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CRITICAL GEOGRAPHICAL REGIONS. A STANDPOINT

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ABSTRACT. Critical Geographical Regions. A Standpoint. The concept of critical region is used to characterize those territorial systems in which some elements or relations among the components of the systems are negative and represent geographical phenomena of risk or the systems are on the verge of a crisis, or the crisis is in progress. As a consequence, the region can completely change its status in a negative way. Two case studies were chosen to emphasize the essence of the concept of "critical region", namely the Sahel and Southeast Asia, both regions being part of the hot zone.

Key words: crisis, critical region, geographical phenomena of risk, the Sahel

1. Concepts and Definitions

In the attempt to define the concept of ***critical geographical region,*** we started from the explanation of some words used in daily life. Their meaning helped at building and defining this concept used in Regional Geography. The concepts we started our attempt from are: "*critical*", used especially as an adjective, and "*crisis*". Analyzing the definitions of the adjective "critical", one can find two sets of meaning. "Critical" in its first meaning referrs to a quality "which appreciates qualities and faults (of people, states of things, actions, works etc.)" (Romanian Dictionary - DEX, 1996: 241). The second meaning also refers to a quality, yet it is used to express an action that is in progress or a moment of this action and implies a change from a certain state to another one, with a different quality. The definition states that: "critical" refers to "a moment of crisis that precedes a sudden change (a negative change), which can determine a major change (in a negative way)" (Romanian Dictionary - DEX, 1996: 241). Another definition would be: "which can determine or produce a major change (in a negative way)" in a "decisive, crucial, fundamental way" (Encyclopedic Dictionary - Dicționar enciclopedic, 1993: 480). All three definitions refer to this possibility of changing a state of things, usually once a crisis started.

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The conclusion is that a critical moment is closely linked with the initiation of a crisis. Therefore, the **crisis** is definied as "the manifestation of some difficulties, problems (economic, political, social etc.); a period of tension, of trouble, of trials (most of the times, crucial ones), that take place in society"; "acute shortage (of products, time, labourforce)"; "critical moment, a major one, in the evolution that precedes the healing or the aggravation of a disease" (Romanian Dictionary - DEX, 1996: 241). Other definitions are: "stage in the evolution of society marked by great difficulties (economic, political, social, military etc.)"; "acute shortage (eg. labourforce shortage, time shortage)"; "climax moment in the evolution of a disease, that precedes its healing or aggravation" (Encyclopedic Dictionary - Dicționar enciclopedic, 1993: 480-481).

We can conclude from the above definitions that a state of things can be characterized as critical or there is a crisis when a threshold is reached, beyond which the state can be changed in a negative way, there is an involution. The crisis moment precedes a sudden change, most of the times a negative change.

The second meaning of "critical" associated with "crisis" was borrowed by Geography. In *Dictionary of Physical Geography - Dicționarul de geografie fizică* (Ielenicz et al., 2004), "critical" is defined as "a state, moment of a network of relations that can bring major changes in the structure and the shape of a system" (Ielenicz et al., 2004: 109). "*Les mots de la géographie. Dictionnaire critique*" (Brunet R. et al., 1993) defines "crisis" in several ways: "moment of extreme tension, paroxysm, conflict, change", "moment that marks the degradation of a system", "shortage and penury".

The term of **critical region** is used to characterize those territorial systems with some elements or relations that bear a negative mark, representing a *geographical risk* or the systems are on a verge of a moment of crisis which is inherently or they even experience a period of crisis. This is why the region can radically change its present qualitative state in a negative way, which makes that territorial entity as an area bearing a great risk, thus being categorized as a critical region (Boțan C., 2005).

Geographical region, as a territorial system, has a certain *structure,* given by the way in which the components of the system blend together and a specific functionality, that results from the interactive relations that take place among the components of the system. The system is characterized by a dynamic equilibrium that includes also variations, usually of low amplitude. Yet, these variations can reach sometimes extreme values, thus exceeding the limit of tolerance of the system (Stângă I., 2007). In this precise moment the system is experiencing a critical stage. Therefore, the manifestation of a critical state depends on the manifestation of processes and phenomena, natural or anthropogenic (considered in this case to be hazards or extreme phenomena) that involve a certain risk for that system. This means that some changes, structural and/or functional, might occur within the system (region) which leads to a complete change (in a negative way) of the initial state of the system.

