

# CLASSIFICATION OF HYDRIC PHENOMENA AND PROCESSES (HAZARDS) IN THE OCEAN AND LITTORAL DOMAINS. A POINT OF VIEW

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**Abstract. Classification of water hazard phenomena and processes (hazards) in coastal and oceanic domains. A point of view.** After a brief characterization of the two components of coastal and oceanic risk, the criteria and objectives pursued in the oceanographic hazard classification are dealt with. In this respect, the criteria used in the classification of water risk phenomena and processes in coastal areas (genetic, spatial, temporal, way of manifestation, nature of phenomena and processes, degree of impact, effects and their perception). Based on a number of criteria (genetic, spatial, temporal and way of manifestation), the risk phenomena and processes in the two domains were classified into dynamic (from oceanic liquid water), mechanical (abrasion and aggradation) and interference (physical, chemical and mixed).

## 1. INTRODUCTION

Water phenomena and risk processes in the ocean and coastline are part of the natural hazards, which are an integral part of human history and can be studied from several points of view. Approached in sociological terms, the severity of natural hazards depends on the level of development of the society (vulnerability level) at the time of occurrence of the hydrological risk phenomenon. A geographical approach focuses on the description and explanation of uncontrollable natural physical events, their causes and consequences.

Hydrological phenomena and processes only receive the attribute of risk when their spatial, temporal, dynamic and energetic parameters affect the integrity of human collectives, their goods and the normal performance of their activities, or when they produce irreversible imbalances in the natural environment.

By phenomena and risk processes commonly called hazards, a high risk situation is defined, possibly occurring at any time, without knowing when and where they will manifest, with what intensity and with what consequences.

There is a clear distinction between hazard and disaster in the sense that a hazard is a perceived natural event that threatens both life and property while a disaster is the materialization of a hazard. A natural hazard occurs when extreme

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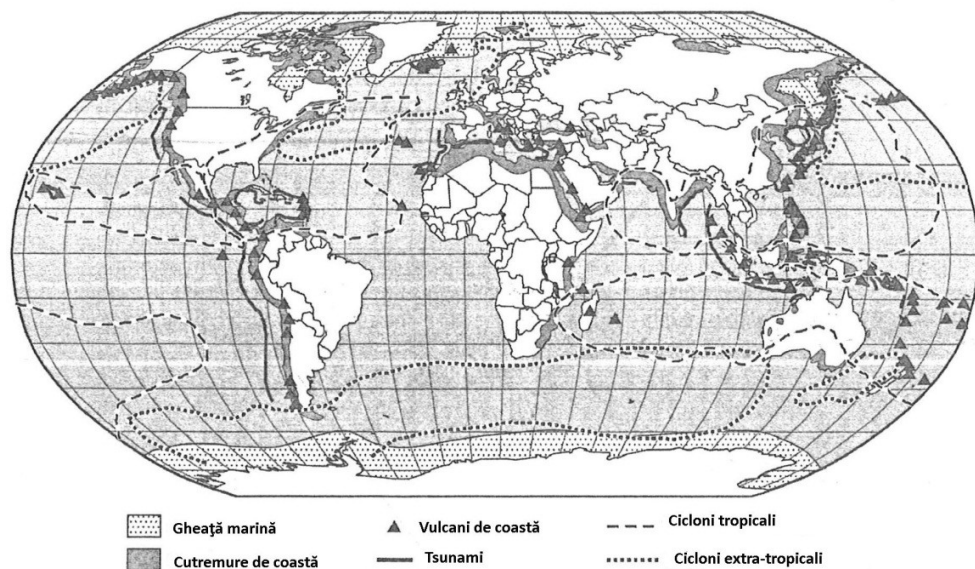
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natural events or processes occur in areas with human settlements and causes loss of human lives and damage to already existing resources and infrastructures.

The most numerous water risk phenomena and processes occur in the coastal area where their diversity and the presence of large human agglomerations are very high (65 cities with over 2.5 million inhabitants), and the migration phenomenon towards these regions is significant. About 60% of the world's population live in coastal areas, less than 60 km away from the shore, and in over three decades this will reach 75%.

In the ocean area, water phenomena and processes are equally varied, but the presence of people, activities and goods is much lower than in the coastal areas.

The risk phenomena and processes taking place in coastal and oceanic areas are very varied as genesis, way of manifestation, etc., being included in the oceanographic hazards category. Of these, the hydrological ones are closely related to the genetic and spatial correlation with geological, climatic risks (Fig. 1).



