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Institute of Logistics
Faculty of Security, Logistics and Management
Military University of Technology
in Warsaw

Threats from the human environment

Jakub Adamkiewicz
jakub.adamkiewicz@wat.edu.pl; ORCID: 0000-0002-5181-3760
Faculty of Security, Logistic and Management, Military University of Technology in Warsaw, Poland

Abstract. The article presents the concept of threats from the human environment, analysing their origin, structure, and division into natural and anthropogenic threats. The research niche of this article is a conceptual refinement of environmental hazard classification by introducing the category of "threats from the human environment". The purpose of the article is to organize information about dangers whose sources are found in the environment (natural and artificial – anthropogenic), their classification, and a brief description. During the considerations, the following research question was posed: "Does the classification of natural hazards adopted in literature reflect the ubiquitous impact of human activity on the environment today?". As a result of this question, a hypothesis was put forward that the division present in the literature is not adequate to the realities of the modern world. The study used the method of existing data analysis, covering theoretical classifications and literature in the field of safety and ecology sciences. A comparative analysis technique was employed to compare different classification models, enabling the identification of common features and elements that distinguish individual approaches. The study also employed content analysis to construct a theoretical framework of threats arising from both natural processes and human activities. The results indicate the dominant influence of civilizational factors on contemporary environmental threats and the interpenetration of both risk categories. The conclusions emphasize the need for a systematic approach to ecological safety and the introduction of a category of threats from the human environment as a tool for organizing risk analysis.
Keywords: safety, natural hazards, anthropogenic hazards, human environment, hazard classification

Introduction

One of the basic tasks of safety science is to identify and describe specific types of hazards. Due to their multitude and diverse nature, various classifications are created as useful tools. They are also presented from different perspectives, including objective, subjective, and spatial. This text is an attempt to supplement this important issue in the field of the theory of the discipline of "safety sciences." The adopted

perception primarily concerns the impact of the environment on human safety. The aim of the article is therefore to organize information on hazards originating in the environment (natural and artificial – anthropogenic), their classification, and a brief description. The following research question was posed: "Does the classification of natural hazards adopted in literature reflect the ubiquitous impact of human activity on the environment today?". The article tests the hypothesis that the traditional division between natural and anthropogenic hazards no longer reflects contemporary conditions due to the pervasive influence of human activity on environmental processes. After all, the boundary between natural and anthropogenic hazards has become blurred, with the result that every danger arising from the environment is marked by the influence of civilization. It is therefore proposed to modify the current approach to the concept of "natural hazards" by introducing in its place an expanded category of "hazards from the human environment". Discussions on this issue will begin with an explanation of the meaning of other key terms: "environment" and "hazard."

Research method and literature review

The methodology of this study is based on the method of existing data analysis, which involves a critical review of the existing literature in the fields of security sciences, geography, ecology, and risk studies. This analysis was qualitative in nature and consisted of systematically organizing concepts, classifying hazards, and interpreting the concept of the human environment. A comparative analysis technique was used, comparing different classification models, which made it possible to identify common features and elements that distinguish between different approaches. The study also used content analysis, which allowed for the reconstruction of a theoretical picture of threats resulting from both natural processes and human activity. Thus, the research methodology is in line with the tradition of theoretical research in security sciences, which aims to organize existing knowledge and build integrative conceptual models. The adopted approach corresponds to established qualitative procedures for document/secondary data analysis and content analysis (Bowen, 2009; Johnston, 2014; Krippendorff, 2018).

The analysis shows that the literature on environmental threats emphasizes their multidimensional and complex nature, which is reflected in geographical, ecological, and systemic approaches. The classic typologies of the human environment developed by Leszczycki (1974), Kopeć and Michalski (2003) point to the need to distinguish between the natural, geographical, and social environments, which forms the basis of contemporary risk analysis. Recent research also highlights the blurring of boundaries between natural and technological disasters, a consequence of climate change, urbanization, and the development of critical infrastructure.

Furthermore, a systemic approach, in line with Ludwig von Bertalanffy's (1984) general systems theory, in which the human environment is treated as an interconnected network of civilizational and natural interactions, is also important for contemporary security research.

