



The 7th International Scientific Conference
**“DEFENSE RESOURCES MANAGEMENT
IN THE 21st CENTURY”**
Bra ov, November 15, 2012



METEOROLOGICAL AND CLIMATIC RISKS – THREATS TO THE NATIONAL SECURITY

Valentin CIUCHEA

Maritime Hydrographic Directorate, Romanian Naval Forces, Constan a, Romania

Abstract:

The aim of this paper is to identify and categorize the meteorological and climatic risk phenomena most present on the Romanian territory and to assess the threats and their effects on the national security. In a restrictive manner these climatic risk phenomena are commonly included in the generic term of so-called climate change and sometimes even reduced to the most known global warming. It must be said that they occurred long before the actual perceivable effects of the climate change. By the other hand the climate change evidentially exacerbated the frequency and the intensity of the hazardous meteorological and climatic risk phenomena.

Key words: meteorological/climatic/atmospheric risk/hazard phenomena, climate change, global warming, national security.

1. Introduction

Up to now the terminology used for defining the natural phenomena that cause human and material damages is not united. The Secretariat of the International Decade for Natural Disaster Reduction (IDNDR 1990-2000) issued in 1992, on behalf of UN, an *Internationally agreed glossary of basic terms related to Disaster Management* [1].

In this glossary the hazard is defined as “a threatening event, or the probability of occurrence of a potentially damaging phenomenon within a given time period and area”. According to the same glossary the vulnerability stands for “degree of loss (from 0% to 100%) resulting from a potentially damaging phenomenon”.

Also, the risk means “expected losses (of lives, persons injured, property damaged, and economic activity disrupted) due to a particular hazard for a given area and reference period. Based on mathematical calculations, risk is the product of hazard and vulnerability”.

It means that hazard refers to the cause of a destructive phenomenon, while the risk is related to the consequences of such an event, implying of course a hazard that produces it.

The disaster is defined as “a serious disruption of the functioning of society, causing widespread human, material or environmental losses which exceed the ability of affected society to cope using only its own resources. Disasters are often classified according to their cause (natural or manmade)”.

METEOROLOGICAL AND CLIMATIC RISKS – THREATS TO THE NATIONAL SECURITY

Climate change means “change observed in the climate on a global, regional or sub-regional scale caused by natural processes and/or human activity”.

It is reflected by the changes of the mean values of the parameters that define the climate (temperature, precipitation, winds, pressure etc.) and includes the global warming, which means increased average temperatures near the Earth’s surface and in the troposphere, due to natural and especially anthropic causes.

In spite of the internationally agreed definitions of terms, in the technical literature it continues to be used many definitions of hazard, risk, disaster, catastrophe, calamity, vulnerability. The terms hazard and disaster are used the most in the Anglo-Saxon literature, while risk and catastrophe in the French one.

In synthesis, one can conclude that:

- a) hazard represents the potentially dangerous phenomenon, of high intensity and which cannot be predicted;
- b) risk means the calculated probability of a hazard to produce human and material damages;
- c) disaster represents the real damages caused by the hazard occurrence.

Another debate in the technical literature concerns the use of the terms meteorological/climatic/atmospheric risk phenomena.

In meteorology a phenomenon has a sporadic irregular presence acceptance; if there are regularity features, one uses the term climatic element, such as the air temperature.

One includes in the climatic risk phenomena the cold and heat waves or the temperature inversions, which are variations of the climatic element air temperature. Considering that these sudden and intense variations of the air temperature occur only in certain moments, their inclusion into the phenomena category and not in the elements one seems to be justified.

One more debate is related to the use of the term climatic risk phenomena. The climate is defined as representing the mean values of the meteorological elements calculated on a minimum 30 years period. But by using average values one loses the most important feature of a phenomenon, its intensity at a given moment and in a specific area.

In order to avoid such a dispute Bogdan O. and Niculescu E. [2] use the phrase “climatic risk phenomena”. Also, Moldovan F. [3] proposes the term “dangerous atmospheric phenomena” and Ciulache S. & Ionac N. [4] the term “risky atmospheric phenomena”, which although are more comprehensive and avoid controversies, are less used on the international scale. In the present paper the terms “meteorological risk phenomenon”, “climatic risk phenomenon” and “climatic risk factor” will be used in the “climatic risk” acceptance.

2. Types of climatic risks on Romania’s territory

As a result of its position in the temperate continental climate region, on the Romanian territory can appear a large variety of climatic risk phenomena. They are a part of the Earth’s climatic hazards/risks, their main genetic factors being the atmosphere general circulation, the regional, local and seasonal particularities of the solar radiation and the features of the active subjacent surface. Also one must mention the Carpathians range as a barrier against air masses flow.

There are many studies on the international and national scale trying to classify the natural risk phenomena, based on a single or a mix of criteria.

