WATER RESOURCES AND ENVIRONMENTAL QUALITY AS FACTORS AFFECTING THE DYNAMIC AND THE SECURITY OF POPULATIONS.

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ABSTRACT

This paper introduces the concept of Environmental Security in relation with the parameters of the environment which could affect the availability of essential resources for populations. Water availability and its management are evaluated in different regions of the world and in different environmental conditions and the role of international organisations on this issue has been taken into consideration. More specifically the content of two workshops sponsored by the Science Programme of NATO and dealing with water resources, environment and security are briefly reported.
Specific attention has been paid to the case of the Mediterranean Region in which the natural conditions are stressed by several factors, including human initiatives, increased population, perspectives of climate change etc.

Keywords: Water, Environment, Populations, Security.

1. INTRODUCTION

The availability of water resources is an essential factor for the quality of the environment and of its components. The scarcity of water or its bad management could dramatically destabilise the equilibrium of a given ecosystem and negatively affect its basic standards like land quality; soil productivity; the cycle of nutrients and the availability of essential resources. In addition, under adverse environmental conditions, the well-being of populations is also directly affected and by consequence they might be forced to find resources elsewhere or to compete with other populations, thus causing tensions and potential conflicts.
The relationship between the conditions of the environment and the stability (social and political) of populations is becoming the subject of analysis and studies and has open a new area of discussion between scientists and policy makers. Such an area is known as *Environmental Security.* It takes into consideration the complex interaction between the quality and the safety of the environment on one side, and the well being and the stability of populations on the other.
International organisations and agencies ((UN, UNEP, UNCCD, UE, OSCE, NATO, etc.) are actively promoting meetings and relevant initiatives to increase the awareness of governments and policy makers on natural and man-induced phenomena which could affect

the safety and the security of the environment and of populations. Recommendations and practical programmes have been put forward to set up policies at the regional and at the international level in order to prevent those adverse environmental conditions which could destabilise entire communities.

2. ENVIRONMENT AND SECURITY

It could be wondered if the environment, and more specifically water, are at the origin of tension and conflicts. Since the end of the 80s a series of studies started by two research centers in Zurich (Switzerland) and in Toronto (Canada) speculated about the relationship between environment and security. These studies have been taken with caution by the experts in security since they considered the conclusions of the mentioned group of scientists too general and with low operative perspective. More specifically, the hypothesis of war for water resulted to be not the case if water is taken as the only direct reason for a conflict. On the contrary water should be considered together with other factors, both environmental, social and economical, while assessing the risk of conflicts [1]

The concept of Environmental Security was officially introduced at the 42th session of the United Nations General Assembly, although international concern about the issues involved dates back at least as far as the first UN Conference on the Human Environment, held in Stockholm in 1972. Environment or ecological security is an evolving concept; consequently an established definition does not yet exist. The concept emerged in response to serious threats to the global environment and it has been postulated especially in the aftermath of the Chernobyl accident, that environmental problems have also become security problems [2].
However the concept of Environment Security became established in the mid-1980s, notably through a chapter in the Bruntland Report. After that there was somewhat of a lull in professional assessment until the mid-1990s when it attracted renewed interest [3].
The consequences of the variations of environmental parameters have a direct effect on the concept of Environmental Security beyond what could be expected. While it is obvious to note that the effects of environmental pollution have direct consequence on the living conditions of men, animals and all the biological systems, it is not self evident that the scarcity or the poor management of the basic resources (water and soil) of an ecosystem could have a negative effect on the security of populations in terms of social and political stability.

3. WATER AND ENVIRONMEMTAL SECURITY

Water scarcity is a multiple source of tension and instability even within a single country: conflict between users; riots due to water shortage and social tension, and for these reasons has long served as a key illustration of Environment Security, but this phenomenon became more relevant in the last decades, primarily as a result of wholly unprecedent growth in human numbers and human activities. Since 1950 the global freshwater supply per person has fallen by 60% as world population has swelled by over 150% and the world's water consumption has increased by 180%; such a figure can be expected to increase by a further 40% within the next two decades [3].
During the past half century there have been more than 450 water-related disputes of hostile

