

POTENTIAL FOR COOPERATION RATHER THAN CONFLICT IN THE FACE OF WATER DEGRADATION: THE CASES OF THE NILE RIVER AND OKAVANGO RIVER BASINS

Hussein Solomon¹

Abstract

Although the notion of environmental security is a relatively new dimension of international relations, and of politics in general, it would be inane to assume that problems of environmental change are in any way novel. Environmental security is a phenomenon that is distinctively associated with the end of the Cold War. Much attention has been paid in both the scholarly literature and the policy community to the potential for conflict to arise as a result of environmental degradation. The aim of this article is to examine the nexus between environmental degradation and the potential for violent conflict by specifically referring to the potential for conflict to arise out of fresh water disputes by utilising the Nile River and Okavango River Basins as case studies.

Keywords: Environmental security; resource scarcity; violent conflict; Egypt; Nile River; SADC; Botswana; Okavango River.

Slutelwoorde: Omgewingsekeriteit; skaarste aan hulpbronne; gewelddadige konflik; Egipte; Nylrivier; SAOG; Botswana; Okavangorivier.

1. INTRODUCTION

Although the notion of environmental security is a relatively new dimension of international relations, and of politics in general, it would be inane to assume that problems of environmental change are in any way novel (Hough 2004:134-135). The 1960s saw a significant rise in the prominence of environmental issues in North America and Western Europe and the emergence of environmental politics, beyond purely economic concerns, on the international political agenda (Hough 2004:135). The gradual appreciation of a number of challenges posed by environmental change to conventional interstate relations since the 1980s has elevated this realm of international politics to a higher diplomatic level and securitised some of the issues.

1 Senior Professor, Department of Political Studies and Governance at the University of the Free State. E-mail: solomonh@ufs.ac.za

Environmental security is a phenomenon that is distinctively associated with the end of the Cold War. The idea of linking the environment with insecurity was one of the first major attempts at the securitisation of a non-military security issue by promoting a security agenda which moved away from the Cold War's fixation on military state-centred security (Dannreuther 2007:59). A range of potential problems, allied with the complex and often confusing processes and consequences of globalisation and fragmentation, are now considered as possible sources of violence and instability, intra- and interstate conflict, transgressions of state borders and threats to international peace and security.

Much attention has been paid in both the scholarly literature and the policy community to the potential for conflict to arise as a result of environmental degradation (Dannreuther 2007:59). In this view, the major concern is the relationship between environmental degradation and the traditional indicators of insecurity: violent conflict and the possibility of war. The argument of the environmental degradation/violent conflict relationship is that the security of a diverse range of referent objects (states, populations, citizens) is constantly under threat from environmental issues (such as climate change) with the developing world being particularly vulnerable.

The aim of this article is to examine the nexus between environmental degradation and the potential for violent conflict. In doing so, the author will explore the debates surrounding the nexus between environmental degradation and the potential for violent conflict by specifically referring to the potential for conflict to arise out of fresh water disputes. The article culminates in case studies of the Nile River and the Okavango River Basins and shows that water disputes could lead to cooperation rather than conflict.

2. THE SCOPE AND NATURE OF THE PROBLEM

One of the most powerful environmental images is that of humankind being on the threshold of an environmental crisis, where continued unrestrained human exploitation of earth's resources will inevitably lead to a severe deterioration of the environment with disastrous implications for human welfare (Hardin 1968). Resources have specific historic, geographic and social qualities participating in shaping the patterns of conflicts and violence (Le Billon 2005:2). Contributions within the resource conflict debate can be divided into two opposing camps.

The first camp provides us with a rather pessimistic argument concerning the relationship between resource scarcity and violent conflict, and can be referred to as neo-Malthusians, in reverence to Thomas Malthus, the economist and demographer of the late eighteenth century, who was one of the first to highlight the dangers of population growth outstripping food production (Urdal 2005:418).

His argument was that human misery and hardship were unavoidable as the human population cannot continue to grow indefinitely and exponentially without at some point exceeding the linearly growing carrying capacity of the earth. This notion of exponential growth was popularised in the Club of Rome's classic *Limits of growth* (1972), which argued that in five key areas – population, food production, industrialisation, pollution and consumption of non-renewable resources – there was indeed clear evidence of exponential growth from one year to the next (Dannreuther 2007:62). This fear gained prominence in the twentieth century as a dramatic fall in death rates in combination with high birth rates resulted in a huge jump in the world's population from 2 billion in 1950 to 6 billion in 2000, expected to rise to just under 9 billion by 2050 (Dannreuther 2007:62).

The second and opposing camp, however, argues that most of the alarming predictions and projections for future scarcities and other feared developments propagated by the neo-Malthusians have failed to realise (Dannreuther 2007:63). This camp has been labelled Cornucopian, characterised by its faith in the capacity of human beings to devise solutions to overcome environmental constraints. Proponents argue that the first approach tends to underestimate the capacity of human beings to overcome the constraints of the physical environment, and propose that instead, based on the ultimate unsustainability of the global economic inequalities between developed and developing states as a result of the processes of development and the subsequent environmental degradation linked with it, a longer-term solution could be the promotion of liberal market-based practices and institutions that can generate the necessary economic incentive to promote technological ingenuity to resolve the environmental consequences of increased prosperity (Dannreuther 2007:65). Their argument is threefold (Urdal 2005:419). First, they argue that most debated natural resources are not really scarce, at least not in the global context, and that we are not going to experience a major resource crisis even in the face of continued population growth. Second, if some resources are getting scarcer, humankind is able to adapt to these challenges and it is argued that natural resource scarcity may even work as a catalyst to trigger technological innovation. The last point made by Cornucopians is that it is the abundance of valuable natural resources, rather than scarcity, that leads to violent conflict. Income from rich natural resources such as gems and tropical timber may be regarded as an incentive for armed conflict (greed) or as a means to finance warfare (opportunity) (Collier and Hoeffler 1998; Le Billon 2005).

2.1 Environmental degradation and violent conflict

A common assumption amongst neo-Malthusian security scholars, and even more so amongst policymakers and the media, is that environmental degradation (either in the form of resource scarcity or environmental damage) is a persistent, and

growing, cause of violent conflict within and between states (Page 2010:13). In fact, Robert Kaplan (1994:58) was so convinced that future conflicts are expected to take on one of two forms – conflict over already scarce resources or military intervention to secure access to resources which might become scarce at some point in the near future – that he argued that the environment was:

“the national security issue of the early twenty-first century. The political and strategic impact of surging populations, spreading disease, deforestation and soil erosion, water depletion, air pollution, and, possibly, rising sea levels in critical, overcrowded regions like the Nile Delta and Bangladesh – developments that will prompt mass migrations and, in turn, incite group conflicts – will be the core foreign policy challenge from which most others will ultimately emanate.”

Natural resources that are essential to human life and welfare are unevenly distributed between and within states, and scarcities of certain natural resources may give rise to environmental insecurities leading to violent conflict (Urdal 2005:419). Thomas Homer-Dixon is arguably the most influential scholar moderating the neo-Malthusian view of environmental security, and along with his associates at the University of Toronto distinguished between different sources of resource scarcity in their “Project on environment, population and security”.

