floods take a huge toll in deaths, misery and economic loss. Economic losses from natural disasters, including floods and droughts, increased three-fold between the 1960s and the 1980s. Development is being set back for years in some developing countries, because investments have not been made in basic data collection and disaster preparedness. Projected climate change and rising sea-levels will intensify the risk for some, while also threatening the apparent security of existing water resources.

Damages and loss of life from floods and droughts can be drastically reduced by the disaster preparedness actions recommended in the Dublin Conference Report.

Water conservation and reuse

Current patterns of water use involve excessive waste. There is great scope for water savings in agriculture, in industry and in domestic water supplies.

Irrigated agriculture accounts for about 80% of water withdrawals in the world. In many irrigation schemes, up to 60% of this water is lost on its way from the source to the plant. More efficient irrigation practices will lead to substantial freshwater savings.

Recycling could reduce the consumption of many industrial consumers by 50% or more, with the additional benefit of reduced pollution. Application of the 'polluter pays' principle and realistic water pricing will encourage conservation and

APPENDIX B: THE DUBLIN STATEMENT ON WATER AND SUSTAINABLE DEVELOPMENT

reuse. On average, 36% of the water produced by urban water utilities in developing countries is 'unaccounted for'. Better management could reduce these costly losses.

Combined savings in agriculture, industry and domestic water supplies could significantly defer investment in costly new water-resource development and have enormous impact on the sustainability of future supplies. More savings will come from multiple use of water. Compliance with effective discharge standards, based on new water protection objectives, will enable successive downstream consumers to reuse water which presently is too contaminated after the first use.

Sustainable urban development

The sustainability of urban growth is threatened by curtailment of the copious supplies of cheap water, as a result of the depletion and degradation caused by past profligacy. After a generation or more of excessive water use and reckless discharge of municipal and industrial wastes, the situation in the majority of the world's major cities is appalling and getting worse. As water scarcity and pollution force development of ever more distant sources, marginal costs of meeting fresh demands are growing rapidly. Future guaranteed supplies must be based on appropriate water charges and discharge controls. Residual contamination of land and water can no longer be seen as a reasonable trade-off for the jobs and prosperity brought by industrial growth.

Agricultural production and rural water supply

Achieving food security is a high priority in many countries, and agriculture must not only provide food for rising populations, but also save water for other uses. The challenge is to develop and apply water-saving technology and management methods, and, through capacity building, enable communities to introduce institutions and incentives for the rural population to adopt new approaches, for both rainfed and irrigated agriculture. The rural population must also have better access to a potable water supply and to sanitation services. It is an immense task, but not an impossible

APPENDIX B: THE DUBLIN STATEMENT ON WATER AND SUSTAINABLE DEVELOPMENT

one, provided appropriate policies and programmes are adopted at all levels - local, national and international.

Protecting aquatic ecosystems

Water is a vital part of the environment and a home for many forms of life on which the well-being of humans ultimately depends. Disruption of flows has reduced the productivity of many such ecosystems, devastated fisheries, agriculture and grazing, and marginalized the rural communities which rely on these. Various kinds of pollution, including transboundary pollution, exacerbate these problems, degrade water supplies, require more expensive water treatment, destroy aquatic fauna, and deny recreation opportunities.

Integrated management of river basins provides the opportunity to safeguard aquatic ecosystems, and make their benefits available to society on a sustainable basis.

Resolving water conflicts

The most appropriate geographical entity for the planning and management of water resources is the river basin, including surface and ground water. Ideally, the **effective integrated planning and development of transboundary river or lake basins has similar institutional requirements to a basin entirely within one country**. The essential function of existing international basin organizations is one of reconciling and harmonizing the interests of riparian countries, monitoring water quantity and quality, development of concerted action programmes, exchange of information, and enforcing agreements.

In the coming decades, management of international watersheds will greatly increase in importance. **A high priority should therefore be given to the preparation and implementation of integrated management plans**, endorsed by all affected governments and backed by international agreements.

