

## CONSEQUENCES OF ECOLOGICAL DISASTERS UPON HUMAN SECURITY

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*It is well-known the surrounding environment and the human society often bears the action of some extremely dangerous phenomena with diverse origin, natural or human, able to produce destructive and brutal detuning in certain established systems or situations. These events (earthquakes, volcanic eruptions, tsunamis, land slides, storms, floods, drought, fires, technological accidents, conflict situations, etc.) usually occur unexpectedly and can cause many victims, a large amount of material damage, ecological unbalances and even severe disturbances of the psychological and moral state of the population being under the incidence of the respective phenomenon.*

*The ecological disasters' summing-up shows this genre of events has continuously multiplied, with more apocalyptic and diversified effects than ever. Moreover, these phenomena changed their probabilistic structure and intensity as to the same type of phenomena recorded a decade ago, this making harder any preventive measure.*

**Keywords:** *environmental disasters; risk; security; vulnerability; effects.*

**D**isasters are a permanent threat for the sustainable development and annually cause many human casualties and material losses; also, the beginning of this millennium is characterized by a greater impact on human activities. For the 1980-2000 period, there are estimations that 75% of the world's population was damaged at least once time by a disaster (earthquake, cyclone, flood, drought, etc.).

In 2005, UNISDR registered an increase by 18% in the mortality caused by disasters in the entire world leading to the loss of 91,900 human lives. Annual statistical reports are uncertain and should not be used to draw short-term conclusions about the disasters' occurrence and impact. Still if we use the database of the Center of Research for

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Epidemiology Disasters (CRED) for a long term statistical perspective, some trends become stronger allowing us to draw some tentative conclusions.

Therefore, out of the 9,000 disasters registered in this database starting with 1900, about 80% took place in the last 30 years and the trend is continuously ascending especially when it comes to hydro-meteorological events as drought, floods, hurricanes, tsunamis and others. Still, the statistical trend should be taken with a certain reserve because a great part of the growth – that cannot be quantified – is undoubtedly owed to enhanced reports and initiation of active collection of information by the US Bureau for Foreign Assistance in Disaster Situations from 1960, and CRED from 1973.

The planet is being confronted with unprecedented-sized disasters, so, in 2006, the United Nations International Strategy for Disasters Reduction (UNISDR) counted 395 disasters resulting in 21,342 dead people, 130 million people affected and material losses estimated to billions \$.

Although, if we frame these predictions under the context of increasing population number, urbanization and many regional populations inability to escape from poverty, seems reasonably to believe that will exist an growth of disasters number and ecological emergencies in the following years.

Traditionally, three types of disasters are identified: natural, technological and social. Natural violent events (earthquakes, floods, hurricanes and land slides) have a peculiar impact over humans. Technological disasters are generally caused by human errors or omissions. Deliberated human acts as wars, revolutions or terrorist acts constitute causes of huge human casualties and material losses constituting themselves as social disasters. Technological ecological disasters can be: chemical (appear when by a violent explosion of some fuel chemical substances are produced destructions through chemical processes), nuclear or thermo-nuclear (characterized by accidental release of radioactive substances after a nuclear accident leading to the growth of radiations level over international levels of safety), colliers (appear when are accumulated mine gases or coal dust which is self firing up and reacts explosively in contact to the air).

Recently, got into discussion a forth type of disaster – ecological, that can be peculiarly caused by peoples and damages on multiple ways over atmosphere, land, flora and fauna. Types of hazards considered as owing potential to provoke ecological disasters are considered to be: armed conflict, cyclone, drought, earthquakes, epidemics, explosions, fires, flows, land slides, major accidents on communication ways, harmful agents for the agricultural cultures, refugees or displaced persons into the same country, tsunami and volcanic eruptions.

### 1. Natural ecological disasters

Phenomena increasing society vulnerability in front of natural disasters are: excessive urbanization, environmental decay, lack of local specialized structures in disasters' management, poverty, unstable and chaotically developed economies. In Romania, if are visualized the statistics concerning natural ecological disasters happened in-between 1980-2010<sup>1</sup> is seen these had general effects as are expressed in the below table:

Categories of damages	Numerically
Number of events	74
Number of killed peoples	902
Range of yearly killed peoples	29
Number of affected peoples	412.998
Number of yearly affected peoples	13.323
Economic prejudices ( thousands US\$)	3.536.618
Yearly economic prejudices (thousands US\$)	114.084

Table 1. General consequences of Romania's disasters in-between 1980-2000

From the above table, we can identify as effects of ecological disasters of variable intensity: human mortality, affected population and economic damages, which every as part affects regional or national security.

Also, is also seen the range of disasters on yearly occurrence and specific types our country is submitted to:

Disaster type	Yearly average
Drought	0,06
Earthquakes	0,10
Epidemics	0,10
Extreme temperatures	0,55
Flows	1,26
Invasion of harmful insects	...
Land slides	0,03
Volcanoes	...
Storms	0,29
Devastating fires	...

Table 2. disasters' yearly average

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<sup>1</sup> Romania – disaster statistics, <http://www.preventionweb.net/english/countries/statistics/index.php?cid=141>

From the below table is seen that flows are the most frequent ecological disasters that manifests in our country.

The types of ecological disasters' consequences over security are immediate, medium and long term. Generally, ecological disasters result in the affected area the following effects: epidemics, lack of water supplies, crowded areas with displaced persons, refugees, the diminution of food resources and famish. There was observed an increase of health effects in the situation of natural disasters owed to the climate modifications through a raised vulnerability of population, and also a better registering of morbidity and mortality data caused by the diseases transmitted by vectors, by contaminated water etc.