sorts, and on 37 occasions rival countries have fired shots, blown up dams, or undertaken some other form of violent action.
At least 261 of the world's major rivers are shared, with 176 flowing through two countries, 48 through three countries and 37 through four or more countries. Their river basins account for more than 45% of the Earth's land surface, they account for 60% of the world's freshwater supply, and they supply nearly 40% of the world's population for domestic use, agriculture, hydro-power and other salient purposes. As many as 80 countries with nearly three billion people or two-fifths of the world's population already suffer serious water deficits. Two-thirds of water withdrawals are used to produce the basic commodity: food. In Southern Asia, water shortages rather than land shortages look likely to curtail plans to expand agriculture. In Asia as a whole with 60% of the world's people, there is only 36% of the world's renewable freshwater.
There are already hefty pushings and showings between Turkey on the one hand and Syria and Iraq on the other hand over the River Tigris and Euphrates; between India and Pakistan over the Indus; between India, Bangladesh and Nepal over the Ganges; between Brazil and Argentina over the Rio de la Plata; and between nations sharing the Mekong's river basin [3].

What has emerged because of water deficits applies also to deforestation, soil erosion and desertification. These phenomena can generate broad scale problems for human welfare and political stability. By virtue of their capacity to trigger famines, internal displacements and international migration, the mentioned phenomena often serve as a recipe for political instability, for tensions between neighbouring countries and even for armed conflicts. Desertification and drought threaten the livelihoods of one billion people in more that 110 countries, and another one billion are at risk. Yet, according to the United Nations Convention to Combat Desertification (UNCCD), a 20-year global effort would cost no more that $22 billion per year, with savings for agriculture alone worth $42 billion per year [3]

To summarise, the reduction of a basic environmental resource like water or its low availability, along with the increased competition to get access to it, is a factor of limiting the environmental viability for life support, by consequence affecting the Security of the Environment.
Essentially this is the rationale on which international organisations, like NATO and OSCE, traditionally dealing with security, implemented recently initiatives addressing this issue from different angles.
The NATO Science Programme, for instance, sponsored several international workshops dealing with environmental security, water management, land degradation and desertification. One of these was focused on: Integrate Water management as a Pre-condition for Human Security and was organised in Morocco in 2008. The workshop was an occasion for high-lightening a variety of issues related to water management and for learning lessons after the presentations on specific cases. More into details, it was noted that water access and equity is indeed a pre-requisite for development, even though is quite difficult to balance water supply with the carrying capacity of the water sources. It was also underlined that the increase of supply is strived for boosting agriculture, tourism etc., but it causes structural problems on the long term. Ignoring the need for ecological flows ultimately leads to loss of ecosystem services that impact both, man and nature.
The empowerment and education of local people was also considered essential to increase

water use efficiency and poverty alleviation. Moreover, development as seen from a nation scale (gross domestic product) can be detrimental to water equity if the local population is left out. Learning trajectories, intellectual capital and public support for water awareness can only be instated when basic needs are fulfilled. As a matter of fact, public water solidarity is not of concern when survival mechanisms are involved.
At the workshop it was illustrated that hydrological changes can be observed in almost every river basin of the world and that the impact of humans on the hydrology has vast consequences, which could be aggravated by the perspective of climate change.
It was also learned from the workshop that he building of dams is a bad initiative in almost all cases. The disruption of longitudinal continuity in river flows causes a disruption in ecologic services downstream and also affect the estuaries and coastal zones (Danube, Nile and Aral Sea). The long term degradation of estuaries and coastal zones causes enormous losses of natural resources and services on a global scale.
The concept of ecosystem service is of great importance for integrated water management. Introducing the role of ecosystems in River Basins Management Plans requires the explicit recognition of the values that they generate. A cost-benefit tool on a basin scale is needed, because the ecosystems and the generated services can extend different spatial cases. Benefits of water quality and hydro geological regulation need to be accumulated on the entire downstream trajectory.
It was acknowledged that there are hopeful developments in the way of thinking about water management. In some parts of the world the challenge may be too big to tackle, which will result in more inequity, poverty and security risks. Restoring local livelihoods and environmental quality is essential to stop migration and abandonment of rural ares. Migration can turn into a domino effect of environmental and social devastation, exceeding ecosystem resilience at increasing scale and causing growing numbers of environmental refugees. In conclusion, the sheer diversity of contributions to the workshop demonstrated that a vaste range of problems exist. What binds them is the entwining between human development and water resources [4].

