A Theoretical Analysis Of Hydropolitics

HOMER–DIXON'S ENVIRONMENTAL SCARCITY THEORY AND THE REGIME THEORY

The hydropolitical landscape of transboundary river basins has been affected by water scarcity. Hydropolitics is the politics of water symbolising the complex relations and interactions among states that share river basins. Hydropolitics should be viewed not only as the change in the hydrological system, but also seen in conjunction with institutional capacity to absorb the change. Due to numerous factors ranging from environmental to geopolitical issues, transboundary basins could become nascent sources of conflict. This article conceptualises both Homer-Dixon's Environmental Scarcity Theory as well as the Regime Theory with regard to transboundary river basins.

MK MAHLAKENG

INTRODUCTION

The hydropolitical landscape of transboundary river basins has been affected by water scarcity. (Abdullahi Elmi, "Hydropolitics in the Horn of Africa: Conflicts and Cooperation in the Juba and Shabelle Rivers", paper presented at the Horn of Africa Conference, Lund, Sweden, 10–12 May 2002, online at http://www.somwe.com) Hydropolitics refers to the politics of water, symbolising the complex relations and interactions among states that share river basins. (Roy Jankielsohn, "Defining Hydropolitics: The Politics of Water in South Africa", *Journal*

for Contemporary History, vol37, no1, 2012, p125) Hydropolitics should be viewed not only as the change in the hydrological system, but also seen in conjunction with the institutional capacity to absorb this change. As argued by Arun P Elhance, ("Hydropolitics: Grounds for Despair, Reasons for Hope", *International Negotiation*, vol5, no2, 2000, p202) hydropolitics is a function of two variables—the rate of environmental scarcity (the change in the hydrological system) and the institutional capacity (regimes) to absorb the change.

Hydropolitics will be a significant topic of future research. It is likely to promote dialogue with economic, natural, political, security and social studies scientists as well as academicians and policymakers. This article aims to contribute to hydropolitical literature by arguing that the politics over water that could lead to environmental conflict is a result of both environmental scarcity and institutional capacity. This idea introduces new thinking into environmental conflict studies. It addresses the research gap on water politics and the emergence of nascent water conflicts. For the most part, the research gap is a result of theoretical limitations that have affected findings on hydropolitics–conflict linkages. For any research to bridge this gap, it must explain "why" environmental scarcity particularly in transboundary basins is a risk factor for a nascent water conflict; "how" environmental scarcity could lead to conflict; "where" environmental scarcity is more prone to lead to conflict and "what" may be done to alleviate potential water conflict as a result of environmental scarcity.

Environmental scarcity is the reduction of the quality and quantity of resources. Conflict becomes likely if the decrease is a result of the interaction between rapid population growth, degradation/depletion and the uneven distribution of resources. The reduction forces states/societies to face ecological marginalisation or pursue resource capture, which are risk factors for nascent water conflicts in transboundary basins.

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water conflicts in transboundary basins. An analysis of the relationship between water scarcity and conflict should be made in consideration of all three sources of conflict and not be limited to any one. Most researches however ignore these inseparable links in producing conflict. Water conflicts are also more likely to occur in regions with fragile institutions that have poor capacity to address water scarcity. Regimes are possible mechanisms that could lessen or avoid the emergence of water scarcity, thus avoiding conflict by addressing water related challenges, setting parameters for water use, management and distribution and fostering cooperation in transboundary basins by creating protocols and agreements. Research on the link between water scarcity and conflict often ignores regimes as key factors in determining the occurrence of conflict.

Just as water scarcity impacts the functionality and effectiveness of regimes, ultimately leading to conflict, similarly, regimes may mitigate the effects of environmental scarcity, thus avoiding conflict. To avoid conflict over resources heavy reliance is placed on the assistance that regimes provide to states/societies in adapting to the effects of water scarcity. More importantly, regimes are crucial tools to manage, sustain and use resources. Two critical questions may be asked in this regard. Firstly, is there a nascent water conflict in a transboundary basin due to water scarcity? Secondly, could regimes establish collective behaviours and outcomes among riparian countries in transboundary basins to address water scarcity and avoid water conflict? Therefore, one theoretical perspective alone would not explain or address related issues and concerns since they require an analysis of water scarcity and its impact on hydropolitics and the emergence of conflict. These issues also require an analysis of the importance of regimes within the framework of hydropolitics.

As such, this article conceptualises both Homer-Dixon's Environmental Scarcity Theory and the Regime Theory. It is only through such approaches and theories that the impact of water scarcity on states, societies and institutions and their vulnerability to water scarcity and its potential for water conflict may be analysed and understood. Such a research strategy has not been done before in water conflict literature. For the first time, hydropolitics is discussed through both theories. Throughout the article, "water scarcity" and "environmental scarcity" are used interchangeably considering that changes in water flow and timing are interlinked to a multitude of environmental factors such as population growth (which ultimately influences urban planning and dam development), climate change and the degradation/depletion of land and water as a result of agricultural,

domestic and industrial use. Since these factors are inextricably linked to the quality, quantity and timing of water flow, to broaden its scope, this article uses "environmental" to include all such factors in its analysis and argument.

WATER SCARCITY: A RISK FACTOR FOR HYDROPOLITICS

Due to numerous factors ranging from environmental to geopolitical issues, it has been argued that transboundary basins could become sources of tension and conflict, with "conflict" being verbal, political or violent. (Idule Amoko, "The Challenges of Climate Change and Transboundary Resources in Eastern Africa" in Debay Tadesse Woldemichael (Ed), *Workshop Report: Climate Change and Transboundary Water Resource Conflict in Africa*, Institute for Security Studies, Mombasa, 2009, p111, online at https://reliefweb.int and Raya Marina Stephan, *Transboundary Aquifers: Managing a Vital Resource – The United Nations International Law Commission Draft Articles on the Law of Transboundary Aquifers*, United Nations Educational, Scientific and Cultural Organisation, Paris, 2009, p3, online at https://unesdoc.unesco.org) The Potential Conflict to Cooperation Potential Project views the term "conflict … as an all-embracing notion covering the entire spectrum of possible situations where the interests of states may collide—from minor differences in opinions to the other extreme of situations of tension and hostility that may threaten international peace and security". (Sergei Vinogradov, Patricia Wouters and Patricia Jones, *Transforming Potential Conflict into Cooperation Potential: The Role of International Water Law*, United Nations Educational, Scientific and Cultural Organisation, International Hydrological Programme, From Potential Conflict to Cooperation Potential Series 2, 2003, p25, online at https://unesdoc.unesco.org) As a result, even the possibility of "water wars" has been mooted, which by definition are "wars caused by the desire for access to water, in which the scarcity of water determines the means to go to war". (Anthony Turton, "Water Wars in Southern Africa: Challenging Conventional Wisdom" in Hussein Solomon and Anthony Turton (Eds), *Water Wars: Enduring Myth or Impending Reality*, Africa Dialogue Monograph Series 2, 2000, p36, online at https://www.africaportal.org) As James Tulloch ("Water