In Romania, effects of climate changes especially impacted over agriculture. In the last decade, drought and flows periods became more frequent with negative consequences over agricultural productivity peculiarly for wheat and maize, species with the bigger heaviness in the field cultures structure<sup>2</sup>.

The extension and intensity of extreme meteorological phenomena, annually, diminishes the agricultural production with at least 30%-50%. In Romania, on about 14.7 millions hectares of agricultural field, from which 9.4 millions hectares arable field (64% from the arable surface), soils are damaged into a higher or smaller degree by frequent droughts, for long periods and in consecutive years<sup>3</sup>.

Locally, **drought** damages: populations' health, human comfort at home, work and in the urban space; surrounding environment decay; buildings' integrity; overstressing of potable water infrastructure and sanitation; drought has direct and indirect effects over health<sup>4</sup>. Therefore, over populations' health are: - *direct effects* over: the older people, children and persons suffering by respiratory and cardiovascular malfunctions being affected by extreme temperatures; the most affected will still be the peoples from the urban areas because of "isles of heat" created by agglomeration of buildings, concrete and roads; high temperatures ease ozone concentration at soil's level growing air pollution problems; and - *indirect effects*: surrounding environment deterioration; restraint or degraded resources of water and food will affect over human alimentation because of wastage of agricultural fields or another consequences; influence of biological bodies and processes related to proliferation of infectious diseases transmitted by the harmful ones; the increase of oceans and seas level will lead to the erosion and destruction of some important ecosystems as swamps and coral reefs; climatic changes can grow the air pollution level by accelerating chemical reactions that produce photochemical oxidants.

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<sup>2</sup> Istoria anilor de arșiță în România, Vezi: <http://www.ecomagazin.ro/istoria-anilor-de-arsita-din-romania/>

<sup>3</sup> Idem.

<sup>4</sup> *Hazarduri climatice – seceta*, <http://www.pagini-scolare.ro/Geografie-si-geologie-planuri-lectii-si-studii/HAZARDURI-CLIMATICE-SECETA/menu-id-62.html>

**Earthquakes and land slides**<sup>5</sup> can produce over buildings and ensemble of constructions negative effects, sometimes disastrous, by: total or partial destruction (collapse) of vulnerable buildings; destruction of some (structured or unstructured) component elements of some public networks or their damage; destruction/damage of some equipments and installations in buildings, some public networks of vital utility (water, gases, electric energy, hitting energy, transport, communication supply) and some areas isolation; fires and explosions on buildings or districts, localities; blockage of some intersections of main roads following some buildings collapse and the hindering of salvation-rescue operations.

By the place and size of earthquake or land slide, strongly related to some specific local conditions, seismic movements and landslides can lead to the apparition of some effects or complementary (collateral or secondary) disasters as: flows after the damage or destruction of some hydro-technical works, blockage or deviation of running waters courses; chemical or radioactive contamination after some chemical or nuclear accidents; explosions and fires following some technological accidents; accidents in road and rail transport as direct consequence of seismic movement or by the impairment or destruction of road or rail ways.

*Earthquakes effects on population* can manifest by: direct action (casualties and injuries), after the impairment and collapse of some buildings or their elements, furniture and objects; fires, explosions, landslides and post-seismic flows; indirect action (casualties and injuries, psychological effects) after some secondary phenomena produced by earthquakes and/or landslides (chain fires, rumors, post-seismically psychic reactions, etc.)<sup>6</sup>.

We must bear in mind that along the previous earthquakes produced in our country's territory were also active a large part of the mentioned effects but the most painful are caused by the buildings' collapse. So, to the earthquake from November 10, 1940 (M=7.4) registered about 500 victims (after some authors 400 casualties and 300 injured peoples) and total wastages about 10 millions US\$. In the earthquake from March 4, 1977 (World Bank Report, 1978), (M=7.2) reported 1,570 casualties, 11,300 injured, and material losses over 2 billions \$ = 5% GDP, over 50% for establishments, in Bucharest being 90% from the victims and 70% from the losses (1.4 billions US\$)<sup>7</sup>.

**Epidemics** produce as direct effects illness and death over population. Beside these strictly medical effects are developing also important indirect effects as: political, psychosocial, economic, and media, these determining one each over. Epidemics can worsen traumatic situations or the ones endangering life as the ones produced along famish, in emergency situations and in refugees' camps.

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<sup>5</sup> *Avarii și pierderi produse de cutremure*, <http://inforisx.incerc2004.ro/avariile.htm>

<sup>6</sup> Idem.

<sup>7</sup> *Avarii și pierderi produse de cutremure*, <http://inforisx.incerc2004.ro/avariile.htm>

**Extreme temperatures** induce negative effects over population health, economic by damaging agricultural cultures and arable terrains.

*Health effects induced by extreme temperatures* are: morbidity and mortality rate increase by diseases transmitted through vectors; morbidity and mortality increase owed to digestive diseases; morbidity and mortality increase through diseases transmitted by water. In the temperate climatic areas, are registered morbidities and mortalities owed to cardiovascular and respiratory diseases while the waves of high temperatures more than in the periods with very low temperatures.

*UV indirect effects:* over climate, over food, over air pollution and vectors transmitting a series of diseases.