This research project was largely motivated by the participants’ dissatisfaction with the existing level of abstraction associated with the initial wave of research on environmental security (Homer-Dixon 1999:83). Homer-Dixon’s aim was to supervise a targeted set of empirically-focussed case studies of the way in which environmental stress gives rise, either directly or indirectly, to violent conflict in various parts of the world. The argument of the environment/violence relationship is that the security of a diverse range of referent objects (states, populations, citizens) is constantly under threat from environmental issues (such as climate change) with the developing world being particularly vulnerable. The core of this violent conflict explanation is a simple causal mechanism to explain how environmental scarcity has a significant bearing on the incidence and intensity of violent conflict within and between states: changes in environmental variables (such as those affecting access to food and fresh water) trigger socio-political effects (such as increasing competition for scarce resources) which in turn trigger insecurity enhancing violent conflicts among those states affected (Homer-Dixon 1999:6-8). If the ensuing violent conflict is sufficiently intense and widespread, both national and international security interests are involved (Homer-Dixon 1999:166-168).

2.2 The link between environmental scarcities and violent conflict explained

Although the scope of this article will not permit the author to do justice to the extensive research conducted by the Toronto group, it is worth outlining briefly four of the key findings of the project (Homer-Dixon 1994). The first claim is that the most important environmental resources as far as environmental causes

of violent conflict are concerned are land, forests, fish and water. It is suggested that the degradation and depletion of these four environmental resources is one of the major environmental changes facing humankind, and will contribute more to social turmoil in coming decades than will climate change or ozone depletion (Homer-Dixon 1994:7-8). The argument is based on the fact that when analysts and policymakers in developed states consider the security impacts of large-scale environmental change, they pay undue attention to the threats emanating from climate change and ozone depletion which will probably not be seen until well into the next century, when vast populations in the developing world are already suffering from shortages of good land, water, forests and fish.

The second claim of the Toronto group propagates that there are three main sources of environmental stress that together form *environmental scarcity*: environmental change, population growth and social inequality (Homer-Dixon 1994:8-11). Resources are broadly divided into two types: non-renewable resources, such as oil and iron ore, and renewable resources, such as fresh water (including fisheries), forests (including timber), fertile soil and arguably the earth's ozone layer. Environmental change refers to "a human-induced decline in the quantity or quality of a renewable resource that occurs faster than it is renewed by natural processes" (Homer-Dixon 1994:8). But by only focussing on environmental change, the scope of environmental security is limited as it is only one of the sources of environmental scarcity. The second main source of scarcity, population growth, reduces a resource's per capita availability by dividing it among more and more people. The third main source of scarcity, unequal resource distribution, concentrates a resource in the hands of a few people and subjects the rest to greater scarcity. In other words, reduction in the quality or quantity of a resource shrinks the resource pie, while population growth divides the pie into smaller slices for each individual and unequal resource distribution means that some groups get disproportionately large slices (Homer-Dixon 1994:9).

The third claim of the Toronto group relates to the notion that the three main sources of environmental scarcities are mutually reinforcing, i.e. the three sources of environmental scarcity often interact, and two patterns of interaction are particularly common (Homer-Dixon 1994:10-11). A decline in the quality and quantity of renewable resources can combine with population growth to encourage powerful groups within society to shift resource distribution in their favour. This process could result in dire environmental scarcities for poorer and weaker groups whose claims to resources are opposed, resulting in a phenomenon termed resource capture. Unequal resource distribution in turn can combine with population growth to cause migrations to regions that are ecologically fragile, such as steep upland slopes, areas at risk of desertification and tropical rainforests. High population densities in these areas combined with a lack of knowledge and capital to protect

local resources cause severe environmental damage and chronic poverty, in what Homer-Dixon terms ecological marginalisation.

Lastly, the Toronto group claims that societies that are able to adapt to environmental stress are more likely to avoid significant violent turmoil and conflict than those that are not (Homer-Dixon 1994:16-17). Strategies for adaptation fall into two categories and both depend on adequate social and technical ingenuity. In the first category, it is argued that societies can continue to rely on their indigenous resources, but use them more sensibly and provide alternative employment to people who have limited resource access. Economic incentives like increases in resource prices and taxes can result in reducing degradation and depletion by encouraging conservation, technological innovation and resource substitution. Likewise, family planning and literacy campaigns can reduce population growth induced scarcity, and land redistribution and labour-intensive rural industries can relieve the effects of unequal access to good cropland (Homer-Dixon 1994:16). The second category states that the state might decouple itself from dependence on its own depleted environmental resources by producing goods and services that do not rely heavily on those resources. The state could then sell those products on the international market for the resources it no longer has at home. It is argued that such a shift might in fact require the rapid exploitation of the state's resources so that the profits can be reinvested in capital, industrial equipment and skills to permit a shift to other forms of wealth creation (Homer-Dixon 1994:16).

Three hypotheses regarding the nexus between environmental scarcities and violent conflict were proposed by the Toronto group at the inception of the Project in 1991, and the findings above led the group to revise the original hypotheses by redefining the independent variable, environmental scarcity. The range of environmental problems that were hypothesised to cause conflict were reduced to focus on forests, water, fisheries and cropland (Homer-Dixon 1994:18). The scope of the independent variable was expanded to reflect scarcity caused by population growth, resource maldistribution and resource depletion or degradation, including the interaction among these three sources of scarcity. The first hypothesis argues that decreasing supplies of physically controllable environmental resources, such as clean water and good agricultural land, would provoke interstate *simple-scarcity* conflicts or resource wars. The second hypothesis propagates that large population movements caused by environmental stress would induce *group-identity* conflicts, especially ethnic clashes. And the final hypothesis suggests that severe environmental scarcity would simultaneously increase economic deprivation and disrupt key social institutions, which in turn could cause *deprivation* conflicts such as civil strife and insurgency.

2.3 African examples since independence

The Toronto group argued that there was little empirical evidence to support their first hypothesis that environmental scarcity causes *simple-scarcity* conflicts between states (Homer-Dixon 1994:18). This conclusion derives from the finding that scarcities of renewable resources such as forests and croplands do not often cause resource wars between states, and the explanation for the fact that states have fought more over non-renewable than renewable resources are twofold (Homer-Dixon 1994:19). Firstly, petroleum and mineral resources can more readily be converted into state power than agricultural land, fish and forests can, as oil and coal fuel factories and armies. In contrast, although captured forests and cropland may eventually generate wealth for states, the outcome is more remote in time and less certain. And secondly, the states that are most dependent on renewable resources, and therefore are most motivated to seize resources from neighbours, usually tend to be poor, which lessens their capability for aggression. However, the research conducted by the group indicates that the most likely renewable resource to stimulate interstate resource war is river water, a finding that has been supported by a number of authors, especially relating to shared rivers (Gleditsch *et al.* 2006; Wolf 1998; Gleick 1993). Water is an important resource for personal and national survival and in the case of shared rivers, a downstream state's access to the water can be affected by an upstream state's actions. Conflict is most probable when a downstream riparian user is highly dependent on river water and is strong militarily and economically in comparison to upstream riparians.