"Critical region", "risk", "hazard" concepts are closely linked among them. A region becomes a critical one once it reaches a critical point in its equilibrium under the action of perturbation factors, either natural or anthropogenic. If these factors continue to perturb the region, its capacity of autoregulation is overrun and dys-functionalities arise. Consequently, the region is under risk to become unstable, its state of equilibrium and internal structure are deteriorated. The factors that induce these processes are considered factors of risk and that territory upon which the factors of risk carry on their influence can develop into a critical region, being under a high risk potential.

Critical region represents a territory characterized by imminent sudden changes or changes in progress; most of the times they are key changes and of a negative nature. Critical regions are geographic areas characterized by an independent dynamism that cumulates a great risk potential.

2. Critical Geographical Regions - Typology

Critical geographical regions can be classified on the basis of several criteria (Boțan C., quoted by Barta A., 2010, with changes).

There are three categories of critical regions considering **the type of the phenomena of risk** that affects them:

- Critical regions affected by natural phenomena of risk
- Critical regions affected by anthropogenic phenomena of risk
- Critical regions affected by complex phenomena of risk

Critical regions affected by natural phenomena of risk include other two sub-categories: critical regions affected by *non-climatic* phenomena of risk (regions affected by earthquakes, regions affected by active volcanic processes, regions affected by tsunamis generated by earthquakes, regions affected by landslides, regions affected by mudflows, regions affected by subsidence processes, regions affected by avalanches etc.) and critical regions affected by *climatic* phenomena of risk (regions in which the risk is generated by meteorological, climatic and hydrological phenomena of risk: regions affected by prolonged droughts, regions affected by powerful storms, regions affected by other meteorological phenomena: hailstone, freezing, frost, fog etc; regions effected by El Niño; regions affected by tsunamis generated by storms; regions affected by frequent floods).

Critical regions affected by anthropogenic phenomena of risk include the following sub-categories: critical regions affected by *political issues* (regions affected by ethnical and confessional conflicts; regions affected by conflicts between states), critical regions affected by *economic and social issues* (regions affected by poverty; regions affected by economic crises; regions affected by financial crises; regions affected by the decline of some economic sectors; regions affected by the deterioration of the demographic structure) and critical regions

affected by *environmental issues* (regions with permanent pollution sources generated by industry and/or traffic; regions with pollution risks generated by ecological accidents).

Critical regions affected by complex phenomena of risk combine simultaneous action of the two other main types of phenomena of risk (natural and anthropogenic). Some examples in this category: regions affected by desertification and regions affected by severe land degradation.

Depending on **the stage of development of the critical element**, regions can be:

- Regions with a latent risk; the moment of acute crisis either passed (Kosovo) or is to come (Tibet)
- Regions in which the risk is persistent; the crisis started and is in progress, yet under various degrees of intensity (the Sahel)
- Regions in which the risk is imminent, the crisis is about to start under the pressure of the factors of risk (Amazonia)
- Regions in which the crisis is in progress (Middle East, Irak)

3. Case Studies. Critical Regions in the Hot Zone

Two case studies of geographical regions from the hot zone have been chosen in order to give examples of the "critical region" concept. The criterion of climate (hot zone) establishes a large area of study and very diverse factors of risk. They can be natural, anthropogenic and both natural and anthropogenic.

3.1. The Sahel as a Critical Region.

The Sahel is a *transition area* that makes the transition from the Sudanese savanna, with tall grass and isolated trees to the arid landscape of Sahara desert. It unfolds as a girdle of about 500-600 kilometres, between 13º and 18º Northern latitude, from Cape Verde Archipelago, in the Atlantic Ocean, to the Ethiopian Plateau. In its Northern part, towards Sahara, the border corresponds to the 150 millimetres isohyet and the "cram-cram" grass (*Cenchrus biflorus*), one of the graminoids that characterizes the Sahel. Southern border is represented by the 600 millimetres isohyet. Within the Sahel region, 350 millimetres isohyet roughly represents the Southern border of the grasslands and stockbreeding activities. In the Southern part of this isohyet, the activities are both agricultural and related to stockbreeding.