**Flows** specific to the waters from Romania can generate over security the following types of negative effects<sup>8</sup>:

a) Economic, respectively destructions or breakdowns to: industrial objectives, road and rail ways, localities, oil, water or gases ducts, electrical and telecommunication lines, bridges and platforms, cultures and forested areas damaging, animal breeding sector.

b) Social: lost of human lives, population evacuation, danger of epidemics, school process interruption, cultural goods destruction, panic provocation, reduction of development rhythm of the affected areas and the diminution of population revenues.

c) Ecological: ambient environment decay, surface and subterranean waters pollution, soils pollution, excess of humidity, versants decay, destruction of flora and fauna.

d) Indirect: production processes interruption, produces delivery delays, expenses for defense along the inundations, expenses for normalizing life after flows, exports reduction.

Risks concerning strong blizzards in our country are assembling with the ones existent in other parts of the world and are represented by losses in human lives, circulation and population supply interruption, breakage of electrical cables, uprooted trees, etc.

*Storms effects over economic-social activities:* casualties; blockage of harbors and airports activities; telecommunications and energy transport impairments; damages in agriculture; damages in the forestry fund, road traffic perturbation owed to the uprooted trees felt down on the road; impairment of buildings; forests, agricultural cultures and some buildings conflagration; perturbation of economic agents supply; phone connections and electric power supply interruption of localities; road accidents producing.

*Snow-drift effects over economic-social activities* can be *direct*: casualties, perturbation or blockage of road, rail, air and navy traffic; road accidents producing; impairment or destroy of some constructions under the action of snow layer weight or avalanches; damages in the forestry fund (conifer forests) owed to trees rupture under snow deposits; losses in the hunting fund; also it manifests *complementary effects*: partial or total

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<sup>8</sup> *Scurgerea apelor în exces – inundații. Cauze manifestări, caracteristici.* Vezi: <http://www.isudobrogea.ro/inundatii.pdf>

isolation of some localities; perturbation or interruption of raw materials, fodder etc. supply of some economic agents; perturbation or interruption in population supply with first necessity goods; decrease of caloric comfort in the dwelling places provisioned by liquid fuel or coal; interruption of educational process; producing some road accidents; perturbation in medical assistance assurance; disturbance of firemen intervention; increase of illness number and casualties owed to the prolonged action of cold.

We continue analysis of the consequences on national plan owed to main types of natural ecological disasters with the biggest occurrence on national territory in the below table. For this, we will quantify effects over security dimensions on types of events taking into account their impact on a scale from 0 to 3, where 0 represents those effects inexistence, 1 – low, 2 medium and 3 – high level of damage.

	Type of natural disaster						
	Drought	Earthquake	Epidemics	Extreme temperature	Flows	Landslide	Storms and snow-drift
<b>Type of effects on:</b>							
<b>a) Social security:</b>							
Casualties	1	2	3	2	2	1	1
Affected population	3	3	3	3	2	1	1
Refugees	1	2	2	0	2	1	0
Famish	3	1	2	0	2	0	1
Increase of poverty rate	3	1	2	3	2	1	1
Medical infrastructure damage	1	3	0	1	3	2	2
Educational infrastructure damage	0	2	3	3	3	1	3
Potable water infrastructure damage	2	1	2	3	3	1	3

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Transport infrastructure damage	0	3	0	1	3	3	3
Energetic infrastructure damage	0	3	0	2	3	3	3
<b>b) Ecological security:</b>							
Pollution	0	1	1	0	2	1	1
Damaged arable fields	3	0	1	3	3	2	2
Damaged forests	3	0	0	3	3	2	2
Protected areas affected	3	0	0	3	3	3	2
Potable water	3	3	3	3	3	3	3
<b>c) Economic security:</b>							
Economic flow intrusion	1	3	3	3	3	1	3
Affected dwellings	0	3	0	1	3	3	3
Indirect economic losses	3	3	3	3	3	3	3
<b>d) Human security</b>							
Psychosis	1	3	3	2	3	3	3
Chronic diseases	3	0	3	3	0	0	0
epidemics	3	2	3	3	3	1	0



<b>e) Informational security</b>							
Communication and information networks damage	0	3	0	3	3	3	3
<b>f) Food security</b>							
Potable water	3	3	3	3	3	1	2
Food	3	3	3	3	3	0	1
Agricultural culture	3	0	0	3	3	3	3

Table 3 – Effects of natural disasters over security

We continue the analysis phase of disaster risk on Romanian territory and we take into consideration as items the affected population, casualties and economic losses and we see from the below tables (4a, 4b and 4c) that flows proved to be the most preponderant and devastating ecological disaster because it affects the most peoples, the wider areas and has the highest economic costs.

Disaster	Year	Number of affected peoples
Flow	1997	122,320
Flow	2000	60,431
Flow	2005	30,800
Flow	2006	17,071
Flow	1991	15,000
Flow	2005	14,669
Flow	2004	14,128
Flow	2004	14,000
Flow	2010	12,237
Flow	1998	12,000

Table 4.a. Affected population

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Disaster	Year	Number of affected peoples
Flow	1991	108
Extreme temperatures	2006	68
Extreme temperatures	1998	60
Extreme temperatures	2010	52
Extreme temperatures	2009	43
Extreme temperatures	2007	38
Flow	2005	33
Flow	1998	31
Flow	2006	30
Extreme temperatures	2007	30

Table 4.b. number of casualties

Disaster	Year	Cost (thousands US\$)
Flow	2010	1,111,428
Flow	2005	800,000
Drought	2000	500,000
Flow	2005	313,000
Flow	2005	200,000
Flow	1998	150,000
Flow	2001	120,000
Flow	1997	110,000
Flow	2000	100,000
Flow	1991	50,000

Table 4.c. Economic losses

Regarding the general national analysis of risks to ecological disaster on Romanian territory fulfilled by these statistics, we considered to be useful to continue the analysis on a single type of risk, the one that affected the most hard the national territory until present.

