
La Universidad de Guantánamo en el fortalecimiento de las medidas de defensa civil en el malecón baracoense
The role of the University of Guantánamo in strengthening civil defense measures in the Baracoa sea wall

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Resumen: Con la utilización de métodos de investigación científica empíricos como observación, entrevistas, encuestas; teóricos como el histórico y lógico, inductivo-deductivo, análisis y síntesis; y estadísticos-matemáticos (análisis porcentual), se analizan las principales insuficiencias que se manifiestan en la aplicación práctica en el malecón de Baracoa de las medidas promulgadas por la defensa civil ante la ocurrencia de eventos meteorológicos severos, y se propone un conjunto de acciones con la participación de profesionales y estudiantes del centro universitario municipal de Baracoa para la reducción y mitigación de los daños causados por estos eventos en esta importante arteria de la ciudad.

Palabras clave: Defensa Civil; Eventos hidro-meteorológicos; Mitigación de desastres; Cambio climático

Abstract: Using empirical scientific research methods (observation, interviews, surveys), theoretical methods (historical and logical, inductive-deductive, analysis and synthesis), and statistical-mathematical methods (percentage analysis), the main insufficiencies manifested in the practical application in Baracoa's sea wall of the measures promulgated by the civil defense to cope with severe meteorological events are analyzed in this paper, and a set of actions is recommended. It involves the participation of professionals and students of the municipal university center of Baracoa for the reduction and mitigation of the damages caused by these kinds of events in the city.

Keywords: Civil Defense; Rainfall-meteorological events; Disaster mitigation; Climate change

Introduction

Serious environmental imbalances such as deforestation, soil degradation, water pollution, and climate change that increasingly impose greater dangers of extreme hydro-meteorological phenomena such as drought, heavy rains and floods, hurricanes, among others, are some of the frequent threats that hit Cuba hard. In this regard Castro Ruz expressed:

Many of our countries are especially vulnerable and are in a more difficult situation in certain aspects than the rest of the underdeveloped world. But we have a resource of exceptional value: we have our peoples, forgers of original cultures, forced to innovate and create by the necessary adaptation to a very fragile and variable environment. (1994, p.66)

The classics of Marxism warn that the dominion over nature consists in being able to know its laws and apply them properly:

Our dominion over nature is nothing like the domain of someone outside of it. We, by our blood and our brain, belong to nature, we are in its bosom and our entire domain over it is that, unlike other beings, we are able to know their laws and apply them properly. (Marx and Engels, 1976, p.188)

In Cuban higher education we work with the consideration that many dangers are inevitable and the total elimination of risks is impossible, but human actions can reduce vulnerabilities and social, economic and environmental risks. According to it, the Cuban universities play a decisive role in the formation and education of an environmental culture in the reduction of risks to face climate change in order to increase the response capacity of the population in the event of a hydro-meteorological disaster, an example of this is the course delivered by the national television on tropical cyclones in the TV space University for All with the purpose that the population acquire information on the subject to adopt the necessary prevention measures with greater conscience and serenity in order to safeguard human lives and material goods.

In this regard, Capote (2012), noted: "it is known that the basis of disaster reduction is the knowledge of hazards, vulnerabilities and risks" (p.3). This corroborates that knowledge management in disaster reduction and climate change occupies an important place.

As a knowledge process, it must be studied, organized, structured and applied creatively under certain objective conditions and in an environment in which the available knowledge and information are accessible to the interested parties, since it includes the protection of the population, the economy and the environment, and the confrontation to climate change.

The University, as an institution of greater scientific prestige in the country, cannot be outside the systematic confrontation to emergency situations, and from this point of view lends its unconditional support with professionals and qualified personnel in the instrumentation of impact studies, the incorporation of adaptation and mitigation issues into environmental education plans, and the development of lectures and theoretical seminars that upgrade the scientific knowledge of leaders and the population in general.

In all provinces, universities have included specialists in different multidisciplinary groups and projects to carry out risk, vulnerability and damage studies. The University of Guantánamo is not an exception, and together with the Municipal University Center of Baracoa it organizes the student and teacher scientific groups providing the necessary cooperation to improve the application of all the civil defense measures to face the extreme recurrent phenomena in the locality.

The system of civil defense measures constitutes a strategic factor for the defensive capacity of the country. It is organized throughout the national territory and its activities are supported by the use of human and material resources of state institutions and agencies, economic entities and social institutions.