**Fig1.** Spatial repartition of oceanic and costal hazards.  
(after Walker and McGraw, 2010)

Hazardurile hidrice din domeniul litoral și oceanic prezintă aceleași trăsături ca și celelalte hazarduri naturale care afectează cele două domenii: originea hazardului și modul de manifestare este, în general, cunoscut; timpul de avertizare este de obicei scurt, cu excepția ridicării nivelului oceanului planetar;

efectele induse de evenimentele produse sunt imediate și foarte rar întârziate; impactul direct sau indirect necesită măsuri urgente, managementul riscului indus urmează aceleași etape.(ig.2)

Hidden coastal and oceanic hazards have the same features as other natural hazards that affect the two areas: the origin of the hazard and the mode of manifestation is generally known; the warning time is usually short, except for the elevation of the planetary ocean; the effects induced by the events are immediate and very rarely delayed; the direct or indirect impact requires urgent action, the induced risk management follows the same steps (Fig.2)

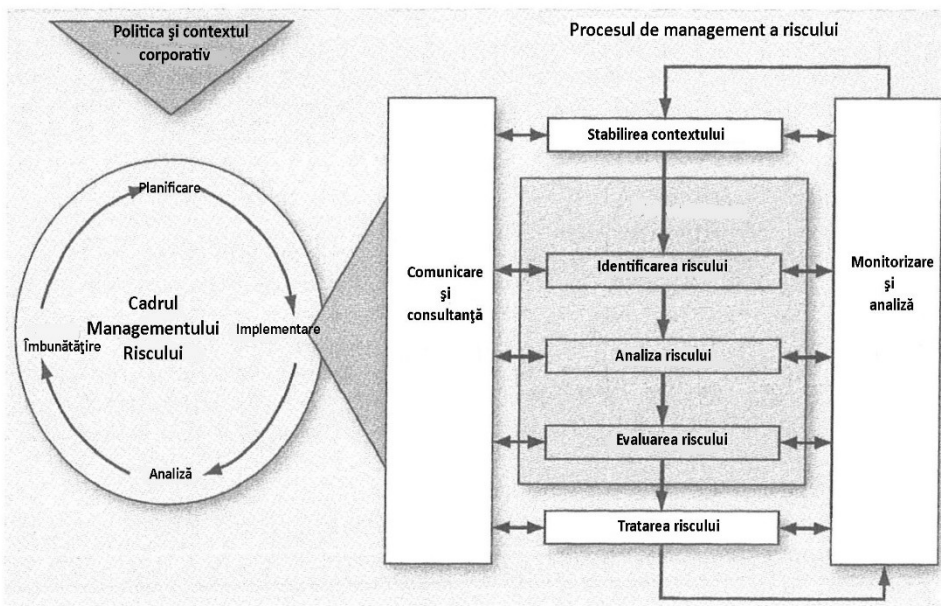


Fig.2. Systemic approach of risk management after ISO31000 (Ayala, 2007)

## 2. CRITERIA AND PURPOSE FOLLOWED IN OCEAN HAZARDS CLASIFICATION

Hazards are classified using a variety of criteria for different purposes and for different user groups. In the classification of hazards, there are several goals: risk assessment, understanding of spatial, temporal, energetic attributes, processes and interrelations between them and how they affect people, and taking the most appropriate measures to prevent and combat effects induced.

An exhaustive and unitary classification of water hazards in both domains is difficult to achieve because of the multitude of variables to be taken into account. First of all, it is the very varied typology of the phenomena underlying the hazards determined by the diversity of the causes that contribute to their triggering and evolution, as well as the way of manifestation. Second, it should be taken into account that many phenomena are associated with the emergence and evolution of hazards. Thirdly, spatial (from local to planetary character), temporal (triggering, duration, frequency), and energetic manifestations (intensity, power, amplitude) of hazards, and the consequences they bring are very varied.

In the classification of water hazards in the two fields, a wide range of criteria is used, either causal or genetic; (rhythm, amplitude, frequency, impact force, reversibility), the nature of the phenomena and processes (physical, chemical, mechanical, dynamic), spatial (localization, area of manifestation, size of the affected space), degree of perception (low, moderate, high), degree of impact and the nature of induced effects (Table 1)