In the late years, our country's territory was damaged by some flows producing with catastrophic followings. Therefore, in 2005, flows affected Banat, Moldova and Muntenia; in 2006, the localities situated in Danube Meadow; and, in 2008, Moldavian counties situated in the

basins of Prut and Siret rivers. These inundations produced casualties, infrastructure and agricultural culture destruction, and ambient environment decay.

Situation was harder so entire localities were erased from the face of the earth or had to be totally or partially moved. Practically, the last decade marked an unprecedented increase as frequency and spreading, as destructions produced by flows, under all their manifestation forms. Iași County was strongly damaged in August 2005 by the inundation produced by Siret river in Pașcani municipal city and its suburbs, and in July – August 2008, especially in the localities from the same Siret river<sup>9</sup>.

*Causes of inundations producing* are seen to be: pollution generated by human activities leading to substantial climatic changes, greenhouse effect and global warming; severe diminution of forested surfaces following the unreasonable cuttings off; localities and some economic-social objectives placement in floodable areas of water courses; insufficiency of some defense works against flows (aprons, barrages, etc.).

*Flows manifestation forms are:* produced by natural overflow of natural watercourses owed to debits growth and blockages produced by ice fields, floaters, alluviums; produced by **drifts from versant** because of rich precipitations of rains in short time, produced by **accidents to the hydro-technical constructions** (damage or destruction of barrages or aprons).

**The effects of inundation producing: are direct or indirect effects** over: **population**, and also its mobile and immobile goods; **social objectives, productive capabilities** (commercial societies, industrial platforms, electric plants, agro-zoo-technical ranches, fisheries establishments, harbors and so on); **barrages and other hydro-technical works** representing sources of risk in downstream if accidents are produced; **road, rail or navy communication ways; electric, gases supply networks and systems of supply for water and sanitation; stations for water treatment and depuration; telecommunication networks** and others; **natural environment** (aquatic ecosystems, forests, agricultural fields, localities with the built-up areas and so on)<sup>10</sup>.

*Ways to combat flows* are as follows: the diminution of global warming effects by reducing pollutant emissions, remaking the forested surfaces, etc.; the establishment of works for defense against flows (aprons, barrages, etc.) and the maintenance of the existent establishments; the development of meteorological and hydrological informational system consisting in observation, measurement, registration and processing of meteorological and hydrological data; prognoses, warnings and alarming elaboration and their transmission to the involved factors and to the exposed population; the forbidden of houses or economic-social objectives placement in floodable areas and the decommission of the existent ones; the maintenance of systems for water absorption from existent rains at localities level

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<sup>9</sup> *Inundațiile – cauze, forme de manifestare, efecte, modalități de combatere*, Vezi: <http://www.isujis.ro/files/lectie-liceu.pdf>

<sup>10</sup> Idem.

(sanitation systems, culverts, channels); the maintenance of watercourses bed (vegetation removal, water beds cleaning, obstacles removal and releasing the watercourse flooding).

## **2. Ecological disasters generated by technological accidents**

Technological hazards importance grew consequently to the economic-social activities development while the new developments of science and technology are assimilated and this leads to transformation of technological materials and processes. Technological hazards leading to disasters produce the interruption or bad perturbation of society functioning and generates casualties, big material losses and environment destruction.

Technological hazards are produced by the design errors of the industrial facilities, by the barrages breakage, by the high level of depreciation of those or/and enterprises' defective management or explosions. Some accidents attended by casualties and air pollution are related to the transport of dangerous substances. There are also situations when technological accidents as barrages breakages or explosions of some facilities are initiated by natural causes (flows, earthquakes) taking place a succession of extreme complex elements as chain reactions. Some technological disasters can have Transfrontalier effects and also Romania can be damaged by such events from our neighbor countries territory or by armed conflicts.

In Romania there exist 245 industrial objectives part of major risk category. The most of them are tided to the chemical and petrochemical industry (144 units)<sup>11</sup>.

Under this category are comprised: chemical, biological, nuclear accidents; subterranean accidents; faults to the hydro-technical construction or ducts; mass fires; major accidents to equipments and major technological installations; big failures to the installations of communication networks, etc.

30% from our country's territory is under technological risk and 8,000,000 persons – are in areas of technological risk. As regards the chemical accident the most vulnerable categories of population are: children because they aren't assured with protection means, intoxication and lethal doses is smaller and they don't have abilities to react when occurs a chemical accident; old peoples because their capacity to react is reduced and the percentage of ill people or having chronic illnesses is high<sup>12</sup>.

After a short analysis over the technological accidents that represent sources of ecological hazards result few categories of such event as follows:

Chemical accident can be defined as uncontrolled emission in the surrounding area of some industrial harmful substances at higher concentrations than maximum admitted ones endangering population's health.