APPENDIX B: THE DUBLIN STATEMENT ON WATER AND SUSTAINABLE DEVELOPMENT

The enabling environment

Implementation of action programmes for water and sustainable development will require a substantial investment, not only in the capital projects concerned, but, crucially, in building the capacity of people and institutions to plan and implement those projects.

The knowledge base

Measurement of components of the water cycle, in quantity and quality, and of other characteristics of the environment affecting water are an essential basis for undertaking effective water management. Research and analysis techniques, applied on an interdisciplinary basis, permit the understanding of these data and their application to many uses.

With the threat of global warming due to increasing greenhouse gas concentrations in the atmosphere, the need for measurements and data exchange on the hydrological cycle on a global scale is evident. The data are required to understand both the world's climate system and the potential impacts on water resources of climate change and sea level rise. All countries must participate and, where necessary, be assisted to take part in the global monitoring, the study of the effects and the development of appropriate response strategies.

Capacity building

All actions identified in the Dublin Conference Report require well-trained and qualified personnel. Countries should identify, as part of national development plans, training needs for water-resources assessment and management, and take steps internally and, if necessary with technical cooperation agencies, to provide the required training, and working conditions which help to retain the trained personnel.

APPENDIX B: THE DUBLIN STATEMENT ON WATER AND SUSTAINABLE DEVELOPMENT

Governments must also assess their capacity to equip their water and other specialists to **implement the full range of activities for integrated water-resources management**. This requires provision of an enabling environment in terms of institutional and legal arrangements, including those for effective water-demand management.

Awareness raising is a vital part of a participatory approach to water resources management. Information, education and communication support programmes must be an integral part of the development process.

Follow-up

Experience has shown that progress towards implementing the actions and achieving the goals of water programmes requires follow-up mechanisms for periodic assessments at national and international levels.

In the framework of the follow-up procedures developed by UNCED for Agenda 21, all Governments should initiate periodic assessments of progress. At the international level, United Nations institutions concerned with water should be strengthened to undertake the assessment and follow-up process. In addition, to involve private institutions, regional and non-governmental organizations along with all interested governments in the assessment and follow-up, the Conference proposes, for consideration by UNCED, a world water forum or council to which all such groups could adhere.

It is proposed that the first full assessment on implementation of the recommended programme should be undertaken by the year 2000.

UNCED is urged to consider the financial requirements for water-related programmes, in accordance with the above principles, in the funding for implementation of Agenda 21. Such considerations must include realistic targets for the time frame for implementation of the programmes, the internal and external resources needed, and the means of mobilizing these.

APPENDIX B: THE DUBLIN STATEMENT ON WATER AND SUSTAINABLE DEVELOPMENT

The International Conference on Water and the Environment began with a Water Ceremony in which children from all parts of the world made a moving plea to the assembled experts to play their part in preserving precious water resources for future generations. In transmitting this Dublin Statement to a world audience, the Conference participants urge all those involved in the development and management of our water resources to allow the message of those children to direct their future actions.

APPENDIX C: AGENDA 21-CHAPTER 18- INTEGRATED WATER RESOURCES MANAGEMENT

United Nations Conference on Environment & Development

Rio de Janeiro, Brazil, 3 to 14 June 1992

AGENDA 21¹¹¹

Chapter 18

PROTECTION OF THE QUALITY AND SUPPLY OF FRESHWATER RESOURCES: APPLICATION OF INTEGRATED APPROACHES TO THE DEVELOPMENT, MANAGEMENT AND USE OF WATER RESOURCES

18.1. Freshwater resources are an essential component of the Earth's hydrosphere and an indispensable part of all terrestrial ecosystems. The freshwater environment is characterized by the hydrological cycle, including floods and droughts, which in some regions have become more extreme and dramatic in their consequences. Global climate change and atmospheric pollution could also have an impact on freshwater resources and their availability and, through sea-level rise, threaten low-lying coastal areas and small island ecosystems.

18.2. Water is needed in all aspects of life. The general objective is to make certain that adequate supplies of water of good quality are maintained for the entire population of this planet, while preserving the hydrological, biological and chemical functions of ecosystems, adapting human activities within the capacity limits of nature and combating vectors of water-related diseases. Innovative technologies, including the improvement of indigenous technologies, are needed to fully utilize limited water resources and to safeguard those resources against pollution.