Water conflicts are more likely to occur in regions with fragile institutions that have poor capacity to address water scarcity. Regimes are possible mechanisms that could lessen or avoid the emergence of water scarcity, thus avoiding conflict by addressing water related challenges, setting parameters for water use, management and distribution and fostering cooperation in transboundary basins by creating protocols and agreements.

Conflicts: Fight or Flight", *Allianz*, 26 August 2009, online at http://knowledge.allianz.com) asserts, the term refers to conflict between countries, states or groups over access to water resources as a result of opposing interests of water users, whether public or private. Water in this regard is similar to oil as it may instigate conflict.

The availability of water is crucial for countless human activities but as a resource, it is limited. (Michael T Klare, *Resource Wars: The New Landscape of Global Conflict*, New York: Henry Holt, 2002, p142) There are already indicators of potential water wars at the transboundary river basin level. (Gregory Simpkins, "Africa Faces Water War Threats", *Africa Rising Twenty-First Century*, 26 February 2010, online at http://africarising2010.blogspot.co.za) Water wars may emerge within a broader framework of environmental conflicts, which are defined as "traditional conflicts as a direct result of environmental deterioration and generally become conflicts over resources". (Stephan Libiszewski, "What is an Environmental Conflict", paper presented at the First Coordination Meeting of the Environment and Conflict Project, Centre for Security Studies, Zurich, 30 April–1 May 1992, p14, online at https://css.ethz.ch) Resources including agricultural land and water are part of a continuously growing list with categories that range from oil to minerals. (Helga M Binningsbø, Indra de Soysa and Nils P Gleditsch, "Green Giant or Straw Man: Environmental Pressure and Civil Conflict 1961–99", *Population and Environment*, vol28, no6, July 2007, p338) The causes, implications and results of these conflicts have been the traditional concerns of international relations. (Jon Barnett, "Destabilising the Environment: Conflict Thesis", *Review of International Studies*, vol26, no2, April 2000, p272) Within the broader context of global environmental politics, international relations are experiencing a new landscape of global conflict for resources with water at the centre of the competition because of its scarcity. (Abdalla Bujra, *African Conflicts: Their Causes and their Political and Social Environment*, Development Policy Management Forum, Addis Ababa, Occasional Paper 4, 2002, p11) Historically as well, given either their abundance or scarcity, water resources have been essential sources determining the potential emergence of conflict or cooperation. (Lulsegged Abebe, "Natural Resource Conflicts in West Africa: The Case of the Niger River Basin" in Woldemichael, *ibid*, p125, online at https://reliefweb.int) According to Klare, (*ibid*, p139) changes in the quantity and quality of a shared resource makes disputes increasingly heated. Similarly, Marina Reyskens (*In Hot Pursuit: Resource Wars in Africa*, November 2011, online at http://www.consultancyafrica.com and *defenceWeb* online at https://www.defenceweb.co.za) asserts that countries become susceptible to conflict if the resource they are dependent on is either threatened or removed. However, Anton Earle ("Hydropolitics in Southern Africa: What is the Prognosis for Peaceful Development of Shared Watercourses", *FWU Volume 3: Topics of Integrated Watershed Management–Proceedings*, 2005, p56, online at https://pdfs.semanticscholar.org) has hypothesised that if the capacity to absorb change is sufficient to respond to the occurring change, then the vulnerability to conflict may be minimised.

As the demand for this fundamental and essential natural resource increases, (Peter J Ashton, "Avoiding Conflict over Africa's Resources", Royal Swedish Academy of Sciences, *AMBIO: A Journal of the Human Environment*, vol31, no3, 2002, p1) water has come to be treated like oil and its protection insured through militaristic defence. ("Treat Water like Oil and Sell it for Profit, Says Ex-DwrCymru/Welsh Water Chief", *WalesOnline*, 10 April 2012, online at http://www.walesonline.co.uk) In most continents, disputes over international waters are both common and current. (Vinogradov, Wouters and Jones, *ibid*, p22) Hence, resource based conflicts have become a major concern to international peace and security with the concept of security expanded to include environmental security. (Jessica T Mathews, "Redefining Security", *Foreign Affairs*, vol68, no2, 1989, p162) The new concept of security includes the impact of environmental stress locally, nationally, regionally and globally. (Gro Harlem Brundtland, *Our Common Future*, Oxford: Oxford University Press, 1987, p19 and Binningsbø, de Soysa and Gleditsch, *ibid*) Such concerns that emanate from humanitarian risks affect governments. That is, environmental issues embodying political and security risks impact the stability of governments. (Debay Tadesse, *The Impact of Climate Change in Africa*, Institute for Security Studies Paper 220, November 2010, p8, online at https://www.files.ethz.ch) According to Tuomas Kuokkanen, ("Water Security and International Law", *Potchefstroom Electronic Law Journal*, vol20, 2017, p2) the rapid increase in water related issues in transboundary river basins has prompted attention on water security. Water security as stipulated by the United Nations is "the capacity of a population to safeguard sustainable access to adequate quantities of acceptable quality water for sustaining livelihoods, human well-being and socioeconomic development, for ensuring protection against waterborne pollution and water related disasters and for preserving ecosystems in a climate of peace and political stability". (Kuokkanen, *ibid*, p3) This is indicative of the fact that the scope of national and international security is now not limited to military aspects but also includes various environmental facets such as water related threats. (Kuokkanen, *ibid*, p15)

Within the broader context of global environmental politics, international relations are experiencing a new landscape of global conflict for resources with water at the centre of the competition because of its scarcity. Historically as well, given either their abundance or scarcity, water resources have been essential sources determining the potential emergence of conflict or cooperation.