An interesting case in this regard is the relationship between South Africa and Lesotho during the late 1980s (Homer-Dixon 1994:19). Facing water shortages, South Africa negotiated in vain with Lesotho for thirty years to divert water from Lesotho's mountains to the arid South African province of Transvaal. In 1986, South Africa gave decisive support to a successful military *coup* against Lesotho's tribal government, declaring that it assisted in the *coup* as Lesotho had been providing sanctuary to guerrillas of the African National Congress. Although this might have been a key motivation for South Africa's involvement in the *coup*, the two governments suddenly reached agreement within a few months to construct the huge Highlands Water Project to meet South Africa's needs. It therefore seems likely that the desire for water was an ulterior motive behind South African support for the *coup*.

The Toronto group argued that there was significant empirical evidence to support their second hypothesis that environmental scarcity causes significant population mobility which in turn causes *group-identity* conflicts (Homer-Dixon 1994:20). They argued that we have to be sensitive to the contextual factors unique to each socio-ecological system, i.e. the system's particular physical, political, economic and cultural features that affect the strengths and linkages

between scarcity, population movement and conflict. One of the considerations that we need to acknowledge is the importance of both “push” and “pull” factors in decisions of potential migrants (Suhrke 1993). These factors help to distinguish between migrants and refugees. While migrants are motivated by a combination of “push” and “pull” factors, refugees are mainly motivated by “push” factors. As Suhrke (1993) eloquently argues, environmental scarcity is therefore more likely to produce migrants than refugees due to the gradual development of environmental scarcities. Population growth by migrants places stress on environmental resources, thereby leading to conflict between them and the citizens of the receiving state.

Events in the Senegal River valley, demarcating the border between Senegal and Mauritania in West Africa, in 1989 illustrate this hypothesis through the process of resource capture (Homer-Dixon 1994:11-13). Senegal has fairly abundant agricultural land, but much of it is readily degraded by high to severe wind and water erosion, loss of nutrients, salinisation because of over irrigation and soil compaction caused by intensification of agriculture. In contrast, except for the Senegal Valley along its southern border and few oases, Mauritania largely consists of arid desert and semi-arid grassland. The broad floodplains fringing the Senegal River usually support productive farming, herding and fishing based on the river’s annual floods, but during the 1970s in the face of chronic food shortages and a serious drought, the region’s governments sought international financing for the Manantali Dam on the Bafing River tributary in Mali, and the Diama self-intrusion barrage near the mouth of the Senegal River between Senegal and Mauritania. The plan had unfortunate and unforeseen consequences (Homer-Dixon 1994:12). Degradation of land resources and population pressures caused by the displacement of the black Africans along the riverbank by elite white Moors in Mauritania helped to precipitate agricultural shortfalls, which in turn encouraged a large development scheme due to increased values of land along the banks as a result of the dams. The powerful elite changed the property rights and resource distribution in their own favour, which produced a sudden increase in resource scarcity for an ethnic minority, expulsion of the minority and ethnic violence erupted.

The third hypothesis of the Toronto group suggested that empirical evidence partially supports the finding that environmental scarcity simultaneously increases economic deprivation and disrupts social institutions, which in turn causes *deprivation* conflicts such as civil strife and insurgency (Homer-Dixon 1994:23-31). The argument is that resource degradation and depletion often affect economic productivity in poor countries and thereby contribute to deprivation. At the time of writing, Homer-Dixon argued that dryland degradation in Burkina Faso reduced the country’s annual gross domestic product by nearly nine per cent annually because of fuel wood loss and lower yield of millet, sorghum and livestock (Homer-Dixon 1994:24). The state is the most vulnerable institution

when it comes to the undermining of social institutions due to environmental scarcity, as large population movements and economic decline appear likely to weaken the capacity and legitimacy of the state in some poor, developing countries. Serious civil strife is, however, not likely to occur unless the structure of political opportunities facing challenger groups keeps them from effectively expressing their grievances peacefully, but offers them opportunities for violence against authority (Homer Dixon 1994:26).

In the 1990s, West Africa not only became the symbol of worldwide demographic, societal and environmental stress, but also a region where scarcity of resources, the increasing erosion of nation-states and international borders, and the empowerment of private military and security companies and drug cartels led to civil wars and rebellions, most notably in Liberia and Sierra Leone (Arthur 2010:3). The economy of Sierra Leone was so closely tied up to the political elite at the time, that once the Revolutionary United Front launched their offensives, the elite could continue to utilise the country's natural resources to protect and maintain themselves at the expense of thousands of citizens (Broodryk and Solomon 2010:12).

The research conducted by the Toronto group concluded that environmental scarcity does indeed contribute as a cause of violent conflict, which can be characterised as occurring persistently, in a diffuse manner and concentrated on a subnational level (Homer-Dixon 1994:39-40).

2.4 Current manifestations of violent conflict in Africa due to environmental scarcity

Following the collapse of the Soviet Union at the end of the Cold War in 1989, some previously frozen conflicts in Africa reignited violently, including those in Liberia, Sierra Leone, the Democratic Republic of the Congo (DRC) and Rwanda (Cilliers and Schünemann 2013:2). In a number of states, external funding from the Cold War rivalries ended abruptly and insurgents turned inward to find new sources of income in the form of natural resources. Diamonds (UNITA and the RUF in Angola), coltan (various factions in the eastern DRC), coffee and cocoa (in Côte d'Ivoire) and even charcoal (in Somalia) were used as alternative sources of revenue (Cilliers and Schünemann 2013:3). Localised violence over access to livelihood resources, such as land and water, is also on the increase on the continent (Cilliers and Schünemann 2013:4). Evidence suggests that resource competition at community level is relatively prone to violence (*Conflict Barometer* 2011:4). In 2010 and 2011, conflicts over resources accounted for approximately 35 per cent of all conflicts in sub-Saharan Africa and 50 per cent of conflicts in the Americas. On the other hand, only 10 per cent of all conflicts in Europe, the Middle East and Maghreb, and Asia and Oceania featured resources as a cause of conflict.

Fresh water is a fundamental resource that is integral to all ecological and societal activities, including food and energy production, transportation, waste disposal, industrial development and human health (Gleick 1993:79). Unfortunately fresh water resources are unevenly and irregularly distributed and some regions of the world have a great shortage of water. It is predicted that water and water-supply systems are increasingly likely to be both objectives of military action and instruments of war as human populations grow, as improving living standards increase the demand for fresh water, and as global climatic changes make water supply and demand more problematic and uncertain (Gleick 1993:79). Gleick (1993:83) argues that water and water-systems have been the roots and instruments of war, where access to shared water resources have been cut off for political and military reasons and inequities in water use have been the source of regional and international frictions and tensions.

According to the *2011 World Development Report*, the occurrence of violent conflict in sub-Saharan Africa is more likely after years of poor rainfall. Potential conflicts over water have focused largely on the regions where peculiar geographical attributes, especially vulnerability to drought and the extent of use, have introduced complexities to the notion of water security (Alao 2007:211). Two specific regions prone to water scarcities have been identified – the Horn of Africa and Southern Africa. For the Horn of Africa, although the region is abundantly endowed with water resources, the potential for conflicts over water are rooted in the uneven distribution in the region. On the other hand, the high number of rivers that cut across national boundaries, the blurred demarcation between land and maritime boundaries, and the disparity in the amount of water needed by the states and the extent of access to it, are the key issues underlying potential conflicts.

