CLEAN OCEANS PROJECT

MANUAL

Ecology

environment and scuba-diving

FAAS

FEDERACIÓN ARGENTINA DE ACTIVIDADES SUBACUÁTICAS
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Prologue

The year 2020 was absolutely exceptional for humanity. The Covid-19 pandemic disrupted life in the whole planet. There were several events with no precedents or with precedents which plunged into history. One of those extraordinary events faded in, approaching us carefully, watching us in those places which were soon empty due to the lockdown: nature entered the cities and surprised us all.

Through our own windows or through the technological windows in our cellphones, computers and televisions, we were able to see wildlife come to light. We saw dolphins swimming in the Venice channels, deer crossing streets, bears visiting backyards, ducks and geese walking in the highway, monkeys playing in rooftops and whales swimming where nobody expected them to. According to the news, the air was cleaner than decades before; coral reefs were recovering the colors which they had lost years ago. In my own yard, I could see birds that I had never seen before. And they were beautiful.

The sky, free of smokestacks and planes, was still there, immense and blue. In my city, just like in many others, car horns and motors made way for silence; and silence invited birds and cicadas. On the whole, the absence of men had given the rest of the world a break.

I felt a kind of sad happiness to see that.

One afternoon, during lockdown, a memory from my childhood visited me. It had been ages since I remembered that.

I was in Entre Ríos, sitting next to my grandfather by 'el Ibicuy', an affluent of the Paraná river which is one of those fresh water treasure troves only accessible to those who know how to find them; and I listened to the silence that was part of the secret treasure that my grandfather used to show me. In a moment, he pointed to the opposite shore without saying anything (because – now, I know – silence is important): a fox, unaware of our presence, was drinking from the fresh water with its cubs. They quietly laid down under the warm afternoon sun and even played with a butterfly that went flying by.

Even though it has been ages since I was that little boy, that image is still so vivid that even now, while writing about it, I have goosebumps. I thought a lot about that river bank during the 2020 quarantine. I have imagined hares, capybaras, jaguars, pumas drinking from that water that we had left in peace.

My grandfather continues pointing at shores for me. Thanks to him, I learned and now I know that love is taught. How to remain silent, how to observe beauty, how to understand transcendence, how to love the place we live in; all that is taught. There is no other way. Our children watch us and learn from every move we make.

Despite its formal register, this book wants to teach us, from the first letter to the final stop, the importance of love towards nature. It focuses on important things. It warns us about the urgency that we (as part of this world) should have to take a positive attitude towards this serious but still reversible situation.

*"Who will change the world if not us // And if it is not now, when?" sings Miguel Abuelo in his song "**Padre soltero**". The questions that the poet makes himself present us with two truths: responsibility and urgency. In this book, apart from the immediate questions, there are also some answers.*

"Everything is done for love" is the final verse of that song. I am sure, my dear reader, that you also have a story, like the one about the fox cubs drinking freshwater, tattooed in your soul. Now it is up to us preserve that story so that it does not become a tale.

Luciano Saracino
Writer and scriptwriter
Capital Federal, Buenos Aires
03/01/2021

https://www.homeinstead.nl/alkmaar

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Introduction

1

Numerous activities, both recreational and productive ones, allow the human being to be in direct contact with nature. Scuba-diving is one of them. So much so that it is not uncommon that a person, during their baptism, while getting a certification or the first time they get into the water, experiences an intimate revelation of the beauty, the fragility and the interdependence of all that inhabits the aquatic environment and, by extension, the whole planet. If the feeling is not short-lived, the diver would like to know more and learn about that environment. And, knowing is the first step to love and protect.

"*People protect what they love*", said Jacques Cousteau. From that perspective, an instructor not only conveys information about technical and safety aspects but also helps to take a fresh look at the environment and the activity; an outlook which encompasses care and protection apart from enjoyment and safety. In short, they help to raise environmental consciousness.

But environmental consciousness is not something that people develop spontaneously, just like environmental problems did not arise spontaneously throughout the history of mankind.

Over a period of thousands of years, natural resources were used with an ultimate goal: the survival of individuals and their species. Food, clothes and tools were provided by nature and the waste produced returned to it; being assimilated without altering its balance. The human species prospered. Longevity and the quality of life improved slowly together with the development of tools and the volume of resources used. The waste produced as a consequence also grew and their reinsertion into the circuit of nature started to become more problematic.

https://delphipages.live/it/tecnologia/auto-e-altri-veicoli/jacques-cousteau

Other activities, such as pottery, metallurgy and incipient chemistry (which developed products such as gypsum or lime) involved a growing consumption of resources and a resulting generation of waste. The evolution of societies led to the formation of urban conglomerates of increasing surface and density. In that context, the quantity and type of waste became a serious problem so landfills appeared: places located away from populations where waste was dumped. The accumulation of waste brought serious public health problems. As a result, in the 14th century, the proliferation of rats, which transmitted the bubonic plague, caused a pandemic that wiped out almost half of the European population. This crisis gave rise to cemeteries, hospitals and urban drainage, but not yet as "environmental" measures but rather to deal with the plague.

