



ISSN 2278 – 0211 (Online)

Freshwater Management: An Approach to Address the 21st Century Water Crisis

Amrisha Pandey

Advocate, Ph.D. Student, University of Leeds, England

Abstract:

This paper is written with the object to address the issue of freshwater management, as it is pivot for the 21st century, to survive and sustain for generations to come. However, the issue is vast and cannot be addressed in isolation, thus all the relevant components are accumulated together to address the problem and find an amicable solution. Furthermore the paper is concerned to arrange the various components of environment together, as they are interdependent and from sustainable point of view, inseparable to be dealt in isolation. Therefore this paper will promote the approach of cooperation among the available legal instruments, treaties, conventions, as well as the separate and joint efforts of the states. Additionally, it will analyse, how the joint efforts of the above mentioned instruments will be utilized to their maximum potential, to deal with the water crises world is facing today.

Water is most viable component of life. Earth need freshwater to survive; and it's beyond our capacity to create or substitute. Thus the only remedy left with us, as a citizen of Earth: is to use the available quantity wisely, replenish the remaining and improvise the quality of water left at our disposal. Though it's a huge step forward, but it could be addressed with the collaborative efforts of the Convention on biological diversity, the United Nation Framework Convention on Climate Change and the Ramsar Convention as suggested by the CBD technical Series No 40. Furthermore the use of the vary potential of the available conventions, their expertise and worldwide membership can address the issue with potential impact. Evidently the later development of the joint efforts of these conventions will encourage the universal implementation of the international water conventions: which is believed to be the future of water law. Additionally the UN Watercourses Convention, the Convention on the Protection and use of Transboundary Watercourses and International Lakes (UNECE Watercourse Convention) are equipped with the principles of international environmental laws making it easier for the world to abide by such well established principles. Therefore they are proposed to address the 21st century water crisis in the light of this technical series no 40 issued by the CBD by means of this paper.

1. Introduction

The issue of fresh water management is of global concern. Water is most important constituent in the life cycle of every living organisms, it is the basic need for the development of human civilization. The availability of fresh water resources for human usage is limited as the vast majority of the earth's water is salt water. Only 1-1.5% of the earth's water is fresh and readily accessible, the rest is locked in the form of ice¹. Evidently, the need to use water sustainably is the pivot of 21st century. Consequently there are insufficient supplies of fresh water available to answer humanity's needs. Evidently the increasing world population and pollution problems are the reason for the deterioration of quality of available water resources to serve the needs of humanity. Mainly there are two type of freshwater resources over-ground in the form of rivers and aquifers and underground water.

Over-ground fresh water in the form of rivers and lakes has been utilized by humanity since the inception of life and also considered as a basic human right². These resources were originally believed to recycle by themselves, but the non-regulated use of such resources is a growing problem with the swelling world population. Consequently, rivers and lakes were used as a dumping ground by us. Evidently the growing rate of contamination has reached an extent where it cannot be recycled by natural means. Therefore strict management and protection by the global community is accepted. A major problem with underground fresh water resources is that, they are yet to be explored, indeed it is unclear what impact on environment such explorations would have. Clearly, such explorations need monitoring to ensure that the water source is not depleted beyond the capacity where it can replenish itself. This problem requires

¹<http://www.unep.or.jp/ietc/issues/freshwater.asp>. UNEP report on freshwater issues. (22 June 13)

²Article 6- Covenant of Civil and Political Rights: Article 11- Covenant on Economic, Social and Cultural rights.

international intervention in the form of public-private partnership across the globe at every possible level, indeed this is the favoured response to this issue³.

Management of Freshwater Resources is essential due to increasing causes of pollution and the changing pattern of water usage. Lack of access to clean and sufficient water is a cause of several deaths annually across the globe. Water scarcity causes disease that accounts for the deaths of millions of children below the age of 5 every year⁴. Further, millions of people die due to the lack of fresh drinking water⁵, therefore this issue is considered to be the biggest obstacle for people to access their right to development. Over the last century the use of water has drastically increased and in last few decades it has doubled its usage per person per day⁶. In addition to the growing population, the global adoption of westernization and the growing industrial demand for water are all the contributing factors in the changing pattern of the usage of water. In a decade's time the use of water in the industrial sector will be increased by 200% in comparison to its usage in 1995⁷. Agricultural usage accounts for the use of more than half of the industrial water supply. Due to increasing problems and limited Freshwater Resources, effective and instant management is required by the International Community.

Industrial pollution, disparity in distribution, Climate Change and rising population are the main cause of water scarcity⁸. There is a significant problem with inadequate sanitation, which cannot be resolved without addressing the issue of water scarcity. Consequently the lack of both the abovementioned problems creates a vicious cycle where one can't be treated in the absence of the other. Human excreta are the main cause of water pollution and proper sanitation is dependent upon sufficient amounts of clean water. Therefore the abovementioned issues were recognized by UN's International Water Supply and Sanitation Decade in 1980 and also addressed by MDG's which aimed at ensuring access to safe drinking water and basic sanitation for half the world's population by 2015. Each dollar invested in sanitation will result in the reduction of individual health care costs by seven dollars per person. Investing in universal sanitation now, will result in a universal saving of 660 billion dollars⁹ in future; therefore the investment is economically viable for the world.

Industrial pollution is a major threat to the quality of freshwater, as it releases flux, chemicals and hazardous waste. The agricultural industry relies on vast amounts of water which returns to the environment, polluted by insecticides and pesticides. Evidently, this adversely affects the quality of water¹⁰ and the living organisms within. This problem can be addressed by stringent environmental policies and their implementation at national level. Moreover it needs to be realized that available natural resources are limited and should be used sustainably to ensure a secure future. Thus the mantra "to reuse and recycle" should be the heart and soul of water management policies throughout the world.

Climate Change has resulted in the uneven pattern of rainfall globally. Unpredictable seasonal changes and extreme climatic conditions are the reason for global warming¹¹. Climate Change results in an increase in atmospheric temperature, which results in increasing pollution concentration¹². The rate of natural calamities such as floods, drought etc will increase and disturb the food production, resulting in hunger and poverty¹³. With the growth of population the need for food and water increases: which in-turn results in Climate Change.

The growing water crisis and its direct relation with food Security and Sustainable environment is one of the biggest challenges 21st century is evident of. As it has been rightly said by MARK TAWINE "Whiskey is for drinking and water is for fighting over".