¹¹¹ United Nations Division for Sustainable Development,

APPENDIX C: AGENDA 21-CHAPTER 18- INTEGRATED WATER RESOURCES MANAGEMENT

18.3. The widespread scarcity, gradual destruction and aggravated pollution of freshwater resources in many world regions, along with the progressive encroachment of incompatible activities, demand integrated water resources planning and management. Such integration must cover all types of interrelated freshwater bodies, including both surface water and groundwater, and duly consider water quantity and quality aspects. The multisectoral nature of water resources development in the context of socio-economic development must be recognized, as well as the multi-interest utilization of water resources for water supply and sanitation, agriculture, industry, urban development, hydropower generation, inland fisheries, transportation, recreation, low and flat lands management and other activities. Rational water utilization schemes for the development of surface and underground water-supply sources and other potential sources have to be supported by concurrent water conservation and wastage minimization measures. Priority, however, must be accorded to flood prevention and control measures, as well as sedimentation control, where required.

18.4. Transboundary water resources and their use are of great importance to riparian States. In this connection, cooperation among those States may be desirable in conformity with existing agreements and/or other relevant arrangements, taking into account the interests of all riparian States concerned.

18.5. The following programme areas are proposed for the freshwater sector:

- a. Integrated water resources development and management;
- b. Water resources assessment;
- c. Protection of water resources, water quality and aquatic ecosystems;
- d. Drinking-water supply and sanitation;
- e. Water and sustainable urban development;
- f. Water for sustainable food production and rural development;
- g. Impacts of climate change on water resources.

APPENDIX C: AGENDA 21-CHAPTER 18- INTEGRATED WATER RESOURCES MANAGEMENT

PROGRAMME AREAS

A. Integrated water resources development and management

Basis for action

18.6. The extent to which water resources development contributes to economic productivity and social well-being is not usually appreciated, although all social and economic activities rely heavily on the supply and quality of freshwater. As populations and economic activities grow, many countries are rapidly reaching conditions of water scarcity or facing limits to economic development. Water demands are increasing rapidly, with 70-80 per cent required for irrigation, less than 20 per cent for industry and a mere 6 per cent for domestic consumption. The holistic management of freshwater as a finite and vulnerable resource, and the integration of sectoral water plans and programmes within the framework of national economic and social policy, are of paramount importance for action in the 1990s and beyond. The fragmentation of responsibilities for water resources development among sectoral agencies is proving, however, to be an even greater impediment to promoting integrated water management than had been anticipated. Effective implementation and coordination mechanisms are required.

Objectives

18.7. The overall objective is to satisfy the freshwater needs of all countries for their sustainable development.

18.8. Integrated water resources management is based on the perception of water as an integral part of the ecosystem, a natural resource and a social and economic good, whose quantity and quality determine the nature of its utilization. To this end, water resources have to be protected, taking into account the functioning of aquatic ecosystems and the perenniality of the resource, in order to satisfy and reconcile needs for water in human activities. In developing and using water resources, priority has to be given to the satisfaction of basic needs and the safeguarding

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of ecosystems. Beyond these requirements, however, water users should be charged appropriately.

18.9. Integrated water resources management, including the integration of land- and water-related aspects, should be carried out at the level of the catchment basin or sub-basin. Four principal objectives should be pursued, as follows:

- a. To promote a dynamic, interactive, iterative and multisectoral approach to water resources management, including the identification and protection of potential sources of freshwater supply, that integrates technological, socio-economic, environmental and human health considerations;
- b. To plan for the sustainable and rational utilization, protection, conservation and management of water resources based on community needs and priorities within the framework of national economic development policy;
- c. To design, implement and evaluate projects and programmes that are both economically efficient and socially appropriate within clearly defined strategies, based on an approach of full public participation, including that of women, youth, indigenous people and local communities in water management policy-making and decision-making;
- d. To identify and strengthen or develop, as required, in particular in developing countries, the appropriate institutional, legal and financial mechanisms to ensure that water policy and its implementation are a catalyst for sustainable social progress and economic growth.