One of the most complex classifications using multiple criteria was developed in 1991 by E. Bryant [5]. It was used by some researchers (Moldovan, F. [3], Croitoru, A.,

METEOROLOGICAL AND CLIMATIC RISKS – THREATS TO THE NATIONAL SECURITY

Moldovan, F. [6]) as a starting point in identifying and categorizing the climatic risk phenomena on the Romanian territory.

In this paper, based on the typology defined by Bogdan O. and Niculescu E. [2], we categorized the most threatening climatic hazards/risks to Romania's national security components.

2.1. Winter climatic hazards/risks, that have as a common feature the preservation of negative temperatures, which include:

a) winter thermic hazards/risks (polar or arctic cold waves, massive coolings, temperature inversions, minimum temperatures below -20°C , -30°C etc.);

b) glacial hazards/risks (frost, hoarfrost, rime, glazed frost, ice deposits, heavy snowfalls, snow cover, snow slides);

c) aeolian hazards/risks (blizzard, crivetz, foehn), strong wind at speeds of over 11 m/s.

During the winter there are also possible pluvial and thermic risks specific to the warm season, such as warm waves and heavy warm rainfalls that cause winter floods.

2.2. Summer climatic hazards/risks, characterized by positive temperatures and intense insolation processes, which include:

a) summer thermic hazards/risks (tropical heat waves, massive warmings over 30°C , maximum temperatures over 35°C , 40°C , natural forest fires);

b) pluvial hazards/risks (heavy rainfall, heavy continuous rain, heavy or violent rain showers);

c) aeolian hazards/risks (dry winds - suhovei, duststorm – Vântul Negru), strong winds at speeds of over 11 m/s;

c) associated hazards/risks (showers, hailstorms, squalls, thunderstorms, tornadoes).

2.3. Transition seasons (spring and autumn) climatic hazards/risks, whose characteristic is the alternation of the positive and negative temperatures. This leads to the interference of the winter and summer hazards/risks, a phenomenon that continues until the prevailing direction of positive or negative temperatures is set.

Not all the climatic phenomena during these seasons can be considered a hazard or risk. They often occur associated. The most specific are:

a) polar cold waves;

b) the earliest (autumn) and the latest (spring) frosts, white frosts, snowfalls and blizzards;

c) tropical heat waves associated with dry winds, which can produce drought and depletion of soil water reserves;

d) tropical heat waves associated with spring rains, causing melting of the snow layer. As the rivers are frozen, they cannot absorb the amount of water coming from snow melting and upstream high regions rains, so downstream floods occur, often catastrophic ones.

2.4. All the year round climatic hazards/risks, which comprise:

a) excess of precipitation, which generates excess of moisture and flooding;

b) precipitation deficits, which generates dryness and drought, which are the most complex climatic hazards/risks possible in any season;

METEOROLOGICAL AND CLIMATIC RISKS – THREATS TO THE NATIONAL SECURITY

- c) strong winds (11-16 m/s) and violent winds (over 17 m/s), which can cause numerous damages to the environment and society;
- d) advection, radiation, evaporation / mixing, urban or industrial and frontal fog.

3. Climatic risks threats to the Romania's national security

In its new acceptance national security means much more than defense against armed attacks of other states or lately against the terrorism and cyber-attacks. Natural disasters due to climatic risks, intensified or not by the global warming and climate change, can threaten in a very serious way the national security.

The most recent severe climatic risk phenomena occurred on the Romanian territory (such as the massive warming in the Summer of 2000 [7], heavy rainfalls in July and September 2005 [7], [8], the heat waves producing floods in the winter of 2006-2007 [7], the heavy snowfalls and blizzards in February 2012) drawn attention to the consequences of climatic hazards and climate change, especially to the destabilizing effects of floods, droughts, blizzards and storms.

On the international scale, the climatic risks can cause humanitarian disasters, political violence, and the undermining of weak governments. On the national scale, the effects of climatic hazard phenomena could simply overwhelm disaster-response capabilities of the national and local authorities.

The starting point is to recognize that some climatic hazards and climate changes are inevitable and to propose a set of feasible and affordable measures in order to reduce the vulnerability to the predictable effects of such hazard phenomena.

On the other hand, also considering our membership to the EU space, we should also draw the attention to the reduction of greenhouse gas emissions, bearing in mind that reductions in the long run are the solution in order to avoid global climatic problems.

The latest climatic hazards evolution also demonstrated that we should define as clear as possible, from our national point of view, the critical infrastructure realms and items.

Climate change and the latest climatic risks cannot be connected directly with each other as obviously as we would be, but they gave us a visual image of what climate change, which scientists predict will exacerbate the intensity and frequency of hazardous weather events, might mean in the future.

