
Η Πολυτεχνείουπολη είναι κτισμένη σε πανοραμική τοποθεσία στο Ακρωτήρι Χανίων, 7 km βορειοανατολικά της πόλης των Χανίων και εκτείνεται σε έκταση 2.900 στρεμμάτων. Το Τμήμα Αρχιτεκτόνων Μηχανικών στεγάζεται στο κτίριο της πρώην Γαλλικής Σχολής στη Χαλέπια, ενώ η Πρωτανεία και οι Διοικητικές Υπηρεσίες Πολυτεχνείο Κρήτης στεγάζονται στο ενετικό συγκρότημα των παλαιών φυλακών και στρατών στην Παλιά Πόλη των Χανίων. Σκοπός του Πολυτεχνείου Κρήτης είναι η ανάπτυξη σύγχρονων ειδικωτήτων, η έμπνευση στην έρευνα σε τομείς προηγμένων τεχνολογιών, καθώς και η στενή συνεργασία με τις βιομηχανικές και λοιπές παραγωγικές μονάδες της χώρας.


The Campus is built on a panoramic location in Akrotiri, 7 km northeast of the city of Chania, with a total area surface of 290 hectares. Off campus, the Department of Architectural Engineering is located at the former French School in Halepa, whereas the Rectorate and the rest of the administration offices are located in the heart of the Old City of Chania in the Venetian complex of the old barracks and prison. The mission of the Technical University of Crete is to develop modern engineering specialties, to place emphasis on research in fields of advanced technology, as well as to establish close cooperation with the industry and other production organizations in Greece.
ΕΡΓΑΣΤΗΡΙΟ ΔΙΑΧΕΙΡΙΣΗΣ ΤΟΞΙΚΩΝ & ΕΠΙΚΙΝΔΥΝΩΝ ΑΠΟΒΛΗΤΩΝ

Το Εργαστήριο Διαχείρισης Τοξικών και Επικίνδυνων Αποβλήτων ιδρύθηκε το 2002 στο Τμήμα Μηχανικών Περιβάλλοντος της Πανεπιστημίου Κρήτης και ανήκει στον Τμέα Ι: Περιβαλλοντική Διαχείριση.

Κύριος στόχος του Εργαστηρίου είναι η ανάπτυξη προηγμένων τεχνολογιών, διεξαγωγή επιστημονικής έρευνας και η μεταφορά τεχνογνώσεως σε θέματα διαχείρισης επικίνδυνων αποβλήτων / ουσιών. Η επεξεργασία επικίνδυνων αποβλήτων με φυσικοχημικές, βιολογικές και θερμικές μεθόδους, η ασφαλής διάθεση υποβλητών σε ειδικούς Χ.Υ.Τ.Ε.Α., η ανακύκλωση και γενικότερα η διαχείριση επικίνδυνων αποβλήτων, καθώς επίσης και η εξυγίανση ρυπασμένων εδαφών και υπογεών υδάτων από επικίνδυνους ρύπους είναι τομείς στους οποίους επικεντρώνεται το Εργαστήριο.

Στο Εργαστήριο Διαχείρισης Τοξικών και Επικίνδυνων Αποβλήτων υπογείων υδάτων από επικίνδυνους ρύπους είναι τομείς στους αποβλήτων, καθώς επίσης και η εξυγίανση ρυπασμένων εδαφών και χημικών μηχανικών Διαχείρισης Τοξικών και Επικίνδυνων Αποβλήτων. Η διεξαγωγή επιστημονικής έρευνας και η μεταφορά γνώσεων και τεχνολογιών από πολιτειακά ιδρύματα του εξωτερικού, καθώς επίσης και ερευνητικών προγραμμάτων, η μεταφορά γνώσεων και τεχνολογιών από πολιτειακά ιδρύματα του εξωτερικού, καθώς επίσης και η εξυγίανση ρυπασμένων εδαφών και υπογεών υδάτων από επικίνδυνους ρύπους είναι τομείς στους οποίους επικεντρώνεται το Εργαστήριο.

Υπεύθυνος Καθηγητής και Διευθυντής του Εργαστηρίου είναι ο Αριστείδης Έβινος Γιδαράκος.

The Laboratory Toxic and Hazardous Waste Management was established in 2002 at the Department of Environmental Engineering of the Technical University of Crete and belongs to Division I: Environmental Management.

The main objective of the Laboratory is the development of advanced technologies, the conduction of scientific research and knowledge transfer on hazardous waste / substances management issues. Hazardous waste treatment using physicochemical, biological and thermal methods, safe disposal at special hazardous waste landfills, recycling, hazardous waste management, as well as contaminated soil and groundwater remediation, are some of the main scientific fields on which the Laboratory focuses.

At the Laboratory of Toxic and Hazardous Waste Management scientific research is carried out within the framework of undergraduate, M.Sc. and Ph.D. dissertations and theses, in co-operation with several institutions abroad, as well as research programs.