From a climatic point of view, the Sahel is characterized by low quantities of precipitation, between 150 millimetres and 500-600 millimetres per year, yet they are very *irregular* in nature, both in space and in time. There is a long, dry season (8-10 months per year) marked by lack of rain and an acute evapotranspiration (winter of the Northern hemisphere) and a short humid season

(2-4 months) (summer of the Northern hemisphere). From a biogeographical point of view, the Sahel is a grassy steppe, populated by annual xerophyte graminoids, not so tall (0.8 – 1 metre) with sparse trees. A specificity of the Sahel groundcover is its discontinuity in space, bushes are alternating with vast areas of bare soil.

Many scientists consider the Sahel a fragile ecological system, and lately there is the idea of a crisis in the Sahel. Its fragility derives from the close and complex internal conditioning that arise among natural and social factors. This means that a change in a single component (for example climate) determines a change and effects, sometimes even major ones, upon the other components (vegetation, people, and animals) (Urucu Veselina, Zamfirescu A., 1984). The most evident sign of fragility is represented by the process of ***desertification,*** present in the last decades. It is also the most characteristic display of the ***crisis in the Sahel***.

Desertification represents, in short, "the extension of the desert" (Lesourd M., 1991: 146). It is expressed in: the degradation and gradual diminishing of the groundcover; the disappearance of certain species of plants, especially of tree type; the natural drainage of water sources; the descent of the water table lower than usual; reinstatement of the wind erosion; soil salinization; transformation of the fixed sand dunes in mobile ones and their expansion. In conformity with the scientists' view, the desertification process in the Sahel is determined by two factors: cyclical prolonged droughts (climatic factor) and an irresponsible use of the environment with the aim of capitalizing all its resources (anthropogenic factor). As Lesourd M. states, the Sahel's crisis is at the same time ***a climatic crisis*** and ***a historic crisis,*** linked to the management of the territory and its natural resources.

3.1.1. Climatic Crisis.

The climatic crisis was triggered in the 1960s, as a consequence of a severe decrease in rainfall, starting with 1968. Between 1968 and 1973, the Sahel faced a severe drought, with important effects especially as this phenomenon followed a wet period (1950-1965). For example, in Maradi (Niger), the average rainfall for 1949-1967 was of 653 millimetres, while in 1972, it reached 288 millimetres, after several years of low quantities of precipitation. In Louga (Senegal), the period of 1949-1967 had a 481 millimetres precipitation average and only 156 millimetres for 1972 (Encyclopædia Universalis, 1989). Tracing the route of the isohyets of 200 and 600 millimetres for the period 1930–1997, the conclusion is that the Sahel advanced towards South with approximately 70–100 kilometres (National Geographic, 2008).

There were several dry periods in the 20th century: 1912-1915, 1940-1944, 1968-1973, 1977-1994 (with a peak during 1983-1985). The last periods (starting with 1968-1973) determined a worsening of the climatic crisis: a continuous decrease of rainfall during 1968-1984, which resulted in a chronic insufficiency of

precipitation, a reduction of the rainy days and intermediate dry periods prolonged their duration. Rainfall deficit contributed to the degradation of woody vegetation species from the Sahel: *Acacia senegal* was decimated in Chad and Senegal; *Acacia nilotica* in Senegal Valley; *Acacia albida* parks disappeared in Chad since 1971 (Lesourd M., op. cit.). Meanwhile, the grass type of vegetation remained, being better adapted to external conditions, yet it lost the floral variety. Spatial discontinuity of the groundcover meant an increased fragility of the bare soil to erosion factors, especially to gully erosion. The sparse character of the groundcover facilitated the reinstating of the fossil sand dune formations in the Northern part of Burkina Faso, Mali and Niger (id. ibidem).

The effects of the droughts also determined a hydrological degradation of the rivers in the Sahel. For example Bani River, right tributary of the Niger River, registered a decrease of its annual average flow rate from 727 cubic metres/second, in 1967 (average of 27 years) to 270 cubic metres/second (for 1968-1984) (Lesourd M., op. cit.). Starting with 1968, flooded areas within the floodplains of the above-mentioned rivers (which facilitated extended agricultural lands) decreased severely, without coming back to the earlier values ever. Niger did not go over its streambed in 1984. For Niamey, the period of low waters increased from several weeks to several months, jeopardizing agricultural lands and water supply (id. ibidem). Chad Lake decreased its area with 2/3 in 1973 (Bălteanu D., Alexe Rădița, 2001).