The civil defense measures developed in the sea wall in Baracoa have demonstrated their effectiveness against the different natural phenomena that have affected the territory, but there are some regularities in their compliance and practical application such as:

- The poor dominance shown by some inhabitants of the theoretical-scientific aspects related to the structure, characteristics and meaning of the intensity scales (Saffir-Simpson, among others) and their destructive power.
- Ignorance of the phenomena associated with these events.
- The low perception of risk motivated by the position assumed while other phenomena without considering the differences in intensity, trajectory, ending; and the exaggerated confidence in the central mountain range of Hispaniola as a protective shield.
- Lack of correct orientation, verification and control of the package of preventive measures established in case of the occurrence of cyclones or hurricanes.
- Debris accumulation in areas of frequent sea penetration.

- Sewer leaks.
- Clogging of sewers.

All the above shows insufficient knowledge by the inhabitants about the characteristics of the meteorological events of greater incidence, and a necessity to enhance their theoretical - scientific preparation so that they can act in accordance with the most appropriate measures in each case.

The authors of this paper consider that a greater theoretical - practical and scientific knowledge of the population of Baracoa about the essence of the meteorological phenomena that produce sea penetrations and coastal floods, contributes to strengthen the civil defense measures. In correspondence with this, it declares as objective the elaboration of theoretical and practical actions to strengthen the application of the civil defense measures in the sea wall in Baracoa.

Development

It would be impossible to apply a set of preventive measures if the link between the educational actions to be carried out, the activity and its structure is not taken into consideration. The activity becomes the object of psychology that allows the subject with active character to relate to the outside world. The activity is constituted by a system of actions united for a reason through a set of operations that ensure the achievement of the objective. Galperin (1966) marked the path of the development of material external activity to internal, psychic activity, through the theory of step-by-step formation of mental actions.

The Galperian model elaborated on the basis of the historical-cultural approach illustrates the elements to be considered in the organization of the didactic aspects of the proposal, the study of the action and its characteristics, which is conceived in three fundamental stages: orientation, execution and control, starting from a guiding base of the action with a system of indications that takes into account that current trends. Rico and Silvestre (1997) also propose the participation of students in the orientation phase.

The university student through the Main Integrating Discipline and as part of its curriculum develops a set of activities previously designed in an annual and monthly planning conceived in four fundamental components: academic, labor, university extension and

investigative, with which it must comply with through the exercise of his systematic or concentrated practice that prepares him for his future professional performance.

The teacher and the students must be immersed in the cultural, social and political world in which they live. It is therefore necessary to conceive students as citizens who have to cope with certain conditions, in a particular context that requires knowledge and that imposes demands and responsibilities. In other words, it is about assuming a didactic model that contemplates sociological, psychological and pedagogical aspects in its relationship with the society in which one lives.

Transforming education also implies the training of a professional capable of implementing the desired changes scientifically based, which contributes to improving the reality in which he develops and, by extension, the locality where he lives.

The research work of the students constitutes an organizational form which fundamental objective is to develop skills related to technical and scientific research work through work practice, and contributes to the development of the initiative, the cognitive independence and the creativity of the students. Research, as a function of the teacher and as a component of the individual work plan of the undergraduate student, should not be understood as the activity of the professional researcher away from everyday practice and limited to theoretical elaborations, but as stated by Blanco and Recarey (2004) "Participation in the dynamics of the community in which the school is located" (p.13).

The University nowadays, because of its character and mission, is inextricably linked to the social context. Every society aspires to form individuals increasingly capable of transforming it to achieve human improvement; however, it is not always aware of the aim with the formation of the professional, producing a process that some authors call devaluation of the formation of professionals.

Consequently, the most advanced positions of the current Cuban pedagogy consider the love of nature as a basic principle to love man, because nowadays the consequences of neglect and lack of respect for the environment are already perceptible. The nature-man-society unit is an important postulate of Marxism and with it methodologically based the approach of numerous problems related to the environment. One of the most important is the one that

postulates: "Nature is for man a link that links man with man himself" (1976, p.48).

In nature everything is interrelated (integrity), processes and phenomena occur with a certain periodicity (rhythm), as happens, for example, in the materials cycle; these processes are not interrupted (continuity), and the whole is unique and at the same time diverse - spatial differentiation. When in anthropoid intervention motivated by the search for the welfare of society, science and technology are not used properly there is an imbalance in the development of these processes and the inevitable negative consequences for the support of countries, their economy, and the life of its population.