**Table 1.** Classification criteria for water hazards in costal and ocean domain

<b>Criterion</b>	<b>Characteristics</b>
<b>GENETIC</b>	.
Nature of hazard	Dinamic, mechanical, phisical, chemical and of interference
<b>SPATIAL</b>	
-Location	Precise, difuse, random
-Space size	Local, regional, planetary
-Domain of appearence	Sea coast, ocean
<b>TEMPORAL</b>	
-Triggering	-Slow, progressive, sudden
-Duration	Short, medium, long
<b>WAY OF MANIFESTATION</b>	
-Pace	-Periodic, non-periodic
-Amplitude	-Small, medium, big
-Frequency	-Low. medium, maximum
-Impact force	-Low, medium, strong
-Reversibility	-Low, medium, high
<b>INDUCED EFFECTS</b>	-Social, economical, mental, environmental
<b>PERCEPTION LEVEL</b>	-Low, moderate, high

Depending on the number of criteria used in the classification of hazards, it is possible to distinguish between single and multi-criteria classifications. Uni-criterion classifications refer to one of the mentioned criteria.

### 3. CLASSIFICATION OF HYDRIC PHENOMENA AND PROCESSES IN THE OCEAN AND LITTORAL DOMAINS.

In the classification of water hazards in litoral and oceanic somains, several criteria were considered: genetic, spatial, temporal, nature of the ocean phenomena and processes for water in liquid and solid estate, mode of manifestation, development areas, induced effects.

**Types and subtypes.** Depending on the nature, the way of manifestation and the area affected by water phenomena and hydrological processes, three main types have been identified that include more subtypes (Table 2).

The first type includes *dynamic phenomena and processes*. Within this type were identified two subtypes: dynamic phenomena and processes of liquid and solid water. According to the way of manifestation and the size of the affected area, the dynamic phenomena and processes of the liquid ocean water have been grouped in non-periodic (normal and exceptional waves) and periodic with rhythmicity: daily, with different amplitudes manifested at the planetary level (tides); seasonal, regional or local (waves caused by regular winds); annual (ENSO phenomenon), manifested at regional level; (eustatic movements) with a slow planetary manifestation.

**Table 2.** Classification of water risk phenomena and processes in costal and ocean domains

Criterion	Types and sub-types	Phenomenon and process
Nature of the phenomenon and the process, mode of manifestation, size of the affected area	<b>Dinamic phenomena and processes</b>	
	- of ocean water in liquid estate	
	: non-periodic	Normal and exceptional waves
	periodic with rhythmicity	
	daily	Tides
	seasonal	Waves generated by regular winds
	annual	ENSO phenomenon
	secular	Eustatic movements
	- of ocean water in solid estate	
	: from litoral domain	Ice shelf, shore ice
	From ocean domain	Aisbergs, polar ice
	<b>Mechanical phenomena and processes</b>	Abrasion, aggradation
	<b>Interference of nature:</b>	
	-Physical	Temperature, transparency, colour
	-Chemical	Salty cone
	-Environmental	Water masses, warm or cold currents

The dynamic phenomena and processes of solid water are not as diversified as those of liquid water. Depending on the area of manifestation, one

can distinguish those from coastal areas (ice shelf and shore ice) and oceanic (icebergs, polar ice).

*Mechanical phenomena and processes* are not as diverse as the dynamic ones and manifest in the seaside. They include degradation processes resulting from the erosion (abrasion) and aggradation processes, resulting in accumulation processes.

*Hydric interference* is the phenomenon of combining two masses of water with distinct physical, temperature, transparency, color, chemical, dynamic, and mechanical characteristics that are encountered at any point in the propagation medium. Physico-chemical processes are carried out with destructive effects in the litoral area, where they are present through salt weathering, hydroclasty, hydration and dissolution.

The chemical phenomena and processes that can induce risks are the water interferences between fresh and salty waters that appear in the coastal area following the penetration of marine waters into the main river mouths, especially in small waters, causing the phenomenon known as "salty cone" or "salt feather". Another risk is the deterioration of the quality of fresh water in sand dunes.

#### 4. CONCLUSIONS

Classification of water phenomena and processes in coastal and oceanic areas is difficult due to their diversity and the variables involved in their temporal and spatial formation and distribution.

In the classification of water risk phenomena and processes in the coastal and oceanic areas several criteria can be used, among which the nature, the mode of manifestation and the size of the affected area are the most significant.

The application of the above mentioned criteria allows the grouping of water phenomena and processes in the coastal and oceanic domains in types (dynamic, mechanical) and subtypes (periodic and non-periodic) with slow, progressive and sudden manifestation.

The classification of hydrologic risk phenomena and processes in the coastal and oceanic domains allows both knowledge of spatial, temporal and energy attributes that can induce immediate or medium and long-term risks, as well as taking appropriate measures to prevent and combat them.

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