It was not until almost six hundred years later that, in 1950, the waste problem started to be seen as a more serious issue. It was not just a matter of human health but an environmental concern. Since the Industrial Revolution, waste changed its composition substantially. Degradable organic materials were gradually replaced by glass, plastic, metal and other compounds which are difficult (or impossible) for nature to assimilate. Hence, the reutilization of waste as fertilizers, which was an important waste disposal practice at the beginning, became unfeasible.

1

In Argentina, the first disposal method was open burning. Although in some places reusable material was previously sorted and separated, the most widespread practice was radical incineration. In 1977, the city of Buenos Aires banned the burning of waste and created the *Ecological Coordination Society of the State Metropolitan Area* (CEAMSE, in its Spanish acronym) to dispose the tons of waste generated in the metropolitan area in a sanitary landfill. But that did not solve the underlying problem either. In the rest of the country, even today, the fight against open dumps and indiscriminate burning continues, by trying to promote practices of separation, reclassification, recovery and recycling of waste, including composting and the generation of energy by gas and solid recovery.

So far, we have dealt with the dilemma of waste and this manual focuses strongly on it, but we must not forget that trash disposal issues derive directly from the problem of the excessive exploitation of the Earth's resources without a sustainable logic. Those old paradigms which see nature as "generous" and an "inexhaustible source", together with the profit motive as the driving force of society, have led to desertification, deforestation, depletion and destruction of numerous natural environments which, paradoxically, are no longer a source of natural wealth.

1

In the 21st century, apart from dealing with water and air pollution, we must face, among other environmental catastrophes, global warming, the weakening of the ozone layer and the plastic islands floating in the oceans (some of which are approximately half a million square miles in size, that is, comparatively as large as the sum of the provinces of Buenos Aires, Córdoba, Mendoza, La Pampa and the entire continental part of Patagonia). It seems like, nowadays, the human species is submerged in a hole from which it intends to dig its way out. It is time we start to emerge.

We may feel that, as divers, we barely do our bit, but nature and the sea show us how krill and plankton, being so tiny, feed the whales. There is no effort or thing so small that is wasted to save it and save us.

This manual seeks to address the issue from different angles and to show what we can do, as individuals, as a community and as State, at first, to stop the problem and, then, to start improving the situation of our home: Planet Earth.

Questionnaire

1. **What were the main reasons why, historically, natural resources were used?**
   A- Food
   B- Clothes
   C- Tools
   D- All the above

2. **What happened with waste after consumption increased?**
   A- A rise in landfills
   B- Accumulation of waste
   C- Sanitary problems
   D- All the above

3. **When was it that the waste problem started to be treated seriously?**
   A- in 1950
   B- In 1982
   C- In 2005

4. **In which of these periods did the composition of waste change substantially?**
   A - The agrarian revolution
   B - The industrial revolution
   C - None of the above

5. **What was the first method of final waste disposal in Argentina?**
   A - Open burning (incineration)
   B - Recycling (waste classification)
   C - All the above
   D - None of the above

6. **What was the role of CEAMSE in the final waste disposal?**
   A - Compacting
   B - Sanitary filling
   C - Open burning

7. **Apart from water and air pollution, what other environmental catastrophes must we face in the 21st century?**
   A - Global warming
   B - The weakening of the ozone layer
   C - Plastic islands floating in the ocean
   D - None of the above
   E - All the above

See answers on page 85


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2 Environmental awareness

'The real voyage of discovery consists not in seeking new landscapes, but in having new eyes.'

Marcel Proust

The awakening of environmental consciousness: see and look

2

https://elpais.com/economia/2017/05/03/actualidad/1493804301_798622.html

We tend to naturalize and take our environments for granted. In our everyday life, we are surrounded by things that 'have always been there', immutable and apparently without any history behind them. We hardly ever asked ourselves why a building is located in a certain place or what such an ordinary choice like buying this or that brand of cookies in the supermarket implies, for example. But it may happen that a friend, a documentary or a newspaper article suddenly makes us aware of the serious global problem of plastic waste. We have always known that cookie brand *X* comes in a simple paper wrapper, while brand *Y* uses a cellophane envelope for each cookie and a plastic tray with another plastic bag as general packaging, but now we see that brand *Y* is profoundly damaging the environment. Then, it is quite possible that if we realize that when standing in front of the cookie shelf, we may feel that the choice is no longer so simple.

Saying that we 'see' is another way of saying that we have become aware, but aware of what? In this simple example of the supermarket, it can be said that we have acquired an incipient environmental consciousness.

If this environmental consciousness develops, our idea of the environment will change and, consequently, our attitudes, decisions and the education we give our children will also undergo a change for the better.

What is environmental consciousness? Some definitions

https://www.bloglenovo.es/robots-esclavos/

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Environmental consciousness is not a vague, romantic idea that circulates through social networks. It is very important to define this concept in order to incorporate it and work on it in a deep, useful and effective way. To this end, we offer below some of the most important current definitions.