Another workshop was organised in Israel in November 2007 with the support of the NATO Science Programme on Water Resources and Infrastructure in Areas of Conflict and Extreme Conditions.
The workshop was designed to explore the challenges and opportunities in managing trans-boundary water resources in extreme regions of conflict. Much of the discussion focused on the Middle East, where both extreme conditions in terms of environment and conflict are present.
In many part of the world water resources traverse political boundaries. The management of these resources by necessity requires regional co-operation among riparian states. In areas where physical, climatological and meteorological conditions are extreme, water resources are scarce. The arid Middle East and North African (MENA) region is characterised by such conditions of extremeness. Coupled with physical water scarcity in the region, is the increasing demand for water by growing populations and expanding economic sectors. The MENA region is also characterised by political belligerency by many riparian nations (the riparian of the Jordan river watershed, the Tigris-Euphrates basin and the Nile River basin). Conditions of extremeness, scarcity, demand and political uncertainty, create unique challenges and opportunities for sustainable water management and environmental security.
The holding of the workshop was timely, as attention was focused on trans-boundary water resources management in the Dead Sea Basin (a part of the Jordan River watershed) shared

by Israel, the Palestinian Authority and Jordan. The World Bank has recently announced the call for a feasibility study on the concept of a Red Sea- Dead Sea conveyance project that will transport water from the Red Sea to the Dead Sea to rehabilitate the shrinking Dead Sea and provide desalinated water for consumption by the population of the riparian countries. The announcement signals an opportunity for trans-boundary co-operation and security in the region, but it also calls for caution on the potential environmental and social impacts of such a project.
The workshop analysed this project and the other aimed at saving the shrinking Dead Sea, as case studies for framing the issues of sustainable trans-boundary water management on a larger scale [5].

4. THE MEDITERRANEAN BASIN

Biological productivity in all terrestrial ecosystems requires light, water and nutrient resources, as well as an appropriate range of climatic and edaphic features. But whereas other ecosystems may be limited by light, nutrients or temperature, it is only the dryland ones that are water-limited. Furthermore, this limitation puts the drylands at a disadvantage and, excluding polar ecosystems, drylands have the naturally lowest primary productivity, compared to any other major terrestrial ecosystems [6].
This concept drives our attention towards those environmental conditions in which the scarcity of water drives the most negative consequences for what concerns the production of resources and the sustenance of populations. If we take into consideration the Mediterranean Basin (that region which geographically coincides with the area of distribution of the olive culture) it can be noticed that such an area can be defined, according to the climatic conditions, as a dry-sub humid one.
This region has a rich experience of conflicts and convergences, of cohabitation between pastoralist societies and sedentary structures, Islam and Christianity, diverging views or accomodating differences. In half a century its population will almost double from 285 million inhabitants in 1970 to 544 million around 2020. But if population stabilises in the Northern shores, it explodes on the Southern one with a population of 116 million in 1970 jumping to 331 million in 2020 [7].
At the same time water scarcity and drought in the region is on the rise as documented by the EC communication on the subject of the Council and the European Parliament.
Some patterns may look similar in the 21 countries on all its shores, such as the littoralisation of the economy and tourism and the resulting demands for water, which compete with agriculture. Water stress issues are widespread; but differences are also apparent.
The Northern shore is well developed, the Eastern Northern shore, more mountainous is still developing. The Western and Southern shores are on the margins of the immense dry-lands areas that run from the Atlantic shores to border of China. There is no doubt that aridity is one of the faces of the Mediterranean region. Henceforth, focusing on the governance of natural resources is well tailored to address strategically the challenge of environmental scarcity in this region.
Research has pointed to the sensitivity of the region's ecosystems to the overuse of dry-land resources in the western and southern regions of the Mediterranean contrasted with the very high population growth rate. Such a reality should not be ignored since it is a factor that exerts an overwhelming influence on the way people respond to constraints and stress [7].