The Director of the Laboratory is Prof. Dr. Evangelos Gidarakos.

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Ομολογία Επιστημονικού Προσωπικού και Υποψήφιου Διδάκτωρος
permanent scientific personnel and PhD candidates

Permanent Scientific Personnel

The Laboratory Toxic and Hazardous Waste Management was established in 2002 at the Department of Environmental Engineering of the Technical University of Crete and belongs to Division I: Environmental Management.
**SOURCES OF MARINE AND OCEAN POLLUTION**

Planet Earth is covered approximately by 70% water, most of which is major oceans. Although this large percentage of water is used to support the more than 7 billion people inhabiting earth, mankind still proceeds to pollute water every single day, through discarding any kind of waste and contaminant, turning oceans into dumping sites.

1. **Direct Discharge**
Solid garbage makes its way to the ocean. Plastic bags, glass bottles, packaging material – if not disposed of correctly, can reach the sea.

2. **Sewage**
In many parts of the world, sewage flows, untreated, or under-treated, into the ocean. For example, 60% of urban sewage are discharged into the Mediterranean Sea without passing through wastewater treatment facilities.

3. **Fertilizers**
Fertilizer runoff from farms and lawns that end up in coastal areas create sea contamination. The extra nutrients, which fertilizers contain, cause eutrophy - flourishing of algal blooms that deplete the water’s dissolved oxygen and suffocate other marine life that can no longer survive. Eutrophication has created enormous “dead zones” in several parts of the world, including the Gulf of Mexico and the Baltic Sea.

4. **Oil**
Oil spills cause huge damage to the marine environment - but in fact are responsible for only around 12% of the oil entering the seas each year. According to a study by the U.S. National Research Council, 36% of oil comes down drains and rivers as waste and runoff from cities and industry. While being toxic to marine life, polycyclic aromatic hydrocarbons (PAHs), found in crude oil, are very difficult to clean up and last for years in the sediment and marine environment.

5. **Ship Pollution**
When the ship’s engine is running it pollutes the water. The engine gives off excess gasoline, which pollutes the waters and ends up killing the animals. Also discharge of cargo residues from bulk carriers can pollute ports, waterways and oceans. Ships also create noise pollution that disturbs natural wildlife. Additionally, the water from ballast tanks can spread harmful algae and other invasive species.

6. **Toxic and Radioactive Chemicals**
For centuries, the oceans have been a convenient dumping ground for waste generated on land including toxic materials such as pesticides, chemical weapons, and radioactive waste (military and industrial). Furthermore, chemicals can escape into the sea during their manufacture, use, or disposal, as well as from accidental leaks or fires. Tiny animals at the bottom of the food chain, such as plankton in the oceans, absorb the chemicals as they feed. Because they do not break down easily, the chemicals accumulate in these organisms, becoming much more concentrated in their bodies than in the surrounding water or soil. These organisms are eaten by small animals, and the concentration rises again. As a result, animals higher up the food chain, such as seals, can have contamination levels millions of times higher than the water in which they live.

7. **Cars exhaust and Industries offgases**
Exhaust gases from cars and industries’ smoke don’t go directly into the ocean. They end up being in acid rain. Acid rain is pollution mixed with regular rain, and when acid rain gets into the ocean, it pollutes the waters and kills many fish over a period of time.

8. **Thermal Pollution**
Refers to cooling water from power plants and industrial sites. This kills off corals and other temperature sensitive sedentary species. Also displaces other marine life.

**REFERENCES**
1. http://library.thinkquest.org/Cs0215471/ocean_pollution.htm
2. 2. http://www.panda.org/about_our_earth/blue_planet/problems/pollution/
4. 4. www.gdrc.org/oceans/marine-pollution.html
5. 5. www.planbleu.org/themes/littoraluk.html
OPERATIONAL DISCHARGES (ballast water, tank washing residues, etc.) are the most often caused oil-pollution. The majority of these discharges happen either close to the mainland or within port areas and terminal stations, resulting usually in small spills, which are dealt by the local authorities.

Accidental discharges are less frequent but have massive environmental and socio-economic impact. The human factor has an important role in these cases (structural failures, loading-unloading errors, ship to ship collision, etc.). Legislation and safety rules have decreased the probabilities of these cases. The two most likely sources of accidental oil spills are groundings and collisions.

REFERENCES
For as long as ships have been traveling upon the seas of the earth, they have been sinking. There are many reasons for the demise of a vessel such as severe weather, poor design, overloading, armed conflicts, as well as navigational or other human errors. United Nations estimate that there are more than 3 million wrecks on the ocean floor. Only during the World War II, around 7,800 vessels are estimated to have sunk worldwide.

The North Atlantic Ocean has 25% of the potentially polluting wrecks in the world and these wrecks are estimated to contain nearly 38% of the total volume of oil trapped in sunken vessels. The Mediterranean has 4% of the world's sunken vessels and around 5% of the estimated oil volume, numbers that are high compared to its size and the fragile marine environment of a landlocked sea like this.