3.1.2. The Sahel Crisis – a Crisis of the Management of Space and Natural Resources

The Sahel's crisis has deeper sources. The latest droughts seem to have more serious effects that the precedents. This is due to the fact that low quantities of rainfall and an uneven distribution of the precipitations affect in a more intensive way the environment that is already weakened by human activities.

During 1945-1965, a humid period, characterized by a higher quantity of precipitations than the multi-annual average, the Sahel registered a demographic increase at high values, supported by a high growth rate. This triggered an increase in food production and animal breeding (cattle and sheep), which implied an extension of the agricultural lands and an advancement of the population and animals towards North, towards the limit of the desert. As a consequence, *the Northern border of the agricultural lands was moved towards North (with approximately 100 kilometres), crossing the grassland areas used for stockbreeding. This determined a continuous and even drastic reduction of the Sahel lands used exclusively for stockbreeding.* This resulted in conflicts, even armed ones, between cultivators, settled in the one and the same area, and nomad stockbreeders. The latter group was practicing transhumance, moving along with their livestock according to rainfall, depending on the seasonal change of precipitations. They advanced towards North, during the wet season and towards

South, during the drouthy one. They have been forbidden to go towards South and made to go towards North, sometimes on large distances.

We can also mention other causes: an improved veterinary assistance and programs of inoculation against diseases, which meant an increased livestock; external stimuli (increased demand of agricultural products and animal proteins). This determined the stockbreeders and farmers to intensify their production.

All these show that the Sahel area became more and more exploited, which determined a deterioration of its internal equilibrium, already a fragile one, so an internal split occurred. Grasslands, less and less in number due to the extension of the agricultural lands from the South of the region, became insufficient for an increased livestock and therefore came to be overexploited, determining **overgrazing**. Vegetation was destroyed especially along the tracks the animals followed in their transhumance movements and around the animal wells, because animals tamped the earth. Woody vegetation was used as a fire resource (it is the main source of energy for the Sahel household), building material or for constructing natural barriers for the agricultural crops.

Because the groundcover was destroyed under the above-mentioned factors, soils lacked their protection and were therefore more exposed to wind and water erosion. In Mali, within an area of 60,000 square kilometres, eroded soil surfaces increased from 4%, in 1952 to 26%, in 1975. In the Northern part of the neighbouring state, Burkina Faso, agricultural lands extended in the same period with 12% and eroded soil with 30% (Dubresson A. et al., 1994). In Niger, every year there is an area of 250,000 hectares lost due to the process of desertification (Petrescu, 2002).

This was the background to all climatic changes characterized by a decrease in the quantity of precipitation and an intensification of their irregular character. Overgrazing, deforestation, the process of uncovering the soils of their vegetation triggered the process of desertification. Droughts only worsened the degradation of the agricultural and grassland systems.

The Sahel's crisis implied an increase in livestock mortality, animal breeders lacking subsistence means. The 1969-1974 droughts caused the death of at least 3.5 million heads of cattle (Petrescu I., op. cit.); in Mauritania, it destroyed almost 50% of the livestock and in Senegal, over 35% (Urucu Veselina, Zamfirescu A., op. cit.). It also determined a collapse of production, causing famine, which meant that many people moved to towns, poor districts extending at their outskirts. Nouakchott (Mauritania's capital) increased its population from 20,000 inhabitants (in 1960) to 480,000 at present. It can be rightly seen as the largest refugee camp in the world (Petrescu I., op. cit.).

Faced with these issues, the Sahel states took actions meant to restore and reinstate the rural environment of the Sahel region. Among some of the measures they took: *fight against soil erosion, capitalizing water resources* and *re-*

forestation. Among the successful actions: the plantation of 5,000 acres with trees (Petrescu I., op. cit.), in Niger; a rehabilitation of the extension area (towards North) of the African Acacia (*Acacia senegal*), in Sudan (Urucu Veselina, Zamfirescu A., op. cit.). Another example would be the construction of two dams meant for the irrigation of an area of 400,000 in Senegal (id. ibidem). Riz Mopti Project developed in Mali involved the establishment of submersible plots for rice cultivation along two rivers (Niger and its tributary Bani, in Mapti region). The outcome meant over 32,000 hectares of cultivated lands (Lesourd M., op. cit.).