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<sup>11</sup> Dan Bălțeanu, Sorin Cheval, Mihaela Șerban, *Evaluarea și cartografierea hazardelor naturale și tehnologice la nivel local și național – Studii de caz*, Institutul de Geografie al Academiei Române, București, p. 7, Vezi: <http://www.racai.ro/RISC1/DanBalteanu.pdf>

<sup>12</sup> Hazarde tehnologice în România, <http://andreivocila.wordpress.com/2010/11/24/hazarde-tehnologice-in-romania/>

World's Health Organization (WHO) appreciates that around the world produce few chemical accident every week. Fortunately, only very small percentage from those endangers peoples' health from surrounding places. Some accidents produced in the last decade were accompanied by the emission of very harmful substances following many casualties among human beings and many intoxicated peoples.

Chemical accidents can be: *minimum chemical accidents* – when into a toxic source installation (source of chemical danger) is produced a controllable failure followed by the release of chemical substances in the surrounding environment; *maximum chemical accidents* - when to the toxic source installation is produced an uncontrollable failure. Under this circumstances, from the toxic source installation is released in the surrounding environment a big part or the entire quantity of toxic substance.

Areas of chemical risk are situated in those points on our country's territory where exist economic important agents that stocks, process, transport or produce dangerous (toxic) substances. There are estimations at national level exist about 50 such source risk points without emphasizing transports number and frequency of such substances.

**Nuclear accident** represents the event affecting installations of a nuclear reactor or of a nuclear-electrical plant provoking population and surrounding environment irradiation and contamination over the limits allowed by the law.

Radiations are present in nature and can be artificially produced without being different as type or effect. By work's specific there exist a great number of persons exposed to ionizing radiations in the research field, in the energetic or nuclear industry, etc.

**Sources of nuclear accident** are: artificial satellites having at board generators of electric energy in direct conversion, nuclear reactors with plutonium or enriched uranium; airships transporting radioactive substances with high activity or nuclear weapons; deposits of radioactive wastes of high radioactivity from the electric nuclear plants and from the irradiated fuel network; crushing-mills, concentration, preparation and treatment of irradiated fuel; energetic or research reactors; underground nuclear objectives for testing in peaceful goals, land transport of radioactive sources.

Electric nuclear plants including in their structure nuclear reactors of high power (500 – 1000 MW) constitute as was proved in the nuclear accidents from Govonia (Brasilia), Chernobâl (1986), Tokaimura (Japan – 1999) the worse dangers for surrounding environment contamination in such situations.

Energetic nuclear reactors still have high level of safety conferred by the profound defense conception by many physical barriers against fission products as combustible elements jacket, primary cooling circuit, enveloping system, and also the existence of special systems of security for rapid turning off.

Sources of nuclear risk for Romania: C.N.E. CERNAVODĂ – Constanța; C.N. COLIBAȘI (MIOVENI) –Argeș County; F.I.N. MĂGURELE – Bucharest.

**Nuclear accidents effects** are of many types therefore there exist biological effects: well shaped somatic (precocity, rush, leucopenia, late depilation, skin cancer, osteosarcom), stochastic somatic effects: precocity; neural-vegetative distress, leukemia, thyroidal cancer and genetic effects (at first generation – hereditary and congenital malformations; birth rate diminution; at the following generations – recessive malformations, immune-biological capacities diminution).

Nuclear reactors can produce partial contamination of respective ambient environment, of atmosphere, by volatile fission products as  $^{131}\text{I}$ ,  $^{133}\text{Xe}$ , of water used as cooling agent, of soil from the vicinity contaminated with fission products and a great quantity of radioactive wastes with hardships in evacuation to avoid the environmental contamination.

**Biological accident** represents any escape under control of pathogen germs from research institutes, hospitals (defection of frigorific devices, accidents in the sterilization process, accidental evasion of infected laboratory animals) or intended sabotage of such installations for these pathogen agents' production and storage.

Breakdowns to the hydro-technical constructions represent the defective functioning of a hydro-technical construction leading to casualties and material losses on the portions situated downstream. The hydro-technical works of hydrographic basins settlement and especially barrages and accumulation lakes are big works stressing out many technical difficulties. Therefore, must be assured, at one hand, their accomplishment into a unity frame regarding the ensemble of hydrographic basin and, on the other hand, in their exploitation should be aimed the optimal satisfaction of all uses and interests.

Barrages control and surveillance that interest public security represents a main obligation coming from state's tasks regarding its inhabitants' life and their goods protection. Therefore they should involve.

From the evidences of Water Cadastre in Romania and from the inventors presented by main holders, results that on our country's rivers there are about 1,900 barrages, able to accumulate a total water volume by about 15 billions cube meters, respectively about 18.7 billions cube meters including the accumulation on Danube, Iron Gates I and II.

**Major accidents on communication ways** represent phenomena of temporary interruption of circulation generating their destruction, human and animal casualties and material losses. They can be air, land or maritime.

*Air accidents* comprise violent impacts of airships transporting passengers and merchandise.

*Land accidents* are constituted by the collisions or derailment of merchandise or passenger trains or vehicles (cars, trucks, buses, etc.).

*Maritime accidents* refer to accidents produced by ships along the storms, explosions, fires, collisions with icebergs or rocks.

Maritime navigation rules, signalization means offer full security and the meteorological prognosis allow to avoid cyclones, which can lead to *accidents on maritime transport way*. Still, these transports means can collapse and expose to death hundreds of passengers.

The traffic accidents trend in increasing owed to the escalation of transport capacities and vehicles speed.

In the late years, aviation accidents occurrence produced on global plan with big number of victims but also the air accidents registered in the late years in Romania increased. We remind here the air accident from Balotești – March 31, 1995, Bucharest – Brussels flight; 60 casualties (49 passengers and 11 crew members).