THE THEORETICAL FRAMEWORK: HOMER-DIXON'S ENVIRONMENTAL SCARCITY THEORY AND THE REGIME THEORY

Homer–Dixon's Environmental Scarcity Theory

The theoretical perspective of Homer-Dixon on environmental scarcity is used to identify a nascent water conflict in transboundary river basins. The assumption behind the approach is that resource scarcity through its three causal forms of demand/supply induced and structural scarcity has the potential to cause conflict. (Thomas F Homer-Dixon, "Environmental Scarcities and Violent Conflict: Evidence from Cases", *International Security*, vol19, no1, 1994, pp8–11 and Charlène Cabot, *Climate Change, Security Risks and Conflict Reduction in Africa: A Case Study of Farmer–Herder Conflicts over Natural Resources in Côte d'Ivoire, Ghana and Burkina Faso 1960–2000*, Berlin: Springer, 2017, p47) The theory denotes that environmental scarcity should be viewed as a process that involves all three causal forms, which often occur simultaneously and influence one another. (Homer-Dixon, 1994, *ibid*, pp8–11 and Earl Conteh-Morgan, *Collective Political Violence: Introduction to the Theories and Cases of Violent Conflict*, New York: Routledge, 2004, p239) Homer-Dixon's theory allows researchers to integrate the three forms of scarcity into one study. It argues for the analysis of shared resource disputes concurrently based on demand/supply induced and structural scarcity. (Homer-Dixon, 1994, *ibid*, pp8–11) It has been proven empirically that the interaction of these forms of scarcity over a shared resource is key to the emergence of tensions and disputes. (Homer-Dixon, 1994, *ibid*, p8 and Henrik Urdal, "Population, Resources and Political Violence: A Subnational Study of India 1956–2002", *Journal of Conflict Resolution*, vol52, no4, 2008, p593)

The three sources of scarcity also have special political significance and interact and reinforce each other in extraordinary ways. If the three sources of scarcity interact, conflict becomes inevitable. The first aspect of interaction "resource capture" is significant in the case of a shared resource. Resource capture occurs when demand and supply pressures outstrip resource availability. The situation forces powerful groups or states to use regimes in their favour to confiscate resources, ultimately causing structural scarcity on weaker states. (Thomas F Homer-Dixon, *Environment, Scarcity and Violence*, Princeton: Princeton University Press, 1999, p15) Another motivation for resource capture is greed. Securing water resources at the expense of other riparian countries opens up opportunities. (Homer-Dixon, 1999, *ibid*, p74) The second aspect of interaction is "ecological marginalisation". (Homer-Dixon, 1999, *ibid*, p15) Environmental scarcity may produce a large number of refugees. (Homer-Dixon, 1999, *ibid*, p93 and Idean Salehyan, "From Climate Change to Conflict: No Consensus Yet", *Journal of Peace Research*, vol45, no3, 2008, p316) Environmental

refugees are defined as people forced to leave their home region due to sudden or long-term changes to their local environment, which compromise their well-being or secure livelihood. Such changes include increased droughts, desertification, sea level rises and disruptions of seasonal weather patterns. (Bogumil Terminski, *Towards Recognition and Protection of Forced Environmental Migrants in Public International Law: Refugees or Internally Displaced Persons Umbrella*, Policy Studies Organisation Summit Proceedings, Washington DC, 2011, p1, online at https://papers.ssrn.com) The combination of demand induced and structural scarcity may produce a large number of migrants, who in turn instigate supply induced scarcity. Migration is fundamental in causing environmental degradation/depletion especially in ecologically fragile regions with poor institutional and financial capacities to preserve resources. The subsequent environmental damage as a result of high population densities may lead to chronic poverty, resource competition and ultimately violent disputes. (Homer-Dixon, 1999, *ibid*, p15) Homer-Dixon's Environmental Scarcity Theory argues that interstate resource wars may ensue where there is a fixed or shrinking pie of natural resources. The growing population demand, climate change, degradation/depletion and the uneven distribution of water resources could act as threat multipliers of instability in some of the most volatile regions of the world that are highly dependent on transboundary river basins.

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Demand Induced Scarcity: is primarily caused by population growth. According to Homer-Dixon, (1999, *ibid*, p51) it is a result of population size multiplied by per capita demand for a given resource and an increase in either factor increases total resource demand. He argues that a growing population and greater per capita resource demand simultaneously boost demand/supply induced scarcity. (*ibid*, p52) Thus, increased population size and per capita demand for a given resource have a dual effect on environmental scarcity. On the one hand, they increase the demand for the resource and on the other decrease supply by contributing

to resource degradation/depletion. (*ibid*) Demand induced scarcity may lay the foundation for conflict in the absence of effective regimes. (Louise van Schaik and Rosa Dinnissen, *Clingendael Report: Terra Incognita: Land Degradation as Underestimated Threat Amplifier*, Netherlands Institute of International Relations, 2014, p33, online at https://www.clingendael.org) Homer-Dixon (1999, *ibid*, p48) adds that resource quantity also declines with an increase in demand. Thus, rivalrous resources like water are subject to demand induced scarcity. A resource is deemed rivalrous when its use by one economic actor diminishes its availability for another. (Homer-Dixon, 1999, *ibid*, p48 and Valerie Percival and Thomas F Homer-Dixon, "Environmental Scarcity and Violent Conflict: The Case of South Africa", *Journal of Peace Research*, vol35, no3, 1998, p280) Therefore, demand induced scarcity results from the water needs of an increasing population, justifying the demand for increased welfare. (Irna van der Molen and Antoinette Hildering, "Water: Cause for Conflict or Cooperation", *ISYP Journal on Science and World Affairs*, vol1, no2, 2005, pp134–5)