All these projects in the Sahel region had also the support of other states. Studies show that only 4.5 billion US dollars would be sufficient on a 20 years period in order to diminish the effects of the crisis and to avoid a social and economic collapse in the Sahel (Petrescu I., op. cit). The most important issue in the Sahel is people's attitude; people have to realize that in order to survive in such a fragile natural environment, they have to learn to protect it and a first measure to put into action is to stop deforestation.

The Sahel crisis triggered by droughts emphasized the fragility of the local ecosystem. The issue is not the low quantity of precipitation but their irregular character and the simultaneous effects of pluviometry, wind and human irresponsible overexploitation. The region is a **critical region** due to its crisis character. The critical nature is triggered by the increase of population in an area affected by aridity. It is true that there is a severe ***climatic crisis*** in the Sahel's steppe, yet it is not the only type of crisis, the reduction meaning that the issue is seen in an oversimplified way. The crisis affecting the Sahel is a multiple-faced one: ***a historic crisis, a crisis linked to the way space is managed from an economic point of view and a natural resources crisis*** (Lesourd M., op. cit.). It is difficult to foresee the development of the Sahel's climate on a longer period, yet changes induced by human activities can be envisaged easier. It is hard to see which of the two factors (the climatic one or the human generated one, linked to the overexploitation of territory) has more serious and long-lasting effects on the degradation of the Sahel. Human intervention is though essential: overgrazing, massive deforestation, along with a permanence of extreme climatic conditions have together destructive effects upon the semi-arid ecosystems, thus inducing difficult and precarious life conditions. Climate becomes a significant element of desertification when it collaborates with human activities that have not been adapted to a fragile environment, with an instable equilibrium.

3.2. Southeast Asia

Southeast Asia consists of two main physical and geographical divisions: Indochinese Peninsula, the mainland part and the Malay Archipelago that comprises the islands (Popa N., 2004). The latter comprises other two divisions: the Indonesian Archipelago and the Philippines.

From a geological point of view, the region is part of the Pacific Ring of Fire, being located at the intersection of several tectonic plates that collide or are in the process of subduction (Eurasian Plate, Pacific Plate, Indo-Australian Plate and the Filipino Plate). The main process is the subduction of the Pacific Plate and the Indo-Australian Plate under the Eurasian Plate, which gives way to *volcanism and earthquakes*. These geological phenomena of risk have a direct impact on the population, economy and environment in general.

On another hand, the region experiences *heavy rainfall*: Indochinese Peninsula is under the influence of the summer monsoons, the Indian and the Pacific Monsoons which induce a great quantity of precipitation (2,000 – 4,000 millimetres/year). In the island part of the Southeast Asia, the Northeast Trade Wind (during winter time in this hemisphere) and the Southwest Monsoon, a continuation of the Southern Hemisphere Trade Wind (during winter) also determines significant precipitations (2,500 – 4,000 millimetres/year). Frequent *typhoons* complete the action the monsoons have. The typhoons appear at the contact between Polar Continental Masses (active mainly in winter time) with Maritime Tropical Air Masses (active mainly during summer). They determine torrential rains (Popa N., op. cit.). These climatic phenomena result in significant *floods*, especially along the coasts, sometimes generating catastrophic effects.

All these phenomena (volcanic activity, earthquakes, heavy rainfall, typhoons and floods as a consequence of the above) represent factors of risk that have direct and serious effects upon population, settlements, economy and environment, in general. Therefore, Southeast Asia is considered an area where there is a high probability for natural phenomena of risk/natural hazards (geological, climatic and hydrological) of major intensity, consequently local population and settlements are under major risk. The conclusion would be that this region has a critical characteristic and can be listed as a **critical region**, as a volcanic eruption, a powerful earthquake or a major flood (as a result of heavy rainfall) can have serious effects upon the structure and the functionality of various territorial systems that are affected. This involves enormous costs for their reconstruction. These processes can be primary hazards, yet they can also be followed by secondary hazards (lahars, tsunamis, landslides, avalanches, fire). The secondary hazards have sometimes more disastrous effects than the phenomena of risk that generated them, increasing the value of the damages and the death toll. The critical characteristic of such regions derives from the fact that there is always the possibility for such phenomena to appear, the risk is high and the consequences are considerable considering the impact on society and economy.