The Nile River is a very important international river of regional importance and the control of the Nile is increasingly becoming contentious as water demands in the region increase drastically (Gleick 1993:86). The Nile flows through some of the most arid regions of Northern Africa and it is vital for agricultural production in Egypt and the Sudan. Egypt relies on the Nile for 97 per cent of its fresh water, and more than 95 per cent of the Nile's runoff originates outside of Egypt in the other nine riparian states of the basin: the Sudan, Ethiopia, Eritrea, Kenya, Rwanda, Burundi, Uganda, Tanzania and the DRC. The Okavango River holds a similar significant importance in Southern Africa as the semi-arid Republic of Botswana relies heavily on the river to feed into the Okavango Delta. The Okavango Delta is Botswana's only significant surface water source and Botswana has to rely on around 94% of its fresh water originating outside of its borders (Turton 1999:1-2). In light of the preceding discussion on the importance of resources to environmental security and the avoidance of violent conflicts, the article now turns to the case

study section, where conflict and cooperation along the Nile River and Okavango River basins will be discussed.

3. CASE STUDY: CONFLICT AND COOPERATION ALONG THE NILE RIVER AND THE OKAVANGO RIVER BASINS

The Nile River, with an estimated length of over 6 800 kilometres, is nearly synonymous with Egypt, and were it not for the river and its sediments, Egypt would have been a mere desert and its great ancient civilizations as well as the present population, cities and economy would never have existed (Wiebe 2001:731). Although Egypt is the furthest downstream Nile riparian, it effectively controls the majority of the water by possessing greater military and economic power than its upstream neighbours. Given that Egypt's existence largely depends on the Nile, it comes as no surprise that Egypt has jealously guarded its claim to the Nile waters, threatening military action against upstream Sudan and Ethiopia whenever they have announced water projects on the river. Engulfed in impoverishment and civil strife, Sudan and Ethiopia have not been able to take serious action to dam the river for irrigation or hydroelectric power so far.

The Okavango River Basin is regarded as one of the least human-impacted basins on the African continent, but mounting socio-economic pressures on the use of the basin by the riparian states of Angola, Botswana and Namibia threaten to change this character (Mbaiwa 2004:1319). Access to water is a prerequisite to achieve the socio-economic objectives of the Southern African Development Community (SADC) and the need for amicable collaboration between the riparian states of the semi-arid Okavango River Basin area is thus of great importance (Pinheiro, Gabaake and Heyns 2003:105). The Okavango Delta, a 15 000 km² wetland system at the end of the Okavango River Basin, for example, is the only significant surface water resource available in the otherwise arid state of Botswana and all the water reaching the delta is derived from upstream riparian state Angola (Turton 1999:1).

3.1 The Nile River

The Nile River is actually composed of three major tributaries: the White and Blue Nile, converging near Khartoum in the Sudan after following long and complex routes, and the Atbara River (Smith and Al-Rawahy 1990:217). The most remote known source of the Nile is the Luvironza River in Tanzania, and from this point of origin the river flows across some 6 825 kilometres (including three climate zones) of the African continent before emptying in the Mediterranean Sea. The White Nile's principal source is Lake Victoria in Uganda, while the Blue Nile originates from Lake Tana in the Ethiopian Highlands. The White Nile has a relatively

steady monthly flow, delivering an average of 12 billion m³ of water to Egypt each year, representing 20 per cent of the total annual flow of the river (Smith and Al-Rawahy 1990:218). As its name suggests, the water is relatively clear of sediment and biological matter. Although droughts have affected its flow in the past, recent droughts in East and Central Africa have not significantly reduced the discharge of the White Nile. The Blue Nile, on the other hand, exhibits great seasonal variations associated with its flow (Smith and Al-Rawahy 1990:218). About 80 per cent of the Blue Nile's discharge into Egypt occurs between August and October, and during the rest of the year the Blue Nile's flow is reduced to a trickle with many of its tributaries drying up completely. The Blue Nile's water is heavily laden with sediment eroded from the Ethiopian Highlands and its discharges vary greatly according to season and yearly flow. The Blue Nile in combination with the Atbara River (both originating in the Ethiopian Highlands) account for 80 per cent of the Nile's waters.

3.2 The Okavango River

The Okavango River Basin has its origins in the highlands of Southern Angola where the Cuito and Cuando Cubango Rivers eventually unite near the border of Namibia and Angola to become what is internationally known as the Okavango River (Mbaiwa 2004:1319). The river then flows across Namibia's Caprivi Strip, finally draining in the Okavango Delta in the north-western corner of Botswana. The exact extent of the southern perimeter of the Okavango basin is not well defined, but the watercourse system drains about 750 000 km² in the central Southern African continent (Pinheiro, Gabaake and Heyns 2003:106). The rainfall over the catchment area is seasonal and summer rainfall conditions prevail. The main annual rainfall in the headwaters of the Okavango River in Angola is 1 200 mm, but decreases to around 600 mm in the middle Okavango (Pinheiro, Gabaake and Heyns 2003:106). Further southwards, the rainfall is between 300 mm and 400 mm respectively in Namibia and Botswana. The Okavango River yields about 9 863 million m³ of water per annum on average at Mohembo on the border between Namibia and Botswana. An estimated 122 000 people live in the basin in Botswana, with 179 000 people in Namibia, of whom 144 000 live no more than 10 km from the Okavango River (Mbaiwa 2004:1320). The civil war in Angola displaced a lot of people and there has been no reliable census carried out to provide the exact number of people resident in the basin. It has however been estimated that there are about 570 000 people living in the Okavango River Basin in Angola (OKACOM: Online).

3.3 The importance of the Nile River

Apart from the fact that Egypt is very dependent on the Nile waters as basically its only source of freshwater, the Sudan also receives 77 per cent of its freshwater from the Nile (Wiebe 2001:734). All Nile Basin riparian states rely to a certain extent on the Nile for a determined amount of freshwater, but Egypt and Sudan have few other options (especially the former) for agriculture, domestic and industrial use. Agriculture consumes the majority of the freshwater in the Nile Basin: Egypt spends 86 per cent of its freshwater on agriculture; the Sudan is thought to apply 99 per cent of its freshwater in the same way. Old and inefficient traditional irrigation techniques waste substantial amounts of crop-designated water through evaporation, but modern projects are implementing more suitable methods, maximising the amount of water actually reaching the plant roots and minimizing losses.

Furthermore, states bordering Lake Victoria employ its waters for use within factories as well as for waste removal from textile and tannery mills; coffee and cotton processing plants; vegetable oil mills; and cosmetics, soap and fish processing plants (Rosegrant and Ringler 1998). Lake water pollution degrades water quality in the downstream, causing scarcities (Wiebe 2001:735). Sugar cane and cotton production are major industries along the Nile in Egypt and the Sudan respectively, and although Egypt only uses about 8 per cent of its freshwater for industry, the remaining heavily polluted runoff from the upstream joins and contaminates remaining freshwater. Domestic water use for drinking, food preparation, cleaning, laundry and hospitality services only account for a small portion of water compared to agriculture and industry (Wiebe 2001:735). Egypt only employs about 6 per cent freshwater annually for domestic use, although it is argued that per capita water use doubled during the period from 1940 to 1990 due to increased standards of living.