Supply Induced Scarcity: Central to the analysis of the linkage of the environment and conflict (Thomas F Homer-Dixon and Jessica Blitt, *Ecoviolence: Links among Environment, Population and Security*, New York: Rowman and Littlefield, 1998, p6) is the idea that environmental change is only one of three primary sources of renewable resource scarcity. When an environmental conflict breaks out, it is usually against the background of a number of different factors interacting with one another. Scholars have asserted that large-scale human induced environmental pressures affect national and international security. (Thomas F Homer-Dixon, "On the Threshold: Environmental Changes as Causes of Acute Conflict", *International Security*, vol16, no2, 1991, p76) The decline in resources due to unsustainable usage is fundamental in causing supply induced scarcity. (Urdal, *ibid*, p593) A decline or fall of a resource means a decrease in its quality and quantity. (Homer-Dixon, 1999, *ibid*, p48) The decline, which ultimately leads to scarcity, is referred to as environmental degradation. That is, environmental degradation reduces the quality and quantity of a limited resource, thereby decreasing the available supply to meet the growing demand. (Bingham Kennedy, *Environmental Scarcity and the Outbreak of Conflict*, Population Reference Bureau, January 2001, online at https://www.prb.org) Environmental security literature stipulates that the degradation of the environment caused by supply induced scarcity is seen globally as a source of conflict. (Homer-Dixon, 1999, *ibid*, pp63–77) The main idea proposed by Homer-Dixon is that environmental degradation causes resource scarcity, which eventually generates competition and conflict. Unlike other analyses, the Environmental Scarcity Theory interprets all types of environmental depletion or damage as forms of the scarcity of renewable resources. It views climate change, land degradation and migration

as fundamental causes of the increase in the scarcity of land and water resources and as sources that increase the scarcity of the regular patterns of rainfall and temperature on which communities and states rely. (Homer-Dixon, 1999, *ibid*, p9)

Structural Scarcity: In resource capture, demand/supply induced scarcity interact to produce structural scarcity. (Homer-Dixon, 1999, *ibid*, p52 and Patricia Kameri-Mbote, *Environment and Conflict Linkages in the Great Lakes Region*, International Environmental Law Research Centre Working Paper, 2005–6, p2, online at http://www.ielrc.org) This scarcity is caused by unequal or uneven resource distribution that concentrates a resource in the hands of some groups and subjects the rest to greater than average scarcity. (Homer-Dixon, 1999, *ibid*, p52 and Bingham, *ibid*) That is, one group is structurally denied equal access through regimes or institutions to a shared key resource by another. (*Toolkit and Guidance for Preventing and Managing Land and Natural Resources Conflict: Renewable Resources and Conflict*, United Nations Interagency Framework Team for Preventive Action, United Nations Environmental Programme, 2012, p9 and p31, online at https://www.un.org) This means that scarcity of a resource would not occur if that resource were distributed equally. (Urdal, *ibid*, p593) Thus, the unequal distribution of water instigates clashes. (David K Kreamer, "The Past, Present and Future of Water Conflict and International Security", *Journal of Contemporary Water Research and Education*, vol149, no1, 2012, p90) Homer-Dixon (1999, *ibid*, p48 and Homer-Dixon and Blitt, *ibid*, p6) adds that resources must be "excludable" to be subject to structural scarcity. An excludable resource is one that is structurally denied access to through the use of regimes, property rights or institutions. For instance, water resources such as transboundary basins may be subject to the assignment of property rights that structurally prevent other actors from accessing the water. Disagreements over access to and distribution of resources often lead to conflict. (Homer-Dixon, 1999, *ibid*, p48) The Environmental Scarcity Theory acknowledges that such disagreements over the allocation and use of resources

An important method of addressing and enhancing both the management and distribution of transboundary river basins is the implementation of institutional support structures. Basin states only gain through the creation of a comprehensive commission serving as an institutional vehicle for cooperation. The equitable development of transboundary river basins requires either an international institutional structure or a negotiated multilateral treaty regime as a bargaining tool between water users.

combined with existing stress factors increase the likelihood of conflict. (*Toolkit and Guidance for Preventing and Managing Land and Natural Resources Conflict: Renewable Resources and Conflict*, *ibid*, p14) The uneven distribution of a resource, which leads to structural scarcity, is a key factor in most scarcity related issues that eventually cause conflict. Often, the imbalance is deeply rooted in institutions. (Homer-Dixon, 1999, *ibid*, p15 and Helen E Purkitt, *African Environmental and Human Security in the Twenty-First Century*, Amherst: Cambria Press, 2009, p62) This warrants stronger regional cooperation and effective water governance around the world. (*National Security and the Threat of Climate Change: Military Advisory Board Findings*, Centre for Climate and Energy Solutions, Arlington, Virginia, 2007, online at www.c2es.org) "The need for integrated, cooperative solutions is particularly urgent" especially in transboundary basins on which two or more riparian states are dependent. (Stephan, *ibid*, p2)

The Regime Theory

An important method of addressing and enhancing both the management and distribution of transboundary river basins is the implementation of institutional support structures. Bonaya Adhi Godana (*Africa's Shared Water Resources: Legal and Institutional Aspects of the Nile, Niger and Senegal River Systems*, Boulder: Lynne Rienner, 1985, p264) posits that basin states only gain through the creation of a comprehensive commission serving as an institutional vehicle for cooperation. The equitable development of transboundary river basins requires either an international institutional structure or a negotiated multilateral treaty regime as a bargaining tool between water users. (Arthur Okoth-Owiro, *The Nile Treaty: State Succession and International Treaty Commitments – A Case Study of the Nile Water Treaties*, Konrad Adenauer Stiftung and the Law and Policy Research Foundation, East Africa Occasional Paper 9, 2004, p24, online at https://www.kas.de) Without a full understanding of regimes and institutions, analysts cannot grasp the nature of the relationship in a given region between human activity and the scarcity of renewable resources or why regions respond well or badly to scarcity. (Homer-Dixon, 1999, *ibid*, pp49–51)

