

Dimensions of Global Water and Human Security

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The survival of life requires sufficient freshwater resources on earth and, therefore, every individual has a fundamental right to access water. The affordable and safe access to sufficient quantity and good quality of water is called an individual's water security. The affordability of water may also be regarded as individuals' economic and health security, because both require the availability of clean water for drinking and sanitation purposes. Furthermore, water security is also linked to environmental security, because both necessitate individuals' protection from all kinds of water-related disasters such as floods. In addition, water security is also an essential feature of food security, because sufficient water is required for irrigating crops and, thus, growing food. As economic, health, food, and environmental security are regarded as dimensions of human security, water security may also be regarded as an element of human security. An adequate water security is essential for human security. Therefore, the 1997 United Nations Watercourses Convention, the 1992 UNECE Convention, the 1992 Dublin Statement on Water and Sustainable Development, and the 2004 Berlin Rules have directed states to maintain sustainable utilization, management, and preservation of freshwater resources to ensure water security and, in turn, human security.

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I. INTRODUCTION

The availability of water in sufficient quantity and good quality is essential for the existence and survival of life on earth.¹ In fact, it is a fundamental human right to have affordable access to a sufficient quantity of water.² Affordable and safe access to adequate quantity and good quality of water is also regarded as individuals' water security.³ The United Nations has provided a thorough definition of water security: “[t]he 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-

¹ PIERRE THIELBÖRGER, THE RIGHT(S) TO WATER: THE MULTI-LEVEL GOVERNANCE OF A UNIQUE HUMAN RIGHT 15 (2014).

² *Id.* at 15–16.

³ BJØRN-OLIVER MAGSIG, INTERNATIONAL WATER LAW AND THE QUEST FOR COMMON SECURITY 30 (2015) [hereinafter MAGSIG].

related disasters, and for preserving ecosystems in a climate of peace and political stability.”⁴

The term “water security” may also be regarded as a fundamental element of “human security.” To understand this concept, it is essential to first consider the definition of human security from the United Nations General Assembly Resolution 66/290 as “an approach to assist Member States in identifying and addressing widespread and cross-cutting challenges to the survival, livelihood and dignity of their people.”⁵ In particular, a report by the United Nations Development Program (UNDP) identifies seven essential dimensions of human security, which are, in fact, seven other securities related to the well-being of human life.⁶ These are economic, food, health, environmental, personal, community, and political security.⁷

Upon evaluating the definition of water security, it becomes evident that water security is deeply linked to these seven dimensions of human security. For instance, the water security condition of availability of sufficient quantity of freshwater is also a precondition of economic security for agrarian economies.⁸ That is, water in sufficient quantities is required for irrigating crops.⁹ As crops yield food products, the availability of water in sufficient quantity and the resulting irrigation of crops lead to ensuring individuals’ food security.¹⁰ Similarly, water security requires the availability of clean water for drinking and sanitation purposes,¹¹ which is fundamental to individuals’ health security.¹² Water security also necessitates protecting people from all

⁴ *Id.*

⁵ G.A. Res. 66/290, ¶ 3 (Sept. 10, 2012).

⁶ OSCAR A. GÓMEZ & DES GASPER, HUMAN SECURITY: A THEMATIC GUIDANCE NOTE FOR REGIONAL AND NATIONAL HUMAN DEVELOPMENT REPORT TEAMS 2 (2013) [hereinafter GÓMEZ & GASPER].

⁷ *Id.*

⁸ This phenomenon is true because irrigating crops requires sufficient water. Any decline in the availability of water can lead to reducing the crop productivity. As agrarian economies depend on crop productivity, it is essential that water be available in sufficient quantity for irrigating crops. For more details, See Miguel Munoz Munoz, *Foreword* to SUSTAINABLE MICRO IRRIGATION: PRINCIPLES AND PRACTICES xxii (Megh R. Goyal ed., 2015) [hereinafter Munoz].

⁹ *Id.*

¹⁰ M. W. Rosegrant et al., *Water Resources, Agriculture and Pasture: Implications of Growing Demand and Increasing Scarcity*, in GRASSLAND: A GLOBAL RESOURCE 227, 227 (D. A. McGilloway ed., 2005) [hereinafter Rosegrant et al.].

¹¹ DAVID RIEPL, KNOWLEDGE-BASED DECISION SUPPORT FOR INTEGRATED WATER RESOURCES MANAGEMENT WITH AN APPLICATION FOR WADI SHUEIB, JORDAN 1 (2013) [hereinafter RIEPL].

¹² *Id.*; Rosegrant et al., *supra* note 10.

kinds of water-related natural disasters,¹³ which is also an essential requirement of environmental security.¹⁴ The availability of sufficient and disease-free water is also essential for individuals' personal security,¹⁵ and the availability of sufficient water can be used for agricultural and industrial projects, which may ensure the well-being of the entire community and contribute to community security.¹⁶ Moreover, water security also implies that riparian states share water equitably via mutual cooperation.¹⁷ Here, cooperation among them can imply political security for such states and their residents.¹⁸ Water security is directly linked to all seven dimensions of human security, thus implying that water security is directly connected to human security.

In light of the importance of ensuring water security in the context of its relation to human security, international law has provided a number of recommendations and principles for ensuring water security.¹⁹ For example, the 1997 United Nations Watercourses Convention, the 1992 United Nations Economic Commission for Europe (UNECE) Convention, the 1992 Dublin Statement on Water and Sustainable Development, and the 2004 Berlin Rules on Water Resources have highlighted many recommendations to enhance the

¹³ Philippe Gourbesville, *Smart Water Solutions for Water Security: From Concept to Operational Implementation*, in WATER SECURITY AND THE SUSTAINABLE DEVELOPMENT GOALS 47, 48 (Kwangsuop Lim et al. eds., 2019) [hereinafter Gourbesville].

¹⁴ See R.J. Wenning et al., *Environmental Security: Approaches and Tools*, in ENVIRONMENTAL SECURITY IN HARBORS AND COASTAL AREAS: MANAGEMENT USING COMPARATIVE RISK ASSESSMENT AND MULTI-CRITERIA DECISION ANALYSIS 19, 23 (Igor Linkov et al. eds., 2007) [hereinafter Wenning et al.].

¹⁵ For instance, Jochen Bundschuh and Jan Hoinkis argue that availability of sufficient quantity and quality of water is essential for human development. Jochen Bundschuh & Jan Hoinkis, *Addressing Freshwaters Shortage with Renewable Energies*, in RENEWABLE ENERGY APPLICATIONS FOR FRESHWATER PRODUCTION 1, 1 (Jochen Bundschuh & Jan Hoinkis eds., 2012) [hereinafter Bundschuh & Hoinkis].

¹⁶ See Richard I. Ford & Roxanne Swentzell, *Precontact Agriculture in Northern New Mexico*, in TRADITIONAL ARID LANDS AGRICULTURE: UNDERSTANDING THE PAST FOR THE FUTURE 330, 330 (Scott E. Ingram & Robert C. Hunt eds., 2015).

¹⁷ Vasiliki-Maria Tzatzaki & A. Dan Tarlock, *International Water Law and Climate Disruption Adaptation*, in THE UNECE CONVENTION ON THE PROTECTION AND USE OF TRANSBOUNDARY WATERCOURSES AND INTERNATIONAL LAKES: ITS CONTRIBUTION TO INTERNATIONAL WATER COOPERATION 379, 390 (Attila Tanzi et al. eds., 2015) [hereinafter Tzatzaki & Tarlock].

¹⁸ *Id.*

¹⁹ Tadesse Kassa Woldetsadik, *Remodeling Sovereignty: Overtures of a New Water Security Paradigm in the Nile Basin Legal Discourse*, in A HISTORY OF WATER SERIES III, VOLUME 2: SOVEREIGNTY AND INTERNATIONAL WATER LAW 641, 644-645 (Terje Tvedt et al. eds., 2015) [hereinafter Woldetsadik].

availability of sustainable water for people.²⁰ This article will explain how water security is fundamentally connected to human security and how international law provides a number of rules, principles, and recommendations for improving the conditions for individuals' water and human security. Adequate availability of water will lead to people's water security and, in turn, human security.²¹

Part II will include a brief elaboration of the term "water security." Part III will present an overview of the term "human security" and an explanation of how deeply water security is connected to human security. Part IV will include an elaboration of the international legal conventions and sets of rules that provide recommendations for mitigating water security and human security concerns. The inferences of the entire article are drawn at the end.

II. WHAT IS WATER SECURITY?

According to the United Nations, the term "water security" is defined as:

The capacity of a population to safeguard sustainable access to adequate quantities of acceptable quality water for sustaining livelihoods, human well-being, and socio-economic development, for ensuring protection against water-borne pollution and water-related disasters, and for preserving ecosystems in a climate of peace and political stability.²²

This definition implies certain preconditions for ensuring water security, especially affordable and safe access to a sufficient quantity and quality of water.²³ According to this definition of water security, it is essential that every human being have access to adequate quantity and quality of water for drinking, sanitation, and other domestic purposes.²⁴ Moreover, it necessitates that access to water be safe and affordable.²⁵

²⁰ ANTOINETTE HILDERING, INTERNATIONAL LAW, SUSTAINABLE DEVELOPMENT AND WATER MANAGEMENT, 47–48 (2004) [hereinafter HILDERING].

²¹ Krasposy Kujinga et al., *Household Water Insecurity in Different Settlement Categories of Ngamiland, Botswana*, in WATER, ENERGY, FOOD AND PEOPLE ACROSS THE GLOBAL SOUTH: "THE NEXUS" IN AN ERA OF CLIMATE CHANGE 207, 209 (Larry A. Swatuk & Corrine Cash eds., 2018). [hereinafter Kujinga et al.].

²² MAGSIG, *supra* note 3.

²³ *Id.*

²⁴ RIEPL, *supra* note 11.

²⁵ See MAGSIG, *supra* note 3.