18.10. In the case of transboundary water resources, there is a need for riparian States to formulate water resources strategies, prepare water resources action programmes and consider, where appropriate, the harmonization of those strategies and action programmes.

18.11. All States, according to their capacity and available resources, and through bilateral or multilateral cooperation, including the United Nations and other relevant organizations as appropriate, could set the following targets:

- a. By the year 2000:

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- i. To have designed and initiated costed and targeted national action programmes, and to have put in place appropriate institutional structures and legal instruments;
 - ii. To have established efficient water-use programmes to attain sustainable resource utilization patterns;
- b. By the year 2025:
- i. To have achieved subsectoral targets of all freshwater programme areas.

It is understood that the fulfilment of the targets quantified in (i) and (ii) above will depend upon new and additional financial resources that will be made available to developing countries in accordance with the relevant provisions of General Assembly resolution 44/228.

Activities

18.12. All States, according to their capacity and available resources, and through bilateral or multilateral cooperation, including the United Nations and other relevant organizations as appropriate, could implement the following activities to improve integrated water resources management:

- a. Formulation of costed and targeted national action plans and investment programmes;
- b. Integration of measures for the protection and conservation of potential sources of freshwater supply, including the inventorying of water resources, with land-use planning, forest resource utilization, protection of mountain slopes and riverbanks and other relevant development and conservation activities;
- c. Development of interactive databases, forecasting models, economic planning models and methods for water management and planning, including environmental impact assessment methods;
- d. Optimization of water resources allocation under physical and socio-economic constraints;

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- e. Implementation of allocation decisions through demand management, pricing mechanisms and regulatory measures;
- f. Flood and drought management, including risk analysis and environmental and social impact assessment;
- g. Promotion of schemes for rational water use through public awareness-raising, educational programmes and levying of water tariffs and other economic instruments;
- h. Mobilization of water resources, particularly in arid and semi-arid areas;
- i. Promotion of international scientific research cooperation on freshwater resources;
- j. Development of new and alternative sources of water-supply such as sea-water desalination, artificial groundwater recharge, use of marginal-quality water, waste-water reuse and water recycling;
- k. Integration of water (including surface and underground water resources) quantity and quality management;
- l. Promotion of water conservation through improved water-use efficiency and wastage minimization schemes for all users, including the development of water-saving devices;
- m. Support to water-users groups to optimize local water resources management;
- n. Development of public participatory techniques and their implementation in decision-making, particularly the enhancement of the role of women in water resources planning and management;
- o. Development and strengthening, as appropriate, of cooperation, including mechanisms where appropriate, at all levels concerned, namely:
 - a. At the lowest appropriate level, delegation of water resources management, generally, to such a level, in accordance with national legislation, including decentralization of government services to local authorities, private enterprises and communities;
 - b. At the national level, integrated water resources planning and management in the framework of the national planning process and, where appropriate,

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establishment of independent regulation and monitoring of freshwater, based on national legislation and economic measures;

c. At the regional level, consideration, where appropriate, of the harmonization of national strategies and action programmes;

d. At the global level, improved delineation of responsibilities, division of labour and coordination of international organizations and programmes, including facilitating discussions and sharing of experiences in areas related to water resources management;

p. Dissemination of information, including operational guidelines, and promotion of education for water users, including the consideration by the United Nations of a World Water Day.

Means of implementation

(a) Financing and cost evaluation

18.13. The Conference secretariat has estimated the average total annual cost (1993-2000) of implementing the activities of this programme to be about \$115 million from the international community on grant or concessional terms. These are indicative and order-of-magnitude estimates only and have not been reviewed by Governments. Actual costs and financial terms, including any that are non-concessional, will depend upon, inter alia, the specific strategies and programmes

Governments decide upon for implementation.

(b) Scientific and technological means

18.14. The development of interactive databases, forecasting methods and economic planning models appropriate to the task of managing water resources in an efficient and sustainable manner will require the application of new techniques such as geographical information systems and expert systems to gather, assimilate, analyse and display multisectoral information and to optimize decisionmaking.