The concepts of regimes and institutions are comparable, as both refer to established rules that govern behaviour. (G Tom Raadgever and Erik Mostert, *Transboundary River Basin Management: State-of-the-Art Review on Transboundary Regimes and Information Management in the Context of Adaptive Management*, NeWater Report Series 10, 2005, p3, online at http://www.newater.info) Robert O Keohane and Joseph S Nye (*Power and Interdependence: World Politics in Transition*, Boston: Little, Brown, 1977, p19) define regimes as sets of governing arrangements that include networks of rules, norms and procedures, which regularise behaviour and control its effects. According

to Andreas Hasenclever, Peter Mayer and Volker Rittberger, ("Integrating Theories of International Regimes", *Review of International Studies*, vol26, no1, 2000, p8) regimes are mechanisms that help self-interested states coordinate behaviour. Another widely accepted definition of an international regime is a set of implicit or explicit principles, norms, rules and decision-making procedures around which the expectations of actors converge in a given area of international relations. (Stephen D Krasner, *International Regimes*, Ithaca: Cornell University Press, 1983, p2 and Robert O Keohane, *International Institutions and State Power: Essays in International Relations Theory*, Boulder: Westview Press, 1989, p3) Thus, water regimes are treaties on international rivers defined as norm and rule based cooperation for the political resolution of problems and conflicts in the field of international river basin management. (Stefan Lindemann "Success and Failure of International River Basin Management: The Case of Southern Africa" in Hans G Brauch, Ursula O Spring, John Grin, Czeslaw Mesjasz, Patricia Kameri-Mbote, Navnita C Behera, Bechir Chourou and Heinz Krummenacher (Eds), *Facing Global Environmental Change: Environmental, Human, Energy, Food, Health and Water Security Concepts*, Hexagon Series on Human and Environmental Security and Peace Volume Four, Berlin: Springer-Verlag, 2009, pp:700–1)

Increased environmental scarcity could cause severe environmental damage, chronic poverty and violent disputes. Subsequently, it could give rise to resource capture (significant in the case of a shared resource) and ecological marginalisation, both caused by the desire to access water resources.

According to Eric Neumayer, ("How Regime Theory and Economic Theory of International Environmental Cooperation can Learn from Each Other", *Global Environmental Politics*, vol1, no1, 2001, p122) the Regime Theory addresses the question of how cooperation may be achieved and sustained in a world divided into sovereign nation-states. In this regard, while the theory is crucial to explaining how regimes create bargaining fora, it does presuppose that states are governed by rules and norms. (Neumayer, *ibid*, pp130–6) The Regime Theory assumes that when regimes or institutions are in place, they are able to mediate between a variety of power and interest variables in a region to produce related behaviours and outcomes in an attempt to foster cooperation in collective security, among other things. (Stephen D Krasner, "Structural Causes and Regime Consequences: Regimes as Intervening Variables", *International Organisation*, vol36, no2, Spring 1982, pp189–90) According to most liberal scholars, (Keohane and Nye, *ibid*; Robert O Keohane, *After Hegemony: Cooperation and Discord in the World Political Economy*, Princeton: Princeton University Press, 1984; Keohane, 1989, *ibid*; Robert Axelrod and Robert O Keohane, "Achieving Cooperation under Anarchy: Strategies and Institutions", *World Politics*, vol38, no1, October 1985; Peter M Haas, Robert O Keohane and Marc A Levy (Eds), *Institutions for the Earth: Sources of Effective International Environmental Protection*, Cambridge: Massachusetts Institute of Technology Press, 1993; Charles Lipson, "International Cooperation in Economic and Security Affairs", *World Politics*, vol37, no1, 1984 and Helen Milner, "International Theories of Cooperation among Nations: Strengths and Weaknesses", *World Politics*, vol44,

no3, 1992) the main role of institutions is to mediate conflicting interests between states over shared resources to achieve cooperation and thus avert tensions and disputes. Only when states realise that institutions and their respective sets of rules are beneficial, as they provide a win-win situation, do they cooperate. These theorists believe that institutions influence state behaviour.

Regimes also have a responsibility to ensure the overall well-being of the environment. Given that many clashes have the environment as a source of conflict, regimes must take an active role where environmental resources are related to conflict. Some regimes are successful in addressing environmental conflicts by intervening directly at the threat level. In other words, if water scarcity is identified as the key conflict driver, regimes may employ a number of strategies to address the threat, for instance, by developing an agreement solely based on addressing water scarcity in a given region—cooperation over shared water resources focussed on river basins. On an international level, many multilateral international efforts by environmental regimes and international organisations (the United Nations, the United Nations Development Programme, the United Nations Environmental Programme, etc) as well as international financial organisations and funds (the Global Environmental Facility, the World Bank, etc) have been established that may have a "general effect of civilising and stabilising cooperation" and prevent environmentally induced conflicts. (Dennis Tanzler, Alexander Carius and Sebastian Oberthur, *Climate Change and Conflict Prevention: Can Climate Change Impacts increase Conflict Potentials – Relevance of this Issue for the International Process on Climate Change*, Federal Ministry for the Environment, Nature Conservation and Nuclear Safety, Berlin, 2002, p63, online at http://www.afes-press.de)

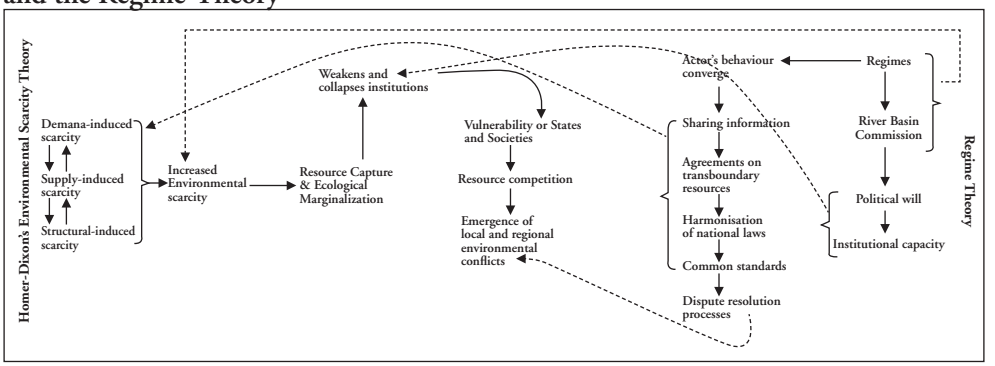
There are common reasons why actors in the international community are drawn into regimes or social institutions. (Oran R Young, "International Regimes: Toward a New Theory of Institutions", *World Politics*, vol39, no1, 1986, p109) Local/regional tensions and violence occur over water issues and are likely to rise as competition for water exists at all levels and is forecast to increase with the growing demand in all countries. (Renée Gendron and Evan Hoffman, "Resource Scarcity and the Prevention of Violent Conflicts", *Peace and Conflict Review*, vol4, no1, 2009, p1) As a result, the formation of governing water regimes is imperative. On a transboundary level, where water supply is shared between two or more states, water regimes have become an effective tool to promote cooperation over water resources. Such regimes shift the debate away from pure water sharing (natural versus historic rights) to a benefit sharing approach. (Earle, *ibid*, p64) According to Salah Al-Din Amer, ("The Law of Water: Historical Record" in B Dupuy (Ed), *Options Méditerranéennes: Aspects Économiques de la Gestion de L'Eau dans le Bassin Méditerranéen/Economic Aspects of Water Management in the Mediterranean Basin*, Centre International de Hautes Etudes Agronomiques Méditerranéennes, Bari,