II.A. Clean Drinking Water

To ensure adequate water security, it is essential that water used for drinking purposes be clean and free from all kinds of waterborne diseases.²⁶ Every member of the household should have access to such clean drinking water.²⁷ As almost every household also uses water to cook food, such water must also be clean and free from waterborne diseases.²⁸ The availability of clean drinking water in sufficient quantity will not only ensure adequate water security for the public but also guarantee favorable conditions for their food and health security.²⁹

II.B. Hygienic Conditions for Sanitation

Water security also implies that people have hygienic sanitation conditions.³⁰ Without proper sanitation, the risk of spreading hazardous diseases intensifies.³¹ For instance, malaria is a disease transmitted by the female *Anopheles* mosquito, which preys on humans and spreads the malaria virus to them.³² This mosquito breeds on freshwater and, particularly, in places that lack sanitation.³³ Historically, malaria has been the cause of numerous human casualties.³⁴ Therefore, to protect humans from such hazardous diseases, it is essential to ensure suitable sanitation conditions.³⁵ Hygienic sanitation would lead to adequate water and health security for

²⁶ *Id.*; see also RIEPL, *supra* note 11.

²⁷ See MAGSIG, *supra* note 3.

²⁸ See RIEPL, *supra* note 11; see also Rosegrant et al., *supra* note 10.

²⁹ See Rosegrant et al., *supra* note 10.

³⁰ See RIEPL, *supra* note 11.

³¹ Gary N. Greenberg & Gregg M. Stave, *Clinical Recognition of Occupational Exposure and Health Consequences*, in PHYSICAL AND BIOLOGICAL HAZARDS OF THE WORKPLACE 249, 257 (Gregg M. Stave & Peter H. Wald eds., 3d ed. 2017).

³² David A. Warrell, *Malaria*, in TRAVELERS' HEALTH: HOW TO STAY HEALTHY ABROAD 100, 104 (Richard Dawood ed., 5th ed. 2012).

³³ *Id.*

³⁴ *Id.* at 100.

³⁵ See RIEPL, *supra* note 11, at 1; see also Greenberg & Stave, *supra* note 31, at 257.

people.³⁶ The protection of humans from waterborne diseases is an essential requirement for ensuring water security.³⁷

II.C. Protection from Water-Related Natural Disasters

To ensure water security, it is also essential that people have protection from all kinds of water-related natural disasters, such as floods, hurricanes, tsunamis, and heavy rainfall.³⁸ Water-related disasters in the past have threatened individuals' water and human security.³⁹ For instance, tsunamis, floods, and hurricanes have been responsible for many human casualties.⁴⁰ Therefore, it is essential that efforts to mitigate threats from water-related natural disasters should be made by governments, because such protection is a fundamental aspect of water and human security.⁴¹

II.D. Reducing Pollution from Fresh Watercourses

Water security also implies that freshwater resources must be free from pollution.⁴² For instance, the presence in freshwater of harmful industrial chemicals such as arsenic can cause the spread of the deadliest diseases such as cancer in humans.⁴³ Unfortunately, many cases have been observed in different regions where factories have dumped industrial waste containing harmful chemicals directly into fresh watercourses.⁴⁴ Such incidents have been

³⁶ See RIEPL, *supra* note 11, at 1; *see also* Rosegrant et al., *supra* note 10, at 227.

³⁷ See Patricia Wouters, Sergei Vinogradov, & Bjørn-Oliver Magsig, *Water Security, Hydrosolidarity, and International Law: A River Runs Through It*, 19 Y.B. INT'L ENV'T. L. 97, 105 (2009).

³⁸ See Gourbesville, *supra* note 13.

³⁹ See generally Madhavi Malalgoda Ariyabandu & Dilrukshi Foneska, *Do Disasters Discriminate? A Human Security Analysis of the Impact of the Tsunami in India, Sri Lanka and of the Kashmir Earthquake in Pakistan*, in *FACING GLOBAL ENVIRONMENTAL CHANGE: ENVIRONMENTAL, HUMAN, ENERGY, FOOD, HEALTH AND WATER SECURITY CONCEPTS* 1215 (Hans G. Brauch et al. eds., 2009). [hereinafter Ariyabandu & Foneska].

⁴⁰ *Id.*

⁴¹ Umma Habiba, Anwarul Abedin, & Rajob Shaw, *Defining Water Insecurity*, in *WATER INSECURITY: A SOCIAL DILEMMA* 3, 5 (Abwarul Abedin, Umma Habiba, & Rajob Shaw eds., 2013).

⁴² The definition of "water security" particularly mentions "protection against water-borne pollution." See MAGSIG, *supra* note 3.

⁴³ DAVID B. RESNIK, *ENVIRONMENTAL HEALTH ETHICS* 142 (2012).

⁴⁴ See IMF, *Bangladesh, Unlocking the Potential, National Strategy for Accelerated Poverty Reduction*, Bangladesh: Poverty Reduction Strategy Paper, 183 (Oct. 2005).

particularly reported in Bangladesh and India, where factories have dumped industrial waste directly into rivers.⁴⁵ This situation is harming the fisheries ecosystem and also making the water unhygienic for household use.⁴⁶ To eliminate the spread of waterborne diseases, it is essential that industrial waste not be dumped openly into fresh watercourses, especially in those watercourses from which humans extract water for drinking purposes.⁴⁷

II.E. Affordable Access to Water

Affordability is an essential feature of water security.⁴⁸ Affordability means that everyone should have access to sufficient quantity of water at zero or minimal cost.⁴⁹ Unfortunately, in many regions in the world, water is prohibitively expensive.⁵⁰ For instance, people in remote areas of Baluchistan Province in Pakistan have to walk for several miles to collect water for drinking and other domestic purposes.⁵¹ Some areas in Africa have similar conditions, with long walks to expensive water.⁵² For example, the recent drought in South Africa caused a significant shortage of water for every household, making it difficult to perform daily tasks involving water⁵³.

In sum, water security implies access to adequate quantity of clean and disease-free water as well as protection from water-related natural disasters such as floods and tsunamis.⁵⁴ It is also essential to ensure hygienic sanitation

⁴⁵ *Id.*

⁴⁶ *Id.*

⁴⁷ *Id.*

⁴⁸ Kujinga et al., *supra* note 21, at 210.

⁴⁹ Úrsula O. Spring & Hans G. Brauch, *Securitizing Water*, in *FACING GLOBAL ENVIRONMENTAL CHANGE: ENVIRONMENTAL, HUMAN, ENERGY, FOOD, HEALTH AND WATER SECURITY CONCEPTS* 175, 194 (Hans G. Brauch et al. eds., 2009).

⁵⁰ LEWIS D. SOLOMON, *ALLEVIATING GLOBAL POVERTY: THE ROLE OF PRIVATE ENTERPRISE* 27 (2014).

⁵¹ Asad S. Qureshi & Mujeeb Akhtar, *Analysis of Drought-Coping Strategies in Baluchistan and Sindh Provinces of Pakistan* 29 (Int'l Water Mgmt. Inst. Working Paper, Paper No. 86, 2004), http://www.iwmi.cgiar.org/Publications/Working_Papers/working/WOR86.pdf.

⁵² UNITED NATIONS ENVIRONMENT PROGRAMME, *AFRICA WATER ATLAS* 127 (2010).

⁵³ Mike Muller, *South Africa's Real Water Crisis: Not Understanding What's Needed*, *CONVERSATION* (Nov. 7, 2019, 8:22 AM), <https://theconversation.com/south-africas-real-water-crisis-not-understanding-whats-needed-126361>.

⁵⁴ See Christina Cook & Karen Bakker, *Water Security: Critical Analysis of Emerging Trends and Definitions*, in *HANDBOOK ON WATER SECURITY* 19, 27 (2016).

conditions for humans to ensure complete water security.⁵⁵ Moreover, such access to hygienic water must be affordable for every human being, because affordability is the most fundamental requirement of water security.⁵⁶ Moreover, the access to water must be secure, without discrimination, and without any social or political fear.⁵⁷

III. THE RELATABILITY OF WATER SECURITY WITH HUMAN SECURITY

Alongside water security, human security is another term that has recently evolved in the arena of international law. It is different from other conventional terms, such as “state security” and “international security,” because, unlike these terms, “human security” covers different dimensions related to economic, political, and social conditions of human life.⁵⁸ Before explaining the dimensions of human security and the relevant relationship between water security and human security, however, it is necessary to first comprehend the definition of human security.

“Human security” has been defined by the General Assembly of the United Nations as “an approach to assist Member States in identifying and addressing widespread and cross-cutting challenges to the survival, livelihood and dignity of their people.”⁵⁹ Human security is a human development–centered concept that focuses on a number of dimensions that can affect humans’ quality of life.⁶⁰ To understand the relationship between water security and human security, it is essential to first understand the seven dimensions of human life that the concept covers, which are elucidated below in detail.

III.A. Human Security and Its Seven Dimensions

According to a report issued by the United Nations, the concept of human security includes seven dimensions of human life.⁶¹ The first dimension is related to individual’s economic security.⁶² It measures individuals’ income

⁵⁵ *Id.*

⁵⁶ See Kujinga et al., *supra* note 21.

⁵⁷ See HUMAN AND ENVIRONMENTAL SECURITY: AN AGENDA FOR CHANGE 168 (Felix Dodds & Tim Pippard eds., 2005).

⁵⁸ See Ariyabandu & Foneska, *supra* note 39.

⁵⁹ G.A. Res. 66/290, ¶ 3 (Sept. 10, 2012).

⁶⁰ See GÓMEZ & GASPER, *supra* note 6.

⁶¹ *Id.*; see also Ariyabandu & Foneska, *supra* note 39.

⁶² See GÓMEZ & GASPER, *supra* note 6; see also Ariyabandu & Foneska, *supra* note 39.

level and standard of living.⁶³ The second dimension of human security is related to “food security.”⁶⁴ This dimension represents access to a sufficient quantity and quality of food for everyone.⁶⁵ This dimension also includes water security because a sufficient quantity and quality of water, alongside food, is required for the survival of life.⁶⁶ The third dimension represents individuals’ health security.⁶⁷ It denotes access to good-quality health care for everyone at an affordable cost and particularly requires adequate sanitation for protection from waterborne diseases.⁶⁸ The fourth dimension of human security includes environmental security,⁶⁹ which implies the protection of individuals from environmental threats.⁷⁰ It also includes safeguarding individuals from threats caused by climate change and global warming.⁷¹

The fifth dimension of human security covers individuals’ personal security,⁷² which comprises their psychological and educational well-being, thus alluding to human development. It also requires the availability of adequate water for human development.⁷³ Similarly, the sixth dimension of human security is community security,⁷⁴ which can be realized through ensuring peace, security, law enforcement, and justice in society.⁷⁵ Lastly, the seventh dimension of human security is related to the political security in the society,⁷⁶ which can be realized through cooperation among states.⁷⁷ Political security also represents how well individuals are able to govern themselves via

⁶³ AMY K. GLASMEIER, *AN ATLAS OF POVERTY IN AMERICA: ONE NATION, PULLING APART 1960–2003*, at xi (2014).