Oil is not the only threat to marine biodiversity. The warships used in the World War II also carried munitions which, over the years, have become corroded to the point where they are liable to start leaking significant quantities of toxic substances. Some of these toxic substances, e.g. heavy metals, such as mercury, are not biodegradable and can cause important contamination of the food chain.

Many studies have attempted a thorough report concerning the consequences to the aquatic environment following a sinking, with most of them concentrating to coral reef areas. After the wreck of the “Prestige” oil tanker metal contamination of the western Galician water column was reported and it was concluded that surface seawater was contaminated from lead (Pb) and copper (Cu). In sediments near the area of the “Norwegian Crown” wreck significant contamination by copper (Cu) and zinc (Zn) was revealed and mainly attributed to the wearing of the antifouling (AF) paint. Other scientists studied heavy metal contamination due to benzoic or oil spills.

The need for a common policy on the treatment and removal of wrecks has long been a topic of discussion at the International Maritime Organization (especially after the recent shipwreck of “Costa Concordia”). The Parliamentary Assembly of the Mediterranean considers that decisions to salvage oil and other dangerous substances from a sunken wreck must be based on a sound risk assessment and a thorough cost-benefit analysis since any salvage effort is usually expensive, time-consuming and risky.

Unlike the most shipwrecks that remained unknown or were forgotten with time, some become worldwide and diachronically known, while they were also escorted by several myths. Perhaps the most representative example is TITANIC, which was discovered in 1985, has consisted the object of many fictions stories, as well as movies, while 100 years after its sinkage (2012) it is eligible for protection under the UNESCO Convention on the Protection of Underwater Cultural Heritage.

One of the reasons why a shipwreck or a naval accident may become famous is the extent and degree of contamination it caused to the sea or coastal environment. An indicative example is the tanker EXXON VALDEZ, that in 1989 struck a reef at Alaska, causing the leakage of more than 61,640 m³ of crude oil, as well as one of the largest ecological disasters worldwide.

REFERENCES

Contamination of the area with Polycyclic Aromatic Hydrocarbons (PAHs)

Several series of seawater sampling were conducted in order to come to a conclusion concerning the possible contamination of the sea water of the surrounding area. One of them revealed that in a significant number of seawater samples (5 out of 8 collected samples), cadmium (Cd) and lead (Pb) concentration values were above the limits set by the US EPA. Moreover, Pb was found in three more samples in concentrations exceeding the aforementioned limits. Although copper (Cu) was, in general, present in normal levels, it is one of the elements that may create future problems due to its low rate of corrosion.

Concentration values of copper in sediment samples were elevated in comparison to previous measurements in the area, indicating that the sea sediments nearby the wreck will be contaminated in the future, up to a point, due to the corrosion of the ship or of the antifouling paints. Lead (Pb) was another element that was present in high concentration levels, indicating anthropogenic contamination. It is also noteworthy the fact that in almost 25% of the samples, cadmium concentrations were higher than the permissible limits, according to certain sediment quality guidelines, thereby associating these values with frequent toxic effects on benthic organisms.

The Technical University of Crete and specifically the Laboratory of Toxic and Hazardous Waste Management, four years after the shipwreck, conducted a thorough environmental study entitled “Qualitative and quantitative characterization of hazardous and toxic substances released from the “Sea Diamond” shipwreck - Evaluation of current and long term Impacts”. Some of the results of this study are presented here.

Contamination of the sea water of the area with heavy metals

Sediment contamination of the area with heavy metals

Heavy metals accumulated in living organisms of the area

Shipwrecks in Greece: The SEA DIAMOND case

Greece has its own Achilles' heel, regarding shipwrecks and it’s called “Sea Diamond”. On April 5th, 2007, at approximately 16:00 local time, “Sea Diamond” struck a reef, at the east side of Nea Kameni, an area within the caldera of the Greek island of Santorini and seawater started flowing inside. The large amount of water that flowed on board led the ship to sink at about 7:00 on April 6th, 2007, just a few hundred meters from the shore.

The deep, almost vertical shore of the bathtub-like caldera has been estimated that made it impossible to beach the ship and save it from becoming a total loss. As it was later reported, the tip of the bow stopped only 62 meters below sea level, whereas the stern reached the depth of 180 meters; a fact that leads to an almost vertical sinking scenario of the ship. Keeping in mind the volcanic activity of the area, it is feared that the hull would either brake or slide deeper and sink into the submerged caldera of the island.

It was also considered necessary to investigate whether and to what extent was the food chain of the marine area burdened. This was obtained by identifying the total content of selected heavy metals in edible tissues, mainly fishes and fish-shells of benthic origin. The results showed high concentrations of cadmium (Cd), zinc (Zn) and lead (Pb) in oysters, indicating, thereby, strong affiliation with the wreck.

The following morning, Sea Diamond ends up to the bottom of the Caldera of Santorini.
For Europe, shipping has been one of the key stepping stones to economic growth and prosperity throughout its history. Maritime transport services, are essential in helping the European economy and European companies to compete globally. Moreover, shipping and all related maritime industries are an important source of revenues and jobs in Europe.