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In addition, the development of new and alternative sources of water-supply and low-cost water technologies will require innovative applied research. This will involve the transfer, adaptation and diffusion of new techniques and technology among developing countries, as well as the development of endogenous capacity, for the purpose of being able to deal with the added dimension of integrating engineering, economic, environmental and social aspects of water resources management and predicting the effects in terms of human impact.

18.15. Pursuant to the recognition of water as a social and economic good, the various available options for charging water users (including domestic, urban, industrial and agricultural water-user groups) have to be further evaluated and field-tested. Further development is required for economic instruments that take into account opportunity costs and environmental externalities. Field studies on the willingness to pay should be conducted in rural and urban situations.

18.16. Water resources development and management should be planned in an integrated manner, taking into account long-term planning needs as well as those with narrower horizons, that is to say, they should incorporate environmental, economic and social considerations based on the principle of sustainability; include the requirements of all users as well as those relating to the prevention and mitigation of water-related hazards; and constitute an integral part of the socio-economic development planning process. A prerequisite for the sustainable management of water as a scarce vulnerable resource is the obligation to acknowledge in all planning and development its full costs.

Planning considerations should reflect benefits investment, environmental protection and operation costs, as well as the opportunity costs reflecting the most valuable alternative use of water. Actual charging need not necessarily burden all beneficiaries with the consequences of those considerations.

Charging mechanisms should, however, reflect as far as possible both the true cost of water when used as an economic good and the ability of the communities to pay.

18.17. The role of water as a social, economic and life-sustaining good should be reflected in demand management mechanisms and implemented through water conservation and reuse, resource assessment and financial instruments.

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18.18. The setting afresh of priorities for private and public investment strategies should take into account (a) maximum utilization of existing projects, through maintenance, rehabilitation and optimal operation; (b) new or alternative clean technologies; and (c) environmentally and socially benign hydropower.

(c) Human resources development

18.19. The delegation of water resources management to the lowest appropriate level necessitates educating and training water management staff at all levels and ensuring that women participate equally in the education and training programmes. Particular emphasis has to be placed on the introduction of public participatory techniques, including enhancement of the role of women, youth, indigenous people and local communities. Skills related to various water management functions have to be developed by municipal government and water authorities, as well as in the private sector, local/national non-governmental organizations, cooperatives, corporations and other water-user groups. Education of the public regarding the importance of water and its proper management is also needed.

18.20. To implement these principles, communities need to have adequate capacities. Those who establish the framework for water development and management at any level, whether international, national or local, need to ensure that the means exist to build those capacities. The means will vary from case to case. They usually include:

- a. Awareness-creation programmes, including mobilizing commitment and support at all levels and initiating global and local action to promote such programmes;
- b. Training of water managers at all levels so that they have an appropriate understanding of all the elements necessary for their decision-making;
- c. Strengthening of training capacities in developing countries;
- d. Appropriate training of the necessary professionals, including extension workers;
- e. Improvement of career structures;
- f. Sharing of appropriate knowledge and technology, both for the collection of data and for the implementation of planned development including non-polluting technologies

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and the knowledge needed to extract the best performance from the existing investment system.

(d) Capacity-building

18.21. Institutional capacity for implementing integrated water management should be reviewed and developed when there is a clear demand. Existing administrative structures will often be quite capable of achieving local water resources management, but the need may arise for new institutions based upon the perspective, for example, of river catchment areas, district development councils and local community committees. Although water is managed at various levels in the socio-political system, demand-driven management requires the development of water-related institutions at appropriate levels, taking into account the need for integration with land-use management.

18.22. In creating the enabling environment for lowest-appropriate-level management, the role of Government includes mobilization of financial and human resources, legislation, standard-setting and other regulatory functions, monitoring and assessment of the use of water and land resources, and creating of opportunities for public participation. International agencies and donors have an important role to play in providing support to developing countries in creating the required enabling environment for integrated water resources management. This should include, as appropriate, donor support to local levels in developing countries, including community-based institutions, nongovernmental organizations and women's groups.