⁶⁴ Ariyabandu & Foneska, *supra* note 39.

⁶⁵ See SURESH C. BABU ET AL., *FOOD SECURITY, POVERTY AND NUTRITION POLICY ANALYSIS: STATISTICAL METHODS AND APPLICATIONS 20* (2d ed. 2014).

⁶⁶ See generally Rosegrant et al., *supra* note 10.

⁶⁷ See Ariyabandu & Foneska, *supra* note 39.

⁶⁸ See generally Rosegrant et al., *supra* note 10.

⁶⁹ See Ariyabandu & Foneska, *supra* note 39.

⁷⁰ See Wenning et al., *supra* note 14, at 21.

⁷¹ See YU HONGYUAN, *GLOBAL WARMING AND CHINA’S ENVIRONMENTAL DIPLOMACY* 131 (2008).

⁷² See Ariyabandu & Foneska, *supra* note 39.

⁷³ See Bundschuh & Hoinkis, *supra* note 15, at 1.

⁷⁴ Ariyabandu & Foneska, *supra* note 39.

⁷⁵ See NEIL MCARTHUR, *DAVID HUME’S POLITICAL THEORY: LAW, COMMERCE, AND THE CONSTITUTION OF GOVERNMENT* 37-38 (2007) [hereinafter MCARTHUR].

⁷⁶ Ariyabandu & Foneska, *supra* note 39.

⁷⁷ See Tzatzaki & Tarlock, *supra* note 17, at 390.

an organized government process.⁷⁸ Self-governance is the most important aspect and can also contribute to the other six dimensions of human security. For instance, a good political process and governance in a society can ultimately lead to the other welfare conditions such as economic well-being, food security, health security, environmental well-being, and personal and community welfare.

III.B. How Is Water Security Related to the Human Security Dimensions?

If we review the dimensions of human security, it becomes evident that water security is a fundamental requirement for ascertaining human security. For instance, sufficient water is required for irrigating crops.⁷⁹ Agricultural production is an essential component of the GDP of many agrarian economies in the world.⁸⁰ An agrarian economy is one that depends primarily on agricultural production and for which agricultural exports make up a major share of its GDP.⁸¹ For instance, 21 percent of Pakistan's GDP comes from the agricultural sector.⁸² A shortage in the amount of water available for irrigation can lead to a decline in agricultural production, leading to a shortfall in an agrarian economy's GDP growth.⁸³ Therefore, the availability of sufficient water is essential for the economic security and survival of such agrarian economies.⁸⁴ Thus, the availability of sufficient freshwater in regard to water security directly contributes to the economic security of agrarian economies. Furthermore, as the production of many crops leads to the production of food, the availability of water substantiates people's food security.⁸⁵ Hence, water

⁷⁸ See MCARTHUR, *supra* note 75.

⁷⁹ See Gajendra Singh, *Foreword* to SUSTAINABLE MICRO IRRIGATION: PRINCIPLES AND PRACTICES xxiii (Megh R. Goyal ed., 2015).

⁸⁰ *Id.*

⁸¹ See, e.g., Shehzad Qazi, *Strategic Posture Review: Pakistan*, WORLD POL. REV. (Mar. 12, 2013), <https://www.worldpoliticsreview.com/articles/12782/strategic-posture-review-pakistan>.

⁸² MUHAMMAD QASIM, DETERMINANTS OF FARM INCOME AND AGRICULTURAL RISK MANAGEMENT STRATEGIES: THE CASE OF RAIN-FED FARM HOUSEHOLDS IN PAKISTAN'S PUNJAB, 69 (Béatrice Knerr ed., 2012) [hereinafter QASIM].

⁸³ Ali Chebil et al., *Effects of Water Scarcity on the Performances of the Agricultural Sector and Adaptation Strategies in Tunisia*, in AGRICULTURAL ECONOMICS 31, 32 (Surendra N. Kulshreshtha ed., 2019), https://www.researchgate.net/publication/334816695_Effects_of_Water_Scarcity_on_the_Performances_of_the_Agricultural_Sector_and_Adaptation_Strategies_in_Tunisia.

⁸⁴ See Munoz, *supra* note 8, at xxiv.

⁸⁵ See Rosegrant et al., *supra* note 10, at 227.

security is essential for ensuring the economic and food security of nations, especially of agrarian economies. As economic and food security are essential dimensions of human security, the relationships of these dimensions with water security connects water security to human security.⁸⁶

In addition, health security, an essential dimension of human security,⁸⁷ requires proper sanitation conditions.⁸⁸ It also implies that the water available for drinking is clean and hygienic.⁸⁹ These requirements of health security are also preconditions of water security.⁹⁰ It is essential for both health and water security to ensure the adequate protection of individuals from waterborne disease.⁹¹ Thus, water security is directly linked to health security.⁹² Consequently, as health security is a necessary dimension of human security,⁹³ water security also becomes essential for human security.

Water security also implies the protection of individuals from water-related natural disasters such as floods and hurricanes.⁹⁴ This protection is a fundamental requirement of environmental security, which implies that everyone must have protection from all kinds of water-related natural disasters.⁹⁵ Hence, this requirement of protection suggests that environmental security is deeply connected to water security. Furthermore, as environmental security is also a dimension of human security, environmental security further connects water security to human security.⁹⁶

Water security becomes a requirement for personal security because the availability of sufficient and good-quality water is essential for human development.⁹⁷ Similarly, water security can lead to community and political security by instigating cooperation among riparian states for equitably

⁸⁶ See Ariyabandu & Foneska, *supra* note 39.

⁸⁷ *Id.*

⁸⁸ See Rosegrant et al., *supra* note 10, at 227.

⁸⁹ *Id.* See also RIEPL, *supra* note 11, at 1.

⁹⁰ See Rosegrant et al., *supra* note 10, at 227. See also RIEPL, *supra* note 11, at 1.

⁹¹ See Rosegrant et al., *supra* note 10, at 227.

⁹² See Ariyabandu & Foneska, *supra* note 39; see also RIEPL, *supra* note 11, at 1.

⁹³ See Ariyabandu & Foneska, *supra* note 39.

⁹⁴ See Gourbesville, *supra* note 13, at 51.

⁹⁵ See Wenning et al., *supra* note 14, at 21.

⁹⁶ See Ariyabandu & Foneska, *supra* note 39.

⁹⁷ See generally Bundschuh & Hoinkis, *supra* note 15.

utilizing and sustainably managing their shared freshwater resources.⁹⁸ This relationship of water security to the personal, community, and political dimensions of human security further connects water security to human security.⁹⁹

In a nutshell, water security is deeply connected to human security, primarily because water security is also essentially connected to all of the seven dimensions of human security. In fact, water security is either a precondition of or directly contributes to ensuring the seven dimensions of human security.¹⁰⁰

IV. THE RELEVANCE OF INTERNATIONAL LAW IN WATER SECURITY DISCOURSE

International law includes a number of codified rules for ensuring water security.¹⁰¹ For example, the U.N. Watercourses Convention, the 1992 UNECE Water Convention, and the Berlin Rules on Water Resources provide a number of recommendations for ensuring water security.¹⁰² These rules also guide equitable water distribution and utilization among riparian states to ensure sufficient water security to their people.¹⁰³ In addition, the ICCPR also provides recommendations for ensuring sufficient water security for every human for the sustenance of life.¹⁰⁴

IV.A. The U.N. Watercourses Convention

The United Nations Watercourses Convention, drafted in 1997,¹⁰⁵ and its set of rules are also referred to as the Law of the Non-Navigational Uses of International Watercourses.¹⁰⁶ The United Nations Watercourses Convention

⁹⁸ See Tzatzaki & Tarlock, *supra* note 17.

⁹⁹ See Ariyabandu & Foneska, *supra* note 39.

¹⁰⁰ *Id.*

¹⁰¹ See Woldetsadik, *supra* note 19, at 645.

¹⁰² See HILDERING, *supra* note 20, at 47-8.

¹⁰³ See Ariel Dinar et al., BRIDGES OVER WATER: UNDERSTANDING TRANSBOUNDARY WATER CONFLICT, NEGOTIATION AND COOPERATION 36 (WORLD SCI. PUB. COMPANY, 2013).

¹⁰⁴ See Owen McIntyre, *Water, Law and Equity*, in THE HUMAN FACE OF WATER SECURITY 45, 48 (2017).

¹⁰⁵ Ruth Vollmer et al., *Institutional Capacity Development in Transboundary Water Management*, UN-Water Decade Programme on Capacity Development (UNW-DPC) 1, 4 (UN WWAP: Side Publication Series, 2009).

¹⁰⁶ Adeno Addis, *Law as a Process of Communication: Reisman Meets Habermas*, in LOOKING TO THE FUTURE: ESSAYS ON INTERNATIONAL LAW IN HONOR OF W. MICHAEL REISMAN 33, 45 (2010).

provides a number of recommendations regarding the apportionment and utilization of transboundary fresh watercourses to ensure sufficient water security for all riparian states.¹⁰⁷

IV.A.1. Cooperation Among Riparian States for Water Security

The convention's first recommendation centers on the need for riparian states to cooperate to ensure the protection of shared transboundary freshwater resources.¹⁰⁸ It also recommends that all riparian states contribute to the development and protection of watercourses.¹⁰⁹ These recommendations are stated in Article 5 of the U.N. Watercourses Convention in the following words:

Watercourse States shall participate in the use, development and protection of an international watercourse in an equitable and reasonable manner. Such participation includes both the right to utilize the watercourse and the duty to cooperate in the protection and development thereof, as provided in the present convention.¹¹⁰

This recommendation implies that watercourses must be protected from natural and man-made hazards such as earthquakes, floods, and industrial pollution.¹¹¹ It is recommended that the government of every state party take all measures required to prevent factories from dumping industrial waste directly into fresh watercourses.¹¹² It was also required in Article 5 of the U.N. Watercourses Convention that the flow of water not be obstructed if such water is also used by another riparian state. To ensure compliance, Article 5 recommends the equitable utilization and development of water resources via mutual cooperation among states.¹¹³ Cooperation is essential to ensure the long-term preservation of the transboundary watercourse, which will lead to improving the water security of those dependent on that water resource.