As part of his historical legacy, Fidel Castro Ruz said: "If we are an island a few meters above the sea, we wonder what will happen when the waters rise in level and if we can face the droughts, the cyclones and other climatic catastrophes that await us "(1994, p 41).

Among the main natural phenomena that have intervened in the paleo-geographic evolution of Cuba is the occurrence of different events with geological characters (faults, displacements of tectonic plates, earthquakes, volcanoes, among others), biological, (origin, evolution and extinction of species of plants and animals) and climatic (alternation of hot and cold climates, movement of high and low pressure centers, cyclones and migratory anticyclones) that continue to develop today, bringing with them numerous consequences that sometimes, due to their size, they are catastrophic.

Baracoa and its sea wall: hydro-meteorological events that have affected it

Considering the previous premise, Baracoa and its sea wall can be impacted by sea penetrations and coastal floods caused by earthquakes, cyclones or hurricanes, and winter storms that cross over its territory or from distant regions of the ocean, which originate different types of waves as those of tsunamis, cyclonic or storm tides, as well as sea originated disasters, never forgetting the fall of a meteorite in the sea, in which case the cause would be astronomical.

The fact that Baracoa is located in the eastern region of the country, very close to the main seismic zone of Cuba, south of the provinces of Granma, Santiago de Cuba and Guantánamo where the tectonic plates of the Caribbean are displaced horizontally in

conditions of occurrence of natural events of great intensity; although it is not likely that tsunamis occur, there will always be a risk.

We must also consider its proximity to the northern coast of Haiti, where recently scientists have discovered a failure of subduction (displacement of one fault below the other), which has not broken in 1000 years and to do so an earthquake of a magnitude of nine degrees on the Richter scale, is likely to produce a large crack of 1000 km and a large tsunami that would wipe out the Caribbean islands, and reach the coasts of the US, Europe, Africa and South America.

Notwithstanding the possibility of occurrence of these events, the priority corresponds to the penetrations originated by meteorological or climatic phenomena, among them, cyclones and winter storms that occur more frequently and cyclically in the geographical area where Cuba is located, and specifically the territory of Baracoa.

A tropical cyclone is a generic term used to designate low pressure systems that form in the oceans, in a homogeneous environment and generally in the tropics are formed on the warm waters of the tropics from pre-existing atmospheric disturbances such as low pressure systems and tropical waves. The tropical waves are formed every three or four days on the waters of the Atlantic Ocean, near the Equatorial line. Tropical cyclones can also form from cold fronts and, occasionally, from a low pressure center at high levels of the atmosphere.

The process by which a tropical storm is formed and subsequently intensifies to the degree of a hurricane depends on at least three of the following conditions:

1. A pre-existing atmospheric disturbance (tropical wave) with storms embedded in it.
2. Warm oceanic temperatures, at least 26 ° C, from the sea surface to 15 meters below it.
3. Weak winds in high levels of the atmosphere that do not change much in direction and speed.

As a tropical cyclone gets organized, it goes through two initial categories. These are not contained within the hurricane scale of Saffir -Simpson, but they classify a tropical cyclone in formation and are used as additional categories to it. They are: the tropical depression, which is an organized system of clouds and electrical storms with a closed and defined

circulation; and the tropical storm, which is an organized system of strong thunderstorms with a well-defined circulation that shows the distinctive cyclonic shape.

To face a hurricane, vulnerability is higher in coastal areas, due to the probability of being affected by the sea waves.

The year of greatest activity for Cuba was 2008, when a tropical storm and three hurricanes of great intensity, one of them with a maximum wind streak of 340 kilometers per hour, lashed the Cuban archipelago, producing seven deaths.

The Baracoan memory collects the scourge of several cyclones or hurricanes:

1. 19th century, presumably on September 3, 1832.
2. 20th century, in 1908 between September 11 and 14.
3. Hurricane Hilda on September 13, 1955.
4. Hurricane Flora, which in October 1963 hit the Caribbean islands with winds of 225 kilometers per hour, was one of the most damaging in history.
5. Hurricane Gilberto, September 1988, with 296 kilometers per hour, the third in history due to the intensity of the winds.
6. George, September 28, 1998.
7. Ike, September 7, 2008.
8. Tropical Storm Erika, effects due to rain.
9. Joaquin, the most dangerous of the 2015 season to reach category four on the Saffir-Simpson scale as it passes through the nearby Bahamas.
10. Matthew, October 4, 2016.
11. Irma, October 7, 2017.