The variability of the Nile's discharge provided the impetus to construct a series of impoundments along the river (Smith and Al-Rawahy 1990:219). Six major control structures line the Nile between Uganda and Egypt, all originally designed for flood control and low flow augmentation, although the Owen Falls Dam and the Aswan Dam are also employed for hydroelectric power production. The annual discharge of the Nile to Egypt is approximately 85 billion m³, and of that about 25 billion m³ comes from the White Nile, while the remaining 60 billion m³ comes from the Blue Nile (50 billion m³) and the Atbara River (10 billion m³) (Smith and Al-Rawahy 1990:219).

The strategic importance of the Nile waters to Egypt and the Sudan is very evident from this section. According to Levy's definition of environmental security, it can be argued that the Nile River is one of those systems necessary for the sustainment and support of life in these two countries specifically, and as such

any attempt to tamper with the flow by riparian states can be viewed as a national environmental security threat.

3.4 The importance of the Okavango River

The livelihoods of the communities living around the Okavango River are directly or indirectly associated with the river (Mbaiwa 2004:1320). The Okavango River Basin provides an example of a transboundary freshwater system where human and ecosystem needs to compete for scarce water supplies in an otherwise arid region. Unlike the Nile River, the effects of land degradation, mining or industry have not posed a significant environmental threat to the watercourse system and as such the Okavango is one of the most pristine rivers in Southern Africa. The catchment in Botswana is used for stock farming and large game parks have been created in the Delta region, with the population centred around the Delta relying on the wetland resources and tourism for their existence (Pinheiro, Gabaake and Heyns 2003:107). In Angola, the upstream Okavango River Basin offers good conditions for the development of agricultural projects, with great potential for hydroelectric and agro-industrial projects that can be realised in the short and long term (Pinheiro, Gabaake and Heyns 2003:109). The rivers in the interior of Namibia, with its extremely arid hydroclimate, are ephemeral in nature (Pinheiro, Gabaake and Heyns 2003:111). Namibia utilises around 20 million m³ of Okavango River water for domestic use and agricultural activity. Based on Namibia's 2003 population growth figures, it has been estimated that the managed water demand would be exceeded by 2020, and this means that Namibia will be looking to its perennial border rivers to augment the scarce water resources in the centre of the country.

If not well managed, the demand and use of water from the Okavango River Basin in Angola, Namibia and Botswana can cause conflict between the riparian states (Mbaiwa 2004:1323). Peter Ashton (2003:175) calculated water demand for each of the riparian states, stating that the total water required in the catchment during 2000 was approximately 23,2 million m³ per year, equivalent to about 0,23 % of the mean annual runoff recorded at Mohembo, the primary inflow point to the Okavango Delta. Ashton showed that of this total Angola required 13,8 million m³ (60%), Botswana needed 4,1 million m³ (18%), and Namibia's requirement was 5,2 million m³ (22%). Ashton's estimates, however, are based on consumptive water needs and exclude any allowance for the quantity of water likely needed to maintain essential ecosystem services within the Okavango River Basin and the Okavango Delta. Ashton's (2003:175) results also indicate that there are small, yet subtle differences in water use patterns within these three states. Most of the water is employed for rural subsistence and urban domestic use, with agricultural activities utilising the third most.

3.5 Causes and effects of Nile water degradation

Nile water degradation occurs due to four causes, which include water diversions by dams and canals, as well as industrialisation and population growth (Wiebe 2001:736-742). Together these four causes have socio-economic implications for the Nile waters and the riparian states, whilst also affecting both the quantity and quality of available freshwater, often resulting in internal strife through damage to crops and fisheries and population displacements, which in turn can lead to conflict in neighbouring states.

Dam proponents argue that the benefits, such as stable water flow and diminished negative drought effects, surpass the human and environmental costs of damming inconsistent waters (Wiebe 2001:736). Critics, however, insist that the detrimental effects on society, the environment and the economy greatly outweigh those benefits. Either way, the Aswan High Dam, built to supplement the Aswan Low Dam built in 1902 to save flood waters for dry season irrigation, took eleven years to build and required materials equal to 17 Egyptian pyramids (Wiebe 2001:736). It is a rockfill dam that controls the majority of the Nile's flow through Egypt (that is after it has passed all the riparian states). The resulting reservoir, Lake Nasser, is the second largest man-made lake in the world with a reservoir capacity of 169 billion m³. Several temples had to be moved to higher ground to build the dam, and the reservoir submerged the old town of Wadi Halfa, displacing 50 000 indigenous people. The dam controls annual floods on the Nile, preventing floodplain damage, and facilitates in the steady supply of irrigation waters through a network of manmade canals. The dam also provides about half of Egypt's power supply, increasing its economic capabilities and decreasing its dependence on other exhaustible resources (Wiebe 2001:736).

The dam, however, also created a number of unforeseen problems that had negative effects on both the land and its inhabitants (Wiebe 2001:736). Reservoir inefficiencies have decreased the total amount of water entering Egypt – three metres of water evaporates off the surface of Lake Nasser annually. Although the dam curbed floods, it also resulted in the need to fertilise cropland as the nutrient-rich silt from the Ethiopian Highlands were no longer being deposited annually during the floods. Poor drainage of irrigated croplands have also resulted in over-saturation of the soil and increased soil salinity. The dam has also affected the Mediterranean delta due to less nutrient-rich silt deposits, resulting in less fish fodder and a subsequent decline in the number of shrimp available to catch.

Industry along the Nile Basin has also contributed to water degradation (Wiebe 2001:741). In addition, mining ventures create mercury waste in the Lake Victoria basin, and overuse of agrochemicals and fertilizers contribute to polluted run-off that eventually joins Nile waters. Irrigation projects tend to increase population densities and urbanisation in irrigated areas, and increased urbanisation

encourages inefficient water usage as well as greater quantities of municipal wastage as living standards rise. Water scarcity and unequal distribution can easily exacerbate social disparity and poverty within a country (Wiebe 2001:742).

3.6 Water wars: Potential for conflict in the Nile River and the Okavango River Basins

There is an increasing tendency in the water resources literature to assess the two concepts of water and war together, and proponents propagate that water has been and probably will be a cause of interstate warfare (Wolf 1998:253; Gleditsch *et al.* 2006; Gleick 1993). The basic argument for water wars is as follows: Because of water's status as a vital resource for the successful survival of human beings, the scarcity of water in arid and semi-arid environments leads to intense political pressures, often referred to as *water stress*, a term coined by Falkenmark (1989). Water is a vital resource to many levels of human survival for which there is no substitute, it ignores political boundaries, fluctuates both in time and space and has multiple and conflicting demands on its use (Wolf 1998:252). The problems of water management are compounded in the international realm by the fact that international law that governs it is poorly developed, contradictory and unenforceable.

The 1997 Convention on the Law of the Non-navigational Uses of International Watercourses, which took 27 years to realise, reflects the difficulty in marrying legal and hydrologic intricacies (United Nations 1997). While the Convention provides many important principles for cooperation, including responsibility for cooperation and joint management, it also institutionalises the inherent upstream/downstream conflict by calling for both *equitable use* and an *obligation not to cause appreciable harm*, instead of answering calls by downstream riparian states for an emphasis on *no significant harm*. The Convention also provides few practical guidelines for allocations,² the main cause of most water conflicts according to Wolf (1998:252). Considering all of these characteristics together – international water as a critical, nonsubstitutable resource, which flows and fluctuates across time and space, for which legal principles are vague and contradictory and which is becoming relatively more scarce with rising population growth figures and standards of living – provides a compelling argument that future wars might be fought due to the scarcities of water (Wolf 1998:253). This view is

2 Allocations are to be based on seven relevant factors, which are to be dealt with collectively: geographic, hydrographic, hydrological, climatic, ecological and other natural factors; social and economic needs of each riparian state; population dependent on the watercourse; effects of use in one state in the uses of other states; existing and potential uses; conservation, protection, development and economy of use and the cost of measures taken to that effect; and the availability of alternatives, of corresponding value, to a particular planned or existing use.

very much in line with Homer-Dixon's identification of the environmental causes of *simple-scarcity* conflicts.