A short presentation of some of the phenomena of risk mentioned is meant to stand as an exemplification of the size these phenomena can present, the degree of risk they involve and the impact on the inhabitants and the environment.

Volcanism phenomena in Southeast Asia are part of the volcanic activity in the Pacific Ring of Fire. The Philippines has approximately 10 active volcanoes,

out of which one has to mention Taal (400 metres) and Pinatubo (1,485 metres). *Pinatubo Volcano* is located in Luzon Island (100 kilometres North-West of Manila). The latest eruption, of June 9, 1991, is believed to be the most powerful volcanic eruption in the 20th century. 722 persons died, other 200,000 became homeless, the number of those affected being 1 million, while the damages went over 100 million US dollars (Bălteanu, Alexe, op. cit. Petrescu, 2002).

Indonesian Archipelago is believed to be the most active volcanic area in the world as it has the highest number of active volcanoes and has registered the most catastrophic volcanic eruptions on the Globe. It has 69 active volcanoes (other sources register 76). The volcanoes from Java Island are considered to be the most destructive in the world, as their eruptions are followed by hot ash clouds (in the case of Merapi, Semeru volcanoes) and/or lahars (Kelut volcano). Sumatera Island also has several volcanoes, with Kerintji the most important to be mentioned. In the strait between the two large islands there is Krakatau, while in Lesser Sunda chain there is Tambora (in Sumbawa Island) and Batur (Bali Island).

Krakatau (818 metres) is known due to its eruption in 1883, which is considered the most powerful eruption in modern times. It blew up 2/3 of the island. The most important effect was that it generated a huge tsunami, of 30 metres height, which caused the death of 36,000 people from the surrounding islands coasts, because of shock or drowning.

The eruption of *Tambora* (2,851 metres – Sumbawa Island) (April 5, 1815) was considered the most powerful eruption in the last 10,000 years, with the highest death toll (from direct and indirect causes) out of all volcanic events in recorded history. Approximately 12,000 people were killed directly by the eruption, other 80,000 being drowned due to the huge tsunamis that followed the eruption and especially due to famine, as some of the people were isolated on the islands (Sumbawa and Lombok) that had their agricultural lands completely covered by ash. The following year (called the "Year without a Summer"), the average global temperature decreased about 0.4 – 0.7ºC, while in North America and Europe, the decrease reached 1 or even 2.5 ºC (Petrescu I., op. cit.).

Merapi volcano (Fire Mountain) (2,911 metres) in Java Island caused the death of over 10,000 persons since 1672. The same island houses *Kelut/Kelud volcano.* It is the most feared volcano on the island as, during the eruptions, lahars are formed, and they are the cause of major damages and deaths. The 1919 eruption caused a merging of the water in the crater lake (38 millions cubic metres) with the volcanic ash, thus forming gigantic lahars that destroyed 104 villages and killed 5,110 people.

Southeast Asia includes areas that manifest a high tectonic mobility, because of its location at the intersection of major tectonic plates, determining thus a seismic character of the area. In the last decade, Indonesia was affected by earthquakes that had increased death tolls and major damages. The most

destructive was the *earthquake* that affected the *Indian Ocean* on December 26, 2004, with 9.1 degrees magnitude. It affected primarily Sumatra Island along with other territories from South and Southeast Asia. The earthquake triggered a 15 meter high tsunami that swept all the North-Western coast of the island (the Aceh province in particular) and the death toll was higher that any other recorded tsunami at that time. 227,898 people were killed or disappeared (http://earthquake.usgs.gov). The May 26, 2006 *earthquake affecting Java Island* (Indonesia), of 6.3 degrees magnitude, affected the surroundings of Yogyakarta and killed 5,749 persons, wounded other 38,500 and over 600,000 became homeless, the total losses being estimated at 3.1 billion US dollars (http://earthquake.usgs.gov).