Specialists do not necessarily attribute single hazardous meteorological or climatic phenomena to climate change; at most, they would affirm that climate change makes severe weather conditions more possible. It is still a much debated topic in the scientific community whether climate change has been responsible for the increased number and intensity of the severe weather phenomena.

On the other hand, it became obvious that climatic risks and climate change can be threat multipliers to the national security causing instability and they present significant national security challenges.

At this time the scientists can predict that the effects of some severe and extreme weather phenomena of climate change by kind, likelihood, and impact on different sectors will become more frequent, more widespread, and/or more intense during the 21st century.

In the short run it is possible that some countries or areas in northern Europe, the Arctic and Russia undergo positive effects of a warming climate, but per total the long run consequences upon all regions will probably be negative if nothing is done in order to further reduce emissions of greenhouse gases.

METEOROLOGICAL AND CLIMATIC RISKS – THREATS TO THE NATIONAL SECURITY

Due to its location Romania is not particularly vulnerable to climatic risks and climate change, still it has to cope with the negative effects of floods, droughts, heat waves, blizzards, storms etc. Each of these phenomena has potential consequences, direct and indirect, for our national security.

For example, as a consequence of global warming and anthropic activities, the southern parts of Dobrogea and Oltenia are already in a process of desertification, which may be a threat to the national security due to the possible decline in regional food production.

Climatic hazard phenomena may overwhelm the capacity of local or even national authorities to respond. In emergency situations they may require support from the national military or even a larger international response. Despite lacking human intentionality, these phenomena can threaten national security.

Just as armed attacks, extreme effects of climatic risks can endanger or even kill a large number of people, damage critical infrastructure in affected regions and cause civil disorder. They can produce large scale disruption so that local public transportation, health, law enforcement and emergency response units could not be able to cope with the threat.

Extreme climatic hazards exacerbated by climate change may have a more direct impact on national security by severely damaging critical military infrastructure, this way diminishing or undermining national defense resources. A compound effect in such a situation would be that a part of military assets couldn't be any more called upon in those domestic emergencies.

4. Conclusion

The debate about climatic risks and climate change has underlined until recently the important economic consequences in comparison with the costs of action, and whether one can afford to address this issue.

The recent extreme weather events suggest a different way of thinking in this respect. Even if the macroeconomic costs are low in the context of the economy, the human and political consequences are important and painful.

Whether or not the latest climatic hazard phenomena are linked to global warming, climate change will probably produce more of these kinds of events, characterized by concentrated costs to particular areas and people that lead to severe local effects and cascading consequences for others.

The concentrated effects of the climatic risks have important national security implications in terms of the direct threat from extreme climatic risks as well as by the indirect consequences.

On the local and regional scale, the extreme climatic risks intensified by climate change can endanger large numbers of people and damage critical infrastructure, including military, thus requiring mobilization and use of military assets.

One must also recognize that the already existing concentration of greenhouse gases made the climate change inevitable.

National policies should thus support risk reduction and adaptation.

The most important adaptation policies that should be supported are early warning systems, emergency response plans, building codes and evacuation and relocation schemes.

METEOROLOGICAL AND CLIMATIC RISKS – THREATS TO THE NATIONAL SECURITY

References:

- [1] * * * (1992) *Internationally agreed glossary of basic terms related to Disaster Management*, IDNDR 1990-2000, United Nations Department of Humanitarian Affairs, Geneva
- [2] Bogdan, O., Niculescu, E. (1999), *Riscurile climatice din România*, Academia Română, Inst. Geogr., Compania Segă – International, pp. 280
- [3] Moldovan, F. (2003) *Fenomene climatice de risc*, Editura Echinoc, Cluj-Napoca
- [4] Ciulache, S., Ionac, N. (1995), *Fenomene atmosferice de risc*, Editura tiin ific , Bucure ti
- [5] Bryant, E.A. (1991), *Natural hazards*, Cambridge University Press
- [6] Croitoru, A., Moldovan, F. (2005), *Vulnerabiliy of Romanian territory to climatic hazards*, Analele Universit ții de Vest din Timișoara, Seria Geografia, XV/2005
- [7] Dragot , C.S., Grigorescu, I., Dumitra cu, M., Dumitra cu, C. (2009), *Regionalization of the main climatic hazard phenomena in the south-west development region, Romania*, Proceedeengs of the 11th International Conference on Environmental Science and Technology, Chania, Crete, Greece, 3-5 September 2009
- [8] Grigorescu, I., Dragot , C.S. (2008), *Regionalization of climatic hazard/risk phenomena and their environmental impact in Bucharest metropolitan area*, BALWOIS 2008 – Ohrid, Republic of Macedonia
- [9] * * * (1999), *WMO/TD No. 955, Comprehensive Risks Assessment for Natural Hazards*, World Meteorologic Organization, reprinted 2006