Writers who foresee growing and increasingly serious global and domestic water scarcities generally adhere to the neo-Malthusian view of the nexus between resource scarcities and violent conflict (Gleditsch *et al.* 2006:363). Gleick (1993:79), for instance, argues that "where water is scarce, competition for limited supplies can lead nations to see access to water as a matter of national security", as "an increasingly salient element of interstate politics, including violent conflict". The characteristics that make water likely to be a source of strategic rivalry are: the degree of scarcity, the extent to which water supply is shared by more than one region or state, the relative power of the basin states and the ease of access to alternative fresh water sources (Gleick 1993:85-86). Malin Falkenmark (1990) is also of the opinion that there is a serious risk of international conflict, especially in the Middle East and Africa, between upstream and downstream states. Unlike upstream/downstream riparian states, states sharing large amounts of river boundaries may not necessarily fight over direct control of the resource of freshwater *per se*, but rather over the political boundary (Gleditsch *et al.* 2006:365). Rivers are notoriously fickle boundaries – normally the river will follow the *Thalweg*, the deepest channel in the valley, but this is not always possible or the case if boundaries follow a riverbank.

Although Egypt possesses the military and political clout in the Nile River Basin, due to the Sudan and Ethiopia's recent histories of political instability and reasonable poverty compared to Egypt, it is unlikely that Egypt would enter into hostile attacks with its riparian neighbours (Smith and Al-Rawahy 1990:220). Ancient Egyptian rulers, British colonialists and even contemporary governments have all recognised Egypt's vulnerable dependence on the Nile for survival. Friction between Egypt and the Sudan over the White Nile flow, and between Egypt and Ethiopia over Blue Nile and Atbara waters, seems to, however, reappear every now and then whenever the Sudan or Ethiopia propose new water development projects. Ethiopia proposed a dam on Lake Tana to preserve headwaters for itself in 1970, and the then Egyptian President, Anwar Sadat, threatened to declare war if they should pursue their plans (Wiebe 2001:743). Most recently, in June 2013, Ethiopia announced plans to construct the Great Ethiopian Renaissance Dam on the Blue Nile, a \$ 4,7 billion project that Ethiopia said will eventually provide 6 000 megawatts of power (*BBC* 2013). Deposed Egyptian President Morsi responded by saying that "all options are open" to deal with Ethiopia if the water security of Egypt was threatened by the construction. Ethiopia responded that the Blue Nile would only be slightly diverted and then allowed to follow its natural course.

The prolonged civil war that started in Angola before 1974 ended recently and this considerably increased the potential for developments that would require water

from the Okavango River (Pinheiro, Gabaake and Heyns 2003:114). It is possible to achieve meaningful infrastructure development and to improve the socio-economic conditions of an estimated 800 000 people living in the upper reaches of the Okavango catchment and on the plains in south-eastern Angola. Feasibility studies that were done before 1974 by the Portuguese authorities indicated that there is great potential for hydropower generation (350 MW) and the development of irrigation (54 000 ha) in the Angolan portion of the Okavango catchment, but very little information is available about the future development potential (Pinheiro, Gabaake and Heyns 2003:114). Angola is seen as a potential sleeping giant that will come alive and that may have some severe consequences for the future availability of water for Namibian abstraction on the Kavango River (as it is known where it forms the border between Namibia and Angola), or for hydropower generation at Divundu or on the Okavango Delta. Although Botswana is sympathetic towards the legitimate and reasonable water requirements of Namibia, the international conservation community regards Botswana as the custodian of the Okavango Delta and this may have an impact on Namibian plans to utilise the Okavango waters. The existing and future water requirements, as well as the impacts that possible future industrial, mining or irrigation activities might have on water abstraction, the quality of the water and downstream environmental health of the Okavango remains unclear (Pinheiro, Gabaake and Heyns 2003:114).

However, the historical and contemporary evidence surveyed by Homer-Dixon regarding the potential for conflict arising from the renewable resource of river water suggests that conflict and turmoil in this regard occur more often on the internal rather than the international level (Homer-Dixon 1994:20). The huge dams that are often built to deal with general water scarcity are especially disruptive, as the relocation of large numbers of people generates turmoil among relocatees and clashes with local groups in the areas where they are resettled. The members affected are often members of ethnic minority groups outside the power hierarchy of the society, and the result is frequent rebellion and repression by the state.

3.7 Arguments against water wars: potential for cooperation in the Nile River and Okavango River Basins

Aaron Wolf (1998:253-258) proposes that water disputes could lead to cooperation rather than conflict, and sets forth four arguments against the plausibility of future water wars: an historic argument, a strategic interest argument, a shared interest argument and an institutional resiliency argument. Wolf argues that the history of water dispute resolution is far more impressive than that of conflict, citing the UN Food and Agriculture Organization's identification of more than 3 600 treaties, relating to international water resources, dating between 805 and 1984, the majority of which deal with some aspect of navigation.

3.7.1 *The historic argument*

Wolf (1998:258) suggests that the historic reality has been quite different from what the water wars literature would have one believe. In modern history, only seven minor skirmishes have been waged over international waters. Conversely, over 3 600 treaties have been signed historically over different aspects of international waters, many showing tremendous elegance and creativity for dealing with this critical resource. He furthermore suggests that a closer look at the very cases most commonly cited as conflicts reveals on-going dialogue, creative exchanges and negotiations leading fairly regularly to new treaties.

This is indeed evident in the case of the Nile River Basin. Understanding that Nile waters held great economic and political importance for a successful occupation, the British, on behalf of Egypt, concluded an agreement with Ethiopia in 1902 to guard Egypt's claim to the Nile (Wiebe 2001:746). After extensive conflict between the Sudan and Egypt, the British and Egyptian governments concluded the 1929 Nile Waters Agreement on behalf of both countries. But after gaining independence in 1953, the Sudan demanded that the existing Agreement must be amended and following four particularly volatile years between economically suffering Sudan and economically advantaged Egypt, the two states finally settled on a division of water in the 1959 Nile Waters Agreement (Wiebe 2001:746).