In the railways catastrophes are three factors: defections of railway (rail deformation, defects of platform where is sited the railway), faults of rolling material and circulation faults (excess of speed, dangerous obstacles, defective signalization). Road catastrophe from Mihăilești represented an accident caused by improper transport of dangerous materials (ammonium nitrate), which in contact with organic substances at critical temperatures produce large explosions.

Major accidents to facilities and dangerous technological installations. By this type of accidents we understand the destruction on damage of facilities and technological installations caused by human carelessness resulting in many human victims and great material losses. Basic characteristics for this type of accident can be: technological field of activity (metallurgical, chemical installations, etc.); technological cycle capacity, productivity and length; size of affected area; way of accident's propagation (explosion, toxic cloud, fire).

Technological accidents are classified after effects amplitude in catastrophic, grave and minor. For our study we consider only catastrophic technological accidents with the following characteristics<sup>13</sup>: human casualties (1 death); total lost of production installation or provoked damages to properties more than 1 million Euro; interruption of production for more than 30 days; long-termed or permanent impact over the environment; potential effects beyond the affected area – impact over population.

General effects happened after the ecological catastrophes caused by technological activities are as follow: lost of human lives and material damages; total or partial destruction of installations; disrespect of demands on intern and extern plan; social problems (unemployment, supplementary expenses for rehabilitation); ambient environment damage.

For the technological hazards, also as in the natural disasters, critical infrastructures represent one of the most vulnerable compounds being damaged as consequence of multitude of "invisible" and multistage threats hard to deal with and assessed by usual methods of detection.

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<sup>13</sup> Hazarde tehnologice în România, <http://andreivocila.wordpress.com/2010/11/24/hazarde-tehnologice-in-romania/>

Vulnerabilities reduction and threats counteraction can be fulfilled by investments in sciences and technology on the background of an adequate legislative and decisional framework in order to enhance resistance capacity to technological hazards of respective community.

Major provocations refer to authorities' capacity to: provide information concerning technological hazards and disasters where and when are needed; decipher and understand anthropic processes activating technological hazards; develop strategies and technologies to diminish technological hazards; identify and reduce vulnerabilities of interdependent critical infrastructures; assess resistance to disaster by using standard methods; promote so-called "calculated risk behavior"<sup>14</sup>.

### **3. Ecological disasters provoked by grave social accidents**

Historically speaking, the biggest ecological disasters were provoked by wars. Along history, the maneuvers used in battles degraded very much the environment and the costs to diminish pollution are rise up to billions of dollars.

Saddam Hussein army withdrawal from Kuwait in 1991 cost Kuwait 1.5 billions dollars to stop the fires to the oil pits and the country lost over 5 billions dollars to rebuild the affected infrastructure. The smoke produced was full of acid gases, toxic particles and dangerous chemical compounds as sulph dioxide and hydrogen sulphide, all these associated with respiratory affections and cancer<sup>15</sup>.

A well-known example of ecological war use was represented by "Agent Orange" use by the USA army to destroy food sources while the Vietnam War. Recently, the blast of oil drills in Kuwait generated the emission in the atmosphere of tones of pollutant gases as carbon dioxide and sulph dioxide bringing on black and acid rains in Saudi Arabia and black snow in Kashmir (over 1,500 miles away)<sup>16</sup>.

The blast of a heavy bomb annihilates all flora and fauna completely destroying the inferior layers of soil which will be able to complete regeneration only after 1,500 – 7,400 years. Over 84 countries were affected by mines and unexploded bombs in 2004, as states the *Landmine Monitor*<sup>17</sup>. Last year, their number reduced to 70. Much time after the conflicts are ended, the land mines can continue to make the conflict areas uninhabited. These can remain active until 50 years. Mines are fabricated with low costs but one mine inactivation can cost about 1,000 dollars. Mines can be ejected at rates about 1,000 per mine but is

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<sup>14</sup> Efectele hazardelor naturale și tehnologice asupra infrastructurilor critice, Colocviu Strategic nr. 2/2009, Editura Universității Naționale de Apărare „Carol I”, București, p. 4.

<sup>15</sup> Pagubele ecologice produse de războaie costă statele miliarde de dolari, Vezi: <http://www.antena3.ro/externe/pagubele-ecologice-produse-de-razboaie-costa-statele-miliarde-de-dolari-121058.html>

<sup>16</sup> EXCLUSIV Green Report: Cat polueaza un razboi? Milioane de dolari pentru reducerea poluarii din razboaie, luni, 21 martie 2011, Vezi: <http://www.green-report.ro/stiri/exclusiv-green-report-cat-polueaza-un-razboi-milioane-de-dolari-pentru-reducerea-poluarii-din-razboaie>

<sup>17</sup> <http://www.the-monitor.org/>



needed a whole day for a qualified expert to clean 20-50 square meters of land contaminated with mines. Also, over 20,000 sites comprising more than 1,700 American military facilities are contaminated with conventional toxic wastes came from mines. In regard to United Nations, the last year costs estimation for cleaning the mines from 27 states cost a half billions dollars<sup>18</sup>.

In 2007, the humankind expensed about 1.1 trillions dollars in the military field to fabricate the ammunition and train soldiers to kill<sup>19</sup>.

USA expended in 2006 for Iraq War more then invested all world countries in energy from renewable sources.