Discussion

The human environment can be most simply defined as the space surrounding humans, which indirectly and directly affects them and is at the same time subject to their influence. However, this simple description does not sufficiently reflect the complexity of the term "environment", which supplemented by other adjectives, is widely used in literature and colloquial language. We therefore use terms such as "natural environment", "geographical environment", "anthropogenic environment", "primary environment" and many others. This multiplicity of meanings of the word "environment" means that we use different terms to describe the same thing, or vice versa – we use one term but mean something different. Therefore, it seems reasonable, to quote Krzysztof Kopeć, to clarify these terms, which constitute a specific classification of the concept of "human environment" (Kopeć, 2008, p. 60).

Stanisław Leszczycki distinguished three types of human environment, basing his considerations on the degree of anthropogenic transformation of our surroundings. He distinguished between natural, geographical, and artificial environments (Leszczycki, 1974).

The natural environment has not been affected by human activity or has undergone only a slight degree of transformation. However, it is very rare today. It can only be found in areas not yet inhabited by humans and not used by them for economic purposes. In contrast, the geographical environment is an area with a noticeable degree of transformation as a result of our activity. It occurs in areas inhabited by humans, except for the most densely populated areas (cities and industrial areas). These have been classified as artificial environments. In such spaces, human influence prevails over natural formations or fills them almost completely.

In a similar vein, Tomasz Michalski (2003) and Krzysztof Kopeć (2008), enriching the earlier categorization with the issue of the "social environment," thus referring to the systemic approach in accordance with Ludwig von Bertalanffy's concept. In this approach, as before, the concept of the "primary environment" (or natural environment) is present. It includes only natural inanimate elements (the atmosphere, hydrosphere, and lithosphere) and animate elements (the biosphere), supplemented by an intermediate state, i.e., the pedosphere. This is a space that, in fact, no longer exists anywhere on Earth, as there are no areas that are not directly or indirectly affected by human activity (e.g., due to global climate change). However, the "geographical environment" integrating natural (natural) and artificial elements is

common. The scale of changes in our environment is obviously not uniform – forest and field areas have been distorted to a small extent, while settlements sometimes represent a complete change in the organization of space. In this typology, however, they still constitute different faces of the geographical environment. A separate space – not always material – is the social sphere, which shapes our lives to the same extent as the physical environment. This is the "social environment," which consists of, among other things, moral norms, behavioural patterns, political and economic systems, cultural achievements, and symbols.

The concepts presented essentially represent two areas of human space – the products of nature and the work of humans. These exist not only as material entities, but also within us, shaping our behaviour, predispositions, needs, and stimuli. The dispute over the dominant motive of human behaviour – natural or cultural – is one of the unsolved mysteries of philosophy, sociology, and psychology. It has not been resolved in the treatises of Thomas Hobbes (2023), Jean-Jacques Rousseau (2002), or Erich Fromm (1999). What remains certain today is that humans, both in the spiritual and physical spheres, function on the borderline between social influences and natural predispositions. Following the line of thought of Władysław Tatarkiewicz, it can be argued that the products of culture (or, more precisely, civilization) are a superstructure to our ability to survive in the wild environment, which originally derives from this natural environment (Kwaśniewski, 1987). The human environment, therefore, has two parallel branches: natural (non-anthropogenic) and civilizational (anthropogenic).

The concept of "threat" has been widely described in the literature on security sciences. This term is one of the most important objects of theoretical and methodological research in studies assigned to this scientific discipline. However, most attempts to explain it are modifications of the same, constantly repeated argument. Threat is usually defined in the context of "dangers," "loss of tangible and intangible assets," or "uncertainty of development." It is also very often presented as the antithesis of security. An example of the numerous definitions of the term "threat" can be found in Stanisław Dworecki's proposal, according to which it is "a combination of internal events or events in international relations in which there is a high probability of a restriction or loss of conditions for undisturbed existence and internal development, or a violation or loss of state sovereignty and its partnership in international relations – as a result of the use of political, psychological, economic, military, etc. violence." It should be noted that this interpretation is consistent with the issue of "national security," which presents a subjective approach from the perspective of the state (Dworecki, 1996). An interesting definition was presented by Krzysztof Ficoń (2007), who pointed out that threats are "events caused by random (natural) or non-random (deliberate) causes that have a negative impact on the functioning of a given system or cause adverse (dangerous) changes in its internal or external environment" (Ficoń, 2007). Finally, we can quote a very broad version by Professor