The Mediterranean Region is already identified as a region with low water resources, since 7% of the world population lives there, but only the 3% of renewable water is available. Today 100 million people are suffering of water shortage, but this figure could raise up in 2100, since, according to model predictions, a strong demographic development is forecast.
Such a scenario could be worsen by the effects of the climate change. According to the most recent predictions, the consequences of the global warming within a range of 20/30 years are worrying. The climate variations will be characterised by heat and drought waves. Rainfall will be more abundant in the Northern shore (+20% in 2100) and less in the Southern shore (-20% in 2100). Rainfall will be more frequent in winter and less in summer while the demand is higher. The increase of the average temperatures will favor the evapo-transpiration and limit the availability of water in the snow/ice reservoir. Globally the availability of water in the Mediterranean region could lower by 30% by 2100. This will cause even more fragile conditions in the region [8].
Water shortages are already occurring in parts of the Mediterranean region and will inevitably spread and worsen in this century, particularly in the South and in the East. The countries where the water resources are the lowest per capita and most costly to mobilise and distribute will see the greatest increases in demand, and face the greatest risk of their resources shrinking. This will require them to make great efforts to adapt to the new Mediterranean situation [8].
The room for manoeuvre when setting water policies in the Mediterranean region is not large but it is real. These policies must be rebalanced by moving from the supply approach, which has no long to be predominant, towards demand management.
The transition from the baseline scenario to a sustainable development scenario can only be gradual, carried by the indispensable policy reforms, posting clear water integrated resource management objectives in all policies – particularly in structural ones – and generating the means for implementation, based on the development of sustainable efficiency plans and financial mechanisms [8].
Water is a local resource, but a proper management of water resources needs to be planned and implemented at the regional and international level, since the Mediterranean area is characterised by the presence of many watershed shared by at least two countries; some of which are in risky conditions, mainly for political reasons.
Since the beginning of this century it has been verified that water resources are at the top of the scientific, political and humanitarian concern all over the world. Some issues are particularly critical like the equitable sharing of a trans-border river; the quality of water and its availability within a framework of lower availability.
Such a low water availability in the Mediterranean region is influencing and related to other factors like:

- the demographic growth
- the food security
- the climate change and the degradation of the environment
- the difficult access to water resources in arid regions
- the not equal sharing of water resources between neighbor countries
- the non proper management of water resource [8].

The impact of those adverse conditions on populations and particularly on their well being (food, health and economic development) is of course negative and might be the reason of conflicts as it was in the Darfur region a few years ago.
As it was stated by the UN Secretary General on June 18, 2007, the Darfur conflict began as an ecological crisis, arising at least in part from climate change. It is no accident that the

violence in Darfur erupted during the drought. When Darfur's land was rich, black farmers welcomed Arab herders and shared their water. For the first time in memory, there was no longer enough food and water for all. Fighting broke out. The conclusion of the UN Secretary general was particularly important: “Any real solution to Darfur's troubles involves sustained economic development”.

5. CLIMATE CHANGE AND EXTREME EVENTS

Land and soil degradation have become a global problem, with very strong implications for land cover and land use. Thus combating this phenomenon has to be forward looking and has to address sustainable land use and integrate development in a future with pronounced climate change perspectives. Already today there are many regions in the world with extreme climate conditions. For instance we see prolonged droughts like in Northern Africa, extreme rainfall in areas like Indonesia and the Amazon Basin and hurricanes in the tropics [9].

Climate changing is an evolving picture, but it is nowadays widely accepted that the increasing concentration of the so-called greenhouse gases in the atmosphere is altering the Earth's radiation balance and causing the temperature to rise. This process in turn triggers a chain of events which leads to changes in the hydrological cycle components such as rainfall intensity and frequency, evapo-transpiration rate, river flows, soil moisture and groundwater recharge. The consequences include the lost of soil fertility and land productivity, but also salinisation, acidification and contamination in soils, besides other negative impacts on human activities.

However, the effect of global climate change on environment degradation is not fully understood yet. Climate change may adversely affect biodiversity and exacerbate desertification due to increased evapo-transpiration and likely decrease in rainfall in dry-lands, but on the other hand some dry-land species can favorably respond to this increase. Therefore, although climate change may increase aridity and desertification risk in many areas, the overall effect on an ecosystem is still difficult to predict [10].

A variety of scenarios could be imagined as a consequence of the increasing evidence of a global climate change. However, this phenomenon needs to be further understood and evaluated in all its consequences. The scientific community has come a long way in elaborating sophisticated models that help us to understand the real existence and the practical consequences of the climate change on environmental alteration.