1st definition

According to Dr. Manuel Jiménez Sánchez, Sociology professor at Pablo Olavide University in Spain:

- *The concept of environmental consciousness is made up of two words: "consciousness" which comes from the Latin term conscientia, defined as the knowledge that human beings have of themselves and their environment; and the word "environment" or "environmental", which refers to the natural milieu, the total sum of everything that surrounds, affects and conditions us, especially the circumstances in the lives of people or society as a whole. The environment encompasses the natural, social, and cultural values existing in a given time and place, which influence humanity, as well as future generations. In other words, it's not just about the space in which life develops; but also about the living organisms, the objects, the water, the soil, the air and the relationship between them. Environmental consciousness means knowing the environment in order to take care of it so that the future generation could also enjoy it. (Jiménez Sánchez, 2010: 735).*

2nd definition

On the other hand, Rafael Blanco Vargas, engineer in Chemistry, defines environmental consciousness as:

- *the level of knowledge or basic notions that the population has of the environment, which could be expressed as concern, interest, care or fear towards the current environmental problem. (Blanco Vargas, 2007:11).*

It's evident that even though the definitions belong to specialists in such different areas as Sociology and Engineering, they are both similar. They focus on gaining knowledge and also changing the look and attitudes towards the environment.

To sum up, environmental consciousness relates to the understanding that human beings have about: their place within nature, the impact they have on the environment, the use they make of natural resources, the problems they cause in the environment and their responsibility to solve those problems, both as an individual and as part of a society.

In today's world, dominated by consumerism and the throw-away culture, the destruction of ecosystems is about to become irreversible. Environmental consciousness is necessary and urgent because it entails, on the one hand, recognizing the devastating impact that our practices have on the environments we inhabit and, on the other hand, adopting a lifestyle which is interested in, concerned about and occupied with reestablishing and preserving the balance in our planet.

https://www.freepik.com/

Promoting environmental consciousness: education

2

Environmental consciousness cannot be real if we are ignorant and we do not realize what is happening to our environment, much less if we neglect our responsibility for the damage caused and, also, for repairing it. It is essential to understand how vast and serious environment degradation is and the consequences it has for our quality of life and, consequently, for the future generations. Without exaggerating, it can be said that we need to develop environmental consciousness to save the planet and, thus, save ourselves.

Reality is so complex that the main tool to raise environmental consciousness is education; specifically, environmental education aimed at both, young people and adults. According to the United Nations (UN), environmental education must set clear objectives: to train citizens to acknowledge their social and natural environment, so that that they act responsibly and rationally in the use of natural resources to promote sustainable and environmentally friendly development, and to carry out practices in their daily lives such as water conservation, waste separation and recycling, among others.

The UN stresses how essential it is to promote environmental education to raise consciousness of the global impact pollution has on rivers, seas and groundwater, deforestation, gas emissions, global warming and other ecological catastrophes caused by mankind. For the UN, it is through education that the population will gain the necessary awareness of and commitment to those issues; values which could be basically fostered in two ways:

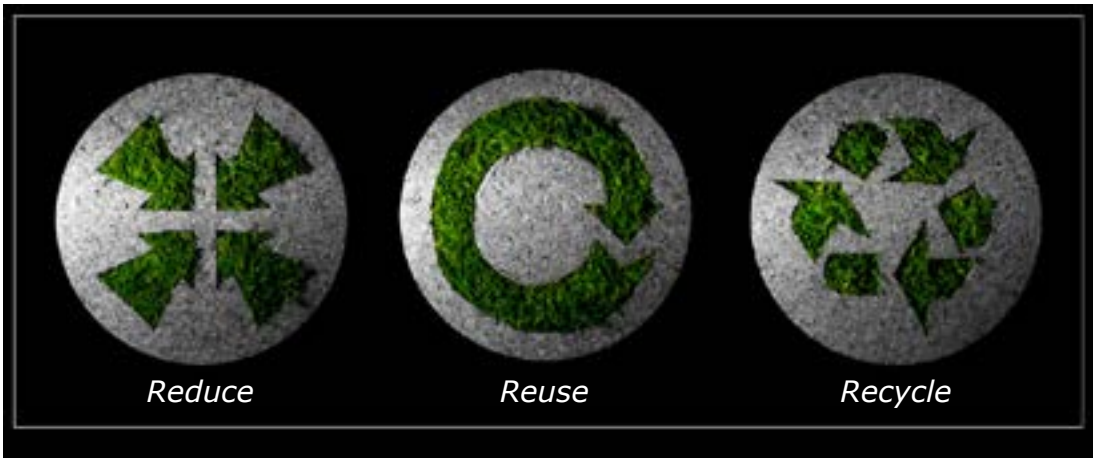
Promoting environmental education exercises and activities in educational organizations and institutions of each country that awaken environmental consciousness in children and young people.

Encouraging state and/or private organizations to carry out specific practices involving: waste collection campaigns, reuse of materials and waste, awareness-raising tours in natural parks that include exploration and recognition of the natural flora and fauna, their problems and care, etc.