Włodzimierz Fehler, who states that "a threat is an event or process accompanying human civilization, occurring in various configurations, causing an imbalance (or preventing the achievement of this balance)" (Fehler, 2011). They concern not only various socio-political entities (individuals, social groups, states, unions of states) that are in constant connection or enter into temporary correlations, but also all the components that make up the material and spiritual environment of human life. These processes and events take specific forms – cataclysms, disasters, epidemics, wars, social pathologies, and many other phenomena with destructive potential – and create significant obstacles to the effective protection of the values that form the foundations of security (life, health, freedom, quality of existence, prospects for development).

However, the definitions presented seem overly elaborate or insufficient. In particular, they lack a broader perspective relating to the concept of "threats" as a universal category, which is more than just an individual event. In fact, the concept of threats is not complicated at all. We understand it intuitively, almost subconsciously. A threat is something that all living organisms can identify and respond to through natural adaptation. Similarly, every human being knows when they are in danger in certain situations. We are also able to identify risks to the functioning of the systems we create (legal, political, economic, etc.). A "threat" is not just an individual situation. It is also a specific mental construct, embedded in our perception of reality. It can therefore be considered in terms of philosophy, metaphysics, psychology, and, of course, social sciences. However, a "threat" always seems to mean a change that is undesirable from the perspective of a specific entity (a person, family, state).

Referring to the above, while striving for a precise (possibly unexpanded) definition of the term that could be considered satisfactory, let us assume that a "threat" is the potential or actual occurrence of a risk of disruption to the desired state of perceived reality. In this approach, we take into account all possible unexpected and undesirable changes in the state of homeostasis maintained at a given moment in a person's life, but also in the political or economic existence of a nation. Here, maintaining a state of constancy appears to be the expected situation. However, is it possible to maintain this stability? Of course not, as evidenced by the history of every country and all people. Every country will eventually collapse or undergo a significant transformation. Every family will eventually face a crisis. Every person will eventually die of illness or a sudden event. Nothing in the world lasts forever.

Threat as a universal value is therefore an inevitable phenomenon in itself. It always occurs, in one form or another. Even if it is not perceived or anticipated at a given moment, it still exists – hidden, as it were. We can eliminate individual risks associated with various aspects of the reality that surrounds us, but ultimately, there is always some danger that will come to pass. Every world eventually perishes, every life eventually ends, and every rock eventually erodes and turns to dust. Passing

away is only a matter of time. From a human perspective, we can at best manage risks, postpone their occurrence, or minimize their negative effects. But ultimately, we are unable to eliminate them completely. Threat – as a general construct – is therefore inevitable and, in a sense, constant. Like the idea in Plato's conception of the duality of the world, it lurks inexorably above us, waiting to manifest itself at the right moment in the real world. The inexorability of threats is particularly noticeable when their sources lie in the world of nature – unpredictable and infinite.

Threat is also a subjective phenomenon, perceived and interpreted independently. For humans, death is a constant threat that affects every one of us. Death also accompanies other living beings, such as pigs. Waiting in slaughterhouses for their inevitable fate, they could define the moment of their death as a state of extreme threat. But from a human perspective, there is no risk in their death. On the contrary, killing an animal means a source of food and thus survival for humans. The relativism of the perception of threat is therefore both obvious and universal. For a threat from one perspective always bears the hallmarks of profit for another entity. The bankruptcy of one company opens up investment opportunities for another; defeat in war means conquered territory for the enemy; the extinction of one species means the opening of an ecological niche for another. Threat is always a matter of perspective and interpretation. It is therefore a phenomenon that does not necessarily have to be subject to axiological evaluation.

Identifying a specific threat requires defining the object that is at risk. It is also necessary to indicate the temporal and spatial perspective of the occurrence of threats and the scope of unacceptable changes. Numerous classifications of threats are based on these variables. Among them, categories are based on, among others, the entity (e.g., nation, municipality, family, human being, living organism, etc.), subject (e.g., political, military, economic, socio-cultural, ecological, terrorism) (Jakubczak and Flis, 2006), space (world, region, state, territorial unit), or source (natural, technical, social). According to Barbara Kaczmarczyk (2014), the latter are one of the most popular forms of threat classification. It seems that this is not without reason. After all, the purpose of risk identification is to prevent its occurrence. Therefore, the earlier a danger is recognized, the more effective the methods used to respond to it will be. This rule is perfectly emphasized by the old definition of threats set out in the 1978 Lexicon of Military Knowledge (i.e., long before the postulate to create "security sciences" was formulated), according to which a threat is "a situation in which there is an increased likelihood of loss of life, health, freedom, or material goods. It results from natural causes – the impact of the elements – or may be caused by another human being."