Increasing population demands increase in food production, to increase food production agriculture demands more water. In order to feed 10 billion people across the globe by 2100, we need to improve agricultural tactics, speed up conservation, and reuse of water, by implementing approach of sustainable development in all the sectors responsible for growth and development. Water problem is not a problem of state or a region but it's a global concern. Thus needs cooperation by states, which further trigger the strategies and make stringent foreign policies to address this issue with utmost sincerity. In order to resolve this issue, along with several global policies and efforts by national governments, UN has adopted human rights based approach to water and sanitation in order to promote individual development and ensure health and hygienic conditions for living.

³Jay Famiglietti, 'can we end global water crisis'

<<http://newswatch.nationalgeographic.com/2013/06/10/can-we-end-the-global-water-crisis/>> [Last accessed on 22 June 2013].

⁴U.N. Human Rights Council, supra 37, 4.

⁵Elliot Curry, 'Water scarcity and the recognition of the human right to safe freshwater' (Fall 2010) Journal of International Human Rights 9, 1.

⁶Ibid.

⁷Wail T.Thorne and William L. Thomas, 'issues of water scarcity and right for multinational companies' (2003) 18 Natural Resources and Env't 31,31.

⁸Elliot Curry, 'Water scarcity and the recognition of the human right to safe freshwater' (Fall2010) Journal of International Human Right 9,1.

⁹'Investment and Financial flows':To address Climate Change UNFCCC' (October 2007)

<http://unfccc.int/resource/docs/publications/financial_flows.pdf>[Last accessed on 3ed October 2013].

¹⁰J.H.Dales, ' Land, Water and Ownership' (November 1968) The Canadian Journal of Economics Vol 1,4, 791-804.

¹¹Working Group I Contribution to the IPCC Fifth Assessment Report Climate Change 2013:"The Physical Science Basis" (27th September 2013)

Twelfth Session of Working Group 1, IPCC WGI AR5. <http://www.climatechange2013.org/images/uploads/WGIAR5-SPM_Approved27Sep2013.pdf#!>[Last accessed on 3ed October 2013].

¹²Julia Martín-Ortega, "Costs of adaptation to climate change impacts on freshwater systems": existing estimates and research gaps' (2011) 1 EARN 11, 5-28.

¹³AviOstfeld; Stefano Barchiesi; MatthijsBonte; Carol R. Collier; Katharine Cross; Geoff Darch; Tracy A. Farrell; Mark Smith; Alan Vicory; Michael Weyand and Julian Wright, "Climate change impacts on river basin and freshwater ecosystems": some observations on challenges and emerging solutions Journal of Water and Climate Change' 3 No 3, 171-184.

Right to water is recognized by UN high commissioner for human rights and WTO¹⁴, UNESCO¹⁵, UNDP¹⁶. Human Right to Water is recognized by IBRD the World Bank in 2004, and HR and access to safe drinking water and sanitation¹⁷ was recognized by UN's general assembly, also determine how it can be achieved. Human Right to Water and Sanitation¹⁸ is recognised by another resolution, General Comment Nu 15: talks about Right to Water¹⁹ which was interpreted from article 11 & 12 of international covenant on economic social and cultural rights²⁰. Finally Millennium development Goal-7 recognises Right to Water and targets to curtail water problems by half till 2015²¹. This human right based approach is debatable, but represents a global action plan to combat this problem with conviction.

The water problem in question is vast and beyond the scope of this paper, consequently this paper will mainly analyze the issue of freshwater management in the light of Technical Series No.40²², issued by the Convention on Biological Diversity. This issue of CBD is the guideline to address the issue of Transboundary Water Resources and their Management by implementation of available legal instruments in the field concerned. Later, this paper will compare the document issued by CBD with other conventions and treaties, reconciling the problem of freshwater Management from a different perspective, followed by the conclusion.

The aforementioned issues are interlinked and cannot be segregated from the issue of freshwater management, yet this paper will confine itself to the issue of freshwater management. The document reviewed in this paper is the CBD Technical Series No.40. which sets the objectives, whereas the mechanisms to achieve such objectives are possessed by the UN Watercourses Convention, the Convention on the Protection and use of Transboundary Watercourses and International Lakes (UNECE Watercourse Convention), the Ramsar Convention and the guidelines issued by the Ramsar Convention on specific issues popularly known as Handbooks. Therefore, the international community handles the issue of freshwater management with the utmost sincerity; due to its irreversible impact on the environment of present and future generations to come. Along with the UN's initiative on water management, the MDG-7 has emerged as a new revived strategy due to its right based approach: thus enhancing the implementation aspect of this plan. Arguably such rights attain their purpose when weighted quantitatively as well as qualitatively²³. It is the primary responsibility of the 21st century to solve the issue of freshwater management, by improving the quality of available freshwater resources: which in turn will result in wise use of freshwater. Moreover to use the quantity sustainably, in order to satisfy the needs of present and future generations²⁴.

2. An Insight into CBD Technical Series No. 40

2.1. Object

Technical Series No.40²⁵ the document produced by the CBD, has come up with an innovative approach towards the wise management of Freshwater. Furthermore it addresses the issue of over utilization of freshwater resources, along with the rate of loss of biodiversity, due to the depleting rate of natural freshwater resources²⁶. This document attempts to explain the obvious link between the two and warn the world at an early stage, of the need for an amicable solution. Another issue addressed by the document is the impact of Climate Change on freshwater resources, its impact on increasing global demand for water and other related challenges faced by the world in the coming decades²⁷. Evidently it urges international cooperation by States at every possible level, including decision making for the management of freshwater resources, which has emerged from Article 5 of the CBD²⁸. Whereas in order to

¹⁴"Right to Water Fact Sheet No 35", by office of High Commissioner of Human Rights' <<http://www.ohchr.org/Documents/Publications/FactSheet35en.pdf>> [Last assessed on 28th August 2013]

¹⁵"Outcome of international experts meeting on Right to Water", Paris(7& 8 July 2009): 'The Human Right to water and sanitation' <http://www.un.org/waterforlifedecade/pdf/human_right_to_water_and_sanitation_milestones.pdf> [Last assessed on 28th August 2013]

¹⁶Human Development Report 2006, 'beyond scarcity power, poverty and global water crisis' Chapter 1.

¹⁷A/HRC/RES/15/9.

¹⁸A/RES/64/292.

¹⁹E/C.12/2002/11/

²⁰'International Covenant on Economic, Social and Cultural Rights', Adopted and opened for signature, ratification and accession by General Assembly resolution 2200A (XXI) of 16 December 1966 entry into force 3 January 1976, in accordance with Article 27. United Nations Human Rights: Office of the High Commissioner of Human Rights.