In Argentina, the Law N° 27621 aims to establish the right to an integral environmental education as a national public policy, according to the article 41 of the National Constitution of the Argentine Republic, and following the article 8 of the Environment General Law N° 25675, the article 89 of the National Education Law N° 26206, and other associated laws such as the Water Environmental Management Regime Law N° 25688, the Domestic Residues Management Law N° 25916, the Native Forest Law N° 26331, the Glaciers Law N°26639, the Fire Management Law N° 26815, and the international treaties and agreements on this subject. Undoubtedly, if we achieve a widespread environmental consciousness through education by understanding how the actions of each person, each institution and each country can improve or put at risk the future of the planet, we will also be able to build consciousness and responsibility into our own habits and activities, which relates to how each one of us can collaborate to improve our environment.

We can summarize the matter of education by quoting Anisley Morejón Ramos, philosopher and specialist in environmental issues at University of Havana, who stated that:

- *The knowledge or notion of the environmental problem, an inner feeling through which we appreciate our actions towards the environment, is not innate and it is not judiciously found in individuals. As a result, it is necessary to form a new man, who is aware of the environmental problems that the planet presents, generated by his behavior and attitude; and it is essential the organization of a new system of values in which solidarity and responsibility towards society and the environment predominate (Morejón Ramos, 2006: 2).*



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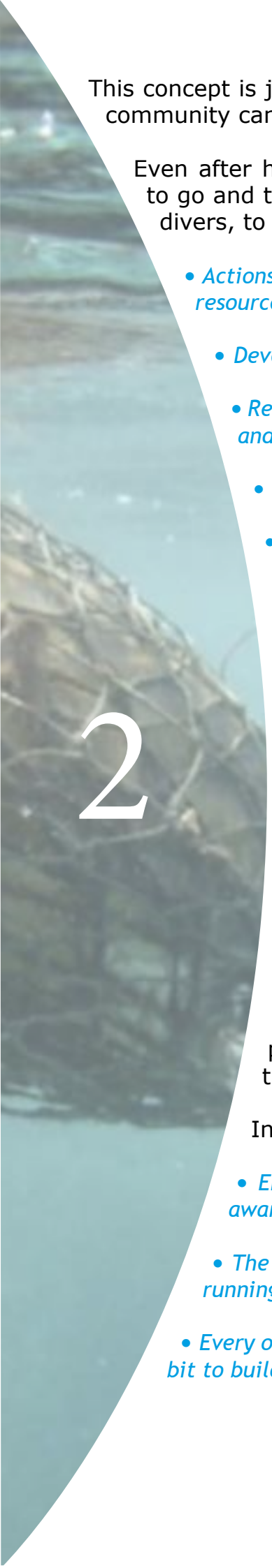
Environmental consciousness in action

2

Having reasoning abilities allowed us, the human species, to build multiple and sophisticated tools to satisfy our needs, to develop animal farming systems, to generate scientific knowledge and many other things, but we are also overexploiting the available resources. Until a few decades ago, we had not realized that, in environmentally related matters, intelligence was not always linked to awareness of the problems caused. Droughts, floods and diseases, among many others, have forcibly led us to develop our environmental consciousness. We have already seen the importance of education in that regard; now it is time to ask ourselves about the actions we must take.

In the first instance, once we understand the relationship between our activities and the damage suffered by the planet, we must propose ourselves, both individually and collectively, to make a radical change of behavior and to favor attitudes of responsible habits and practices that foster the reduction and, if possible, the mitigation of the damage caused in all the ecosystems within our reach.

As a result of what was said in the preceding paragraph, it is imperative in every community, from a productive point of view, to investigate and apply concepts to the planning of sustainable activities. We could mention, for example, the *ecological footprint*, developed by ecologists William Rees and Mathis Wackernagel, which is understood as the total ecologically productive surface, necessary to produce the resources consumed by an average citizen of a given human community, as well as the necessary surface to absorb the waste generated, regardless of the location of these surfaces.



2

This concept is just one among many that a productive, environmentally conscious community can and should investigate about, apply and disseminate.

Even after having achieved a high degree of awareness, we have a long way to go and time is short. Therefore, it is urgent for us, citizens and responsible divers, to strengthen:

- *Actions that encourage the recognition, valorization and sustainable use of natural resources.*
- *Development and promotion of environmental education and consciousness.*
- *Recycling and reusing habits at home, in the workplace and places of recreation and tourism.*
- *Individual and collective commitment to environmental protection.*
- *Participation in environmental organizations and their projects.*
- *The collection of garbage that is within our reach, both on the surface and in our dives.*
- *Awareness of the alterations of the environment to avoid their causes.*
- *The commitment to enjoy water activities preventing possible damages; without getting too close to living beings and without touching, altering or extracting elements of the environment.*
- *Refusal to feed wild animals.*

Not all people or organizations appreciate the importance of a healthy ecosystem or feel sorry for the loss of flora and fauna in our environment, which sometimes is irreversible. It can be frustrating that many people neither see nor want to see the serious reality in front of us. That should encourage us to promote environmental consciousness. It is worth remembering that, perhaps, at some point we were also indifferent, until something or someone changed the way we 'see' it.

In conclusion, environmental consciousness will make us realize that:

- *Environmental problems are impossible to solve if we do not foster global awareness of the dangers we face.*
- *The search for solutions to save our planet must be immediate because time is running out.*
- *Every one of us should act now, in our everyday lives. It is essential that we do our bit to build a future which will only be real in a healthy, sustainable planet.*

Questionnaire

8. How can we develop our environmental consciousness when standing in front of a supermarket shelf?

A- Buying cheap products which harm the environment

B- Choosing products with attractive packaging and several plastic wrappers.