The last of the proposed definitions of the term "threat" seems to explain the concept in accordance with its intuitive understanding. After all, with regard to the default subject (human beings), the most fundamental risks and their sources have been identified here. Based on the same observations, we carry out the process of

natural identification of dangers present in our daily existence and adapt our actions to them so that they can be avoided. At the same time, this definition fits well with the concept of hazard classification promoted in this text. The term "threats from the human environment" refers to the spatial, territorial, or geographical format of describing the threats present in the domain of our species' existence.

However, the definition cited does not satisfactorily reflect the knowledge we have today about the origins of threats. Although the division into natural and man-made threats is relatively accurate, it overlooks certain nuances. Referring to the definitions of the human environment presented in the first part of this chapter, we know that few geographical areas remain untouched by the stigma of civilization. Humanity has left little or no mark only on the most inaccessible areas of our globe (e.g., the mantle and core of the Earth, or the stratosphere and upper layers of the atmosphere). However, most of them have been marked to a greater or lesser extent by the influence of the homo sapiens species. Therefore, we can assume that the sources of threats most often originate directly from civilization (caused by humans and the social structures they create), although they also occur in a form that combines anthropogenic and natural elements. Hence, a different classification of the sources of environmental threats than the most mentioned one is proposed.

In foreign sources, environmental (natural) hazards are often compared with the classification of the Center for Research on the Epidemiology of Disasters (CRED) (Halkos, Zisiadou, 2019). According to this classification, environmental hazards are distinguished as biological, climatological, geophysical, hydrological and meteorological hazards (and, in extended approaches, technological hazards). At the same time, this ranking takes into account risks related to human activity (technological hazards): industrial and transport disasters, and others. This classification seems adequate to reality, although, considering the scale of human impact on the environment, it requires a slight modification – less fragmentation of the "natural" category and expansion of the catalogue of types of hazards included in the "technological – other" category. Therefore, concerning the presented classification, but also to the earlier considerations on the definitions of "environment" and "hazards," a modified concept of "hazards from the human environment" is proposed.

Considering the degree of human interference in the environment, where few ecosystems still function separately from human culture, we should rather identify three overarching categories of environmental hazards. First, "natural" hazards, occurring in the natural environment to a similar extent as in pre-industrial times (e.g., extraterrestrial, geophysical). Secondly, "civilizational" hazards, resulting directly from social activity and material structures produced by the human species (including industrial and transport disasters). And finally, "mixed" hazards, which are the result of the impact of an environment significantly altered by humans, combining elements of natural processes modified by pollution (climatological, meteorological, hydrological).

However, delving deeper into this division, we can see that even threats that seem to be independent of humans actually bear the symptoms of our interference. For example, earthquakes, which are most often the result of processes occurring deep beneath the Earth's crust, sometimes have a technogenic origin (e.g., related to the creation of large artificial water reservoirs or the drilling of mine shafts). On the other hand, the spread of substances hazardous to the health of living organisms, e.g., as a result of accidents or improper infrastructure organization, occurs in the natural environment. It is only the combination of toxic man-made products with the natural exposure of substances in nature that makes the problem significant on a large scale. It can therefore be concluded that these two environmental risk factors cannot be effectively separated.

Therefore, within the framework of these considerations, it is proposed to maintain a dual division of "threats from the human environment" based on the following criteria: non-anthropogenic (natural) and anthropogenic (civilizational) threats. The first category refers to a group of environmental factors affecting our safety, the origins of which are predominantly natural. In other words, they would exist regardless of the existence of the human species. Our influence only affects the scale and scope of these dangers. In contrast, the second category of hazards concerns phenomena that would not occur in the environment without human involvement. Although the medium in which they find their outlet is natural (but also artificial, e.g., cities) ecosystems, the origin of these harmful factors always stems from the products of civilization. In other words, the proposed division is based on the dominance of cultural or natural factors of origin of a given danger.