²¹"A New Global Partnership": Eradicate Poverty and Transform Economies through Sustainable Development', The Report of the High-Level Panel of Eminent Persons on the Post-2015 Development Agenda. 2013 United Nations Publications.

²²CBD Technical Series No.40."Transboundary Water resources Management": The role of international watercourse agreements in implementation of the CBD' (2008) Published by Secretariat of the CBD.

²³Kristin L. Retherford, "Regulating the Corporate Tap": Applying Global Administrative Law Principles to Achieve the Human Right to Water' Indiana Law Journal 88. 811-835.

²⁴Report of the World Commission on Environment and Development: 'Our Common Future'.

²⁵CBD Technical Series No.40."Transboundary Water resources Management": The role of international watercourse agreements in implementation of the CBD' (2008) Published by Secretariat of the CBD.

²⁶Ibid.

²⁷The Nairobi Work Programme: "On impacts, vulnerability and adaptation to climate change Climate Change and freshwater resources":'UNFCCC. A synthesis of adaptation actions undertaken by Nairobi Work Programme'

Partner Organizations (2011) <http://unfccc.int/resource/docs/publications/11_nwp_clim_freshwater_en.pdf> [Last accessed on 3ed October 2013]

²⁸The Convention of Biological Diversity 1992.

achieve this objective this document under analysis suggests three main concepts: sustainable use of water resources, international cooperation in addressing the issue and rights based approach to strengthen its compliance²⁹. This document has raised various concerns which will be discussed in detail, along with the available legal instruments which could be used to manage the international watercourses.

Freshwater Management mainly concerns rivers and aquifers; rivers are considered as a main source of freshwater as they flow freely from one state to another, across the globe, without recognizing the geographical boundaries of those states³⁰. Whereas, the law of land recognizes such boundaries, thus it becomes difficult for the national laws of the state to regulate the issues arising from such international freshwater resources. Indeed detailed provisions of international law and cooperation are required to address such issues. Therefore such international laws are based on the norms of customary international laws³¹, creating unanimity and ease for the state to abide by such principles: for management of freshwater resources. Finally this resulted in the codification of the Helsinki Rules in 1966³², and the 1997 Watercourses Convention which is not yet enforced³³.

2.2. Relation between Biodiversity and Freshwater Resources

Management of freshwater widely depends on the states sharing these natural resources, in the realm of freshwater management biodiversity of the region plays a significant role. Conversely if the water quality and quantity is sufficient, the surroundings will be rich in biodiversity and vice-versa³⁴. Thus it can be said that, they are interrelated and act as a saviour for each other, indeed it is impossible to address one without the other. Rather they have to be dealt concurrently for efficient results and sustainable development³⁵. In order to reconcile these pervasive issues, the principles of international law such as good neighbourliness³⁶, cooperation³⁷, no harm rule³⁸ and equitable use of resources, are taken into account³⁹. Another argument states that, the management of freshwater and conservation of biodiversity is a critical issue, due to uncertain impact of climate change⁴⁰.

2.3. Impact of Climate Change in loss of Biodiversity and Freshwater Resources

It is broadly defined in article 1 of the UNFCCC 1992⁴¹, it can cause transition in available water quality and quantity. The wavering impact of Climate Change in freshwater resources can cause trouble in their management. Due to Climate Change many Freshwater Lakes have reported a change in composition of their water content, quality of water, variety of species, etc. The rising global temperature will result in the acceleration of the process of the melting of ice-caps and uneven patterns of rainfall, which will aggravate natural calamities such as floods and droughts⁴². Another argument is that, the global warming is one of the results of Climate Change; the increased temperature of the earth will increase the precipitation of water, resulting in deterioration of water quality⁴³. Evidently the level of pollutants in the water is raised, resulting in sedimentation and soil erosion, moreover problems such as loss of marine life, lack of available freshwater resources to feed local populations and irrigation for agriculture will be adversely affected⁴⁴. In addition to this, the health and socio-economic development, as well as the fundamental right of life, would be jeopardized. The abovementioned issues need to be addressed in a manner to avoid the repercussions of Climate Change on limited freshwater resources.

In order to mitigate the future impact of Climate Change, to redress the issue of freshwater management and loss of biodiversity, a strategy is imminently required. The cost of Climate Change is high, it includes cost effective desalinization, chlorination of

²⁹CBD Technical Series No.40."Transboundary Water resources Management":'The role of international watercourse agreements in implementation of the CBD' (2008) Published by Secretariat of the CBD.

³⁰Sands and Peel, 'Principles of International Environmental Law' (third edition Published by Cambridge University Press) Chapter 8.

³¹Ibid.

³²'The Helsinki Rules on the Uses of the Waters of International Rivers', Adopted by the International Law Association at the fifty-second conference, held at Helsinki in August 1966. Report of the Committee on the Uses of the Waters of International Rivers.(London, International Law Association, 1967)

³³The Convention on the law of the Non-navigational uses of International Watercourses 1997. Adopted by the GA of the UN on 21st May 1997.

³⁴Davis Lewis Feldman, 'Water Policy for Sustainable Development' (2007) Published by The Johns Hopkins University Press, 176-180.

³⁵N.F.Madulu, 'Integrated water supply and water demand for sustainable use of water resource' (2003) 28 *Physic and Chemistry of Earth, Parts A/B/C*, 20-27, 759-760.

³⁶Article 74, 'Chapter XI: Declaration Regarding Non-self Governing Treaties' The Charter of the United Nations.

³⁷Implementation of Principle 10 of the Rio Declaration of the United Nations Conference on Environment and Development Caribbean forum:'Shaping a Sustainable Development Agenda to Address the Caribbean reality in the twenty-first century' (5th March 2013)<http://www.eclac.org/rio20/noticias/paginas/5/48925/2.-Janice_Miller.pdf> [Last accessed on 4th September 2013]

³⁸"No harm rule" Rio declaration 1992 Article 2.

³⁹Article 5: The Convention on the Law of Non-Navigational Uses of International Watercourses 1999.

⁴⁰United Nations Framework Convention on Climate Change and freshwater resources:

"The Nairobi Work Programme on impacts, vulnerability and adaptation to climate change" Climate Change and Freshwater Resources': A synthesis of Adaptation Action Undertaken by Nairobi Work Programme Partner Organisation. Part II.

⁴¹The United Nations Framework Convention on Climate Change 1992. FCCC/INFORMAL/84 GE.05-62220 (E) 200705.

⁴²Bates, B.C; Z.W. Kundzewicz; S. Wu and J.P. Palutikof,(2008)"Climate Change and Water" Technical Paper of the Intergovernmental Panel on Climate Change, IPCC Secretariat, Geneva, 210.