These hurricanes of different intensity have unleashed their fury on the coast of Baracoa and specifically on its sea wall located along the northern coast of the city with a length of 2 km. The Sea Wall Avenue is one of the most distinctive works of the city, which is a priority as it represents for the population in terms of culture, traditions, economy and politics an icon; it is the public space that is most used in the city with a political-recreational character

because of its privileged location within the town. Due to the proximity to the sea, its geometry, materials used in its construction, acting loads, foundations, construction methods, public utility and the economic relevance it possesses, this engineering work is the object of admiration for both national and foreign visitors.

During the days 21 and 22 of March of 2008 there was a sea tide that started from the big waves that are generated in the Atlantic, provoking until that moment the most impressive marine penetration known in Baracoa.

According to Enrique Perigó, head of the Forecasts Group of the Guantanamo Meteorological Center, the Bahamas act as a natural barrier that prevents the waves from unloading its tremendous power over the north of Cuba, but a gap of 54 kilometers in the Paso de Mayaguana gives access to a deep canyon that extends very close to the coast of Baracoa, through which the waves generated hundreds of kilometers reach this point of the island practically without losing height or intensity.

In September 2008 the promenade of the First City of Cuba succumbed to the devastating hurricane, wave trains between five and seven meters high kept all the arteries near the pier and several streets beyond the foreseeable surpassed by far the most recent sea of cam happened. Some of the waves caused by Ike, with more than seven meters passed over the buildings of Baracoa's seawall and the sea penetrated 400 meters into the city. There were no reports of loss of human life, although there were seven injuries that were quickly taken care of.

To this chronology is added the most recent meteorological event, which far exceeded Ike and its effects, Hurricane Matthew, one of the worst that has passed through Cuba in recent years. It produced the greatest devastation the municipality of Baracoa had in its history and consequently great damage to the seawall during its passage on October 4, 2016, coinciding with the date in which the center of Hurricane Flora penetrated between the cities of Guantanamo and Baracoa.

1963 Plan of actions for the reduction and mitigation of the damages caused by these events
The negative effects of these hurricanes on housing and social institutions near the sea wall showed that the knowledge and the preparation of the inhabitants for their confrontation is

insufficient. This was corroborated with the application of surveys and interviews to 300 inhabitants of the area of the sea wall, representing 46% of the total population.

Results of the test:

- 80% of the respondents know the measures that are oriented to face a tropical cyclone.
- 85% consider the participation of state organizations in the care and protection of the population to face these events.
- 66% believe that the evacuation of personnel should be carried out by the State and its organizations.
- 34% determined that it was the person themselves who evacuated and protected their resources in the homes of relatives or neighbors.
- 75% considered that the forecasts have been very accurate and precise in recent years.
- 57% agreed that there were failures regarding the distribution of resources in the recovery phase.

Results of the interview:

- 82% of the interviewees are unaware of all the natural phenomena that can cause sea penetrations in the sea wall in Baracoa.
- Only 10% showed knowledge about the phenomena associated with cyclones or hurricanes.
- 43% recognizes only cold cyclones and fronts as phenomena that could cause sea penetrations in the sea wall in Baracoa.
- 97% of the interviewees do not know how to explain what a high tide is.

In spite of the preventive measures carried out by the civil defense, the level of information and the culture acquired by the people are still insufficient and also for the execution of the measures adopted by the civil defense, there is a lack of theoretical knowledge about of the meteorological phenomena, reason for which the following plan of actions has been elaborated.

Action 1: application of instruments for the determination of the level of theoretical and practical knowledge of the inhabitants living near the sea wall in Baracoa about the types of

most frequent phenomena that cause sea penetrations and their consequences, and the most appropriate preventive measures to be applied before, during and after the occurrence of each events.

Objective: to diagnose the level of theoretical and practical knowledge of the inhabitants of the sea wall neighbors on the meteorological phenomena of greater incidence in the penetrations of the sea and coastal floods, and the measures to be adopted by the population in accordance with the plans of the civil defense for these cases.

Responsible: tutor and student scientific group of the Biology - Geography course of the Municipal University Center of Baracoa.

Action 2: video - debate high tide and hurricane Ike

Objective: to encourage the population to analyze how it could respond to a meteorological event of this magnitude.

Responsible: teacher - communicator.