One of the unintended consequences of the colonial legacy in Africa is the large number of international river basins that exist (Turton, Patrick and Julien 2006:22). Rivers that were used to demarcate the boundaries of states became to be regarded as artificial barriers in the post-colonial era. Of the 263 known international river basins in the world, 63 are found in Africa, with at least 22 aquifer systems that are known to exist in the SADC region alone (Turton, Patrick and Julien 2006:23). The Okavango River Basin traverses an area that is predominantly semi-arid, and the water carried by the river and the wetland resources that it supports therefore provide a livelihood for the residents in the basin (Pinheiro, Gabaake and Heyns 2003:107). Shortly after independence in 1990, Namibia established a number of river basin institutions with other riparian states on its internationally shared border rivers (Pinheiro, Gabaake and Heyns 2003:114-115). In September 1990, the governments of the People's Republic of Angola and the Republic of Namibia agreed to endorse and affirm the old agreements on the Cunene River between the old colonial powers (South Africa and Portugal) and to re-establish the Permanent Joint Technical Commission (PJTC). In November of the same year, the governments of the Republics of Namibia and Botswana established the Joint Permanent Technical Commission (JPTC) to deal with water resources of common interest. All three riparian states were thus represented on a bilateral basis in either the PJTC or JPTC.

3.7.2 *The strategic argument*

Wolf's (1998:259) strategic interest argument asks the question, if one were to launch a war over water, what would be the goal? It is assumed that the aggressor would have to be both downstream and the regional hegemon – an upstream riparian would have no cause to launch an attack and a weaker state would be foolhardy to do so. An upstream state would have to launch a project which decreases either the quality or quantity, knowing that it will antagonise a stronger downstream neighbour. The downstream power would then have to decide whether to respond to the threat – if the project were a dam, for instance, in the case of the Nile River Basin between Ethiopia and Egypt, destroying it would probably be the obvious response, although this will result in a wall of water rushing back on downstream territory. There are only a number of international watersheds, the Nile Basin is one, where this tactic would be feasible, and many of those already have existing treaties or ongoing negotiations towards a treaty. Wolf (1998:259) suggests that it is just as difficult to find a site for such a scenario to occur as it is to accept the rationale for launching one.

In the Okavango River Basin's case, Anthony Turton (1999:1-2) suggests that in order to understand the developmental complexities confronting an arid state like Botswana, one needs to grasp four key hydropolitical facts. The first hydropolitical fact states that probably the most important developmental problem in the arid portions of Southern Africa is the fact that water is unevenly distributed in special terms. This means that in order to be effectively harnessed into economic potential, water has to be moved over vast distances and at great costs. As a direct result of the spatial misdistribution of water, the second key hydropolitical fact states that existing sources of water become critically important in strategic terms. The Okavango Delta is the only source of permanently running surface water within the borders of Botswana and it is therefore of crucial importance to Botswana to keep Namibia and Angola from implementing any major developments upstream that would affect the quantity or quality of water reaching the Okavango Delta. The problems related to the critical strategic importance of existing water for states in arid regions is compounded by hydropolitical fact number three, which states that existing waters very often originate in other states, referred to as exogenous water in hydropolitical terms. In the case of Botswana, around 94% of all available surface water originates outside of its borders. The last hydropolitical fact relates to the fact that Botswana is an arid region³ and in the case of the Okavango Delta, evapotranspiration accounts for some 96% of the total water loss from the overall

3 Aridity means that the naturally occurring precipitation is lower than the potential evapotranspiration demand, i.e. more water is lost through either evaporation or transpiration via plant stomata than falls naturally (Turton 1999:2).

system. Botswana therefore has every reason to launch an attack over the Okavango River waters against its upstream riparian neighbours, but fortunately it has not been necessary so far. The same logic of launching an attack with unintended and unwanted consequences applies to this case as with the Nile River and Egypt.

3.7.3 The shared interests argument

Wolf's (1998:259) second to last argument relates to shared interests. He stipulates that one is offered insight into the question of what it is about water, which tends to induce cooperation, even among riparians which are hostile over other issues, by reading through the treaties concluded over international waterways. Along larger waterways, the better sites for dams tend to be upstream at the headwaters where the valley walls are steeper and incidentally the environmental impact of dams is not as great. The prime agricultural land is usually found downstream, where the gradient has dropped and alluvial deposits enrich the soil. It therefore makes sense that a dam in the headwaters can provide hydropower to the riparian state while simultaneously managing to even out the flow for downstream agriculture. Other examples of shared interests are: no development of a river which acts as a boundary can take place without cooperation; farmers, environmentalists and beach-goers all share an interest in seeing a healthy stream-system; and all riparians share an interest in high water quality (Wolf 1998:260). Egypt's vulnerable dependence on the waters of the Nile is of interest here.

The sustainable use of the Okavango River waters is highly dependent on the political cooperation between Angola, Namibia and Botswana, which has been made possible through regional and international water protocols and agreements on the use of water resources in the basin (Mbaiwa 2004:1323). The original Southern African Development Community Protocol on Shared Water Courses was signed in 1995 and came into force in 1998 when two-thirds of the original SADC member states had ratified it (Mbaiwa 2004:1323). The revised Protocol was signed in Windhoek on 7 August 2000, and came into force in October 2003 after Tanzania became the ninth member state to ratify it. Angola, Botswana, Lesotho, Malawi, Mauritius, Mozambique, Namibia, Seychelles, South Africa, Swaziland, Tanzania, Zambia and Zimbabwe are all signatory parties to the Protocol. The Protocol aims to bring water use in the SADC region in line with international water law, particularly the 1997 UN Convention on Non-Navigational Uses of International Waters.

3.7.4 The institutional resiliency argument

Wolf's (1998:206) last argument relates to institutional resiliency. Another factor that adds to the stability of international watersheds is that once cooperative water regimes have been established through treaties, they tend to be tremendously

resilient over time, even between otherwise hostile riparians and even as conflict is waged over other issues. The Nile Basin states united in 1992 for the first time to pursue a joint dialogue on sustainable development and management of the Nile waters (Wiebe 2001:751). Out of shared interest and need, water affairs ministers from the Nile Basin states gathered a group of scientific professionals from all the riparian states for discussion that culminated in the 1997 Nile Basin Initiative (NBI). The 1999 Strategic Action Program continues to define the NBI's primary guiding principles today, and the ending of two previous programs gave rise to a new phase for the Strategic Action Program of 1999 as well as launching the Strategic Plan 2012-2016 (*Nile Basin Initiative*: Online 2013).

In partial reaction to the pressure on water resources, but also as a reflection of the changing political context in the region, Angola, Botswana and Namibia agreed to the establishment of the Permanent Okavango River Basin Water Commission (OKACOM) on 15 September 1994 in Windhoek, Namibia (Mbaiwa 2004:1323). The member states recognise the importance of cooperation to avoid conflict as a result of water disputes through OKACOM, and OKACOM is therefore an institutional expression of the international and regional agreements meant to promote cooperation between states on shared water resources (*OKACOM*: Online). OKACOM is a relatively young institution and it is still evolving to become a major driving force in the sustainable development of the Okavango River Basin (Mbaiwa 2004:1323).

4. OUTLOOK

It is predicted that the frequency of violent conflict over resource scarcities will probably increase sharply over the next decades as circumstances of scarcity rapidly increase in many parts of the world. States experiencing chronic internal conflict because of environmental stress will probably either fragment or become more authoritarian (Homer-Dixon 1994:39-40). Fragmenting states will be the cause of large population migrations, and they will be unable to implement international agreements on security, trade and environmental protection. Any of these outcomes could seriously pose threats to international security, and the social impacts of environmental scarcity, therefore, deserve concerted attention from security scholars to better understand the threats of conflict arising from a wide range of resource and environmental problems.