Around 80% of world trade is carried by sea whilst short-sea shipping carries 40% of intra-European freight. With more than 400 million sea passengers passing through European ports each year, maritime transport has also a direct impact on the quality of life of citizens, both tourists and inhabitants of islands and peripheral regions.

Shipping – which transports 90% of global trade – is, statistically, the least environmentally damaging mode of transport, when its productive value is taken into consideration. The vast quantity of grain required to make the world’s daily bread, for example, could not be transported any other way than by ship. Moreover, set against land-based industry, shipping is a comparatively minor contributor, overall, to marine pollution from human activities.

The main causes of sea pollution can be summarized, in alphabetical order, as follows:
- Collisions.
- Crew inattention during cargo operations.
- Fires.
- Improper human handling.
- Navigation systems faults.
- Poor maintenance of building construction.
- Poor maintenance of mechanical equipment.
- Propulsion plant faults.
- Stranding.
- Weather conditions.

According to international regulations, the transport of toxic waste, must follow the following:

- Mooring of ships with hazardous cargo must be linked with bow pointing to the host port.
- Presence of fire boat during hazardous materials handling.
- Alert of the ship fire fighting equipment under responsibility of ship’s master.
- Immediate removal, by barge or other means, of hazardous cargo to an area suitable for its storage.
- Prohibition of hazardous toxic waste operations during night.
- Ships and boats carrying hazardous materials must have posted the International Code signal B ‘(red flag) during day and red lamp on their large sail and at a height equal to 2/3 of its length during night, which must be visible in the horizon with illumination intensity visible at least from 2 miles.
- During hazardous toxic waste handling, the required number of skilled workers must be used along with appropriate means of handling, while all employees must make every effort for safe and harmless shift of these materials.

International sea transport is regulated by the International Maritime Organization’s (IMO) International Maritime Dangerous Goods (IMDG) Code. These organizations publish Dangerous Goods Codes based on the UN Recommendations, which outline the requirements for safely transporting dangerous goods by sea.

In 1973, IMO adopted the International Convention for the Prevention of Pollution from Ships, now known universally as MARPOL, which has been amended by the Protocols of 1978 and 1997 and kept updated with relevant amendments. The MARPOL Convention addresses pollution from ships by oil; by noxious liquid substances carried in bulk; harmful substances carried by sea in packaged form; sewage, garbage; and the prevention of air pollution from ships. MARPOL has greatly contributed to a significant decrease in pollution from international shipping and applies to 99% of the world’s merchant tonnage.

REFERENCES
1. www.ec.europa.eu
2. www.imo.org
3. Marpol Annex V
4. European Parliament, Sea transport: Strategic approach
5. 2008/56/EC
6. Commission Of The European Communities, COM(2009) 8 final
κηλίδες σκουπιδιών

Garbage patches

The term “garbage patch” is a misnomer. There are no big islands of garbage in the middle of the ocean, they are more like a complex of smaller “patches”.

They’re not garbage islands.

Most of the debris are small pieces of plastic, some of which are actually not easily notable even at short distances.

Their dimensions are not known.

Experts don’t know exactly how extended the “garbage patches” are.

Not everything floats...

There are also submerged marine debris.

A long journey...

Land-based marine debris could be traveling in the ocean for six or seven years before ending up in the areas where “garbage patches” are concentrated.

PROSELASY THALASSION ZΥΝΤΡΙΜΜΙΩΝ

Sources of marine debris

κηλίδες σκουπιδιών

Garbage patches

σκουπιδιών

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Land-based marine debris could be traveling in the ocean for six or seven years before ending up in the areas where “garbage patches” are concentrated.
Plastic debris floating on the ocean surface is eventually broken down to smaller pieces by sunlight and wave action. Plastics, though, often contain colorants and chemicals (e.g. bisphenol-A) which may cause various types of environmental and health problems. Moreover, plastic may adsorb or absorb persistent organic pollutants (POPs) like PCBs, pesticides, PAHs and hydrocarbons from eventually polluted seawater. This way chemical substances are transported along with the debris and if these are accidentally ingested by marine life, all these substances may eventually enter the food chain, potentially affecting human health.

**Photodegradation**

Photodegradation can be a major factor in the breakdown of plastic debris in the ocean. The process involves the use of UV light to break down the plastic into smaller, more manageable pieces. This process not only helps to reduce the volume of plastic debris in the ocean but also makes it easier for marine organisms to break down and consume the plastic.

**Plastic ingestion**

Plastic ingestion is one of the most significant problems associated with plastic pollution. Marine life, especially seabirds, marine mammals, and fish, are at risk of ingesting plastic debris. The ingestion of plastic can cause physical harm to these animals, leading to choking, digestive issues, and even death.