As Romania regards, *Jane's Information Group* sustains ROMAIR Company developed and produced CL-250 combined bomb, assembling to RBK-250 soviet one. It also states this bomb is endowed with BAAT-10 antitank mines and BF-10T antipersonnel mines<sup>20</sup>.

Jane's Information Group also reported about Aerostar SA that produces LAR-160 multi-launcher missile system able to use MK4 missile containing 104 M85 sub-munitions<sup>21</sup>

As regards Romanian stocks of combined munitions, on ROMARM site appear two types of enhanced conventional multi-use munitions, 152mm projectiles, CG-540 and CG-540 ER<sup>22</sup>. These types of combined munitions containing GAA-001 charge represent a production and marketing result with the support of Israeli military industry. GAA-001 charge is described to be identical to M85 israelian and is produced by Romanian Aeroteh SA Company<sup>23</sup>.

Still, in April 2011, Romania declared "it doesn't have KMG-U distributors or combined bombs RBK-250, RBK-275 or RBK-500 types"<sup>24</sup>.

### Conclusions

Disasters became more common and destroying mainly owed to the climatic changes and unsustainable development. Disasters are – natural and anthropological -

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<sup>18</sup> Pagubele ecologice produse de războaie costă statele miliarde de dolari, Vezi: <http://www.antena3.ro/externe/pagubele-ecologice-produse-de-razboaie-costa-statele-miliarde-de-dolari-121058.html>

<sup>19</sup> EXCLUSIV Green Report: Cat polueaza un razboi? Milioane de dolari pentru reducerea poluarii din razboaie, luni, 21 martie 2011, Vezi: <http://www.green-report.ro/stiri/exclusiv-green-report-cat-polueaza-un-razboi-milioane-de-dolari-pentru-reducerea-poluarii-din-razboaie>

<sup>20</sup> Robert Hewson, ed., *Jane's Air Launched Weapons*, Issue 44 (Surrey, UK: Jane's Information Group Limited, 2004), p. 290.

<sup>21</sup> Leland S. Ness and Anthony G. Williams, eds., *Jane's Ammunition Handbook 2007–2008* (Surrey, UK: Jane's Information Group Limited, 2007), p. 714.

<sup>22</sup> Romarm, "Artillery Ammunition," [www.romarm.ro](http://www.romarm.ro).

<sup>23</sup> Leland S. Ness and Anthony G. Williams, eds., *Jane's Ammunition Handbook 2007–2008* (Surrey, UK: Jane's Information Group Limited, 2007), pp. 605–606.

<sup>24</sup> Letter from Doru Costea, 27 April 2011, C1-3/3782. Jane's Information Group has listed Romania as possessing KMG-U dispensers (which deploy submunitions), and RBK-250, RBK-275, and RBK-500 cluster bombs.

dangers' result overwhelming the capacity of vulnerable peoples to confront them. Therefore, disasters shouldn't be seen as external threats but as risks created by human society – able to be combated by human action.

Disasters occurrence has a complex relation with human development processes and consequently with the intervention in development related to subsistence. Wellbeing and economic growth assurance is just an aspect of development that doesn't necessarily reduce the risk: we should remember the devastating impact of Katrina hurricane in USA. In exchange, the relation between development and disasters' risk is multi-thematic comprising location, causality and programmatic effects of development work. In this regard we can draw up following conclusions:

a) *Ecological disasters disproportionately affect poor people in the world.* More than half from the deaths are caused in countries with low items of human development although only 11% from the population exposed to risk live in there<sup>25</sup>. So, low levels of human development are strongly related to low capacity and high vulnerability in determining risks. Inversely, poverty reduction can help to disasters' risk diminution by reducing vulnerability and capacity enhancement but only if the measures to diminish disasters' risks are consciously assessed and implemented as part of intervention.

b) *Disasters are born from development failures.* Disaster's outburst often leads to infrastructure's destroy, subsistence erosion, hurt, illness, and death. Yet, the losses caused by disasters interact with and deepens other social weaknesses and can lead on long term to political, social and economic crises. Also, social changes and development programs from the past failed to prepare social structure for disasters' outburst: societies remained vulnerable.

c) *Development projects can raise disasters' risk.* Intervention for development of state and non-state actors can negatively and strongly impact over social capacities and vulnerabilities to the basic causes' level of the dynamic pressures and other uncertainty conditions. There are many examples when the trend for economic growth and social enhancement creates new disasters' risks as, for example, rapid urbanization.

d) *Allotment of limited resources for development and aid projects* can be a game without gain while the both types of interventions access the same low sum of money, a growth in the aid intervention could quick an decrease in the development interventions.

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<sup>25</sup> Df (1999) Guidance for Evaluation Humanitarian Assistance in Complex Emergencies, de la [www.the-centre.net/resource/e\\_library/doc/OECD.pdf](http://www.the-centre.net/resource/e_library/doc/OECD.pdf)