C- Carefully choosing products which minimize pollution to the environment

D- None of the above

9. What is the objective of environmental consciousness?

A- To acquire knowledge

B- To change our attitudes towards the environment

C- To understand nature, the use of resources, environmental problems and the individual and collective responsibility we have for solving them.

D- All the above

10. Which organization stresses the importance of promoting education to raise awareness of the global impact pollution has on the environment?

A- The UN (United nations)

B- The NATO (North Atlantic Treaty Organization)

C- The UNICEF (United Nations Children's Fund)

D- All the above

11. Which are the consequences of the overexploitation of natural resources?

A- Droughts

B- Floods

C- Diseases

D- All the above

12. As responsible scuba-divers, we should ...

A- strengthen the commitment to enjoy water activities without causing damage or coming to close to living beings and without touching, altering or extracting elements from the environment.

B- be responsible for environmental alterations.

C- put aside garbage that is within our reach to be collected both on the surface and on our dives.

D- None of the above

See answers on page 85

3 Responsible use of resources

"...if we are not willing to change, we will disappear from the face of the globe, to be replaced by the insect."

Jacques Cousteau

The sea as a reservoir of resources

3

National Geographic

We have already mentioned that, while the degradation of our environment progresses, the myth that described nature as an inexhaustible source of resources is crumbling. Resources are depleted, especially if they are used irresponsibly. This global issue is an overwhelming reality for the seas and oceans, which are also the central sites of our underwater activities.

The Earth as a habitable world is primarily sustained by the momentum that the ocean provides to all its systems. Temperature, rainfall, drinking water, food supply for the entire food chain, oxygen in the air we breathe and other resources that sustain life on the planet are provided and regulated by the sea.

Currently, the garbage that ends up in the oceans seriously affects biological diversity. Marine debris poisons numerous species and prevents the reproduction of others, and also destroys the habitat and migratory routes of countless marine inhabitants. The continuous deterioration of coastal waters, due to pollution and acidification, multiplies the adverse effects on the natural functioning of ecosystems. The consequences are extended to the whole of nature and, sooner rather than later, economic and social impacts are produced.

It is at this point that it becomes clear that careful and responsible management of the world's natural resources is absolutely essential to building a sustainable future. Overfishing is one of the most notorious examples of the consequences of mismanagement of marine resources. It is estimated that the economic losses of the fisheries sector due to overfishing are around $50 billion annually. These losses, which at first are perceived as only business-related, are rapidly spread to all social sectors linked to fisheries. Other observations, made by the United Nations Environment Program, estimate that poor ocean management practices cause a cumulative economic impact of at least $200 billion per year.

3 Some important data

https://pixabay.com/id/photos/buku-hutan-fantasi-permainan-papan-3164759/

The situation of the fishing activity is just one example of the environmental difficulties that we face in terms of obtaining and managing resources. Below, we offer a non-exhaustive list of data that seeks to highlight some fundamental issues in order to reach a more complete picture of the situation, and also invites us to continue researching:

3

- *Three quarters of the Earth's surface is covered by water.*
- *Oceans contain 97 per cent of the Earth's water.*
- *Oceans contain nearly 200,000 identified species, but actual numbers may lie in the millions according to scientists.*
- *Oceans absorb about 30 per cent of carbon dioxide (CO_2) produced by humans, buffering the impacts of global warming.*
- *Oceans serve as the world's largest source of protein, with more than 3 billion people depending on the oceans as their primary source of protein.*
- *Marine fisheries directly or indirectly employ over 200 million people.*
- *Globally, the market value of marine and coastal resources and industries is estimated at $3 trillion per year or about 5 per cent of global GDP.*[1]
- *Studies at open ocean show that current levels of marine acidity have increased by about 26 per cent on average since the start of the Industrial Revolution due to the absorption of (CO_2).*
- *Coastal waters are being deteriorated due to pollution and eutrophication, a process which causes excessive growth of green algae as a result of organic waste accumulation. Without concerted efforts, coastal eutrophication is expected to increase in 20 per cent of large marine ecosystems by 2050.*
- *20 per cent of coral reef have already been destroyed with no hope for recovery. As a consequence of constant pressure from human activities, 24 per cent of the remaining coral reef are under imminent risk of collapse, and an additional 26 per cent are at risk due to longer-term threats.*

1 *According to 2020 updated data from the 2030 Agenda for Sustainable Development, released by the UN in 2015.*

Protecting the environment, protecting the natural resources

3


pixabay.com

Protecting our oceans must be a personal and societal priority. Marine biodiversity provides an important part of the vital resources for ecosystems, societies and people. Individuals, states and organizations must effectively manage the marine environment and its resources. It is imperative to reduce overfishing, discarding, pollution, eutrophication (pollution resulting from nutrient enrichment of waters) and acidification in oceans.