**Marine ecosystem disturbance**

Plastic debris floating in the ocean can often transport species to non-native waters, by providing them with a surface to live on. This can have significant impacts on local ecosystems, disrupting the balance of species and affecting the health of the environment.

**References**

For hundreds of years, the seas have been used as a place to dispose of wastes resulting from human activities, including radioactive / nuclear waste. In 1946, the first sea dumping operation of radioactive waste took place at a site in the North East Pacific Ocean, about 80 km off the coast of California. From 1946 through 1993, thirteen countries, including Russia, Germany, Belgium, Italy, UK, USA, South Korea and Sweden used ocean disposal or ocean dumping as a method to manage nuclear/ radioactive waste. Since 1993, ocean disposal has been banned by agreement through a number of international treaties (London Convention, 1972).

Nuclear power plants produce waste that represent important hazards, if not correctly and safely managed. Even nuclear power plant accidents can cause the release of high amounts of radioactivity, posing the living organisms and the environment in general in danger. Nuclear weapon tests that are conducted above ground or under water release important quantities of radioactivity. Nuclear weapon disposal waste, that had been carried out for several years by many countries, has severely burdened the sea environment, with many and continuous radioactivity sources. Even today, potential illegal sea dumping of such type of waste cannot be considered unlikely.

**REFERENCES**

The Irish Sea has been described by Greenpeace as the most radioactively contaminated sea in the world, with some eight million liters of nuclear waste discharged into it, each day from Sellafield reprocessing plants (UK), contaminating seawater, sediments and marine life.

The 2009 mélée of the Italian Mafia oxidized that every time the Italian Mafia buried piles, it meteored, buried piles and other apostles, hence the paragaphic heredity. The Greenpeace, and other parabolocentric organizations, have been shown literally piles of expectedly in the actit's Italy and the Eládása the telauta they were. This was the first announcement that during 1946 and 1970 seven million liters of nuclear waste were dumped onto the ocean floor, west of San Francisco. The Farallon waste site is a triangle shaped piece of sea space at a distance of 30 miles west of San Francisco. It represents a refuge of gorgeous marine and other wildlife. These waters are rich with fish and other sea life. But astonishingly this was America’s largest sea dump of nuclear waste till some years back.

The 2006 mélée of the Italian Mafia oxidized that every time the Italian Mafia was sinking ships with nuclear and other waste on board, as part of a money-making racket. Greenpeace and environmental organizations others have compiled lists of past the few decades of ships that have disappeared off the coast of Italy and Greece.

In 2009, Italian mafia members confessed that for years the Italian Mafia was sinking ships with nuclear and other waste on board, as part of a money-making racket. Greenpeace and environmental organizations others have compiled lists of past the few decades of ships that have disappeared off the coast of Italy and Greece.

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The French Ministry of defense acknowledged that 22 underground tests had given rise to the release of radioactive gases. More than 3,200 tons of various types of radioactive waste are estimated to exist on site. Some reports indicate the Fukosima disaster as the world’s worst nuclear sea contamination. Although nobody knows the exact extent of the potential contamination, it is clear that at the peak of the Chernobyl disaster 1,000 Bq/m³ of sea water was detected, while at the peak of the Fukosima disaster 100,000 Bq/m³.
The natural sound-based system of marine animals has been compromised by the introduction of manmade sound. This anthropogenic sound can interfere with normal communication, increase ambient noise levels and cause physical harm and behavioural changes to some species.

The two largest contributors to anthropogenic sound in the oceans are the use of SONAR and air gun arrays. SONAR stands for sound navigation and ranging and is used for the acoustic location in the ocean by both ships and marine mammals. The air gun arrays are primarily used for oil and gas exploration in the oceans. Additional sound sources are:

- dredging and drilling to extract geological resources,
- operation of offshore wind farms,
- explosions for undersea constructions and occasionally in the removal of unwanted subsea structures,
- ship traffic and oceanographical research.

Depending on the frequency, duration and the sound source level the main impacts on marine species are related with orientation, breathing, migration and feeding. Secondary, these effects can have negative impact on reproduction and population growth rate.

Scientifically it is not fully understood yet which sounds affect which species. However, it is generally accepted that exposure to anthropogenic sound can induce a range of adverse effects on marine life, including physiological and behavioural changes. The main research is focused on cetaceans and other marine mammals, as they are the most impacted species.

**WHAT CAN BE DONE?**

- Further research into the effects on the many species that could be impacted.
- Establishment and use of Marine Protected Areas.
- Adaptation of legislation according to the new scientific findings.

**REFERENCES**

1. OSPAR COMMISSION. Overview of the impacts of anthropogenic underwater sound in the marine environment, 2009.
A tsunami is usually generated by an earthquake of great magnitude and may cost many thousands of human lives, at different and distant areas of the globe, as history has shown. The major disaster that may be caused is not only limited to the terrestrial environment (human lives, infrastructures and nature), but it expands to the sea, due to the huge amounts of debris that is transferred to the seas and the oceans, during its withdrawal.