⁴³Ibid.

⁴⁴Ibid.

freshwater, water infrastructure, etc.⁴⁵. Climate Change is uncertain and unpredictable, thus we have to act according to the precautionary principle⁴⁶; as it is beyond human capacity to create or substitute water. Furthermore nature remains the victim of our unsustainable, continuous, anthropogenic activities and it is our moral liability and obligation to compensate the nature. It is reported that the number of international disputes about freshwater resources have increased in the last few decades, additionally it is also predicted that more than three quarters of the world population will live in conditions with water scarcity, by 2050⁴⁷.

The nature of the aforementioned disputes is complex; as they cannot be dealt conventionally. This is due to the presence of multiple factors such as, state sovereignty, geographical variations and socio-economic aspects, etc. Another factor is community life within the cultural, social and economic paradigm and most important is the impact on water resources due to the activities of riparian states⁴⁸. Therefore these issues should be considered holistically by all the state parties concerned; any act of state with reference shared resources cannot be left unnoticed, nor can it be fixed in isolation. If done, it will result in animosity among the riparian states sharing such water resources. This view is evident by various international water disputes such as *the Indus river dispute between India and Pakistan*⁴⁹, *the India Nepal case on Mahakali dam*⁵⁰, etc. Climate Change is one of the factors which results in proliferating international water disputes. Furthermore it has been recognized as a threat to international peace and security by the UN.

In 2005, former UN Secretary General Boutros Boutros-Ghali warned of the inevitability of “water wars” between the countries surrounding the Nile basin⁵¹. Inevitably, the impact of Climate Change will increase the tension among riparian states sharing international watercourses: aggravating the conditions of tension which will finally result in water wars in the next century⁵². Therefore in order to address these water-disputes the ICJ should be capable of achieving quick and efficient resolution of such disputes. Evidently the international treaties cannot resolve these issues. Conversely the treaties are binding only for the parties who have ratified such treaties, which is another procedural limitation. Thus it has been suggested by the author that Climate Change should be included within the body of Chapter VII of the UN Charter, where the Security Council can deal with the issue, recognising it as a threat to international peace and security⁵³. Therefore it is considered as a moral duty of state to protect people and work for their betterment, as it results in strengthening of international security⁵⁴. Due to the increasing water crisis the International Security is threatened, as is evident from increasing international disputes across the globe.

2.4. The Impact of Climate Change on Biodiversity

Wetlands are considered to be most vulnerable to Climate Change. Climate Change will adversely affect the freshwater wetlands by causing changes in the rate of precipitation; this will result in extreme climatic conditions such as drought, famine, flood, storms, etc.⁵⁵. Conversely Climate Change can indirectly cause the drying out of wetland ecosystems, which is most likely to cause a threat to the extension of biodiversity. This results in the loss of amphibians, reptiles and birds, as wetlands are considered to be a hotspot for biodiversity⁵⁶. The Ramsar Convention and the World Heritage Convention also recognize the importance of such wetlands for the biodiversity of plant and animal species. Thus they work to protect the habitats of species by an ecosystem-approach; additionally it represents international cooperation of various treaties working together for the same cause⁵⁷. This kind of cooperation and joint effort is the gist of the document under analysis, where it specifies the objects to be achieved by such aforementioned means.

⁴⁵Dr.KarobiB.Saikia, ‘Impact of Climate Change of Fishing Population of Majuli, the largest Riverine Island and its Freshwater Biodiversity’ 1 The International Journal of Climate Change: Impacts and Responses, 3, 199-222.

⁴⁶ Principle 15: Rio Declaration 1992.

⁴⁷Elliot Curry, ‘Water Scarcity and the Recognition of the Human Right to Safe Freshwater’ (2010) 9 Northwestern Journal of International Human Rights 1, (article) 5.

⁴⁸Salman M. A. Salman, “International Water Disputes”: A New Breed of Claims, Claimants, and Settlement Institutions’, (March 2006) 31 International Water Resources Association Water International, 1, 2–11.

⁴⁹Aaron T. Wolf and Joshua T. Newton, ‘Case Study of Transboundary Dispute Resolution: The Indus Water Treaty’, Oregon State University Collage of Science. Programme in water conflict management and transformation, Institute for water and watersheds <http://www.transboundarywaters.orst.edu/research/case_studies/Indus_New.htm> [Last accessed on 3ed October 2013].

⁵⁰VidyaBir Singh Kansakar, ‘Nepal-India Open Border: Prospects, Problems and Challenges’ <http://www.nepaldemocracy.org/documents/treaties_agreements/nep_india_open_border.htm> [Last accessed on 3ed October 2013]; See also, Shlomi Dinar, ‘International Water Treaties Negotiation and cooperation along transboundary rivers’ (2008) Published by Routledge Taylor and Francis Group.

⁵¹Sonia Gupta, ‘Environmental Law and Policy: Climate Change as a Threat to International Peace and Security’ <<http://www.perspectivesonglobalissues.com/0401/envirolaw.pdf>> [Last accessed on 27 September 2013]

⁵²Ibid.

⁵³The United Nations Charter: Chapter VII.

⁵⁴Mark Duffield, ‘Development Security and Unending War Governing the World of Peoples’ (2007) Published by Polity Press.

⁵⁵Bates, B.C; Z.W. Kundzewicz; S. Wu and J.P. Palutikof, (2008) ‘Climate Change and Water’ Technical Paper of the Intergovernmental Panel on Climate Change, IPCC Secretariat, Geneva, 210.Part 4.

⁵⁶“IPCC fourth Assessment on Climate Change 2007”: Working Group II: Impacts, Adaptation and Vulnerability’ 4.4.8 Freshwater wetlands, lakes and rivers.

<http://www.ipcc.ch/publications_and_data/ar4/wg2/en/ch4s4-4-8.html> [last accessed on 9 September 2013]

⁵⁷Joseph Dellapenna and FlaviaLoures, ‘forthcoming developments in international groundwater law: proposals for the way ahead’, (21st August 2007) Water Environment 9.4, 58-62. (IWA publishing Journals online)

Climate Change is likely to reduce the volume of water, or will increase the loss of water due to precipitation, which results in increasing the salinity of water⁵⁸. Reduction in the volume of water will increase the salinity in coastal estuaries and wetlands, whereas increased salinity of a coastal area is caused by a decreased flow of water⁵⁹. Thus the salinity of the coast will rise, altering the composition of plant and animal species of that area. Therefore the availability of freshwater for human use will be reduced causing various social and health issues⁶⁰. Consequently the Ramsar Convention had realized the importance of freshwater for the prevention of biological diversity from wetlands, subsequently they have published some handbooks for the simultaneous management of freshwater and biodiversity⁶¹.