In the presented approach, the category of "non-anthropogenic hazards" therefore includes the following subgroups of hazards: "extraterrestrial" (impacts of celestial bodies, the influence of the sun's atmosphere, cosmic radiation); "geological" (volcanism, earthquakes, tsunamis); "atmospheric" (including climatic: extreme temperatures, fires, droughts, as well as hurricanes, tornadoes, El Niño); "gravitational-hydrological" (floods, landslides, avalanches, sinkholes); "biological" (resulting from the impact of living organisms: bacteria [and viruses], fungi, parasites, pests, etc.). The criterion of "anthropogenic hazards" includes: "technical disasters" (industrial, energy-related, and others, causing exposure of toxic substances to human communities and nature); "transport accidents" (with a similar impact); emissions of pollutants into the environment (all forms of long-term degradation of the natural environment); "military transformations of the environment" (related to the devastation of the environment caused by the deliberate use of means of destruction). The last of these subgroups is special. It refers specifically to deliberate actions aimed at changing environmental conditions in such a way that a specific group of people will cease to exist in their space, or that space will become harmful to them. The peculiarity of the last subcategory has another dimension. Conflict within or between communities may indirectly depend on radical changes in environmental

conditions. In other words, natural disasters can lead to such a transformation of the conditions of existence of a given community that it becomes more prone to acts of violence against other social groups.

Natural disasters have often changed the face of the earth, especially its biosphere. Numerous cases of species extinction, including the five so-called mass extinctions (Ordovician, Devonian, Permian, Triassic, and Cretaceous), serve as examples. These catastrophes usually had three causes: impacts of objects from space, super volcano eruptions, and sudden climate change.

The first cause of these catastrophes continues to threaten the Earth. Thousands of celestial bodies orbit in near-Earth space. Some of them are small, while others are measured in kilometres in diameter. These are comets and asteroids, which pose a deadly threat to species living on Earth. But it is not only cosmic rocks that threaten our planet, but also the sun, which is essential for life. Our star is active, and the atmospheric phenomena occurring within it can cause specific damage to man-made infrastructure, especially electrical equipment, transmission networks, and satellite communication systems. These cosmic dangers form the first group of non-anthropogenic threats – "from outer space."

The second category is geological hazards. The interior of our planet is much more dynamic than we can see daily. The layers of our planet between the (probably) solid core and the Earth's crust are rather malleable and changeable. The Earth's mantle resembles a thick soup rather than solid rock. Therefore, the tectonic plates that form the Earth's crust are constantly moving relative to each other. This movement is very slow, but it has spectacular effects. Colliding tectonic plates can cause one of the most destructive natural phenomena – earthquakes. On land, they cause tremors that lead to the destruction of buildings, often trapping people in the rubble. An earthquake under the ocean causes a tsunami wave, which can reach a height of up to several meters and penetrate deep into the land, causing damage extending kilometres from the coastline. Volcanism is also a manifestation of seismic activity.

The category of atmospheric hazards covers the widest group of dangerous natural phenomena. It includes all hazards resulting from weather variability. In this context, the scale of hazards is primarily related to the potentially destructive force of wind, lightning, heavy rain, snow, or hail. This group includes one of the most important contemporary challenges, namely global climate change and its numerous negative consequences. It also includes extreme atmospheric phenomena associated with extreme water shortages (including large-scale fires and droughts) and excess water (stormy weather, hurricanes, and tornadoes).

The category of gravitational and hydrological hazards mainly concerns dangers related to landslides, avalanches, and other ground movements. However, this category also seems to include hydrological phenomena: floods, which are a consequence of the rising level of water bodies and watercourses, filling up with the inflow of successive volumes of water layers. However, flooding is the most undefined type of

non-anthropogenic hazard, as it can be classified as geological hazards (as a result of tsunamis), atmospheric hazards (due to their connection with precipitation), and gravitational hazards (as they occur when excess water that cannot be contained in a water reservoir moves and fills lower-lying areas of land).