On March 11th, 2011, a 9.1 Richter earthquake happened at Japan, causing a tsunami of 24 m (maximum height) that was observed all over the Pacific region and caused tremendous devastation locally.

According to official reports as of March 8, 2012, there are 15,854 deaths and 3,203 missing in Japan. The tsunami also caused one death in Jakarta, Indonesia and one death in Klamath River, California. The earthquake and tsunami caused over $200 billion damage in Japan and resulted in a nuclear accident with explosions and leaks in three reactors at the Fukushima Nuclear Power station. The tsunami also caused damage over 16,000 km away at Chile, Hawaii and California.

The 2011 Japan earthquake is the fourth largest in the world and the largest in Japan since instrumental recordings began in 1900. The earthquake generated the deadliest tsunami since the 2004 magnitude 9.1 Sumatra earthquake and tsunami caused nearly 230,000 deaths and $10 billion in damage.

**REFERENCES**

1. NOAA – National Oceanic and Atmospheric Administration (U.S. Department of Commerce)
2. U.S. Navy
4. www.oceanconservancy.org

**ΠΗΓΕΣ**

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H NASA και η Ιαπωνική κυβέρνηση εκτιμούν ότι 5 εκατ. τόνοι συντριμμών (πλοία, κτίρια, συσκευές, πλαστικά, μέταλλα, ξύλα, κλπ.) παρασύρθηκαν στην θάλασσα από το τσουνάμι, εκ των οποίων περίπου το 70% βυθίστηκε στην πυθμένα και περίπου 1,5 εκ. τόνοι παρέμειναν στην επιφάνεια των ωκεανών. Τα επεισόδια συντριμμών δεν είναι πλέον ορατά από δορυφόρους, καθώς έχουν διασκορπιστεί, υπό την επίδραση ωκεανών ρευμάτων, ανέμων και των εκάστοτε καυκών σφηνών. Επιπλέον, προσπαθούν να προβλέψουν τις κινήσεις τους, μέσω μοντέλοποισέρς.

An estimated 5 million tons of debris (boats, buildings, appliances, plastics, metals, wood, etc.) were swept out to sea by the tsunami, about 70% of which sank to the seafloor, according to estimates by NASA and the Japanese government. Around 1.5 million tons of debris remain at the surface of the oceans. The floating debris is no longer visible by satellites as it has dispersed, under the influence of ocean currents, winds and different weather conditions.

Scientists try to predict its movement, through modeling.

The real extent of the existing hazardousness of the debris presence and movement in the Pacific Ocean is not easy to be determined, as it depends on the type of materials that are present, but also the processes they go through in the sea environment. In any case, the disaster of sensitive ecosystems/reels, the injury or death of protected species (turtles, seals, etc.), as well as the creation of navigational problems are considered very likely. The presence of radioactivity in these debris, due to the Fukushima accident, is considered probably, but not impossible.

Είναι ευαίσθητες οι αξίες και προστασίας των πλοίων, και προστασίας των περιβάλλοντος, κρίθηκε αναγκαία η βύθιση του. Στις 6 Απριλίου 2012 η Αμερικανική Ακτοφαλακτική, με χρήση εκρηκτικών και άπειρο από επιχείρηση 4 ωρών, κατάφερε να το βυθίσει, σε βάθος μεγαλύτερο των 300 μέτρων και σε απόσταση ~330 χιλιομέτρων από τις ακτές της Αλάσκας.

For navigation safety reasons, as well as the environmental protection of the area, its sinking was considered necessary. On April 6, 2012, the U.S. Coast-guard sunk it, using explosives and after a 4 hour operation, at a depth of about 300 meters, ~330 km away from the coasts of Alaska.
PROTECTED MARINE SPECIES
IN CRETE

In the broad area of the island of Crete several protected marine species are present, among which the loggerhead turtle Caretta caretta, the Mediterrenean monk seal Monachus monachus, the loggerhead turtle Caretta caretta, the Mediterrenean monk seal
Monachus monachus, the Sperm whale, the Dolphin and the Triton’s trumpet. Other protected species of marine animals, are molluscs (Lithophaga lithophaga, Tonna galea, Erosaria spurca, Pinna nobilis, Charonia tritonis), oestechytes (Xyrichtys novacula, Sparisoma cretense, Hippocampus guttulatus) and echinoderms (Ophidiaster ophidianus).

An endangered species is a population of organisms which is facing a high risk of becoming extinct because it is either few in numbers, or threatened by changing environmental or predation parameters. The International Union for Conservation of Nature (IUCN) divides threatened species into three categories: 1. critically endangered (CR), 2. endangered (EN) and 3. vulnerable (VU).

REFERENCES
5. MOn/ Hellenic Society for the Study and Protection of the Monk Seal (www.mon.gr)
6. ARCHIPELAGO, Institute of Marine & Environmental Research (www.archipelago.gr)
7. World Conservation Union & International Union for Conservation of Nature and Natural Resources (http://www.iucn.org)
H ήπειρος αυτών των ζώων, το κομμάτι τους, που βρίσκονται υψηλά στην τροπική αλυσίδα συγκεντρώνουν μεγάλες ποσότητες τοξικών ουσιών στο σώμα τους.