None of this will be viable if citizens do not assume their role as a factor of change. Each and every one of our actions affects the environment. The potential of each one of us as a motor of change is enormous. Acquiring habits and decision-making criteria that promote the efficient and responsible use of resources, both personally and in the workplace, will contribute to making our society more sustainable.

But, how can the protection of the environment and its resources be achieved? We can classify actions into two broad categories:

Firstly, there are major actions that the present generation must take towards future generations:

1. *To work on and promote sustainable development, preserving the living conditions and the quality and integrity of the environment.*

2. *To protect future generations from exposure to levels of pollution that endanger their health or even their very existence.*

Secondly, small actions, at the individual or community level, that modify our daily relationship with the environment and the available resources, and that contribute as a whole to the aforementioned changes:

1. *To save energy, even in trivial matters like using public transport when travelling long distances and walking or riding a bicycle for short distances, unplugging electronic devices that are not in use, reducing water consumption, obtaining at least part of our electricity from clean sources (solar, wind), etc.*

2. *To consume strictly what we need and avoid waste, especially when it comes to products from the oceans. We should try to choose those products which are certified to have an environmentally friendly origin and production.*

3. *To eliminate, as much as possible, the use of single-use plastics and choose products which are sold in returnable or biodegradable packaging. Also, to participate in clean-up days, done in coastal areas, both on the surface and on the seabed.*

4. *To promote environmental consciousness and highlight the importance of protecting marine life and natural resources.*

https://hdwallpaperim.com/light-bulb/

Questionnaire

13. Which of these resources are provided and regulated by the sea?

A- Temperature, rainfall, drinking water and oxygen in the air.

B- Food supply for the entire food chain

C- Options A and B are correct.

D- None of the above

14. What does waste which ends up in oceans affect negatively?

A- Biodiversity

B- Animal reproduction

C- Marine habitats

D- Options A and B are correct

E- All the above

15. Which of the following is a model activity for the correct management of natural resources?

A- Overfishing

B- Deforestation

C- Overgrazing

D- All the above

E- None of the above

16. What percentage of CO_2 produced by human activity is absorbed by the seas?

A- 15%

B- 30%

C- 40%

17. What are the reasons why coastal waters are deteriorating?

A- Lack of coastal vegetation

B- Brown color of the waters

C- Proliferation of certain algae

D- All the above

18. What small individual actions can we do on a daily basis to modify our behavior and contribute to the environment?

A- To light up our house to make it look nicer.

B- To eliminate or reduce the use of plastics.

C- To increase our consumption and generate more waste.

See answers on page 85

Ecosystem alteration

1

*"According to the macro study **State of the World's Plants and Fungi 2020**, conducted by more than two hundred researchers from 47 different countries and published by the New Phytologist Foundation, human action on Earth has already caused 40 percent of plant and fungal species to be at risk of extinction. The threat to global vegetation (two out of five plants are in danger of disappearing) could have consequences for food security, as 30 percent of edible species are on the Red List of Threatened Species by the International Union for Conservation of Nature (IUCN). According to the report, the scarcity of plant species intended for human consumption is of increasing concern."*

Página 12 Newspaper, October 3, 2020

Introduction: The altered ecosystem and the human being

https://pxhere.com/de/photo/660066

4

The existence of the human species and the rest of living beings, has always depended on nature. Being integrated into the ecosystem, human beings have learnt how to take advantage of their environment to provide themselves with food and to protect themselves from the rigors of the climate. Throughout history, different societies have had varying degrees of awareness about their relationship with the environment and the way in which they have altered it to obtain its resources. Modern society perceived natural resources as infinite until the mid-twentieth century, and it was not until consciousness began to develop and it became clear that that was far from being the case.

The extinction of animal and plant species and changes in landscapes and the climate, i.e., the alteration of ecosystems, turned into a cause for great concern, not only because of the ecological impact it had, but also because it inevitably started to harm the economy and the health of the world's inhabitants.

Even from a utilitarian perspective, which sees the benefits we obtain from the environment as "environmental services", it is evident that they depend entirely on the healthy functioning of ecosystems and their biodiversity. It is perhaps easier to recognize the benefits and harms of this dependent relationship in tourism and recreational activities: an integrated view of our economic activities and their impact on nature will show us that, if ecosystems continue to be altered and degraded, so are the services they provide. Unfortunately, this degrading alteration of ecosystems entails an economic cost that we often fail to take into account or we postpone considering until it is too late.

Biodiversity alteration: the extinction of species

4

Causes

The United Nations Convention on Biological Diversity (ratified by 196 countries) defines biodiversity as:

"variability among living organisms from all sources including, inter alia, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part; this includes diversity within species, between species, and across ecosystems." (UN Convention on Biological Diversity, 1992:3-4)

This biodiversity is absolutely essential to the functioning of the entire planetary ecosystem and, consequently, to the survival of humanity as a whole. However, it is currently undergoing an accelerated process of destruction. The number of animal and plant species in danger of extinction is growing, both in terrestrial and aquatic environments. To understand this destructive process and to be able to stop it, it is crucial to recognize its causes. Without claiming to be exhaustive, here are some of the main ones:

***Overexploitation**: it refers to the extraction of natural resources at a rate that exceeds the carrying capacity of an ecosystem, i.e., the ability of an ecosystem to regenerate resources naturally.*