Evidently the CBD technical series has dealt in great depth with these aforementioned issues. In their response, it has come up with a proposal, to consider all the possible interrelated components of the ecosystem, before deciding any projects of water allocation by the appropriate authorities. It has further specified that all the components of water; the aquatic ecosystems, biodiversity and Climate Change must be considered before deciding such issues⁶². Thus the document under consideration encourages the cooperation and joint implementation of various bilateral and multilateral treaties for realization of its aim. Another means suggested for effective results is by approaching the issue of water management in relation to biodiversity loss and human well-being⁶³: by means of a rights based approach with the help of MDG's as discussed below.

2.5. Sustainable Utilization of Water with Millennium Development Goals

The Technical series issued by the CBD has emphasis on sustainable management of inland water biodiversity to reconcile the MDG's. Therefore sustainable development is the only way to protect the need of present and future generations; otherwise the social, economic and environmental aspects are divergent from one another and cannot be addressed together⁶⁴. Conversely if such issues are considered separately, they won't create a similar impact, rather they will be detrimental to the development of one another. Evidently the rights based approach of Human Rights had reported great success with its binding nature and separate institutions for resolution of disputes⁶⁵. Therefore the rights based approach is applied by the MDG, as an initiative to address the issue with a different perspective⁶⁶. The institutions, whether national or international; public or private; NGO's or the UN, are globally active to achieve their aims of freshwater management. Furthermore the realization of this aim becomes more efficient with a rights based approach: as the right to water is realized as a basic human right by the international community⁶⁷.

"Access to safe water is fundamental human need and therefore a basic human right" by Kofi Annan United Nation Secretary General.

The right to water is recognized and adopted in forthcoming policies and developmental projects globally. Evidently the right to water and sanitation is considered to be the motto for next decade's action plan, not only in the field of environmental protection, but also as an important Human Right⁶⁸. Goal 7 of the MDG's recognises the human right to water and sanitation⁶⁹. It is important to understand the concept of this rights based approach before applying this for realisation of such rights. The Human Rights comprise of a set of indivisible rights which gives them strength and unique identity. Therefore the human rights are: Universal(the birthright of all human beings): they focus on the inherent dignity and equal worth of all human beings, which cannot be waived or taken away. To impose obligations of action and omission, particularly on States and State actors; these rights have been internationally guaranteed and legally protected⁷⁰. These rights are interrelated and cannot be addressed in isolation, thus this approach seems to be very effective for

⁵⁸Elizabeth Johns and Thomas N. Lee, 'Weather and climate strongly influence salinity, water quality, and circulation of south Florida coastal waters and bays' Tropical Connections
<http://www.aoml.noaa.gov/outreach/floridaseagrant/pdf_files/TropicalConnections_WeatherAndClimateInfluenceCircuation_JohnsLee.pdf> [Last accessed on 3ed October 2013].

⁵⁹Bates; Bryson.C; Zbigniew.W; Kundzewicz; Shaohng. Wu and Jean.P.Palutikof, 'Climate Change and Wate' (edition June 2008) Technical Paper of the Intergovernmental Panel on Climate Change, IPCC Secretariat, Geneva, 210.Part 4.1.3.3.

⁶⁰Paolo Vines; Queenie Chan; Aneire Khan, 'Climate change impacts on water salinity and health' (December 2011) 1 Journal of Epidemiology and Global Health, 1, 5-10.

⁶¹Handbook series 4th edition 'Handbook 9, 10 and 11 on water management', The Ramsar Convention 1971.

⁶²CBD Technical Series No.40."Transboundary Water resources Management": The role of international watercourse agreements in implementation of the CBD', (2008) Published by Secretariat of the CBD. Part II.

⁶³"A Good Practice Guide": Drinking Water, Biodiversity and Development' (2010) Published by Secretariat of the Convention on Biological Diversity.

⁶⁴Bourquain; Knut, "Freshwater Access from a Human Rights Perspective": A Challenge to International Water and Human Rights Law'. 97 International Studies in Human Rights.

⁶⁵Orientation to a Rights-based approach, what is a Rights Based Approach?<[http://insightshare.org/sites/default/files/A%20Rights-Based%20Approach%20to%20Participatory%20Video%20-%20toolkit%20\(CHAPTER%20\).pdf](http://insightshare.org/sites/default/files/A%20Rights-Based%20Approach%20to%20Participatory%20Video%20-%20toolkit%20(CHAPTER%20).pdf)>[last accessed on 16th September 2013]

⁶⁶"Human Rights- based approaches and managing water resources" exploring the potential for enhancing development outcomes', Water Governance Facility Report No1<www.watgovernance.org> [Last accessed on 16th September 16, 2013]

⁶⁷A/RES/65/154. (65/154, International Year of Water Cooperation 2013, resolution adopted by the General Assembly)

⁶⁸Rio +20 outcome document: The future we want. <http://www.unece.org/fileadmin/DAM/oes/Rio_20/RIO_20_Outcome_document.pdf> [Last accessed on 17 September 2013]

⁶⁹Goal 7: Millennium Development Goal.

⁷⁰"Claiming the Millennium Development Goals": A human rights based approach' (2008) United Nations New York and Genève
<http://www.ohchr.org/Documents/Publications/Claiming_MDGs_en.pdf> [Last accessed on 16th September 2013]

the realization of the aforementioned multi-dimensional task⁷¹. Whereas the MDG's have set the targets and the time frame for their implementation, and keeps a regular check to create constant pressure on the global community; to realise the importance of such rights and implement the targets holistically for their realization⁷². In order to maintain the brevity of this paper, it will specifically deal with goal 7 of the MDG: which deals with sustainable development (7.A); reduction of biodiversity loss (7.B); and targets on right to water and sanitation (7.C).

Goal 7 of the MDG's is divided into four parts, whereas this paper will mainly deal with the aforementioned goals, as these goals are dealt in the document under analysis. Goal 7.A specifically deals with Sustainable Development, as a result of which it urges the international community to integrate the concept of sustainable development in policy and planning for the desired results⁷³. The right to environmental health was recognized by the GA of the UN and principle 1 of Stockholm was also reaffirmed in this context. Evidently the human rights based approach made realization of rights easy and effective due to global recognition of the "right to environmental health"⁷⁴. Various cases have recognized such rights in national and international forums giving them importance and strength.