**Mediterranean Monk Seal**

**Scientific name:** *Delphinus delphis*

**Habitat**

The length of adults may reach 3.80 m, but usually does not exceed 2.5 m. The weight of young seals is about 20-30 kg, while adults weigh about 300 kg. Monk seals live for about 40 years.

Although they spend a large part of their life at sea, where they mate, monk seals often come ashore in order to rest and give birth.

The main threats are the destruction of its habitats and deliberate killing.

**Main threats**

- Overfishing: serious effects on the balance of the coastal ecosystem.

**Conservation status**

- Least Concern (IUCN 3.1)

**Endangered (IUCN 2.3)**

**Peribálloan / Habitat**

- Vulnerable (UCN 3.1)

**Periárrηγμα / Description**

- Vulnerable (UCN 3.1)

**Main threats**

- Extensive fishing and marine pollution.

**Προβλήματα της παρακτικής ζώνης**

- Μεγάλα έργα όπως η κατασκευή λιμανιών, θαλάσσιων καταδύσεων και άλλη ανθρωποκατασκευή καταλήγουν στην οικονομία του παρακτικού οικοσυστήματος.

**Degradation of the coastal zone**

- Large construction projects such as major ports, fish farming and intensive human activities have serious effects on the balance of the coastal ecosystem.

**Περιβάλλον / Habitat**

- Vulnerable (UCN 3.1)

**Periárrηγμα / Description**

- Vulnerable (UCN 3.1)

**Main threats**

- Extensive fishing and marine pollution.

**Προβλήματα της παρακτικής ζώνης**

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**Ειδική Περιβαλλοντική Εκπαίδευση**

- Widely recognized as one of the seven sea turtle species that exist on earth.

**Logggerhead Sea Turtles**

**Scientific name:** *Caretta caretta*

- Vulnerable (UCN 3.1)

**Periárrηγμα / Description**

- Vulnerable (UCN 3.1)

**Main threats**

- Extensive fishing and marine pollution.

**Προβλήματα της παρακτικής ζώνης**

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ΓΑΛΑΖΙΕΣ ΣΗΜΑΙΕΣ ΤΩΝ ΧΑΝΙΩΝ

BLUE FLAGS OF CHANIA

Η ιδέα της Γαλάξας Σημαίας γεννήθηκε στη Γαλλία. Το 1985, οι Γαλλοκομικοί παραθόλοσοι δήμου βραβεύτηκαν με τη Γαλάξα Σημαία για τη συμμόρφωσή τους με τα ισχυρότερα κριτήρια επεξεργασίας λιμάνων και ποιότητας υδάτων κολύμβησης. Το 1987, το Ευρωπαϊκό Έτος για το Περιβάλλον, ο Οργανισμός Περιβαλλοντικής Εκπαίδευσης της Ευρώπης (Foundation for Environmental Education in Europe - FEEE) παρουσίασε τη γαλλική αυτή ιδέα στην Ευρωπαϊκή Επιτροπή και το πρόγραμμα της Γαλάξας Σημαίας ξεκίνησε, ως μια από τις δράσεις της Επιτροπής για το συγκεκριμένο έτος. Εκτός από τα αρχικά κριτήρια της επεξεργασίας λιμάνων και της ποιότητας υδάτων κολύμβησης, για την απόκτηση της Γαλάξας Σημαίας σε Ευρωπαϊκά επίπεδα, προστέθηκαν και άλλα κριτήρια περιβαλλοντικής διαχείρισης, όπως διαχείριση απορριμμάτων, καθώς επίσης και σχεδιασμός και προστασία παράκτιων περιοχών. Οι μαρίνες επίσης έγιναν υποψήφιες για το συγκεκριμένο βραβείο. Το 2001 ο FEEE έγινε παικτικός οργανισμός και άλλαξε το όνομά του σε Οργανισμό Περιβαλλοντικής Εκπαίδευσης (FEE - Foundation for Environmental Education). Έκτοτε, πολλοί οργανισμοί και αρχές εκτός της Ευρώπης εξέδρασαν ενδιαφέρον για τη διάδοση του προγράμματος Γαλάξα Σημαίας και δήλωσαν συμμετοχή σε αυτό. Με την επέκταση του προγράμματος, τα κριτήρια έγιναν πιο αυστηρά και ενιαία.