Action 2: conducting training seminars for the residents of the area of the sea wall and adjacent streets on the actions to be developed in accordance with the characteristics of the events that could cause sea penetrations and coastal flooding, through the use of new technologies of the scientific - technical information available to educational centers and state institutions located in this important artery of the city.

Objective: to train the inhabitants of the sea wall in Baracoa; to increase knowledge about the characteristics of the phenomena that most frequently produce sea penetrations in this coast.

Person in charge: teacher – communicator

Action 3: workshop with the leaders of political and mass organizations and institutions in correspondence with the measures established in the plans against disasters and hurricanes, specifying the role that each person has to play.

Objective: to prepare all the personnel committed to the protection of the population and the private and state material resources.

Person in charge: teacher – communicator

Action 4: workshop for observing real visual images about the occurrence of other extreme hydro-meteorological events related to sea penetrations and coastal floods in the country and other regions of the world.

Objective: to increase the risk perception of the population of the Baracoa sea wall through real visual images to enhance theoretical and practical knowledge about its occurrence in Cuba and in other parts of the world.

Responsible: teacher - communicator.

Action 5: creation of circles of interest, scientific societies and socio-cultural projects directed by the University in the educational centers and state institutions located in the area of the sea wall and adjacent areas, including the participation of the private sector.

Objective: to contribute from scientific research to mitigate the damage that extreme hydro-meteorological phenomena can cause from the enhancement of a comprehensive general culture that involves all levels of education and sectors of the population of the area.

Responsible: Director of Scientific - Technical and Postgraduate studies of the Baracoa Municipal University Center.

Action 6: attention to the control and verification of the measures oriented from the informative phase to avoid irregularities in their fulfillment, motivated by human irresponsibility, elevating the sense of appertainance of each citizen to cope with the possible affectations caused by events of this nature.

Objective: to determine the individual and collective responsibility of all the factors involved in the confrontation of these phenomena.

Responsible: council of municipal and zone defense.

Action 7: debris recollection in the area with possible effects due to sea penetrations before the beginning of the cyclonic and winter season in order to avoid its impact against the houses and state institutions.

Objective: to prevent the debris from becoming possible projectiles to impact houses and real estate due to the occurrence of new penetrations of the sea.

Responsible: council of municipal and zone defense.

Action 8: location and elimination of the sewer leaks in some buildings in the area near the sea wall, and remove the drainage from the artificial drainage since the completion of the Meteor Exercise that is carried out annually before the start of the hurricane season and before the arrival of the cold front during the winter season.

Objective: to avoid biological contamination caused by mixing the water from the penetrations with the leaks of the sewers that might spread along the coastal areas as a flood that can affect all the houses and buildings.

Responsible: council of municipal and zone defense.

Action 9: workshop with the experts of the company Geocuba who, together with specialists from the University of Havana, carry out impact studies on the waves on this coast based on the geographical characteristics of the town, the organization and intensity of the meteorological phenomenon that generates it, the speed, time of affectation and angle of direction of the wind with respect to the coast, as well as the size of the waves, including the frequency of arrival of the waves, the predominant phase of the astronomical tide, the drainage of the place and the anthropic deformations carried out in the coastal zone.

Responsible: representative of GeoCuba in the municipality

Objective: to know the impact studies carried out on the waves in the Baracoa sea wall and its application in the executed engineering works.

Action 10: evacuation exercise to increase the perception of risk in the sea wall neighboring areas and in adjacent areas where these phenomena have not affected to avoid surprises and to adopt the measures with agility, evacuating and putting care to the resources of the population and the State institutions.

Objective: extend these actions to other areas that have not been affected by these events under the principle that no place is exempt given the narrowness of the city, due to the fact that the intensity of sea leads and other phenomena have increased more and more with time associated with global climate change.

Responsible: council of municipal and zone defense.

Conclusions

The University of today, due to its character and mission, is inextricably linked to the social context, which allowed identifying the insufficiencies in the application of the civil defense measures in the Baracoa sea wall to face the occurrence of severe meteorological phenomena, and proposing a set of actions to reduce disasters.

The development of the proposed actions promotes a greater knowledge of the theoretical-practical elements on the most frequent meteorological events that affect the Baracoa sea wall, such as hurricanes, sea leads and cold fronts, based on their essential characteristics: time of year in which they occur, forming areas, intensity, trajectory, which will allow the inhabitants to know the type of phenomenon they face, raise their capacity for response and perception of risk, guaranteeing an adequate level of preparation at all times.

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