Target 7.B was added in 2010 to achieve significant reduction in the loss of Biodiversity. This document also recognizes the negative impact of the loss of biodiversity and its direct impact on freshwater management. Therefore it puts emphasis on the ecosystem approach: where the biodiversity and fresh water resources could be managed simultaneously, as they broadly depend on each other for their protection and conservation. Evidently the rights based approach applied by MDG has compiled these aspects, by strengthening the right to environmental health, environmental sustainability, etc⁷⁵. Controversial issues such as the right to participation and access to information in environmental matters are also addressed by the rights based approach. Therefore the treaties and conventions are signed, which recognizes the importance of such norms in the level of policy making, and decision making to access environmental justice⁷⁶. In addition to this they provide the mechanism of international complaint for monitoring the treaty⁷⁷. Evidently this approach is applied in the UN Watercourse Convention and the UNECE Water Convention with similar results, as reflected in this document.

Target 7.C: water and sanitation is the most complex aim of the rights based approach, as these rights are recognized by declarations, yet they are non-binding, thus constitute recommendatory nature. The right to water is considered by general comment Nu.15⁷⁸ to empower its implementation whilst deciding national policies⁷⁹. Whereas the UN has acted beyond its capacity to address the state governments: to apply the most empathetic approach beyond the principles of constitution for realization of right to water, in their legislation⁸⁰. Therefore the right to water can be addressed only when global freshwater resources are regulated by public-private partnership, at every possible level by implementation of the rights based approach, without any discrimination among nations, people or region⁸¹. In addition to this, all the interrelated ecological aspects have to be considered together, in order to conserve these resources sustainably.

The right to water and sanitation as decided by the MDG-7 is actively working to achieve its desired goals, which is evident by the Hashimoto action plan II⁸² and III. The Hashimoto Plan II has provision for all the important sectors pertinent to these issues such as: financing, sanitation, monitoring, integrated water resource management, water and disaster. Additionally plan III⁸³ is finalized with some improved provision over plan II, for effective results. Therefore the rights based approach is significant for sustainable development, as it incorporates all the factors of development. In 1987, the aftermath of the publication of the Brundtland report,

⁷¹Ibid.

⁷²"The Post 2015 Water Thematic Consultation Report" The World We Want'.

<http://www.unwater.org/downloads/Final9Aug2013_WATER_THEMATIC_CONSULTATION_REPORT.pdf> [Last accessed on 16th September 2013]

⁷³Singh Amita; Gonzalez, Eduardo T; Thomson, Stanley Bruce. 'Millennium Development Goals and Community Initiatives in the Asia Pacific' (2013) Published by Springer, 69-80.

⁷⁴Formme H; Tittlemier, S.A.; Volkel W; Wilhelm, M; Twardella D, 'Perfluorinated compounds- Exposure assessment for the general population in western countries' (2009) 212 International Journal of Hygiene and Environmental Health, 3, 239-270.

⁷⁵"Environment and Human Well-being: a practical strategy", UN Millennium project task force on environmental sustainability (2005) Published nu UNDP).

⁷⁶Aarhus Convention: convention on access to information, public participation in decision-making and access to justice in environmental matters done at Aarhus, Denmark, on 25 June 1998

⁷⁷Ibid.

⁷⁸General Comment No. 15 (2002) 'The Right to Water' (arts. 11 and 12 of the International Covenant on Economic, Social and Cultural Rights) United Nation Economic and Social Council.

⁷⁹Millennium Project, 'Health, dignity, and development: what will it take?' (United Nations publication, Sales N° 05.B.III.14), p.178.

⁸⁰The UNDP Human Development Report 2006 was more emphatic and stated: "All Governments should go beyond vague constitutional principles to enshrine the human right to water in enabling legislation... Clear benchmarks should be set for progressing towards the target, with national and local governments and water providers held accountable for progress."

⁸¹"Claiming the Millennium Development Goals: A human rights based approach", (2008) United Nations New York and Genève <http://www.ohchr.org/Documents/Publications/Claiming_MDGs_en.pdf> [Last accessed on 16th September 2013]

⁸²"Hashimoto Action Plan II" The United Nations Secretary-Generals Advisory Board on Water and Sanitation: Strategy and Objective through 2012' <http://www.unsgab.org/content/documents/HAP-II_en.pdf> [Last accessed on 20 September 2013]

⁸³"Hashimoto Action Plan III". The United Nations Secretary-Generals Advisory Board on Water and Sanitation: Strategy and Objective through 2015' <<http://www.unsgab.org/content/documents/hap3.pdf>> [Last accessed on 20 September 2013]

sustainable development is considered to be the core principle of environmental law⁸⁴. Therefore guides the CBD and the UN watercourse convention to address the issue of water management according to the needs of present and future generations. This principle is embedded in paragraph 23 and 5 of the preambles of the aforementioned conventions, respectively.

2.6. Biodiversity in Context of the UN Watercourse Convention and the CBD

Part V of the Technical series No 40 issued by the CBD ensures the principle of cooperation among the states, in order to manage transboundary water; but lacks an implementation mechanism⁸⁵ however this is fulfilled by the UN watercourse convention. Evidently the UN Watercourse Convention is in perfect harmony with the CBD convention, as it relates to the conservation of biodiversity and the management of freshwater resources⁸⁶. Furthermore it applies the ecosystem approach with the emphasis on simultaneous management of land and water resources, in addition to the restoration of the ecosystem, which is the cornerstone of the CBD⁸⁷.

Thus the implication of the ecosystem approach by the national judiciary is evident from the case law of *S. Jagannath vs Union Of India and Others* on 11th Dec 1996⁸⁸, although it does not deal with international watercourses. Yet this is used, to explain the judicial emphasis on the ecosystem approach and the importance of sustainable development for the protection of environment⁸⁹. In this case the land and water resources were adversely affected, along with the ecological and economic structure of the region, which had suffered great loss due to the short term unsustainable shrimp farming. The main issue of this case was the unsustainable methods of shrimp farming which caused water pollution, resulting in the poor quality of brackish and the under-ground water. In addition to that, rice farming had suffered huge losses due to loss of soil fertility, the presence of chemicals in water and soil and due to the unavailability of sufficient amount of water for irrigation. Evidently it had resulted in the loss of livelihood for local people, caused ecological imbalance, and polluted the water quality for under and over-ground water resources, resulting in a disastrous impact on the life of people living in the region, as well as the entire region itself. Therefore the Supreme Court of India in its decision had ordered a complete ban on such unsustainable practices like shrimp farming and directed the state governments to adopt the ecosystem approach with consideration of every possible environmental aspect before authorising any such activities⁹⁰. Evidently this reflects the judicial activism to protect the environment and how it has gone so far as to issuance of the guidelines for other states on the matter concerned, as reflected in article 20 of the UN Watercourse Convention 1997.