The concept of the Blue Flag was born in France. In 1985, French coastal municipalities were awarded the Blue Flag for complying with sewage treatment and bathing water quality criteria. In 1987, the "European Year of the Environment", the Foundation for Environmental Education in Europe (FEEE) presented the French concept to the European Commission and the Blue Flag Programme was launched as one of the year’s community activities. In addition to sewage treatment and bathing water quality, criteria for obtaining a Blue Flag on a European level included other areas of environmental management, such as waste management and coastal planning and protection. Marinas were also made eligible for the award. In 2001 FEE became a global organization and changed its name from FEEE to FEE (Foundation for Environmental Education). Since then, many organizations and authorities outside Europe wishing for cooperation on spreading the Blue Flag Programme have made applications to FEE. With the expansion of the program, the criteria has become more rigorous and unified.
KRITHEREIA BRABEIOY GALAZIAS SIMEIAS

CRITERIA OF THE BLUE FLAGS AWARD

1) Environmental Education and Information

- Information about the Blue Flag, bathing water quality, as well as information relating to local ecosystems and environmental phenomena must be displayed.
- Environmental education activities must be offered and promoted to beach users.
- A map of the beach indicating different facilities must be displayed.
- A code of conduct that reflects appropriate laws governing the use of the beach and surrounding areas must be displayed.

2) Water Quality

- The beach must fully comply with: a) the water quality sampling and frequency requirements, b) the standards and requirements for water quality analysis, c) the Blue Flag requirements for the microbiological parameter faecal coliform bacteria (E.coli) and intestinal enterococci/streptococci and d) the Blue Flag requirements for physical and chemical parameters.
- No industrial, wastewater or sewage-related discharges should affect the beach area.

3) Environmental Management

- The local authority/beach operator should establish a beach management committee and comply with all regulations affecting the location and operation of the beach.
- The beach must be clean.
- Algae vegetation or natural debris should be left on the beach.
- Waste disposal bins/containers must be available at the beach in adequate numbers and they must be regularly maintained.
- Facilities for the separation of recyclable waste materials should be available at the beach.
- An adequate number of toilet or restroom facilities must be provided.
- The toilet or restroom facilities must be kept clean and have controlled sewage disposal.
- There should be no unauthorised camping, driving or dumping of waste on the beach.
- Access to the beach by dogs and other domestic animals must be strictly controlled.
- All buildings and beach equipment must be properly maintained.
- Coral reefs in the vicinity of the beach must be monitored.
- A sustainable means of transportation should be promoted in the beach area.

4) Safety and Services

- An adequate number of lifeguards and/or lifesaving equipment must be available at the beach.
- First aid equipment must be available on the beach.
- Emergency plans to cope with pollution risks must be in place.
- There must be management of beach users and events to prevent conflicts and accidents, as well as safety measures in place to protect beach users.
- A supply of drinking water should be available at the beach.
- At least one Blue Flag beach in each municipality must have wheelchair and accessibility features.

1) Periballontikí Ekpaideúsh kai Plηροφορίες

- Πληροφορίες σχετικά με τις Γαλάζιες Σημαίες, την ποιότητα των υδάτων κολύμβησης, καθώς επίσης και πληροφορίες σχετικά με τα τοπικά οικοσυστήματα και περιβαλλοντικά φαινόμενα πρέπει να παρουσιάζονται.
- Στηρικτικές περιβαλλοντικής εκπαίδευσης πρέπει να προσφέρονται και να προωθούνται στους χρήστες των παραλιών.
- Ένας χάρτης της παραλίας με τις διάφορες εγκαταστάσεις πρέπει να παρουσιάζεται.
- Ένας κωδικός διεύθυνσης, που αντικατοπτρίζει τους νόμους που διέπουν την χρήση της παραλίας και της περιβαλλοντικός περιοχής, πρέπει να παρουσιάζεται.

2) Ποιότητα Υδάτων

- Η παραλία πρέπει να τηρεί πλήρως: α) τις απαιτήσεις δειγματοληψίας υδάτων και συχνότητας αυτής, β) τα πρότυπα και τις απαιτήσεις για την ανάλυση των υδάτων, γ) τις απαιτήσεις της Γαλάζιας Σημαίας για μικροβιολογικά παραμέτρους (E.coli, εντεροκοκκος και στρέπτεγκοκκος) και δ) τις απαιτήσεις της Γαλάζιας Σημαίας για φυσικές και χημικές παραμέτρους.
- Καμία βιολογική ή άλλη εκροή αποβλήτων δεν πρέπει να καθάρισει την περιοχή της παραλίας.

3) Περιβαλλοντική Διαχείριση

- Οι τοπικές αρχές / διοικητικές της παραλίας πρέπει να προωθούν μια επιτροπή διαχείρισης παραλιών και να συμμορφώνονται με όλους τους κανονισμούς που σχετίζονται με τη θέση και τη λειτουργία της παραλίας.
- Η παραλία πρέπει να είναι καθαρή.
- Η συντήρηση των υδατικών ύλεων πρέπει να γίνει μέσω επαρκής διαχείρισης των λυμάτων.
- Οι τουαλέτες πρέπει να διαστάσουν καθαρά και να διαθέτουν έλεγχο της διάθεσης των λυμάτων.
- Οι τοπικές αρχές πρέπει να διαστάσουν καθαρά και να διαθέτουν έλεγχο της διάθεσης των λυμάτων.
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