¹⁰⁷ *Id.* at 915.

¹⁰⁸ See Christina Leb, *The Significance of the Duty to Cooperate for Transboundary Water Resource Management Under International Water Law*, in *ROUTLEDGE HANDBOOK OF WATER LAW AND POLICY* 247, 252 (2017).

¹⁰⁹ *Id.*

¹¹⁰ See G.A. Res. 51/229, art. 5, Convention on the Law of the Non-Navigational Uses of International Watercourses (May 1997).

¹¹¹ See JAMES R. CAMPBELL, *HUMAN SECURITY: SECURING EAST ASIA'S FUTURE* 174 (Benny Teh Cheng Guan ed., 2012).

¹¹² This recommendation is in the Sustainable Development Goals (SDGs) of the United Nations. See G.A. Res. 70/1, at 18 (Sept. 2015).

¹¹³ G.A. Res. 51/229, *supra* note 110.

IV.A.1.a. Sharing of Up-to-Date Information

In order to extend cooperation to perform the development and protection of transboundary shared fresh watercourses, the United Nations Watercourses Convention recommends that riparian states exchange data with one another about the flow of water and all other related aspects.¹¹⁴ In the event of any distortions or hindrances in the flow of water or any other issues discovered in the analysis of these data, the riparian states must take all of the required measures to ensure an adequate flow of water in the basins.¹¹⁵ This recommendation is provided in Article 8 of the U.N. Watercourses Convention:

Pursuant to article 8, watercourse States shall on a regular basis exchange readily available data and information on the condition of the watercourse, in particular that of a hydrological, meteorological, hydrogeological and ecological nature and related to the water quality as well as related forecasts.¹¹⁶

The same recommendation was also reiterated in Article 11 of the United Nations Watercourses Convention, which states that riparian states should share information with each other regarding their planned water storage measures on their mutually shared transboundary watercourses.¹¹⁷ If a water storage work constructed in the territory of one riparian state has the potential to cause harm to the water security of the other riparian state, then the design of such water storage work should be modified to ascertain sufficient water security for all individuals sharing that transboundary water resource. Such a concern is recommended for all the planned water storage endeavors of a riparian state.¹¹⁸

IV.A.1.b. Implementing Joint Initiatives for Improving Water Security of Transboundary Water Resources

In order to prevent any perceived threats from a planned or constructed water storage work, the United Nations Watercourses Convention advises states sharing a transboundary watercourse to implement joint endeavors via

¹¹⁴ *Id.*

¹¹⁵ Leb, *supra* note 108, at 252.

¹¹⁶ G.A. Res. 51/229, *Convention on the Law of Non-Navigational Uses of International Watercourses*, at 9, ¶1 (July, 1997).

¹¹⁷ *Id.* at 11.

¹¹⁸ *Id.* at 12

mutual planning, exchange of data, and engineering works to minimize the harm associated with any aspect of the storage work.¹¹⁹ Such cooperative work is especially required if the harm associated with the water storage work may be aggravated by the occurrence of a future forecasted natural disaster.¹²⁰ These recommendations were specifically asserted in Article 27 of the United Nations Watercourses Convention in the following words:

Watercourse states shall, individually and, where appropriate, jointly, take all appropriate measures to prevent or mitigate conditions related to an international watercourse that may be harmful to other watercourse states, whether resulting from natural causes or human conduct, such as flood or ice conditions, water-borne diseases, siltation, erosion, salt-water intrusion, drought or desertification.¹²¹

By implementing the recommendations in Article 27, water-related environmental damage can be prevented, which will eventually ensure not only individuals' water security but also environmental security and the resulting human security of the individuals residing near the water storage work.¹²²

IV.A.2. Obligation to Cause No Harm for Ensuring Water Security of All

In addition, the United Nations Watercourses Convention strictly prevents riparian states from causing any harm to another riparian state in utilizing a shared transboundary watercourse.¹²³ This obligation to cause no harm also leads to increased water security to the individuals in the riparian states. It is also a fundamental principle of the U.N. Watercourses Convention and mentioned in Article 7 of the Convention: Watercourse states shall, in utilising an international watercourse in their territories, take all appropriate

¹¹⁹ ALISTAIR RIEU-CLARKE & RUBY MOYNIHAN, *TRANSBOUNDARY WATER GOVERNANCE AND CLIMATE CHANGE ADAPTATION: INTERNATIONAL LAW, POLICY GUIDELINES AND BEST PRACTICE APPLICATION*, 42 (UNESCO, 2015).

¹²⁰ *Id.*

¹²¹ G.A. Res 51/229, *supra* note 116, at 27.

¹²² See RIEU-CLARKE & MOYNIHAN, *supra* note 119; see also Convention on the Law of the Non-Navigational Uses of International Watercourses art. 27, May 21, 1997, https://treaties.un.org/doc/Treaties/1998/09/19980925%2006-30%20PM/Ch_XXVII_12p.pdf [hereinafter Watercourses Convention].

¹²³ See Watercourses Convention, *supra* note 122, art. 7; see also Muhammad Mizanur Rahaman, *Principles of transboundary water resources management and water-related agreements in Central Asia: An analysis*, in *WATER AND SECURITY IN CENTRAL ASIA: SOLVING A RUBIK'S CUBE*, 84 (2014). [hereinafter Rahaman] (To know more regarding obligation to cause no harm).

measures to prevent the causing of significant harm to other watercourse states.¹²⁴

IV.A.3. Principle of Equitable Utilization of Transboundary Watercourses

In addition to the principle obligation to cause no harm, the principle of equitable utilization is another important principle in the text of the United Nations Watercourses Convention.¹²⁵ According to this principle, all states sharing one or more transboundary watercourse must ensure that the water of the resource(s) is shared equitably among them.¹²⁶ This principle is specifically mentioned in Article 5 of the United Nations Watercourses Convention in the following words: “Watercourse states shall in their respective territories utilize an international watercourse in an equitable and reasonable manner.”¹²⁷

The application of the principle of equitable utilization also implies that no riparian state may deprive another of its due share of water by taking a higher course of water either via exploiting its upper riparian geographical location or via constructing a particular water storage work. The equitable utilization of a shared transboundary watercourse will preserve the water security of the individuals residing in the riparian states sharing that watercourse.¹²⁸

In a nutshell, the United Nations Watercourses Convention recommends that riparian states sharing one or more transboundary fresh watercourses cooperate for utilizing and preserving the shared watercourse(s).¹²⁹ In particular, it mandates them to cause no harm to each other in their endeavors of utilizing the water of the shared watercourse(s).¹³⁰ Furthermore, it recommends that riparian states take adequate measures, preferably jointly, to maintain the protection and development of their shared watercourse(s).¹³¹ In this regard, the U.N. Watercourses Convention makes it mandatory for all riparian states to ensure an equitable utilization of their shared watercourse(s), which must be carried out in such a manner that does not deprive any riparian

¹²⁴ See Watercourses Convention, *supra* note 122, art. 7.

¹²⁵ Dinara Ziganshina, *PROMOTING TRANSBOUNDARY WATER SECURITY IN THE ARAL SEA BASIN THROUGH INTERNATIONAL LAW*, 92 (2014) [hereinafter Ziganshina].

¹²⁶ Watercourses Convention, *supra* note 122, art. 7.

¹²⁷ For more details, *see id.* art. 5.

¹²⁸ See Ziganshina, *supra* note 125.

¹²⁹ See Leb, *supra* note 108.

¹³⁰ See Rahaman, *supra* note 123.

¹³¹ *Id.*

state of its due share of water in the watercourse(s).¹³² The observance and implementation of these recommendations by the U.N. Watercourses Convention will eventually lead to enhancing water security of the individuals dependent on the transboundary watercourse(s).¹³³

IV.B. 1992 UNECE Water Convention

The UNECE Convention, arranged by the United Nations Economic Commission for Europe in 1992, also provided a number of recommendations for riparian states in managing, preserving, and developing their shared fresh watercourses sustainably.¹³⁴ In this regard, it particularly advises riparian states to ensure effective cooperation and perform joint endeavors for sustainably preserving and utilizing their shared watercourses.¹³⁵ To ensure cooperation, the UNECE Convention suggests that riparian states sign agreements with each other involving their jointly planned sustainable water management works on their shared fresh watercourses.¹³⁶

Similarly to the United Nations Watercourses Convention, the 1992 UNECE Convention also affirms the obligation to cause no harm.¹³⁷ Thus, again, no water-related project of one riparian state should cause any harm to the water security of individuals residing in another riparian state.¹³⁸ In addition to individuals, the UNECE Convention also makes it mandatory that any water-related storage work not cause any harm to the environment.¹³⁹ Such works must be suitable to the environment.¹⁴⁰ This rule resonates with the idea of environmental security, another dimension of human security that implies that the environment must be protected from all kinds of natural and manmade endeavors. Thus, here, the effort to preserve water security of

¹³² See G.A. Res. 51/229, art. 5 (May 21, 1997).

¹³³ See Ziganshina, *supra* note 125.

¹³⁴ See CHRISTINA LEB, COOPERATION IN THE LAW OF TRANSBOUNDARY WATER RESOURCES, 64 (Cambridge University Press, 2013).

¹³⁵ Anatole Boute, *The water–energy–climate nexus under international law: A Central Asian perspective*, (2016) MICH. J. ENVL. & ADMIN. L. 371–434, 408 (2016).

¹³⁶ See Econ. Comm'n for Eur., *River Basin Commissions and Other Institutions for Transboundary Water Cooperation: Capacity for Water Cooperation in Eastern Europe, Caucasus and Central Asia*, at 8, U.N. Sales No. 09.II.E. 16 (2009).

¹³⁷ See Edith Hodl, *Legislative Framework for River Ecosystem Management on International and European Level*, in RIVERINE ECOSYSTEM MANAGEMENT: SCIENCE FOR GOVERNING TOWARDS A SUSTAINABLE FUTURE, 329 (Stefan Schmutz & Jan Sendzimir eds., 2018).

¹³⁸ *Id.*

¹³⁹ See Boute, *supra* note 135, at 409.