According to article 20 of the UN Watercourse Convention it is the general obligation of states to protect and preserve the ecosystem of International Watercourses individually, or jointly. Furthermore it requires equitable and reasonable use of shared water resources⁹¹; this view is supported by the *Gabcikovo-Nagyamaros* case⁹² where the ICJ had referred to the principles of International Law. Therefore the ICJ was of the view that the diversion of the Danube River carried by Czechoslovakia is not justified, because it violates the international law of equitable and reasonable share of natural resources⁹³. Thus it can be concluded that the management of international watercourses is based on the principles of international law. Furthermore they have gained global support, which is evident by the application of such norms in international, regional, bilateral and multilateral treaties. The ICJ in the years 1989 and 1992 had made an iconic judgment in this case, which later resulted in the codification of various treaties. Furthermore it resulted in the shift of the approach from an economic point of view, to the environmental view point, to address concerns relating to International Watercourses⁹⁴.

One of the main objectives of the CBD as mentioned in article 1, deals with the conservation of the ecosystem⁹⁵, to rehabilitate and restore the damaged ecosystem⁹⁶ and restoration of the inland water ecosystem⁹⁷. Evidently in order to achieve this goal, the UN Watercourse Convention has the obligation to protect and preserve the ecosystem, indeed the scope of the convention is enlarged in order to preserve the biodiversity, and the convention is smartly drafted to include the term ecosystem, which is broadly defined in the CBD. Therefore International Watercourses include both the right to utilize or usufructory right⁹⁸ and duty to cooperate⁹⁹ and the 'no

⁸⁴World commission on environment and Development "our common future" (1987). UN Doc.A/42/427, Development and International Co-operation in Environment (2 August 1987).

⁸⁵Eighth meeting of the Conference of parties to the Convention of Biological Diversity, decision VIII/8, available at <<http://www.cbd.int/decisions/?m=COP-08&id=11020&lg=0>> [Last accessed on 26 September 2013]

⁸⁶Alistair Rieu-Clarke; Ruby Moynihan; Bjorn- Oliver Magsig, 'UN Watercourses Convention User's Guide' (2012) Dundee WWF Publication.

⁸⁷"Natural Solution for Water Security" (22 May 2013) International Day for Biological Diversity Water and Biodiversity' Published by the Secretariat of the Convention on Biological Diversity.

⁸⁸The Supreme Court Of India *S. Jagannath vs Union Of India and Others* on 11th Dec 1996. <<http://indiankanoon.org/doc/507684>>

⁸⁹STEPHEN C McCAFFREY, 'The Law of International Watercourses Non-Navigational Uses' (2001) Published by Oxford University Press, 382.

⁹⁰Ibid.

⁹¹Article 5, Convention of the law of the Non- navigational Uses of International Watercourses 1997.

⁹²International Court of Justice reports of Judgments, advisory opinion and orders case concerning *THE GABCIKOVO-NAGYMAROS PROJECT (HUNGARY/SLOVAKIA)* 25 SEPTEMBER 1997. <<http://www.icj-cij.org/docket/files/92/7375.pdf>>

⁹³Sands and Peel, "Principles of International Environmental Law" Published by Cambridge University Press (third edition). Chapter 8, 317.

⁹⁴Ibid. page 318

⁹⁵Article 1 CBD 1992.

⁹⁶Article 8(f) CBD 1992.

⁹⁷The Convention on Biological Diversity COP 7 decision VII/4. <<http://www.cbd.int/decision/cop/default.shtml?id=7741>> [Last accessed on 3ed September 2013]

⁹⁸Article 2: Convention on the Law of the Non-Navigational uses of International Watercourses 1997.

⁹⁹Article 8: Convention on the Law of the Non-Navigational uses of International Watercourses 1997.

harm' principle of the Rio Declaration is incorporated in the convention in article 7, in order to imply concrete provisions to conserve the biodiversity. Evidently the cooperation of the International Conventions could result in a feasible solution to resolve the problem of international environmental pollution, as it is reflected in the document under analysis¹⁰⁰. Whereas, the convention has the obligation to restore the degraded watercourse though, it is not binding on the member states. Arguably this could be beneficial for the restoration of watercourses, by encouraging the member states to cooperate, on one hand, or it could be disregarded completely by the state, due to its recommendatory or non-binding nature.

3. Conclusion

The water crisis is complex and cooperation is the only mantra to address a problem, as vast as 21st century water crisis. The document under analysis and every other platform addressing the issue of freshwater crisis supports this view. Therefore three-fold cooperation is suggested solution for resolving the water crisis. The first element of cooperation among various international environmental conventions: because the water problem is complex and interrelated to various inseparable components of environment, which have to be addressed together for the desired outcome. Moreover the combined strength, experience, expertise, and the overall geographical area covered by the member states, will create a remarkable difference in the simultaneous implementation of such policies.

Secondly cooperation among the riparian states sharing natural resources in the form of river-basin, aquifers, ground water, wetlands, etc. The policy or strategy formed after sharing information on ecological aspects, sharing benefits of community knowledge, consideration of mutual interest and other related socio-economic issues will be sound enough to address the issue. Hereinafter result in sustainable development of the region and will eventually enhance the socio-economic conditions for the people living in those areas as well.

Thirdly "Community Cooperation": means cooperation among all the relevant communities such as scientific, environmental, legal, political, governmental, intergovernmental, NGO's, local community participation, public-private enterprise and individuals at every possible level. This kind of cooperation is required for the proficient implementation of policies.

In addition to cooperation, the water crisis is best addressed by the natural infrastructure: which refers to the earth's ecosystem such as wetlands, soil management, well vegetative catchments etc¹⁰¹. Evidently this natural infrastructure is the cost effective and most sustainable way to manage water crisis in the 21st century, this will benefit the environment by providing mutual ecosystem benefits from various components of the environment itself. Arguably this natural technique could replace all the physical and chemical means of water treatment, with eco-friendly, more sustainable means driven by the socio-economic aspects of policy making¹⁰².

The COP 10 had first realized the relation between biodiversity and water¹⁰³, later in COP 11 the importance of the water cycle was realized and it was urged by the parties to give this priority whilst implementing the strategic plan for biodiversity 2011-2020¹⁰⁴. Moreover the impact of climate change and active cooperation from the Ramsar Convention was also considered as priority. Therefore these aforementioned developments, along with the UN initiatives in the International Year of Water Cooperation 2013, to address this issue, are a positive hope towards sustainable water use in the coming future.