Typhoons represent another climatic phenomenon of risk in the area. During 1948-2006, the Philippines were affected by an average of 19-20 tropical cyclones per year, out of which 10 were classified as typhoons, considering their intensity. The direct, immediate impact on society and the environment of these extreme phenomena is represented by major economic damages and high death tolls. *Tip typhoon* affected the Philippines on October 12, 1979. The low sea-level pressure reached a record of 870 hectopascals (Moldovan F., 2003). It caused heavy rainfall in the Philippines and major damages. *Megi typhoon* affected the Northern part of the Philippines on October 18, 2010 generating floods along the coast and massive destructions of the agricultural lands. The damages were estimated at 190 billion US dollars, the rice and corn crop losses reaching tens of thousands. Infrastructure (transport, electrical) was damaged and more than 100,000 houses were partially or totally destroyed. Due to the efficiency in alerting the population, the number of victims was significantly decreased (28 deaths and 4 disappeared). The tropical cyclone that had the highest death toll in the Philippines is *Thelma* (Uring after PAGASA), in November 1991. It killed over 6,000 people. The most important damages (evaluated at over 600 million US dollars) were registered after *Parma/Pepeng* typhoon (September 2009).

Heavy rainfall that accompanies the typhoons trigger also *floods of the coasts,* affecting the Philippines. Sometimes, depending on the intensity of the tropical storm, the floods affect also the interior of the islands. Along the floods determined by the typhoons mentioned above, one can mention also the major floods that affected Malaysia, Indonesia and Singapore at the end of 2006 and the beginning of 2007, triggered by the heavy rainfall caused by Utor cyclone. Vietnam registered significant damages as a consequence of the 1999 and 2008 floods.

Impact on Population and Environment. All these natural hazards (volcanism, earthquakes, heavy rainfalls generating typhoons and floods**)** generally have direct and indirect effects on population, settlements, transport infrastructure, economy and environment in general.

In those areas where there are active volcanoes their eruptions represent a continuous threat for people. The threat lies also in the fact the areas with volcanic eruptions have a *high population density*. Except for Indonesia, nowhere in the world do so many people live so closely to active volcanoes. Java Island, with 20 active volcanoes, is the most populated island in the world, with approximately 120 million people (55% of Indonesia's population), with a density of 1,000 inhabitants/square kilometres. Some areas in Luzon Island, in the Philippines, which house Taal and Pinatubo volcanoes, register more that 386 inhabitants/square kilometres. At the base of the volcanoes there are *high population densities*. Yogyakarta city (approximately 500,000 inhabitants) lies very close to Merapi volcano (32 kilometres South) and thousands of people live on the flanks of the volcanoes, with settlements as high as 1,700 metres altitude. Studies of risks show that, around 1990, there were 79,100 people, from 32 villages, living in the so called "forbidden red area", which is directly exposed to Merapi's explosions. There were other 115,000 people living in the "Ist grade risk area" (Petrescu, 2008). There are over 350,000 living in a perimeter of 10 kilometres from Kelut volcano. Surabaya, the second largest town in Indonesia, that houses one of the largest airports in the country, lies 90 kilometres North-West of the volcano. The fact that some volcanoes have rare eruption episodes makes them more dangerous as during quiet times settlements at their base develop and occupy areas that are more an more at risk.

Soils formed on the slopes of the volcanoes are extremely fertile, being intensely cultivated and supporting many crops. Farmers on Java Island obtain three crops of rice per season; those in Borneo, the neighbouring island, having just one volcano, do not have such successful crops (Marshall, 2008). The areas that have hot springs and geysers flourish as *balneary resorts*. *Coastal regions*, affected by tsunamis, have some of the highest population densities.

At their turn, earthquakes are dangerous geologic phenomena due to their direct and indirect consequences, affecting large territories, sometimes with high population density.

Tropical cyclones and floods affect large areas and a high number of people, settlements and agricultural lands. The most affected areas are the *coastal* ones that also have high population densities. A major effect of these phenomena is the destruction of large agricultural lands. Large areas in Southern and South-Eastern Asia (Vietnam, Cambodia, and Malaysia) are dedicated to rice. Therefore, the major part of the population lives in flooded areas where rice is cultivated or other plants that need a lot of water. Floods in these territories, when they do not exceed certain limits (concerning duration and amplitude), are beneficial. On the other hand, if floods go over those precise limits, damages are significant, causing a decrease in productivity, difficulties in feeding the population and even famine, at the extreme.

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