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ASIA

Source: International Crisis Group, *op.cit.*



KAZAKHSTAN

Source: Nations Online Project



APPENDIX F: MAP OF KYRGYZSTAN

Source: International Crisis Group, *op.cit.*



APPENDIX G: MAP OF TAJIKISTAN

Source: International Crisis Group, *op.cit.*



APPENDIX I: MAP OF UZBEKISTAN

Source: International Crisis Group, *op.cit.*



APPENDIX I: MAP OF UZBEKISTAN

Source: International Crisis Group, *op.cit.*



Map No. 3777 Rev. 6 UNITED NATIONS
January 2004

Department of Peacekeeping Operations
Cartographic Section

APPENDIX J- ALMATY AGREEMENT, 1992

Agreement

Between the Republic of Kazakhstan , the Republic of Kirgyzstan, the Republic of
Uzbekistan, the Republic of Tajikistan and Turkmenistan

On Cooperation in the Field of Joint Water Resources Management and Conservation of Interstate Sources¹¹²

The Republic of Kazakhstan, the Republic of Kyrgyzstan, the Republic of Uzbekistan,
the Republic of Tajikistan and Turkmenistan, hereinafter called the Parties,

- Guided by the necessity of approved and organized solution of the problems of joint management of water of interstate sources, and in further pursuance of agreed policy of economic development and raising of the peoples' standard of living;
- Based on the historical community of peoples living on the territory of the Republics, their equal rights and responsibility for providing rational use and protection of water resources;
- Recognizing the unbreakable interdependence and relationship of the interests of all the Republics in solving problems of joint use of water resources on the basis of common principles for the whole region and equitable regulation of their consumption;
- Considering that only unification and joint coordination of action will create favorable conditions for solving social and economic problems, will allow mitigation and stabilization of ecological stresses, which originated as a

¹¹² Available at: <http://www.caee.utexas.edu/prof/mckinney/papers/ara/agreements/ICWC-Feb18-1992.pdf>

APPENDIX J- ALMATY AGREEMENT, 1992

consequence of water resources depletion, and taking into account that in the Republic of Tajikistan there is a disproportionate amount of irrigated land per capita, and recognizing possible increase in water supply for irrigated agriculture;

- Respecting the existing pattern and principles of water allocation, and based on acting regulations of water allocation from interstate sources, the parties agreed as follows:

Article 1

Recognizing the community and unity of the region's water resources, the Parties have equal rights for their use and responsibility for ensuring their rational use and protection.

Article 2

The Parties are obliged to provide for strict observation of agreed order and the establishment of rules of water resources use and protection.

Article 3

Each of the Parties to this Agreement is obliged to prevent actions on its territory which can infringe on the interests of the other Parties and cause damage to them, lead to deviation from agreed values of water discharges and pollution of water sources.

Article 4

The Parties are obliged to carry out joint works for solving ecological problems, related with the Aral Sea desiccation, and establish sanitary water discharge volumes for each year on the basis of water availability of interstate sources.

APPENDIX J- ALMATY AGREEMENT, 1992

During extremely dry years a special separate decision shall be taken on the problems of water supply to the regions of acute water deficiency.

Article 5

The Parties shall facilitate wide information exchange on scientific-technical progress in water economy, complex use and protection of water resources, conducting joint research for scientific-technical support of problems and expertise in water related projects.

Article 6

The Parties take decisions on the joint use of production potential of the Republics' water economy.

Article 7

The Parties decided to establish on parity conditions an Interstate Coordinating Water Management Commission on the problems of regulation, rational use and protection of water resources from interstate sources, including in its membership first authorities of water management agencies, having envisaged quarterly meetings, and if required on Parties initiative.

Meetings of the above-said Commission are held in succession under chairmanship of state representatives and in corresponding capital.

Article 8

The Coordinating Water Management Commission will be responsible for:

APPENDIX J- ALMATY AGREEMENT, 1992

- Determination of water management policy in the region, elaboration of its trends with regard for the needs of all branches of national economy, complex and rational use of water resources, long-term program of water supply in the region and measures for its implementation;
- Elaboration and approval of water use limits, annually for each Republic and the region on the whole, corresponding operations schedule for water reservoirs, their correction by specified forecasts depending on actual water availability and the water management situation.