¹⁴⁰ *Id.*

individuals leads to environmental security and, in turn, to preserving human security.¹⁴¹

Here, again, in order to assess the impact of the water storage works on individuals and on the environment, the 1992 UNECE Convention advises riparian states to constitute joint bodies of experts.¹⁴² This suggestion is in Article 9 of the UNECE Convention.¹⁴³ These joint bodies can also help resolve any conflicts that may arise between the representatives of the riparian states over a particular water management project on the shared watercourse(s) or over the allocation of the share of water for each riparian state in a jointly shared watercourse.¹⁴⁴ Such bodies must also facilitate the exchange of correct and up-to-date information about the flow and quality of water in the shared watercourses.¹⁴⁵ Furthermore, it is also recommended that special programs be initiated to help reduce pollution in the freshwater resources.¹⁴⁶ In addition, Article 10 of the UNECE Convention calls for joint monitoring of the sites of shared watercourses to assess any issues pertaining to the quality and quantity of the flow of water in the basin.¹⁴⁷

The rules provided in the 1992 UNECE Convention are obligatory for parties. These include the obligation to cause no harm, the obligation to cooperate, and the obligation to ensure equitable utilization of the shared transboundary fresh watercourse(s).¹⁴⁸ Compliance with these obligations by the riparian states can lead to enhanced water security for individuals dependent on the shared transboundary freshwater resources, because it will lead to improved accessibility and availability of water to people.

IV.C. Berlin Rules on Water Resources

¹⁴¹ This phenomenon is true because environmental security is an essential element of human security, as mentioned earlier. See Ariyabandu & Foneska, *supra* note 39.

¹⁴² LEB, *supra* note 134, at 133.

¹⁴³ See Convention on the Protection and Use of Transboundary Watercourses and International Lakes, art. 9, Mar. 17, 1992, 1936 U.N.T.S. 269 [hereinafter UNECE Water Convention].

¹⁴⁴ See, e.g., FEREDOUN GHASSEMI & IAN WHITE, INTER-BASIN WATER TRANSFER: CASE STUDIES FROM AUSTRALIA, UNITED STATES, CANADA, CHINA AND INDIA 42 (2007).

¹⁴⁵ See UNECE Water Convention, *supra* note 143, at 275–77.

¹⁴⁶ *Id.*

¹⁴⁷ See Convention on the Protection and Use of Transboundary Watercourses and International Lakes, art. 10, Mar. 17, 1992, 1936 U.N.T.S. 269.

¹⁴⁸ See Hodl, *supra* note 137, at 329.

The Berlin Rules on Water Resources, set by the International Law Association in 2004, provide a number of recommendations to the state parties for sustainably managing their freshwater resources to ensure an improved level of water security for their people.¹⁴⁹

IV.C.1. The Right to Access Water

The right to access water is fundamental for ascertaining individuals' water security and this right has been endorsed in Article 17 of the Berlin Rules.¹⁵⁰ The text of Article 17 of the Berlin Rules endorses this right in unequivocal words: "Every individual has a right of access to sufficient, safe, acceptable, physically accessible, and affordable water to meet that individual's vital human needs."¹⁵¹ Furthermore, the Berlin Rules also make it obligatory for state parties to take all the required measures to ensure that the right to access water is available to every individual without discrimination.¹⁵² This requirement is stated in the second part of Article 17: "States shall ensure the implementation of the right of access to water on a non-discriminatory basis."¹⁵³

Article 17 also recommends that state parties spread awareness to the public about their inherent right to access water.¹⁵⁴ For this purpose, it demands the involvement of public communities to reach out to every individual.¹⁵⁵ In addition, the Berlin Rules also advise state parties to ensure the adequate allocation of freshwater resources to meet the fundamental necessities of individuals, i.e., related to drinking and sanitation purposes.¹⁵⁶

The Berlin Rules further assert that meeting vital human needs is more important than meeting any other necessity related to the consumption of water.¹⁵⁷ This assertion is made in the text of Article 14 of the Berlin Rules:

¹⁴⁹ See OWEN MCINTYRE, ENVIRONMENTAL PROTECTION OF INTERNATIONAL WATERCOURSES UNDER INTERNATIONAL LAW 247 (2016) [hereinafter MCINTYRE].

¹⁵⁰ See International Law Association Berlin Conference (2004) Water Resources Law, *Berlin Rules on Water Resources*, art. 17, 71 Int'l L. Ass'n Rep. Conf. 1 (Aug. 16-25, 2004) [hereinafter The Berlin Rules].

¹⁵¹ *Id.* art. 17(1).

¹⁵² See, e.g. *id.* art. 17(2).

¹⁵³ *Id.*

¹⁵⁴ *Id.*; see also *id.* art. 18.

¹⁵⁵ The Berlin Rules, *supra* note 150.

¹⁵⁶ See, e.g., *id.* art. 14.

¹⁵⁷ *Id.* art. 14(2).

1. In determining an equitable and reasonable use, States shall first allocate waters to satisfy vital human needs.¹⁵⁸
2. No other use or category of uses shall have an inherent preference over any other use or category of uses.¹⁵⁹

The Berlin Rules also define what needs may actually be considered “vital human needs,” which are superior and, therefore, more important than any other need related to the utilization of water.¹⁶⁰ Thus, to clarify, Article 3 of the Berlin Rules states, “Vital human needs means waters used for immediate human survival, including drinking, cooking, and sanitary needs, as well as water needed for the immediate sustenance of a household.”¹⁶¹ All these vital human needs are regarded as the fundamental requirements for realizing individuals’ water security.¹⁶²

To ensure that all vital human needs related to water are met, the Berlin Rules provide several directions to aid states’ compliance. For instance, the Rules recommend that states “take all appropriate measures to manage waters sustainably.”¹⁶³ In order to better explain the sustainable management of water resources, the Berlin Rules define the “sustainable use” of watercourses as the “integrated management of resources to assure efficient use of and equitable access to waters for the benefit of current and future generations while preserving renewable resources and maintaining non-renewable resources to the maximum extent reasonably possible.”¹⁶⁴ Furthermore, these vital human needs are essential for ensuring individuals’ adequate economic, food, and health security, which are, in turn, the fundamental aspects of their human security.¹⁶⁵ Thus, the Berlin Rules indirectly provide rules not only for improving water security but also for promoting conditions that ensure human security.

¹⁵⁸ The Berlin Rules, *supra* note 150, art. 14(1).

¹⁵⁹ *Id.* art. 14(2).

¹⁶⁰ *Id.* art. 3(20), 14(2).

¹⁶¹ *Id.* art. 3(20).

¹⁶² This idea is mentioned in the definition of water security provided by the United Nations; see MAGSIG, *supra* note 3, at 30.

¹⁶³ See The Berlin Rules, *supra* note 150, art. 7.

¹⁶⁴ *Id.* art. 3(19).

¹⁶⁵ See discussion *supra* Section III.B. See also Ariyabandu & Foneska, *supra* note 39.

IV.C.2. Integrated Management of Freshwater Resources for Ensuring an Enhanced Level of Water Security

Further, the Berlin Rules recommend that states perform integrated management of freshwater resources.¹⁶⁶ To perform integrated water management sustainably, it is essential that it results in the equitable utilization and protection of the natural watercourses.¹⁶⁷ For this purpose, the Berlin Rules also direct states, especially those sharing one or more transboundary freshwater resources, to cooperate.¹⁶⁸ Such cooperation, however, must ensure a mutual benefit for all the riparian states sharing a particular water resource, as mentioned in Article 11 of the Berlin Rules: “[b]asin States shall cooperate in good faith in the management of waters of an international drainage basin for the mutual benefit of the participating States.”¹⁶⁹

IV.C.3. Joint Management of Transboundary Freshwater Resources

In order to realize this cooperation, like the 1992 UNECE Convention, the Berlin Rules advise riparian states to form joint bodies to monitor and assess the flow, quantity, quality, and all other aspects of the shared water resources and, consequently, to recommend measures to states to perform the integrated management of these water resources.¹⁷⁰ Joint bodies of experts from the riparian states could lead to the adoption of measures beneficial for ascertaining water security of all the riparian states. It is necessary, however, that such integrated management measures ensure the equitable and sustainable utilization of the water resources to preserve and develop them.¹⁷¹

IV.C.4. An Obligation to Cause No Harm and the Principle of Equitable Utilization

To ensure adequate water security for all the riparian states, the Berlin Rules also require states to cause no harm to other states in utilizing a shared transboundary freshwater resource.¹⁷² To ensure this outcome, the Berlin Rules impose on all riparian states an obligation to utilize the shared water

¹⁶⁶ See The Berlin Rules, *supra* note 150, art. 6.

¹⁶⁷ *Id.* art. 3(19).

¹⁶⁸ *Id.* art. 11.

¹⁶⁹ *Id.*

¹⁷⁰ See The Berlin Rules, *supra* note 150, art. 64.

¹⁷¹ *Id.*

¹⁷² See HILDERING, *supra* note 20, at 44.

resource equitably.¹⁷³ The text of Article 12 of the Berlin Rules mentions this obligation explicitly, stating that “[b]asin States shall in their respective territories manage the waters of an international drainage basin in an equitable and reasonable manner having due regard for the obligation not to cause significant harm to other basin States.”¹⁷⁴

An equitable utilization of shared water resources will cause no harm to the water security of the riparian states.¹⁷⁵ Article 13 of the Berlin Rules recommends considering a number of relevant factors to determine the equitable use of a shared transboundary water resource.¹⁷⁶ These factors include the geography, climate, hydrology and other natural features of the watercourse,¹⁷⁷ the socioeconomic needs and the total population of those dependent on the water resource,¹⁷⁸ as well as the potential impact water use by people in one riparian state has upon those sharing the watercourse.¹⁷⁹ This impacts evaluation is the most crucial requirement for determining the equitable utilization of a shared water resource. In addition, it is also essential to evaluate the potential costs of the management, protection, and development of the watercourses¹⁸⁰ as well as the sustainability and reliability of the existing and planned utilization of the freshwater resources.¹⁸¹ In this regard, it is also necessary that the planned or existing use of the watercourses cause no harm to the environment.¹⁸² This requirement aligns with ascertaining environmental security, which is also a fundamental element of human security.¹⁸³

After considering all these factors, the joint bodies of the riparian states may give weight to any of the factors as per their assessment of their impact. Consequently, through deliberation and mutual consultation, the joint bodies may decide on the amount of water to be used or allocated to each riparian

¹⁷³ See The Berlin Rules, *supra* note 150, art. 12.