The last category of non-anthropogenic hazards – biological hazards – includes all manifestations of the negative impact of living organisms other than humans. This mainly concerns the impact of microorganisms such as bacteria, fungi, protozoa, and viruses. This group also includes the economic and health consequences of pests and natural toxins produced by living organisms. The scale of the real risk associated with this category of hazards is evidenced by the recent SARS-CoV-2 pandemic, which has so far claimed the lives of nearly seven million people globally.

The broad category of anthropogenic (civilization-related) threats primarily includes manifestations of unintentional environmental pollution with substances that cause sudden or delayed health consequences in humans and other living organisms. The most common manifestations of these threats are all kinds of emissions from industrial, agricultural, energy, municipal, transport, and other sources related to people's daily lives and their exploitation of natural resources. Most of the practices associated with the use of any cultural behaviours (especially in the so-called first world) involve leaving substances that are dangerous to living organisms (including humans) in the natural environment. The more artificial the environment, the more man-made creations it contains (cities, agglomerations), the greater the scale of dangerous pollution. However, the standards for avoiding specific pollutants vary from country to country, resulting in the scale of the threat associated with their occurrence being extremely disproportionate in different regions of the world. These pollutants cause numerous diseases, now referred to as lifestyle diseases. Their occurrence means that our lives are shorter and that we are exposed to diseases that may not have existed in the distant past.

Although a certain level of pollution is acceptable in individual societies, sudden failures or damage to industrial, energy, and other installations can occur, causing sudden contamination of a given part of the natural environment on an extremely dangerous scale. We then refer to these as industrial disasters. Contact with an environment contaminated as a result often leads to extreme damage to health or even death. The past decades have brought numerous examples of such threats. The Union Carbide factory disaster in Bhopal in 1984, the Chernobyl nuclear power plant reactor failure in 1986, the oil spill at the Deepwater Horizon drilling platform in 2010, and the damage to the nuclear power plant on the island of Fukushima in 2012 are just a few examples of such dangers.

Another category of anthropogenic hazards concerns transport disasters. The transport of materials that are potentially dangerous to living organisms takes many forms, from land travel to sea and air freight. In each of these forms, serious accidents causing severe environmental contamination can occur and have occurred in

the past. The most serious accidents to date seem to be those involving sea vessels transporting energy resources (e.g., oil, as in the case of the Exxon Valdez tanker) or hazardous chemicals.

There are certainly other types of anthropogenic threats. However, the most important of these seems to be the category of threats related to human military activity. Its uniqueness stems from the deliberate destruction of ecosystems (the environment) or their elements in order to achieve specific socio-political goals. Environmental destruction as a result of military activities is particularly devastating. Potentially, the type of military activity with the strongest impact on the environment is the use of weapons of mass destruction (nuclear, biological, and chemical). However, all types of weapons and the use of military equipment cause damage to nature to a greater or lesser extent.

Conclusions

The results of the analysis indicate that a key element in understanding threats to the human environment is their dual nature, encompassing both non-anthropogenic and anthropogenic threats. Based on the original concept presented in the article, it has been identified that contemporary threats are mixed in nature, as natural factors are increasingly manifesting themselves in spaces that have been heavily transformed by human activity. An important result of the research is the demonstration that phenomena such as extreme weather events, environmental degradation, and epidemics are exacerbated by urbanization, industrialization, and the globalization of socio-economic processes. The analysis also showed that the boundary between natural and technological hazards is becoming blurred, which should be considered in the classifications used in security sciences. The results suggest that the concept of "natural hazards" should be replaced by the term "hazards from the human environment" as it better reflects the contemporary reality in which human activity affects every aspect of the environment. In addition, it has been shown that traditional environmental safety models need to be updated to consider the synergistic effects of global factors such as climate change, ecosystem degradation, and the development of critical infrastructure. The analysis also confirmed the growing importance of human-induced hazards, which in many cases exceed natural hazards in scale and dynamics. These findings support the proposed hypothesis and indicate that the traditional natural/anthropogenic division does not fully reflect the contemporary, hybrid nature of environmental threats shaped by human activity.

The presented concept of " hazards from the human environment" is an attempt to systematize and organize knowledge in the field of ecological security. This category covers all threats that arise in the human environment. At the same time, due to the

ubiquitous interference of our species in the natural environment, the presented classification is based on the dominance of anthropogenic or non-anthropogenic factors. The proposed classification seems to comprehensively present the threats arising in the natural and artificial environment.

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