Article 9

The executive and interdepartmental organs of the Interstate Coordination Water Management Commission shall specify the basin water management associations “Syrdarya” and “Amudarya” which shall function on conditions that all structures and facilities on the rivers and water services operated by them are the property of the corresponding Republic which owns them and should be deemed transferred for temporary use with out the right of transfer and redemption as stated by 1 January 1992.

Basin water management associations are maintained at the expense of allocations of water management organs of the Republics on the basis of parity and sharing.

Article 10

The Interstate Coordination Water Management Commission and its executive body shall provide for:

APPENDIX J- ALMATY AGREEMENT, 1992

- Strict observance of release regimes and water use limits;
- Implementation of measures on the rational and economic use of water resources, sanitary water discharges along the river channels and through the irrigation systems (where they are planned), delivery of guaranteed water volume to the river deltas and the Aral Sea for the purpose of rehabilitating of ecological condition, preservation of water quality in accordance with achieved agreements.

Article 11

Decisions adopted by the Interstate Coordination Water Management Commission on the observance of limits for water withdrawal, rational use and protection of water resources are binding for all water consumers and water users.

Article 12

The Parties agreed to elaborate within 1992 the mechanism of economic and such other responsibility for violation of the agreed regime and limits of water use.

Article 13

All disputable matters are solved by the heads of water management agencies of the Republics, and, if needed, with participation of a representative of the party concerned.

APPENDIX J- ALMATY AGREEMENT, 1992

Article 14

Agreements may be changed or supplemented only by way of joint consideration of all parties to this agreement.

Article 15

This Agreement enters into force the date of signing.

Agreement accepted in Alma-Ata 18 February, 1992.

On behalf of the Republic of Kazakhstan

N. Kipshakbaev

On behalf of the Republic of Kyrgyzstan

M. Zulpuev

On behalf of the Republic of Tajikistan

A. Nurov

On behalf of the Republic of Uzbekistan

R. Giniatulin

On behalf of Turkmenistan

A. Ilamanov

APPENDIX K: CHARTER OF THE UNITED NATIONS

CHAPTER I: PURPOSES AND PRINCIPLES¹¹³

Article 1

The Purposes of the United Nations are:

1. To maintain international peace and security, and to that end: to take effective collective measures for the prevention and removal of threats to the peace, and for the suppression of acts of aggression or other breaches of the peace, and to bring about by peaceful means, and in conformity with the principles of justice and international law, adjustment or settlement of international disputes or situations which might lead to a breach of the peace;
2. To develop friendly relations among nations based on respect for the principle of equal rights and self-determination of peoples, and to take other appropriate measures to strengthen universal peace;
3. To achieve international co-operation in solving international problems of an economic, social, cultural, or humanitarian character, and in promoting and encouraging respect for human rights and for fundamental freedoms for all without distinction as to race, sex, language, or religion; and
4. To be a centre for harmonizing the actions of nations in the attainment of these common ends.