¹⁷⁴ *Id.*

¹⁷⁵ *Id.* arts. 12, ¶ 1, 16.

¹⁷⁶ *Id.* art. 13, ¶ 1.

¹⁷⁷ *Id.* art. 13, ¶ 2(a).

¹⁷⁸ *Id.* arts. 13, ¶ 2(b), 13, ¶ 2(c).

¹⁷⁹ *Id.* arts. 13, ¶ 2(d), 13, ¶ 2(e).

¹⁸⁰ *Id.* arts. 13, ¶ 2(f), 13, ¶ 2(h).

¹⁸¹ *Id.*

¹⁸² *Id.* art. 13, ¶ 2(i).

¹⁸³ Ariyabandu & Foneska, *supra* note 39.

state, confirming that share as equitable for all riparian states.¹⁸⁴ Thus, the Berlin Rules provide comprehensive instructions for ensuring the equitable utilization of transboundary shared freshwater resources to affirm adequate water security for individuals of all riparian states sharing one or more fresh watercourses.¹⁸⁵

IV.C.5. Protecting Freshwater Resources

In addition to the principles of sustainable and equitable utilization, the Berlin Rules also provide recommendations to states for protecting their freshwater resources.¹⁸⁶ Protection of freshwater resources is essential for ensuring adequate water security and, in effect, human security for individuals.¹⁸⁷ Recognizing this importance, the whole of Chapter V of the Berlin Rules is specifically dedicated to recommendations to states for extending protection to their freshwater resources.¹⁸⁸ In particular, Chapter V recommends that states prevent pollution in freshwater resources.¹⁸⁹ Specific stress on eliminating pollution and improving the quality of freshwater resources is given in Chapter V.¹⁹⁰

Improving the quality of water is essential for ensuring individuals' water and health security.¹⁹¹ Therefore, Paragraph 1 of Article 28 specifically directs states to improve the quality of drinkable water and make it free from pollution.¹⁹² Here, again, this recommendation is a clear reflection of the definition of water security, which mandates the improvement of the quality of drinkable water to ensure adequate water security for people.¹⁹³

As Chapter V of the Berlin Rules addresses the protection of aquatic environments, it also includes instructions for maintaining the protection of all aquatic resources in the event of water-related natural disasters and

¹⁸⁴ See The Berlin Rules, *supra* note 150, art. 13.

¹⁸⁵ MCINTYRE, *supra* note 149.

¹⁸⁶ PHILIPPE SANDS ET AL., PRINCIPLES OF INTERNATIONAL ENVIRONMENTAL LAW 309 (Cambridge University Press, 3d ed. 2012).

¹⁸⁷ See MAGSIG, *supra* note 3, at 30.

¹⁸⁸ *Id.*; see The Berlin Rules, *supra* note 150, ch. 5.

¹⁸⁹ See MAGSIG, *supra* note 3, at 30; see The Berlin Rules, *supra* note 150, ch. 5.

¹⁹⁰ See The Berlin Rules, *supra* note 150, arts. 27, 28.

¹⁹¹ See Rosegrant et al., *supra* note 10, at 227; see also RIEPL, *supra* note 11, at 1; see also MAGSIG, *supra* note 3, at 30.

¹⁹² See The Berlin Rules, *supra* note 150, art. 28, ¶ 1.

¹⁹³ See MAGSIG, *supra* note 3.

calamities such as floods and droughts.¹⁹⁴ Articles 34 and 35 specifically instruct states to take preventive measures to mitigate the risks of floods and droughts.¹⁹⁵ The protection of freshwater resources in the events of floods and droughts is essential for ensuring sustainable water security.¹⁹⁶ Similarly, it is also essential to ensure that individuals are protected from the potential hazards of floods and droughts because this protection is a requirement of water security as well as of human security.¹⁹⁷ In this regard, Chapter V of the Berlin Rules suggests that states can mitigate the harmful risks of flooding by sharing up-to-date data about the quality and quantity of flow of water to carry out joint measures on their transboundary shared watercourses.¹⁹⁸

Unlike the U.N. Watercourses Convention and the 1992 UNECE Convention, the Berlin Rules on Water Resources also provide recommendations for preserving and efficiently utilizing groundwater resources to ensure water security.¹⁹⁹ Since most of the world relies heavily on groundwater for drinking, sanitation, and other purposes, the Berlin Rules dedicate the whole of Chapter VIII to recommendations for the efficient use of groundwater aquifers.²⁰⁰ It specifically directs states to ensure protection of groundwater aquifers from salinity, pollution, and other relevant issues.²⁰¹ Furthermore, it directs states to take measures to sustainably use aquifers.²⁰² The sustainable utilization and preservation of groundwater aquifers can ensure sufficient water security for us as well as for our next generations in using the groundwater resources.²⁰³

IV.C.6. Water Security in Armed Conflicts

¹⁹⁴ See The Berlin Rules, *supra* note 150, ch. V.

¹⁹⁵ See *supra* text accompanying note 150, art. 34–35.

¹⁹⁶ See *supra* text accompanying note 150, ch. V.

¹⁹⁷ See Gourbesville, *supra* note 13; see also Ariyabandu & Foneska, *supra* note 39.

¹⁹⁸ See The Berlin Rules, *supra* note 150, ch. V, art. 34–35.

¹⁹⁹ Joseph W. Dellapenna, *The law of transboundary groundwater*, in, THE EARTH CHARTER, ECOLOGICAL INTEGRITY AND SOCIAL MOVEMENTS 84 (Laura Westra & Mirian Vilela eds., 2014) [hereinafter Dellapenna]; see also SANDS ET AL., *supra* note 186.

²⁰⁰ See The Berlin Rules, *supra* note 150, ch. VIII; see also SANDS ET AL., *supra* note 186.

²⁰¹ See The Berlin Rules, *supra* note 150, art. 41.

²⁰² See *supra* text accompanying note 150, art. 40.

²⁰³ See Dellapenna, *supra* note 199.

The Berlin Rules on Water Resources also include recommendations for ensuring water security in the event of armed conflicts,²⁰⁴ and Chapter X of the Berlin Rules is specifically dedicated to recommendations for protecting watercourses in the event of armed conflicts.²⁰⁵ Articles 50 to 55 specifically include a strict prohibition on all belligerents in an armed conflict causing any harm to freshwater resources such as dams, groundwater aquifers, and natural open aquifers.²⁰⁶ This prohibition is intended to ensure individuals' water security in the event of armed conflicts.²⁰⁷

In a nutshell, the Berlin Rules on Water Resources contain many rules and recommendations for state authorities to ensure the preservation, integrated management, sustainable utilization, and equitable allocation of freshwater resources.²⁰⁸ In addition, the Berlin Rules also include suggestions for enhancing cooperation among riparian states to ensure an equitable and efficient utilization of their shared transboundary freshwater resources.²⁰⁹ Likewise, the Berlin Rules contain instructions for the preservation of freshwater resources in times of peace and war by preventing belligerents from causing any harm to natural aquifers during war.²¹⁰ It also makes it mandatory for states to sustainably use and protect their groundwater resources because a significant number of people depend on groundwater aquifers for drinking and sanitation purposes.²¹¹ The implementation of the recommendations provided in the Berlin Rules can ensure improved water security for the public.²¹² Furthermore, it can also ensure favorable conditions for strengthening human security, because water security is deeply linked to human security, as explained in Part III.

IV.D. The Dublin Statement on Water and Sustainable Development

The International Conference on Water and the Environment (ICWE) adopted the Dublin Statement on Water and Sustainable Development in its

²⁰⁴ See Patricia Wouters et al., *Water Security, Hydrosolidarity, and International Law: A River Runs Through It*, 19 Y.B. INT'L ENVTL. L. 97, 124 (2008).

²⁰⁵ *Id.*; see also The Berlin Rules, *supra* note 150, ch. X.

²⁰⁶ Wouters et al., *supra* note 204, at 124; see The Berlin Rules, *supra* note 150, ch. X.

²⁰⁷ See The Berlin Rules, *supra* note 150, ch. X.

²⁰⁸ Wouters et al., *supra* note 204, at 124.

²⁰⁹ *Id.*

²¹⁰ See The Berlin Rules, *supra* note 150, ch. X.

²¹¹ See The Berlin Rules, *supra* note 150, arts. 38, 40.

²¹² See MCINTYRE, *supra* note 149.

session held in 1992 in Dublin, Ireland.²¹³ The Dublin Statement was intended to formulate policy mechanisms for extending sustainable development and water security worldwide.²¹⁴ In particular, the Dublin Statement is focused on addressing the threats that exist to ensuring global water security, for instance, the emerging scarcity of water, pollution of freshwater resources, and the inequitable distribution of watercourses among riparian states.²¹⁵ The Dublin Statement proposes policies and plans for mitigating these threats.²¹⁶ Furthermore, it especially calls for the initiation of cooperation among states to ensure sustainable development of the existing water resources.²¹⁷ In particular, the Dublin Statement proposes four main principles for realizing sufficient and sustainable water security.²¹⁸

IV.D.1. Call for Formulating Policies for Preserving Freshwater Resources

The first principle affirms the finite nature of the freshwater resources on earth by asserting that “[f]resh water is a finite and vulnerable resource, essential to sustain life, development and the environment.”²¹⁹

This principle demands the formulation of appropriate policies for preserving and developing the existing freshwater resources.²²⁰ It also calls for an efficient and sustainable management of groundwater aquifers.²²¹ Owing to the finite nature of the natural aquifers and the growing population, the pressure on existing freshwater resources is mounting, leading to an unsustainable use of water from natural aquifers.²²²

²¹³ See Michelle Barnard & Willem Daniel Lubbe, *Sustainable Development of SADC's Watercourses: The IncoMaputo River Basin Agreement of 2002*, in REGIONAL ENVIRONMENTAL LAW: TRANSREGIONAL COMPARATIVE LESSONS IN PURSUIT OF SUSTAINABLE DEVELOPMENT 72, 95 (Werner Scholtz & Jonathan Verschuuren eds., 2015).

²¹⁴ See Int'l Conf. on Water and the Env't, *The Dublin Statement on Water and Sustainable Development*, Jan. 31, 1992, <http://www.un-documents.net/h2o-dub.htm> [hereinafter *The Dublin Statement*].