## BIBLIOGRAPHY

- European Environment Agency, Mapping the impacts of recent natural disasters and technological accidents in Europe – Environmental issue report no. 35, Copenhagen, 2003.
- Maxx Dilley, Robert S. Chen et al., Natural disaster hotspots: a global risk analysis, Synthesis Report, March 2005
- Anexa la Strategia națională de management al riscului la inundații - prevenirea, protecția și diminuarea efectelor inundațiilor, [http://schimbariclimatice.amr.ro/documente/strategia\\_nationala\\_de\\_management\\_al\\_riscului\\_la\\_inundatii.pdf](http://schimbariclimatice.amr.ro/documente/strategia_nationala_de_management_al_riscului_la_inundatii.pdf)
- Ministerul Mediului și Pădurilor, Strategia națională pe termen mediu și lung de management al riscului la inundații, 2009-2010.
- Carta verde, Politici de mediu, Guvernul României, Programul Phare 2000 Fenomene de risc geografic, studiu al Academiei Române, 1998
- European Agency for Safety and Health at Work, OSH in figures: stress at work — facts and figures – European Risk Observatory Report No. 9, Luxembourg: Office for Official Publications of the European Communities, 2009.
- United Nations, International Strategy for Disaster Reduction, South Eastern Europe Disaster Risk Mitigation and Adaptation Initiative, Risk Assessment for South Eastern Europe Desk Study Review
- Ministerul Administrației și Internelor, Strategia Națională de educare și informare publică pentru situații de urgență, [http://www.mai.gov.ro/documente/transparenta%20decizionala/strategia\\_de\\_constientizare\\_publica.pdf](http://www.mai.gov.ro/documente/transparenta%20decizionala/strategia_de_constientizare_publica.pdf)
- Strategia națională de securitate nucleară pe anii 2009-2012.
- Confederația CARITAS România, Reducerea riscurilor de dezastre. Învățând pentru subzistență Seria nr. 1, [http://caritasbucuresti.org/emergency/files/Documente\\_utile8/Literatura/Romana/Reducerea\\_riscului.pdf](http://caritasbucuresti.org/emergency/files/Documente_utile8/Literatura/Romana/Reducerea_riscului.pdf)
- Asociația ALMA-Ro, *Managementul riscului de dezastru – ghid de lucru pentru ONG-urile de mediu în prevenirea dezastrelor*, martie 2007
- UNISDR (2006) Comunicat presă luni 30 ian. 2006 Dezastrele au crescut cu 18% în 2005, dar rata mortalității scade, de la [www.unisdr.org](http://www.unisdr.org)
- UNISDR (2007) Comunicat presă luni 29 ian. 2007, de la [www.unisdr.org](http://www.unisdr.org)
- CRED (2004) 30 Years of Natural Disasters - 1974-2003: The Numbers, UCL Presses Universitaires De Louvain, de la [www.cred.be](http://www.cred.be)
- Romania – disaster statistics, <http://www.preventionweb.net/english/countries/statistics/index.php?cid=141>
- Istoria anilor de arșiță în România, Vezi: <http://www.ecomagazin.ro/istoria-anilor-de-arsita-din-romania/>

- Hazarduri climatice – seceta*, <http://www.pagini-scolare.ro/Geografie-si-geologie-planuri-lectii-si-studii/HAZARDURI-CLIMATICE-SECETA/menu-id-62.html>
- Avarii și pierderi produse de cutremure*, <http://inforisx.incerc2004.ro/avariile.htm>
- Scurgerea apelor în exces – inundații. Cauze manifestări, caracteristici:*  
<http://www.isudobrogea.ro/inundatii.pdf>
- Inundațiile – cauze, forme de manifestare, efecte, modalități de combatere,*  
<http://www.isujis.ro/files/lectie-liceu.pdf>
- Dan Bălțeanu, Sorin Cheval, Mihaela Șerban, Evaluarea și cartografierea hazardelor naturale și tehnologice la nivel local și național – Studii de caz, Institutul de Geografie al Academiei Române, București, <http://www.racai.ro/RISC1/DanBalteanu.pdf>
- Hazarde tehnologice în România, <http://andreivocila.wordpress.com/2010/11/24/hazarde-tehnologice-in-romania/>
- Efectele hazardelor naturale și tehnologice asupra infrastructurilor critice, Colocviu Strategic nr. 2/2009, Editura Universității Naționale de Apărare „Carol I”, București.
- Pagubele ecologice produse de războaie costă statele miliarde de dolari,  
<http://www.antena3.ro/externe/pagubele-ecologice-produse-de-razboaie-costa-statele-miliarde-de-dolari-121058.html>
- EXCLUSIV Green Report: Cat polueaza un razboi? Milioane de dolari pentru reducerea poluarii din razboaie, luni, 21 martie 2011, Vezi: <http://www.green-report.ro/stiri/exclusiv-green-report-cat-polueaza-un-razboi-milioane-de-dolari-pentru-reducerea-poluarii-din-razboaie>  
<http://www.the-monitor.org/>
- Robert Hewson, ed., *Jane's Air Launched Weapons*, Issue 44 (Surrey, UK: Jane's Information Group Limited, 2004).
- Leland S. Ness and Anthony G. Williams, eds., *Jane's Ammunition Handbook 2007–2008* (Surrey, UK: Jane's Information Group Limited, 2007).
- Romarm, “Artillery Ammunition”, [www.romarm.ro](http://www.romarm.ro).
- Leland S. Ness and Anthony G. Williams, eds., *Jane's Ammunition Handbook 2007–2008* (Surrey, UK: Jane's Information Group Limited, 2007).
- Letter from Doru Costea, 27 April 2011, C1-3/3782. Jane's Information Group has listed Romania as possessing KMG-U dispensers (which deploy submunitions), and RBK-250, RBK-275, and RBK-500 cluster bombs.
- Df (1999) Guidance for Evaluation Humanitarian Assistance in Complex Emergencies, de la [www.the-ecentre.net/resource/e\\_library/doc/OECD.pdf](http://www.the-ecentre.net/resource/e_library/doc/OECD.pdf)