Séminaires Méditerranéens, Série A, no31, 1997, p381, online at http://om.ciheam.org) "absolute territorial integrity (historical rights) protect(s) the rights of use for the country that puts the water into use first", thereby giving downstream countries the power to accuse upstream countries of illegally taking measures disadvantageous to their interests. However, absolute territorial sovereignty (natural rights) regards water bodies as an integral part of a state's national territory. This principle protects the sovereignty of countries within which watersheds, lakes and rivers originate.

THE RELATIONSHIP BETWEEN HOMER-DIXON'S ENVIRONMENTAL SCARCITY THEORY AND THE REGIME THEORY

There is a unique relationship between Homer-Dixon's Environmental Scarcity Theory and the Regime Theory (Figure 1).

Figure 1: The Relationship between Homer–Dixon's Environmental Scarcity Theory and the Regime Theory



The two theories respectively explain the impact of environmental scarcity on states and institutions and the role of institutions in countering environmental pressures on states. The dotted lines on the figure below symbolise an action in opposition, which reduces or neutralises a previous action. The figure is divided into two with Homer-Dixon's Environmental Scarcity Theory on the left illustrating the environmental processes within which localised and regional inter-riparian conflicts over transboundary river basins may emerge. The Regime Theory on the right is counteractive to the left and illustrates how the emergence of such conflicts may be avoided, reduced or neutralised by forming and using

regimes. If regimes are established and backed by political will, then the threat and impact of environmental scarcity may be avoided. However, having regimes, institutions and treaties is not the same as having them resolve specific problems. Regimes are of little value without the political will to pursue certain strategies aimed at specific problems.

An analysis of the left side of the figure shows that transboundary basin cooperation relies heavily on narrowly defined agreements between states, focusing on specific water resource management projects. It also depends on an intense political process of implementing rules and principles of water usage and river basin development by states. In deciphering and understanding environmental scarcity, one must understand and note that environmental scarcity encompasses or is the result of demand/supply induced and structural scarcity, also known as the sources of scarcity. (Homer-Dixon, 1999, *ibid*, p8 and p177 and 1994, *ibid*, pp8–11) Unregulated population growth, degradation/depletion of resources and unequal distribution of shared resources lead to increased environmental scarcity that could cause severe environmental damage, chronic poverty and violent disputes. Subsequently, the increase in environmental scarcity could give rise to resource capture (significant in the case of a shared resource) and ecological marginalisation, both caused by the desire to access water resources. (Homer-Dixon, 1999, *ibid*, p15) As stated above, both resource capture and ecological marginalisation symbolise the interaction and effect of demand/supply induced and structural scarcity. Resource capture and ecological marginalisation expose regimes to issues ranging from the unequal access of shared resources to an influx of environmental refugees and migrants on a large-scale. Many regimes lack the political will to carry out strategies aimed at addressing shared problems effectively and efficiently; have poor technological expertise and innovation to address climatic issues; lack knowledge for adapting to an ever-changing landscape and lack the capital necessary to protect resources. With all these challenges, the effects of environmental scarcity may weaken and lead to the collapse of institutions. (Daniel Deudney, "The Case against Linking Environmental Degradation and National Security", *Millennium: Journal of International Studies*, vol19, no3, 1990, pp462–3) Eventually, this will leave societies/states vulnerable to the impact and pressures of environmental scarcity. As a result, they would compete fiercely for available, yet limited, resources, culminating in localised or regional environmental conflicts (as seen in Figure 1). A number of regions in the world have rivers that

flow through several adjacent nations and the strength, weakness or absence of existing regimes between political entities creates tensions. (Homer-Dixon, 1999, *ibid*, pp17–8)

On the other hand, from an analysis of the right side of Figure 1, it is evident that there is a reverse or counteractive side. In the face of regional tensions and disputes over shared transboundary resources, states establish regimes in the form of international river basin commissions, in which transboundary cooperation may be institutionalised. (Carel Dieperink, "From Open Sewer to Salmon Run: Lessons from the Rhine Water Quality Regime", *Water Policy*, vol1, no5, 1998, p472) One of the most important aspects of regimes is norm convergence, which makes states behave in a common manner, thus making cooperation possible. The general expectation is that cooperation between riparian states bolsters adaptive capacity by allowing them to recognise (through the collection, exchange and use of data) and respond to (through joint planning and policy implementation) changing circumstances in the basin. (Elizabeth J Kistin Keller, "Critiquing Cooperation: Transboundary Water Governance and Adaptive Capacity in the Orange-Senqu Basin", *Journal of Contemporary Water Research and Education*, vol149, no1, 2012, p41) Regimes serve as rules (formal or informal) that constrain and regulate state behaviour. Norm convergence therefore discourages member states from calculating gains based on self-interest. (Andrew Jones, *Comparatively Assess Neorealism and Neoliberalism: Whose Argument do you find the More Convincing and Why*, 21 December 2007, online at https://www.e-ir.info)

One of the most important aspects of regimes is norm convergence, which makes states behave in a common manner, thus making cooperation possible. The general expectation is that cooperation between riparian states bolsters adaptive capacity by allowing them to recognise (through the collection, exchange and use of data) and respond to (through joint planning and policy implementation) changing circumstances in the basin.