²¹⁵ *Id.*

²¹⁶ *Id.*

²¹⁷ *Id.*

²¹⁸ *Id.*

²¹⁹ *The Dublin Statement*, *supra* note 214.

²²⁰ *Id.*

²²¹ *Id.*

²²² See *id.*

In many regions, freshwater aquifers are drying up, leading to a significant shortage of water in those regions. For instance, the natural aquifer in Chennai has almost dried up and people are facing severe water shortages for drinking and domestic household purposes.²²³ Therefore, according to the first principle of the Dublin Statement, it is necessary to formulate and implement effective and sustainable policies for preserving and developing the existing water resources in order to ensure improved water security for every individual.²²⁴

IV.D.2. Inviting Participation from Public and Private Entities

The second principle in the Dublin Statement recognizes the importance of the participation of private and public entities in formulating policies for managing freshwater resources:²²⁵ “Water development, and management should be based on a participatory approach, involving users, planners and policymakers at all levels.”²²⁶

Thus, the second principle demands consultation with people for formulating and implementing policies for preserving natural aquifers.²²⁷ Consultation with the public is important because people become more aware of their water-related needs and preferences regarding utilization of a particular natural aquifer. These preferences have to be accounted for before making and implementing any stringent rules or policies for managing a natural aquifer. Furthermore, the second principle of the Dublin Statement also recognizes the importance of spreading awareness regarding the use and preservation of natural aquifers.²²⁸ Spreading awareness to the public regarding the importance of the sustainable use of natural aquifers is essential to gain cooperation from the public in implementing policies on preserving and managing natural aquifers.²²⁹

IV.D.3. Recognizing the Essential Role of Women in Ensuring Water Security for Households

²²³ S. Jency, *Quenching Chennai's Insatiable Thirst: A Study of the City's Water Demands and Solutions*, in *WATER AND URBAN DEVELOPMENT PARADIGMS: TOWARDS AN INTEGRATION OF ENGINEERING, DESIGN AND MANAGEMENT APPROACHES* 435, 438 (Jan Feyen et al. eds., 2008).

²²⁴ *The Dublin Statement*, *supra* note 214, princ. no. 1.

²²⁵ *Id.* princ. no. 2.

²²⁶ *Id.*

²²⁷ *Id.*

²²⁸ *See id.*

²²⁹ *See The Dublin Statement*, *supra* note 214, princ. no. 2.

The Dublin Statement regards it as essential to recognize the importance of the participation of women in preserving and managing freshwater resources, primarily because women perform the most vital role in the household for saving and using water for different household purposes.²³⁰ This situation is particularly true in the context of South Asia, where many women are required to travel long distances to collect water for their family. By ensuring water for their families, women play the role of guardian, especially for their children. The third principle of the Dublin Statement particularly recognizes this important role played by women in preserving water for their household: “Women play a central part in the provision, management and safeguarding of water.”²³¹

Owing to the crucial role played by women in preserving water for the household, the Dublin Statement calls for increased participation by women in public consultations for formulating policies for preserving and managing natural aquifers.²³² For this purpose, it stresses the need for special “institutional arrangements” to take place to empower women to take part in the development of policies and approaches for managing water resources.²³³

IV.D.4. Assigning Economic Value to Freshwater

Unfortunately, many people waste water and assign no economic value to it. Therefore, to discourage the wastage of water, the Dublin Statement recognizes the economic significance of water by making it an economic good.²³⁴ Accordingly, the fourth principle of the Dublin Statement specifically mentions this valuation of water: “Water has an economic value in all its competing uses and should be recognized as an economic good.”²³⁵ However, by assigning economic value to water, the Dublin Statement does not imply increases in the price of water for individuals. It only implies raising the importance of water as a good. According to the Dublin Statement, recognizing the economic value of water can lead to the sustainable use and preservation of freshwater resources.²³⁶ It also recognizes affordable access to water for drinking and

²³⁰ See *id.* princ. no. 3.

²³¹ *Id.*

²³² See *id.*

²³³ *Id.*

²³⁴ See *The Dublin Statement*, *supra* note 214, princ. no. 4.

²³⁵ *Id.*

²³⁶ See *id.*

sanitation purposes as the most fundamental right of every individual.²³⁷ This affordability in accessing water must be ensured by states to ascertain sufficient water security for every individual.²³⁸

In addition to the four main principles, the Dublin Statement also includes an action agenda comprising a number of recommendations for ensuring sustainable water security.²³⁹ These recommendations demand efforts from states to reduce poverty, prevent disease, mitigate natural disaster-related risks, preserve freshwater resources, and solve water-related conflicts among states.²⁴⁰ Furthermore, the recommendations also include a call to states to sustainably develop urban regions, protect the natural aquatic environment, and ensure adequate supply of water for agricultural productive regions.²⁴¹ It also calls for capacity building through spreading awareness among the public regarding the efficient use of freshwater resources.²⁴²

The Action Agenda of the Dublin Statement calls for conserving freshwater resources by preventing the excessive wastage of the resource.²⁴³ The text of the Agenda notes that around eighty percent of freshwater withdrawal in the world is allocated to irrigating crops, but, unfortunately, nearly sixty percent of this withdrawal is wasted on its way to the plants.²⁴⁴ Therefore, the Action Agenda calls for the implementation of efficient techniques for irrigating crops.²⁴⁵ For instance, one way to reduce the wastage of water is through adopting the drip and sprinkler irrigation system that involves sprinkling water drops onto plants and supplying this water to be sprinkled via pipes into the crops.²⁴⁶ Such irrigating schemes can save a significant amount of water and avert the impending water scarcity around the globe.²⁴⁷

²³⁷ *Id.*

²³⁸ *See id.*

²³⁹ *See The Dublin Statement, supra* note 214, The Action Agenda.

²⁴⁰ *Id.*

²⁴¹ *Id.*

²⁴² *Id.*

²⁴³ *Id.*

²⁴⁴ *The Dublin Statement, supra* note 214, The Action Agenda.

²⁴⁵ *Id.*

²⁴⁶ *See* Kassim Jumanne Msuya, *Applicability of Drip Irrigation for Smallholder Farmers: A Case Study of the Horticultural Industry in Tanzania* 13 (2016) (M.S. thesis, The Ohio State University).

²⁴⁷ *See id.*

The Action Agenda particularly recommends that state parties take adequate measures to protect natural aquifers.²⁴⁸ In addition, it considers climate change and the resulting rise in sea levels to be a threat to water security.²⁴⁹ To mitigate the threats associated with climate change and water-related natural disasters such as floods and droughts, the Action Agenda recommends that states take adequate disaster preparedness measures.²⁵⁰

The Action Agenda also advises riparian states to cooperate and implement jointly monitored mechanisms for the distribution and utilization of their shared water resources.²⁵¹ In this regard, such utilization of water resources must be equitable and sustainable.²⁵² To further this purpose, the Action Agenda also suggests integrated management of the water resources, including both surface and groundwater aquifers.²⁵³ It also suggests that states must only hire qualified teams with experience in the integrated management of water resources.²⁵⁴

IV.E. *The Human Right to Water*

The right to access water is a fundamental human right recognized by a number of international conventions and committees. For instance, the United Nations General Assembly, United Nations Human Rights Council, and the United Nations Committee on Economic, Social and Cultural Rights endorse an individual's right to water as a fundamental human right.²⁵⁵ Similarly, the 2003 Protocol to the African Charter on Human and Peoples' Rights on the Rights of Women in Africa and the 1990 African Charter on the Rights and Welfare of the Child also affirm the right to water as a fundamental human right that must be available to every individual without discrimination.²⁵⁶ Likewise, the 1989 Convention on the Rights of the Child and the 2006

²⁴⁸ See *The Dublin Statement*, *supra* note 214, The Action Agenda.

²⁴⁹ *Id.*

²⁵⁰ *Id.*

²⁵¹ *Id.*

²⁵² *Id.*

²⁵³ *The Dublin Statement*, *supra* note 214, The Action Agenda.

²⁵⁴ *Id.*

²⁵⁵ McIntyre, *supra* note 104, at 48–49.

²⁵⁶ See Christina Leb & Patricia Wouters, *The Water Security Paradox and International Law: Securitisation as an Obstacle to Achieving Water Security and the Role of Law in Desecuritising the World's Most Precious Resource*, in WATER SECURITY: PRINCIPLES, PERSPECTIVES AND PRACTICES 26, 39 (Bruce Lankford et al. eds., 2013).

Convention on the Rights of Persons with Disabilities also uphold the right to water as an individual's most essential human right.²⁵⁷

Thus, many conventions and charters recognize the right to access water, an essential precondition of ascertaining individuals' water security, as the most fundamental human right.²⁵⁸ This right cannot be taken away from individuals because it is their inherent right.²⁵⁹

In sum, international law has provided a number of recommendations and principles for the equitable utilization, preservation, and sustainable development of freshwater resources.²⁶⁰ In particular, the 1997 United Nations Watercourses Convention, the 1992 UNECE Convention, the 2004 Berlin Rules on Water Resources, and the 1992 Dublin Statement on Water and Sustainable Development have given many recommendations to states for equitably and efficiently utilizing and managing their freshwater resources.²⁶¹ These conventions have also articulated the obligations on states to cause no harm to other riparian states in using their shared transboundary freshwater resources. Furthermore, obligations to equitably utilize and preserve freshwater resources have also been imposed on states.²⁶² The full observance and pursuance of these recommendations can lead to ensuring improved water security for people. Likewise, an improved level of water security will also translate into ensuring better health, food, environmental, and economic security for people. The obligation to cooperate imposed on riparian states in using transboundary water resources can also lead to improved political security for riparian states.²⁶³ All these securities will eventually strengthen the conditions for human security.

V. CONCLUSION

Water is required in sufficient quantity and good quality for the survival of life on earth.²⁶⁴ In particular, humans require clean water for drinking and

²⁵⁷ *Id.*

²⁵⁸ *Id.*

²⁵⁹ *Id.*

²⁶⁰ Woldetsadik, *supra* note 19, at 645.

²⁶¹ HILDERING, *supra* note 20, at 47–48.

²⁶² Patricia Wouters & Alistair Rieu-Clarke, *The Role of International Water Law in Ensuring "Good Water Governance": A Call for Renewed Focus and Action*, 15 J. WATER L. 89, 92–94 (2004).