Global climatic changes will increase the demand for water for human and industrial uses, and states, such as Egypt and Botswana, that are considerably dependent on fresh water for irrigation and hydroelectricity purposes are vulnerable to changes in the changing flow of rivers due to the changing climate or intentional acts perpetrated by upstream riparian neighbours.

The NBI in the case of the Nile River is a very good example of Wolf's institutional resiliency debate. The latest phase redefines NBI's Core Program Areas and provides a clear division of roles and responsibilities, to ensure delivery and increase of tangible benefits. The core Program Areas are threefold: (1) The Basin Cooperation Program whose objective is to facilitate, support and nurture cooperation amongst the Nile Basin countries so as to promote timely and efficient joint actions required for securing benefit from the common Nile Basin water resources. (2) The Water Resource Management Program with the objective to assess, manage and safeguard the water resource base that supports the peoples of the Nile Basin through applying the principles of knowledge-based Integrated Water Resources Management to water development planning and assessment. (3) The Water Resource Development Program whose objective is to identify, prepare and facilitate investment in trans-boundary water development projects and programs whilst avoiding negative impacts on the health of the Nile Basin's resources through applying the principles of Integrated Water Resources Management (*Nile Basin Initiative*: Online 2013).

The article has shown that, in the case of the Nile River and Okavango River Basins, water-related disputes are more likely to lead to political confrontations and negotiations than to violent conflict, through institutional capacity regarded as the key element in the mitigation of potential conflicts arising from shared river basins, as propagated by Wolf and the Oregon School (Wolf *et al.* 2003:52). Growing disparities among riparian states between water availability and demand make it urgent that we work to reduce the probability and consequences of water-related conflict (Gleick 1993:112).

LIST OF SOURCES

Alao A 2007. *Natural resources and conflict in Africa: the tragedy of endowment*. Rochester: Rochester University Press.

Arthur P 2010. "ECOWAS and regional peacekeeping in West Africa: lessons for the future", *Africa Today* 57(2):3-24.

Ashton PJ 2003. "The search for an equitable base for water sharing in the Okavango River Basin". In: Nakamura M (ed.). *International waters in Southern Africa*. Tokyo: United Nations University Press, pp. 164-188.

British Broadcasting Corporation (BBC) News, 10 June 2013. Egyptian warning over Ethiopia Nile dam [online], <<http://www.bbc.co.uk/news/world-africa-22850124>>, accessed 25 July 2013.

Broodryk A and Solomon H 2010. "From war economies to peace economies in Africa", *Scientiae Militaria* 38(1):1-24.

Cilliers J and Schünemann J 2013. "The future of intrastate conflict in Africa: more violence or greater peace?", *Institute for Security Studies*, Paper 246.

Collier P and Hoeffler A 1998. "On economic causes of civil war", *Oxford Economic Papers* 50(4):563-573.

Dannreuther R 2007. *International security: the contemporary agenda*. Cambridge: Polity Press.

Falkenmark M 1989. "The massive water shortage in Africa: why isn't it being addressed?", *Ambio* 18(2).

Falkenmark M 1990. "Global water issues confronting humanity", *Journal of Peace Research* 27(2):177-190.

Gleditsch NP, Furlong K, Hegre H, Lacina B and Owen T 2006. "Conflicts over shared rivers: resource scarcity or fuzzy boundaries?", *Political Geography* 25:361-382.

Gleick PH 1993. "Water and conflict: fresh water resources and international security", *International Security* 18(1):79-112.

Hardin G 1968. "The tragedy of the commons", *Science* 162(3859):1243-1248.

Heidelberg Institute for International Conflict Research 2011. *Conflict Barometer* [online], <http://www.hiik.de/en/konfliktbarometer/pdf/ConflictBarometer_2011.pdf>, accessed 26 July 2013.

Homer-Dixon TF 1994. "Environmental scarcities and violent conflict", *International Security* 19(1):5-40.

Homer-Dixon TF 1999. *Environment, scarcity and violence*. Princeton: Princeton University Press.

Hough P 2004. *Understanding global security*. Abingdon: Routledge.

Kaplan R 1994. "The coming anarchy", *The Atlantic Monthly* 273(2).

Le Billon P (ed.). 2005. *The geopolitics of resource wars: resource dependence, governance and violence*. Abingdon: Frank Cass.

Mbaiwa JE 2004. “Causes and possible solutions to water resource conflicts in the Okavango River Basin: the case of Angola, Namibia and Botswana”, *Physics and Chemistry of the Earth*, Parts A/B/C 29(15):1319-1326.

The Nile Basin Initiative (NBI) 2013 [online], <http://www.nilebasin.org/newsite/index.php?option=com_content&view=article&id=139%3Aabout-the-nbi&catid=34%3Anbi-background-facts&Itemid=74&lang=en&limitstart=2>, accessed 1 August 2013.

Okavango River Basin Water Commission (OKACOM) 2013 [online], <<http://www.okacom.org/knowning-the-river/okavango-people>>, accessed 1 August 2013.

Page E 2010. What’s the point of environmental security? Paper presented for the SGIR at the 7th Pan-European International Relations Conference, Stockholm, 10 September.

Pinheiro I, Gabaake G and Heyns P 2003. “Cooperation in the Okavango River Basin: the OKACOM perspective”. In: Turton A, Ashton PJ and Cloete E (eds). *Transboundary rivers, sovereignty and development: hydropolitical drivers in the Okavango River Basin*. Pretoria and Geneva: AWIRU and Green Cross International.

Rosegrant MW and Ringler C 1998. “Impact on food security and rural development of reallocating water from agriculture for other uses”, *United Nations Commission on Sustainable Development* [online], <<http://www.un.org/documents/ecosoc/cn17/1998/background/ecn171998-roseg.htm>>, accessed 1 July 2013.

Smith SE and Al-Rawahy HM 1990. “The Blue Nile: potential for conflict and alternatives for meeting future demands”, *Water International* 15(4):217-222.

Suhrke A 1993. “Pressure points: environmental degradation, migration and conflict”, Occasional Paper 3, *Project on Environmental Change and Acute Conflict*.

Turton A 1999. Sea of sand, land of water: a synopsis of some strategic developmental issues confronting the Okavango Delta, *MEWREW Occasional Paper 6*. Water Issues Study Group, School of Oriental and African Studies (SOAS), University of London [online], <<http://www.soas.ac.uk/Geography/WaterIssues/OccasionalPapers/home.html>>, accessed 15 July 2013.

Turton AR, Patrick MJ and Julien F 2006. “Transboundary water resources in Southern Africa: conflict or cooperation”, *Development* 49(3):22-31.

United Nations 1997 *Convention on the Law of the Non-navigational Uses of International Watercourses*, adopted by the General Assembly on 21 May [online],

<http://untreaty.un.org/ilc/texts/instruments/english/conventions/8_3_1997.pdf>, accessed 31 July 2013.

Urdal H 2005. "People vs. Malthus: population pressure, environmental degradation and armed conflict revisited", *Journal of Peace Research* 42(4):417-434.

Wiebe K 2001. "The Nile River: potential for conflict and cooperation in the face of water degradation", *Natural Resources Journal* 41:731-754.

Wolf AT 1998. "Conflict and cooperation along international waterways", *Water Policy* 1:251-265.

Wolf AT, Yoffe SB and Giordano M 2003. "International waters: identifying basins at risk", *Water Policy* 5(1):29-60.