The likelihood and intensity of disputes decrease as regimes gain the capacity to absorb environmental and institutional change. States also develop a sense of political will to pursue and implement the aims and objective of regimes out of fear of a possible inter-riparian conflict that may compromise win-win gains. The political will of regime member countries is imperative to enhancing regime or institutional capacity, thus countering the threat of a regime weakening or collapsing. Political will also includes and relies heavily on member states financing

the regime. (G Tom Raadgever, Erik Mostert, Nicole Kranz, Eduard Interwies and Jos G Timmerman, "Assessing Management Regimes in Transboundary River Basins: Do they support Adaptive Management", *Ecology and Society*, vol13, no1, 2008, p5) According to Aaron T Wolf, ("Conflict and Cooperation along International Waterways", *Water Policy*, vol1, no2, 1998, p261) without a good financing system, transboundary river basin management is not viable in the long run. Over dependence on donors and banks makes management vulnerable. The political will of regime member states may be measured by their effectiveness to implement policy. To promote effective implementation, policy should be tailored towards the specific interests and resources of the involved parties. Moreover, these policies should be updated periodically to provide an opportunity to adapt objectives and measures to changing conditions. (Raadgever, Mostert, Kranz, Interwies and Timmerman, *ibid*, p3)

An essential aspect given the presence of regime member countries' political will is the development of strategies that focus directly at the threat level. For instance, disputes over transboundary river basins require the formation of water regimes whose sole responsibility is to address the management and use of shared water resources. Also evident from the right side of Figure 1 is that as soon as regimes are in place, actors' behaviour and expectations should converge. When this happens, numerous levels of cooperation, confidence building and joint management would take place, which would also address environmental scarcity. This is due to a number of reasons. First, states would be motivated to share information and expertise. As Raadgever, Mostert, Kranz, Interwies and Timmerman (*ibid*, p5) argue, the most important requirement for successful international cooperation is mutual trust, which is achieved and strengthened through information sharing among basin states. Mutual trust among regime member states also enhances informed decision-making and proper transboundary resource management. (Pieter van der Zaag and Hubert HG Savenije, "Towards Improved Management of Shared River Basins: Lessons from the Maseru Conference", *Water Policy*, vol2, no1, 2000, p50) Sharing information is essential in identifying common opportunities and risks to transboundary management and structure equitable benefit sharing arrangements. Sustaining the collection and sharing of information is critical to enabling productive negotiations, reducing uncertainty and identifying priorities. Information sharing may increase the likelihood that, rather than diverging perceptions or emotions, agreed facts might guide decision-making and form the basis of future relationships. It may also help depoliticise problems further by focusing on technical issues.

Second, regime member countries establish agreements on how the

transboundary resources are to be shared, managed or protected. Such agreements provide an imperative legal framework to regimes. Agreements may be formal such as treaties or informal such as non-binding joint declarations. (Thomas Bernauer, "Explaining Success and Failure in International River Management", *Aquatic Sciences*, vol64, no1, 2002, p3) Transboundary river basin management may be analysed in terms of the development and implementation of international agreements, such as treaties and protocols. (Raadgever, Mostert, Kranz, Interwies and Timmerman, *ibid*, p3) A diverse range of issues is covered by transboundary agreements including the specific rights of each party, responsible institutions, enforcement and compliance mechanisms, procedures for monitoring and validating agreed quantities or qualities and mechanisms for resolving disputes. (Raadgever, Mostert, Kranz, Interwies and Timmerman, *ibid*, p7) According to Earle, (*ibid*, p56) the existence of legal agreements, as well as the legal and institutional capacity to implement cooperation effectively at political levels and enhance political will, have a direct bearing on the ability of a region to adapt to changing climatic, demographic, economic and social conditions. Measures for natural variations in the supply of a specific resource, as well as potential risks from climate change and natural hazards, should be considered as well. Equitable and adequate resource allocation and management of a shared resource is possible through better cooperation. (United Nations Department of Economic and Social Affairs, *International Decade for Action: Water for Life 2005–2015*, online at http://www.un.org) While parties may wish to negotiate their own agreements, they could also join multilateral or regional environmental conventions that provide a common framework for all signatory states. (Tanzler, Carius and Oberthur, *ibid*, p63)

Third, to counter effectively and cooperatively the threat posed by environmental issues in transboundary river basins, regime member countries establish institutions and harmonise national laws to implement transboundary agreements. Institutions may range from independent national bodies that coordinate policies to joint institutions that formally receive decision-making powers from their respective national governments. In many cases, both national and local institutions are required with strong connections between them as well as sufficient financing. Countries that are part of a transboundary resource agreement may have to adjust national policy and legislation and make them compatible with international policy. (Sabine Brels, David Coates and Flavia Loures, *Transboundary Water Resources Management: The Role of International Watercourse Agreements in Implementation of the CBD*, Convention on Biological Diversity Technical Series, no40, 2008, p13, online at https://www.cbd.int) Even in cases where a transboundary resource agreement already considers existing national structures,

some level of harmonisation is normally necessary. Earle (*ibid*, p56) argues that a basin runs the risk of water scarcity leading to some type of dispute if joint institutional capacity and legal frameworks are not in place.

Fourth, regimes enable member countries to establish common standards for monitoring and verifying agreed quantities or qualities of shared natural resources. Common standards coupled with compatible national laws of all regime member states help address environmental scarcity. Finally, regimes enable members to establish collective dispute resolution processes. Even within agreements, disputes arise, whether based on fact, uncertainty, negative environmental impact or inequitable use. A structured dispute resolution mechanism should be developed and tailored to a specific resource. Dispute resolution processes may be effective if they consist of joint technical bodies/experts and high-level political processes involving national leaders, diplomats and concerned stakeholders. As such, inviting an international tribunal to settle disputes may not be necessary. Watercourse agreements need to be concrete, problem specific and accountable. They must include and incorporate detailed resolution mechanisms for disputes. (United Nations Department of Economic and Social Affairs, *ibid*)

CONCLUSION

All aspects of state and society are dependent on water security. However, the poor governance of water resources has exacerbated its scarcity and distribution and could produce instability over shared water resources especially in countries with fragile institutions. Access to water could become a thorny issue between relevant users if access by one user affects access or use by another. (Abebe, *ibid*, p121) Theoretically, this study proposes that research into environment conflict studies, particularly hydropolitics, should be analysed and explained by both Homer-Dixon's Environmental Scarcity Theory and the Regime Theory. The security implications of environmental scarcity are grave. Understanding the relationship between environmental degradation (caused by rapid population growth, land degradation, climate change, migration and the unequal distribution of resources) and conflict has become a significant challenge. (Idule Amoko, *ibid*, p110) Environment–conflict linkages require careful scrutiny. (Marisa Goulden and Roger Few, *Climate Change, Water and Conflict in the Niger River Basin*, International Alert, December 2011, p6, online at https://www.international-alert.org) Environmental scarcity, if not managed, will increasingly

threaten humanity's shared interests and collective security in many parts of the world. It will also pose a variety of political, social and strategic challenges to regional organisations.