***Habitat loss**: it refers to the destruction, fragmentation or drastic modification of the natural environments, which result from human activities that endanger the survival of their inhabiting species. The reduction of jungles and forests through deforestation, the drainage of wetlands, the burning of pastures and the dumping of waste in seas and rivers are some of the most widespread practices that destroy habitats.*

***Environmental contamination**: it refers to the presence of foreign agents in the water, air and soil that produce a harmful alteration in the ecosystem. Although there may be situations of contamination due to natural causes, the most serious and damaging cases are caused by human activity.*

***Introduction of exotic / invasive species**: it refers to the entry of species into an ecosystem, because of anthropic causes. As those species do not belong to that ecosystem, they alter it, generally in a harmful way.*

__Climate change__: it refers to climate variation, mainly produced as a consequence of an increase in the concentration of greenhouse gases, which has harmful effects on the habitability of an ecosystem, causing many species to be unable to adapt to the new conditions and to disappear.

4

Extinction events

Biodiversity loss is determined by the phenomenon of species extinction. In general terms, the *extinction of a species* occurs when the last specimen dies and, consequently, there is no member of that species capable of reproducing and giving rise to a new generation. We refer to *functional extinction* when only a certain number of members of a species survive, but these are unable to reproduce at an adequate rate due to health problems, aging, geographic distance or lack of individuals of a given sex (in those species with sexual reproduction). In the field of ecology, we also speak of *local extinction* when a species disappears from a given area, even if there are individuals and/or communities of the same species in another geographical area.

If a species undergoes any of the above processes, the structure and functioning of the ecosystem in which it lived are affected to some degree. The extinction of one species can cause a cascade effect that leads to the extinction of other species in the same habitat.

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This effect is called a *chain of extinction* or *coextinction*. Examples of this phenomenon are plants that disappear due to the loss of their pollinators, or predators of a food chain that become extinct after the disappearance of their prey.

In general, extinction processes happen naturally, almost always due to changes in environmental conditions that occur faster than the adaptive response of the endangered species. These changes can be sudden or they can develop over thousands or millions of years, affecting mostly small populations with little capacity to adapt and survive a change in environmental conditions.

Throughout the history of planet Earth, five events known as mass extinctions have been recorded, all of them as a result of natural causes. Currently, scientists are discussing whether or not we are going through a sixth mass extinction. What is disturbing about this discussion is that some claim that this time the causes are not natural, but derive from the damage that mankind is causing to the environment[1].

Introduction of exotic species

Migration is a phenomenon that occurs in countless species, including our own. But unlike the rest of the species, humans move from one place of the world to another, taking cultural elements, animals and plants with them. Sometimes animals and plants are transported deliberately, as in the case of livestock and cereals, and sometimes they are moved unintentionally or accidentally. In many cases, the introduction of an exotic species does not produce any environmental changes, but in others, the process is so successful that they become invasive species, capable of modifying the recipient ecosystem in a catastrophic way.

Invasive exotic species are those species of animals, plants, fungi or microorganisms that thrive outside their natural distribution areas, taking advantage of very favorable development conditions, such as an overabundance of food or the absence of predators/competitors. Thus, these species increase their population density in an uncontrolled manner, colonizing more and more territory to the detriment of native species and, consequently, of all the richness and diversity of the receiving ecosystem. The damage caused will depend on the conditions of the invaded environment, the characteristics of the invasive species and the mode of their introduction into that ecosystem.

1 Even in this context, it is still difficult to say humans are in danger of extinction. In fact, population continues to grow. Culture confers us a great adaptive flexibility and we will probably find a way out, but we cannot say the same for the rest of the species we share the planet with.

The fact that an invasive species turns out to be harmful implies strong changes in the processes, the structure and the composition of the ecosystem. The immediate consequence is the threat to the endemic biodiversity (specific to an ecosystem). Among other effects, there might be a drastic decline or extinction of native species, a scarcity or depletion of natural resources and a homogenization of the landscape. Invasive species affect native species by preying on them, outcompeting for resources, crossbreeding and producing hybrid and sterile offspring, introducing diseases for which the local population has no defenses, or degrading the habitat[2].

4

On the other hand, it is important to point out that many of the possible solutions adopted to control these species can affect the environment. This is the case, for example, when the use of pesticides becomes necessary but it can contaminate the water or the soil.