The general degradation of the environment is also one of the reasons (if not the most important) for natural and man-induced disasters. A degrade environment means less protection for populations against extreme climate condition and consequent adverse and devastating weather and natural phenomena.

The number of disasters has globally risen from about 750 in the period 1989-84 to almost 2.000 in the 2000-2004 period. The number of people affected has risen from about 500 million to 1.4 billion during the same periods, sand the pace is likely to accelerate in coming years as climate changes translates into more intense storms, flooding, heat waves and droughts [11].

Disasters have a devastating effect on the concerned populations in terms of people killed and injured; infrastructure destroyed, increased marginalisation of weak economies and generally worse living conditions and by consequence forced migrations.

Natural disasters are normally independent from human activities, although the way by

which the environment is managed could play an important role in reducing or in enhancing their negative effects which, in regions with low natural resilience could cause heavy damages and induce populations to migrate.
Earthquakes, flooding, heat waves, forest fires, nuclear and industrial accidents have long lasting consequences on entire regions and their populations, including security concern. Prevention against these phenomena is essential, as well as national and international regulations, solidarity and emergency programmes.
On this matter, international organisations could play an important role and become platforms for trans-national collaborations, aimed at evaluating to what extent the not proper management of the environment could affect the living conditions of the populations in a given region.
A few years ago, several international organisations (UNDP, UNEP, OSCE and NATO) launched a cooperative partnership called ENVSEC, aimed at addressing environmental risks to security and at fostering stability through environmental cooperation. ENVSEC operates in a number of regions (Central Asia, Southern Caucasus, the Balkans, Eastern Europe) by conducting regional assessments which form the basis for regional initiatives like creating regional maps highlighting issues and areas where environmental problems influence security or are possible source for trans-boundary environmental co-operation.

6. CONCLUSIONS

Environment is the fundamental resource on which humans can rely for subsistence, development and well-being. It provides essential resources and services which interact with the human initiatives for the production of food, energy and for the creation of healthy living conditions. Ideally those interactions should evolve within equilibrate processes through which the exploitation of environmental resources does not disrupt the ecosystem.
The chain of environmental factors which play a fundamental role within the interaction man-environment, includes water, soil, and biological processes. The non proper management of these multi-factorial processes might trigger negative cycles with long-lasting negative consequences on populations, including their social and political stability.
Even though a single factor by itself does not normally induce a critical situation or a conflict, the interlinking of several factors can create the conditions by which the entire stability of an ecosystem and of populations living on it are put under threat.
Such a danger is more actual in those regions of the world where there is a tendency to demographic increase, combined with adverse conditions for the economic and the social development (water scarcity, land degradation, poverty and political instability). The same danger is nowadays more relevant due to the perspectives of climate change which, according to the most recent models, could even exacerbate the present un-favorable environmental conditions.
The basic approach to avoid negative consequences implies a variety of initiatives aimed at increasing the awareness of populations, and to support the decisions of governments and policy makers, with studies and analysis to design and plan progammes for an equilibrate exploitation of environmental resources and services. It is also essential the involvement of international organisations and agencies in order to face the challenge of preserving the environment towards new possible scenarios related to the global climate change and consequent phenomena.
It is recognised that environmental issues do not respect political and/or cultural borders, but they follow the natural development of natural phenomena and events. The factors which

may alter the equilibrium of the environment are various and interact at different levels regardless national or international borders. The security of the environment refers to a status in which the overall functions and services of the environment are accessible to populations leaving on it, without competition and/or conflicts with other subjects. The disruption of such a status might not be fully perceived as a potential threat to the security of populations. As a matter of fact, the term security is normally associated with criminal and military scenarios, but, as I tried to elaborate in this paper, the competition and tension originating from a degraded environment could put in danger the peaceful living of populations. For such a reason the political consequences of a non-stable/degraded environment should take an high rank in the agenda of governments, public institutions and international organisations.

NOMENCLATURE

ENVSEC: International Cooperative Partnership for Environmental Security
NATO: North Atlantic Treaty Organisation
OSCE: Organisation for Security and Cooperation in Europe
UE: European Union
UN: United Nations
UNCCD: United Nations Convention to Combat Desertification
UNDP: United Nations Development Programme
UNEP: United Nations Environment Programme

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