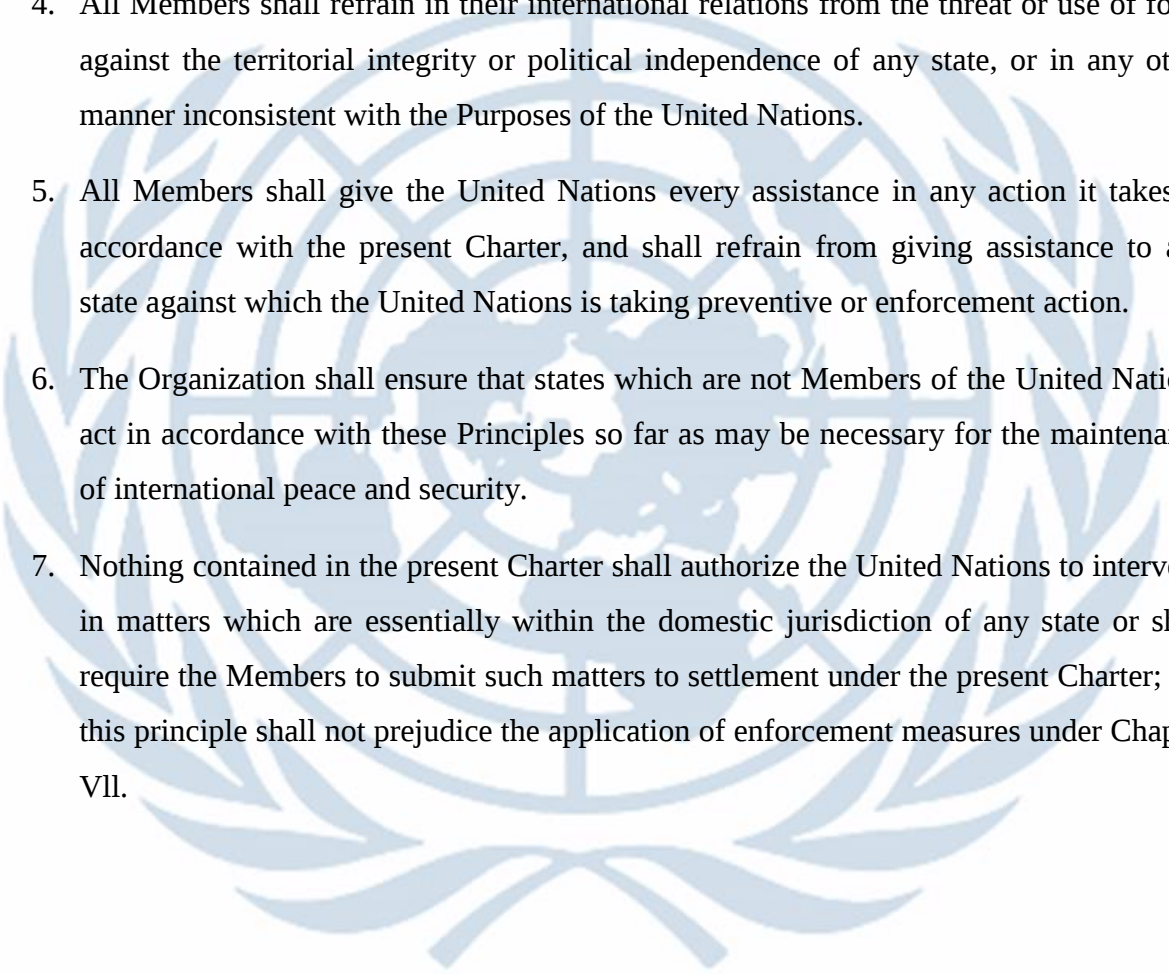
Article 2

The Organization and its Members, in pursuit of the Purposes stated in Article 1, shall act in accordance with the following Principles.

1. The Organization is based on the principle of the sovereign equality of all its Members.

¹¹³ Available at: <http://www.un.org/en/sections/un-charter/chapter-i/index.html>

APPENDIX K: CHARTER OF THE UNITED NATIONS

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2. All Members, in order to ensure to all of them the rights and benefits resulting from membership, shall fulfill in good faith the obligations assumed by them in accordance with the present Charter.
 3. All Members shall settle their international disputes by peaceful means in such a manner that international peace and security, and justice, are not endangered.
 4. All Members shall refrain in their international relations from the threat or use of force against the territorial integrity or political independence of any state, or in any other manner inconsistent with the Purposes of the United Nations.
 5. All Members shall give the United Nations every assistance in any action it takes in accordance with the present Charter, and shall refrain from giving assistance to any state against which the United Nations is taking preventive or enforcement action.
 6. The Organization shall ensure that states which are not Members of the United Nations act in accordance with these Principles so far as may be necessary for the maintenance of international peace and security.
 7. Nothing contained in the present Charter shall authorize the United Nations to intervene in matters which are essentially within the domestic jurisdiction of any state or shall require the Members to submit such matters to settlement under the present Charter; but this principle shall not prejudice the application of enforcement measures under Chapter VII.