²⁶³ Tzatzaki & Tarlock, *supra* note 17.

²⁶⁴ THIELBÖRGER, *supra* note 1.

sanitation purposes²⁶⁵ and for irrigating crops.²⁶⁶ These requirements translate into the term “water security” for individuals.²⁶⁷ According to the United Nations, the term “water security” is defined as “[t]he capacity of a population to safeguard sustainable access to adequate quantities of acceptable quality water for sustaining livelihoods, human well-being, and socio-economic development, for ensuring protection against water-borne pollution and water-related disasters, and for preserving ecosystems in a climate of peace and political stability.”²⁶⁸ This definition further implies that water security refers to the fulfillment of a number of other conditions such as the protection of individuals from waterborne diseases and water-related natural disasters such as floods and droughts.²⁶⁹ Moreover, water security also implies the preservation and sustainable utilization of freshwater resources.²⁷⁰

Upon analyzing these requirements for water security, it becomes evident that they coincide with other securities such as economic, health, food, environmental, personal, community, and political security. For instance, the availability of adequate quantity of water for irrigation supports the agricultural sector, an essential component of the economies of many countries. For example, in Pakistan, around 45 percent of total employment belongs to the agricultural sector.²⁷¹ Moreover, the agricultural sector also contributes around 21 percent of national GDP²⁷² and fulfills most of the country’s food requirements.²⁷³ Hence, the availability of water for irrigating crops indirectly contributes to fulfilling the conditions for people’s food security. Furthermore, water is also an essential component of daily eating routine as every human being requires drinking water to digest food and to survive.²⁷⁴ Therefore, this requirement of sufficient access to water again translates into fulfilling individuals’ food security.

²⁶⁵ RIEPL, *supra* note 11.

²⁶⁶ See Munoz, *supra* note 8.

²⁶⁷ See MAGSIG, *supra* note 3.

²⁶⁸ *Id.*

²⁶⁹ See G.A. Res. 51/229, *supra* note 110, art. 27 (regarding protection from waterborne diseases); see also RIEPL, *supra* note 11; see also Gourbesville, *supra* note 13 (regarding protection from water-related natural disasters).

²⁷⁰ See The Berlin Rules, *supra* note 150, art. 64.

²⁷¹ QASIM, *supra* note 82.

²⁷² *Id.*

²⁷³ *Id.*

²⁷⁴ For more details, see The Berlin Rules, *supra* note 150, art. 3(20).

In addition to economic and food security, the availability of good quality of water is linked to individuals' health security.²⁷⁵ For instance, it is essential for maintaining individuals' good health that the water they drink and use for other household chores, e.g., washing pots, should be clean and free from diseases.²⁷⁶ Otherwise, using unclean water can cause waterborne diseases like cholera, diarrhea, typhoid, and other harmful diseases.²⁷⁷ Therefore, to ensure every individual's water security, it is essential that individuals have access to clean water for drinking and other purposes.²⁷⁸ This requirement further translates into individuals' health security.²⁷⁹

In addition, water security is also directly linked with individuals' environmental security.²⁸⁰ For example, as per the definition of water security, the protection of individuals from all kinds of water-related natural disasters is an essential requirement of water security.²⁸¹ These disasters can include floods and droughts.²⁸² Unfortunately, in the contemporary era, climate change and global warming have caused the emergence of a number of water-related environmental threats, such as floods and hurricanes, primarily because of the rise in sea levels and the melting of glaciers.²⁸³ Global warming, defined as the rise in the average temperature of earth through an increased concentration of greenhouse gases,²⁸⁴ has increased glaciers' pace of melting, not only increasing the flow of water in the river basins but is also increasing the sea levels.²⁸⁵ Consequently, incidents of flooding in the river basins and the resultant damage to the nearby areas have happened in many regions.²⁸⁶ The

²⁷⁵ See Rosegrant et al., *supra* note 10.

²⁷⁶ All of these needs are also regarded as "vital human needs," for details, see The Berlin Rules, *supra* note 150, art. 3(20).

²⁷⁷ For details, see CAROL TURKINGTON & BONNIE ASHBY, THE ENCYCLOPEDIA OF INFECTIOUS DISEASES 339 (3rd ed. 2007).

²⁷⁸ See RIEPL, *supra* note 11; *see also* Rosegrant et al., *supra* note 10.

²⁷⁹ Rosegrant et al., *supra* note 10; *see also* RIEPL, *supra* note 11.

²⁸⁰ See Gourbesville, *supra* note 13.

²⁸¹ *Id.*; *see* MAGSIG, *supra* note 3.

²⁸² See Gourbesville, *supra* note 13.

²⁸³ See INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE, CLIMATE CHANGE 2007 - IMPACTS, ADAPTATION AND VULNERABILITY: WORKING GROUP II CONTRIBUTION TO THE FOURTH ASSESSMENT REPORT OF THE IPCC 187 (Clair Hanson et al. eds., 2007). [Hereinafter: INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE].

²⁸⁴ MOHAMMAD ALI, CLIMATE CHANGE IMPACTS ON PLANT BIOMASS GROWTH 13 (2013).

²⁸⁵ See JOHN ANDREWS & NICK JELLEY, ENERGY SCIENCE: PRINCIPLES, TECHNOLOGIES, AND IMPACTS 371 (2d ed. 2013).

²⁸⁶ See INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE, *supra* note 283.

2010 flood in Pakistan, which took place in the Indus River Basin and caused significant damage to the agrarian economy and the GDP of the country, is an example of such flooding.²⁸⁷ As per an estimate, it caused a loss of PKR 429 billion to the agricultural sector of Pakistan.²⁸⁸ Moreover, the flood also resulted in around 2000 human casualties.²⁸⁹ Therefore, it is essential for water security and human security that humans have protection from such water-related environmental threats. This requirement implies that water and environmental security are deeply linked.

In addition, water security is essential for personal security because access to sufficient clean water is essential for human development.²⁹⁰ Likewise, water can be utilized in the agricultural and industrial sectors, which can lead to increasing welfare for the entire community.²⁹¹ Thus, water security, here, boosts community security. Similarly, an equitable and sustainable utilization of shared transboundary freshwater resources by riparian states through mutual cooperation can lead to increased community and political security for these riparian states, because cooperation over the distribution and utilization of water will develop friendly relations among them.²⁹² Thus, in a nutshell, water security is directly linked to economic, food, health, environmental, personal, community, and political security. All these securities are collectively regarded as the seven essential dimensions of “human security.”²⁹³ That is, to ensure sufficient human security, it is essential that all these seven securities are met.²⁹⁴ Thus, water security is deeply connected to human security.

Considering the importance associated with water security and human security, international law has provided a number of rules, recommendations, and guidelines for improving individuals’ water security.²⁹⁵ Improved water security can lead to enhanced conditions for improving individuals’ human

²⁸⁷ Shahid Hassan Rizvi & Syed Iazaz Ahmad Bukhari, *Impact of 2010 Floods on Pakistan’s Agriculture*, 7 *J. Env’t & Analytical Toxicology* 1 (2017).

²⁸⁸ *Id.*

²⁸⁹ K. ALAN KRONSTADT ET AL., CONG. RESEARCH SERV., R41424, FLOODING IN PAKISTAN: OVERVIEW AND ISSUES FOR CONGRESS 1 (2010).

²⁹⁰ Bundschuh & Hoinkis, *supra* note 15.

²⁹¹ Ford & Swentzell, *supra* note 16.

²⁹² Tzatzaki & Tarlock, *supra* note 17.

²⁹³ Ariyabandu & Foneska, *supra* note 39.

²⁹⁴ *Id.*

²⁹⁵ HILDERING, *supra* note 20, at 47–48.

security.²⁹⁶ In this regard, the 1997 United Nations Watercourses Convention, the 1992 UNECE Convention, the 1992 Dublin Statement on Water and Sustainable Development, and the 2004 Berlin Rules on Water Resources have provided a number of recommendations to states for improving individuals' water security.²⁹⁷ In particular, these conventions have suggested that freshwater resources should be utilized sustainably.²⁹⁸ Moreover, it is also recommended that states implement integrated water management approaches for preserving, utilizing, and developing their existing freshwater resources.²⁹⁹ Furthermore, these conventions have also recommended the establishment of cooperation among riparian states to share their transboundary freshwater resources.³⁰⁰ In this regard, it has been made an obligation under the Berlin Rules on Water Resources and under the United Nations Watercourses Convention that no riparian state should cause any harm to another when utilizing shared water resources.³⁰¹ It has also been made obligatory for riparian states to share up-to-date information regarding their planned projects on the shared water resources.³⁰²

A complete observance and implementation of the recommendations given by the Berlin Rules, U.N. Watercourses Convention, UNECE Convention, and Dublin Statement can help fulfill the conditions for preserving, developing, and sustainably using freshwater resources that would ultimately lead to improving individuals' water security.³⁰³ Subsequently, improved water security will also lead to strengthening human security through the inherently deep relationship between water security and the seven dimensions of human security.³⁰⁴

²⁹⁶ See Ariyabandu & Foneska, *supra* note 39.

²⁹⁷ E.g., HILDERING, *supra* note 20, at 47–48.

²⁹⁸ See, e.g., *The Dublin Statement*, *supra* note 214, The Action Agenda; The Berlin Rules, *supra* note 150, arts. 38, 40.

²⁹⁹ See, e.g., *The Dublin Statement*, *supra* note 214, Capacity Building; The Berlin Rules, *supra* note 150, art. 64; Wouters et al., *supra* note 204, at 124.

³⁰⁰ Wouters et al., *supra* note 204, at 124. See also The Berlin Rules, *supra* note 150, art. 11.

³⁰¹ The Berlin Rules, *supra* note 150, at art. 12(1); The Berlin Rules, *supra* note 150, art. 16; G.A. Res. 51/229, *supra* note 110, art. 7.

³⁰² See Convention on the Protection and Use of Transboundary Watercourses and International Lakes, art. 9, Mar. 17, 1992, 1936 U.N.T.S. 269 [hereinafter UN Watercourses Convention]; see also UN Watercourses Convention, art. 11.

³⁰³ See HILDERING, *supra* note 20, at 47–48.

³⁰⁴ See ARIYABANDU & FONESKA, *supra* note 39.