A growing population and other factors, such as decreasing rainfall and the increased use of water for agricultural and industrial production are likely to contribute to an unequal relationship between water supply, demand and distribution. (David Pimentel, Xuewen Huang, Ana Cordova and Marcia Pimentel, "Impact of Population Growth on Food Supplies and Environment", paper presented at the AAAS Annual Meeting, 9 February 1996, online at http://www.dieoff.com) Dissociating elements of environmental scarcity causing changes in economic, environmental, political and social realities from other multiple elements that shape and influence regional transboundary basins remains a challenge. This reflects the underlying analysis that one environmental feature has an impact in combination with other features of the economic, environmental, political and social landscape. The increasingly negative consequences of the degradation/depletion of land and water resources have influenced academics and governments worldwide to acknowledge the need to minimise the phenomena and restore degraded lands and watersheds. (van Schaik and Dinnissen, *ibid*, p11) With or without these challenges, it is important that the utilisation, management and sustainability of transboundary water resources be done collectively and equitably. Only through cooperative efforts will harmony be achieved while avoiding interstate tensions and conflicts.

An important factor for ensuring the long-term sustainable development of water resources remains in the realm of economic, institutional and social development. The focus of cooperation should be on sharing the benefits of the water resource, rather than a strict adherence to sharing the water itself. A move from the top-down management approach towards a participatory system, which links communities that share a resource, is needed.

An evident issue regarding the effectiveness and formation of regimes is that problem and process factors clearly determine the prospects of regime formation. Institutional factors, country specific factors and factors in the international context determine the effectiveness of regimes. An important negative social effect of environmental scarcity that regimes must address is the constraints that environmental scarcity imposes on regional economic development such

as domestic agricultural and industrial production. (Homer-Dixon, 1999, *ibid*, p88) Institutions, regimes, agreements, laws and regulations for distributing efficiently and effectively environmental goods and services among states are imperative. The analysis of resources and conflicts requires a thorough understanding of institutions that shape the rules and rights of resource use. Different layers of environmental governance at local, national and international levels must be incorporated into the analysis of resource use conflicts. As such, when determining whether regimes or institutions matter, researchers need to analyse their significance as determinants of collective behaviour at the international level. (Young, *ibid*, p115)

An important factor for ensuring the long-term sustainable development of water resources remains in the realm of economic, institutional and social development. The focus of cooperation should be on sharing the benefits of the water resource, rather than a strict adherence to sharing the water itself. A move from the top-down management approach towards a participatory system, which links communities that share a resource, is needed. These communities need to be resilient to the drivers of change, such as those brought about through changes in climate and population, by developing networks with other communities. The focus should be on trying to up-scale local cooperation over shared water resources to national and regional levels.

Whether scarcity problems are resolved peacefully or not depends largely on the effectiveness of governing institutions. Environmental stresses are particularly aggravated when combined with rapid population growth. As the regime weakens, its ability to manage emerging conflicts becomes limited. Effective climate and environmental policies hold the promise of reducing such potential and serve as tools for conflict prevention and avoidance. (Tanzler, Carius and Oberthur, p4) Haas, Keohane and Levy (*ibid*, p53) also assert that avoiding conflict depends greatly on institutionalised cooperation. So far, many conflicts on competing claims for transboundary water resources (both rivers and aquifers) have been solved by negotiations (hydro-diplomacy) and international cooperation through both bilateral and multilateral agreements. (Tanzler, Carius and Oberthur, *ibid*, p63)

Good governance is likely to benefit land management practices, food and water policies and economic growth, as well as prevent tensions and conflicts. Governance is important, as it defines who has the power to make decisions about the ownership, consumption and distribution of resources. Equally, dysfunctional institutions or bad governance practices are strong indicators

that conflict may emerge and environmental stresses worsen. A majority of existing institutions governing international rivers are turning volatile due to the increased demand and decreased supply of fresh water. Adding to the problem is the threat of climate change, which has started to undermine current regimes and institutions relating to water sharing and the management of international rivers. (Ashok Swain and Florian Krampe, "Transboundary Rivers and Climate Change: African and Asian Rivers", *Conflict Trends*, vol 2, 2011, p17)

Authors Ashok Swain and Florian Krampe (*ibid*, p21) argue that to address the imminent problems of existing water crises and changes in run-off structures due to climate change, the ownership and more importantly the accountability of transboundary water management must be restored to the countries in the regions. The role of the international community should be limited as far as regional water sharing politics is concerned. This will enable and encourage riparian countries to find distinct emancipatory approaches to basin based river management. The approaches should address a region's unique culture and history, as well as its economic disparity and ecological sensitivity. (Swain and Krampe, *ibid*, p21) Regimes that focus on addressing vulnerabilities and threats caused by the environment may prevent or mitigate conflicts. Given the complexity of conflicts, regimes should avoid focusing on just one element of environmental insecurity. An aspect that features in the arguments of both Homer-Dixon's Environmental Scarcity Theory and the Regime Theory is that the environmental scarcity of renewable resources could indirectly help generate instability, while institutions due to their capacity often determine cooperation or conflict. (Homer-Dixon and Blitt, *ibid*, p223) It is thus evident that a large number of factors (human, natural and institutional) influence the emergence and continuation of conflicts and these are usually interrelated. In conclusion, the environmental quantity and quality of a country or region may be causally linked to the presence or absence of conflict. It is in this manner that Homer-Dixon's Environmental Scarcity Theory and the Regime Theory may be merged within the context of transboundary river basins.

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