The components of this management policy are: Cooperation at every possible level; implementation of policies for water management; enforcement of legal instrument for universal adaptation of such norms; public participation and world-wide awareness is the soul of such policies to address the 21st century water crisis. Therefore the effective enforcement of UN watercourse convention and UNECE watercourse convention is the desirable answer to the issue of freshwater management of 21st century. The international community awaits its implementation with positive hope towards future management of international watercourses. By extension, it is believed and anticipated that such international law will have world-wide implementation, and later will transform into codified international water law¹⁰⁵. Evidently these conventions possess all the modern mechanism to address such a complex issue. Moreover they are based on the foundations of the Principles of International laws, which make it easier for the world to abide by such norms.

¹⁰⁰Sir Robert Jennings (Introduction), 'Resolution of International Water Disputes' (2002) Published by Kluwer Law International.

¹⁰¹Natural Solution for Water Security 22 may 2013 International Day for Biological Diversity Water and Biodiversity, Published by the Secretariat of the Convention on Biological Diversity.

¹⁰²Ibid.

¹⁰³CBD-COP 10 Decision X/2X/2.Strategic Plan for Biodiversity 2011-2020.

¹⁰⁴CBD-COP 11 Decisions: Eleventh meeting of the Conference of the Parties to the Convention on Biological Diversity, 8 - 19 October 2012 - Hyderabad, India

¹⁰⁵Flavia Loures; Dr. Alistair Rieu-Clarke and Marie-Laure Vercambre, 'Everything you need to know about the UN Watercourses Convention', WWF.

4. References

1. Davis Lewis Feldman, 'Water Policy for Sustainable Development' (2007) Published by The Johns Hopkins University Press.
2. Mark Duffield, 'Development Security and Unending War Governing the World of Peoples' (2007) Published by Polity Press.
3. Sands and Peel, 'Principles of International Environmental Law' (third edition Published by Cambridge University Press)
4. Aaron T. Wolf and Joshua T. Newton, 'Case Study of Transboundary Dispute Resolution: The Indus Water Treaty', Oregon State University Collage of Science. Programme in water conflict management and transformation, Institute for water and watersheds <http://www.transboundarywaters.orst.edu/research/case_studies/Indus_New.htm> [Last accessed on 3ed October 2013].
5. Alistair Rieu-Clarke; Ruby Moynihan; Bjorn- Oliver Magsig, 'UN Watercourses Convention User's Guide' (2012) Dundee WWF Publication.
6. AviOstfeld; Stefano Barchiesi; MatthijsBonte; Carol R. Collier; Katharine Cross; Geoff Darch; Tracy A. Farrell; Mark Smith; Alan Vicory; Michael Weyand and Julian Wright, "Climate change impacts on river basin and freshwater ecosystems": some observations on challenges and emerging solutions *Journal of Water and Climate Change* 3 No 3, 171–184.
7. Bates, B.C; Z.W. Kundzewicz; S. Wu and J.P. Palutikof,(2008)"Climate Change and Water" Technical Paper of the
8. Bourquain; Knut, "Freshwater Access from a Human Rights Perspective": A Challenge to International Water and Human Rights Law'. 97 *International Studies in Human Rights Intergovernmental Panel on Climate Change, IPCC Secretariat, Geneva*, 210
9. Dr.KarobiB.Saikia, 'Impact of Climate Change of Fishing Population of Majuli, the largest Riverine Island and its Freshwater Biodiversity' 1 *The International Journal of Climate Change: Impacts and Responses*, 3, 199-222.
10. Elliot Curry, 'Water scarcity and the recognition of the human right to safe freshwater' (Fall 2010) *Journal of International Human Rights* 9, 1.
11. Elizabeth Johns and Thomas N. Lee, 'Weather and climate strongly influence salinity, water quality, and circulation of south Florida coastal waters and bays' *Tropical Connections* <http://www.aoml.noaa.gov/outreach/floridaseagrant/pdf_files/TropicalConnections_WeatherAndClimateInfluenceCirculation_JohnsLee.pdf> [Last accessed on 3ed October 2013].
12. Formme H; Tittlemier, S.A.; Volkel W; Wilhelm, M; Twardella D, 'Perfluorinated compounds- Exposure assessment for the general population in western countries' (2009) 212 *International Journal of Hygiene and Environmental Health*, 3, 239-270.
13. J.H.Dales, 'Land, Water and Ownership' (November 1968) *The Canadian Journal of Economics* Vol 1,4, 791-804.
14. Joseph Dellapenna and FlaviaLoures, 'forthcoming developments in international groundwater law: proposals for the way ahead', (21st August 2007) *Water Environment* 9.4, 58-62. (IWA publishing Journals online)
15. Julia Martín-Ortega, "Costs of adaptation to climate change impacts on freshwater systems": existing estimates and research gaps' (2011) 1 *EARN* 11, 5-28.
16. Kristin L. Retherford, "Regulating the Corporate Tap": Applying Global Administrative Law Principles to Achieve the Human Right to Water' *Indiana Law Journal* 88. 811-835.
17. N.F.Madulu, 'Integrated water supply and water demand for sustainable use of water resource' (2003) 28 *Physic and Chemistry of Earth, Parts A/B/C*, 20-27, 759-760.
18. Sir Robert Jennings (Introduction), 'Resolution of International Water Disputes' (2002) Published by Kluwer Law International
19. Salman M. A. Salman, "International Water Disputes": A New Breed of Claims, Claimants, and Settlement Institutions', (March 2006) 31 *International Water Resources Association Water International*, 1, 2–11
20. Sonia Gupta, ' Environmental Law and Policy: Climate Change as a Threat to International Peace and Security' <<http://www.perspectivesonglobalissues.com/0401/envirolaw.pdf>> [Last accessed on 27 September 2013]
21. STEPHEN C McCAFFREY, 'The Law of International Watercourses Non-Navigational Uses' (2001) Published by Oxford University Press, 382.
22. VidyaBir Singh Kansakar, 'Nepal-India Open Border: Prospects, Problems and Challenges' <http://www.nepaldemocracy.org/documents/treaties_agreements/nep_india_open_border.htm> [Last accessed on 3ed October 2013]; See also, Shlomi Dinar, 'International Water Treaties Negotiation and cooperation along transboundary rivers' (2008) Published by Routledge Taylor and Francis Group.
23. Wail T.Thorne and William L. Thomas, 'issues of water scarcity and right for multinational companies' (2003) 18 *Natural Resources and Env't* 31,31.