In a nutshell, the introduction of invasive species entails serious environmental problems in various ways. We can briefly mention the following drawbacks:

- *From an ecological perspective, it causes biodiversity loss and degradation of the invaded habitats.*

- *From a productive perspective, it has direct and indirect effects on agricultural, industrial and fishing activities, among others.*

2 *Researchers from the Argentine National Scientific and Technical Research Council (CONICET, in its Spanish acronym) and the National Institute of Fisheries Research and Development (INIDEP, in its Spanish acronym) discovered the existence of Asian snails of the Rapana venosa type in the waters of the Río de la Plata; a species which is spreading along the Argentinian and Uruguayan coasts. They were first detected in the estuary of the Río de La Plata in 1998, and they are believed to have arrived via ballast water from commercial ships from Asia or the Black Sea. It is a species with wide tolerance to environmental variations and great capacity to feed on new prey in the invaded environments. It usually proliferates uncontrollably because it does not normally have natural predators. A report from the CONICET explains that this type of snail feeds on bivalve mollusks, especially mussels, oysters and clams, affecting the abundance of these species in marine communities and estuaries of the region and changes the biodiversity in the coast of Buenos Aires. This not only alters the conditions of the environment, in particular the food chain, but can also lead to serious economic damage. The case of the clams predated by this mollusk is illustrative as they are the food of several commercially important fish species, such as the Yellow Corvina, which is one of the main economic resources of the region. The Rapana venosa had also been identified as the main cause of the collapse of several oyster and mussel fisheries in the Black Sea, where it is also invasive.*

- *From a sanitary perspective, it favors the introduction of human, animal and plant pathogens in exotic birds, rodents or insects that act as their vectors.*
- *From a socio-economic perspective, it produces high costs associated to the management of exotic species, including their eradication and control. It is almost always impossible to reverse invasion processes, so prevention is essential despite the fact that identifying and stopping potential invaders also involves great costs.*

4

Socioeconomic aspects: ecosystem services

https://pras.mma.gob.cl

As we have seen, the alteration of ecosystems has consequences in all aspects of life for the species that inhabit the planet. But, apart from the environmental consequences, these phenomena also have a significant socioeconomic impact for humans.

The socioeconomic aspect can be analyzed in different ways and from various perspectives. The study of these approaches is beyond the scope of this manual but we can present, as an example, the one based on the concept of *ecosystem services*.

4

Ecosystem services (also known as environmental services) are defined as those resources and/or processes inherent to ecosystems that provide direct or indirect benefits to humans and their communities.

Ecosystem services are the result of the natural functioning of ecosystems and provide improvements in people's health, economy and quality of life. This category includes products (such as drinking water, fuels or food) and processes (such as the natural soil formation and fertilization or the decomposition of waste). In economic terms, they are the suppliers of a huge amount of goods and services.

The following is a synthetic classification of ecosystem services:

Supporting services are those which provide the necessary conditions to guarantee the existence of other ecosystem services. Among others, we can highlight the biogeochemical cycles responsible for the transport and recycling of nutrients, seed dispersal, primary production, habitat development for species and the preservation of genetic diversity.

Provisioning services include those goods or raw materials that an ecosystem offers for the sustenance of a community, such as wood, water, food, raw material for medicines and energy.

Regulating services are those that help mitigate the local or global impacts of ecological modifications. They derive from the capacity of ecosystems to regulate processes. They include the following: carbon capture and storage, climate regulation, detoxification and waste decomposition, water and air purification, crop pollination, and natural control of plagues and diseases affecting humans, animals and plants.

Cultural services are the non-material benefits that people and communities obtain from healthy ecosystems. They promote spiritual enrichment, cognitive and intellectual development, reflection, aesthetic experience and recreation.

It is clear that almost all changes in biodiversity can have a negative impact on the provision of ecosystem services. This implies the urgent need to manage these services in a sustainable way, i.e. protecting biodiversity. For example, the restoration of biodiversity enhances both the benefits and the variety of ecosystem services provided, and contributes to the overall stability of the ecosystem. Considering that biodiversity encompasses diversity within species as well as between species and even between ecosystems, the sustainability and/or recovery of ecosystem services will be linked to the notion of resilience and response diversity. The latter refers to the fact that a set of species will have differential responses to a given environmental disturbance, jointly creating a stabilizing function to increase resilience, aiding to preserve the integrity of the system and maintain a service.

4

A huge number of human activities damage or destroy ecosystems and degrade their environmental services. Countries outline various policy proposals to stop, mitigate or compensate the effects of those activities. In some cases, for example, they promote economic valuation of ecosystem services. Unfortunately, despite the fact that this economic value accounts for the enormous damage that we are experiencing, these proposals do not always receive sufficient attention or funds to invest in prevention, protection and management.

However, even if there is no state or organization concerned with the care of the environment and environmental services, we should not underestimate the importance of the actions that can be taken by individuals. The first and main action will be to investigate and learn about how the ecosystem, which we inhabit and from which we obtain numerous services, works and how it is organized. The second one will be to foster conditions and attitudes that are essential to facilitate development without harming biodiversity. Starting from these basic actions, each individual can then add innumerable ones related to their specific environment, such as: being careful not to introduce foreign species that could become invasive; assessing the impact on local flora and fauna of any operation or enterprise they might run (overexploitation, reduction of habitats, pollution); disposing waste in a responsible manner. There are as many possible individual actions as people and ecosystems.

Achieving a full understanding of the synergistic effect of the relationships between organisms, the environment and the services that a specific ecosystem provides is a very complex task and requires extensive work by individuals and organizations, which is now crucial.

Questionnaire

19. What factors led humans realize that natural resources are not infinite?

A- The extinction of species

B- Changes in landscapes and climate

C- Impact on the economy and health of inhabitants

D- All the above

20. Which of these factors alter biodiversity?

A- Overexploitation

B- Habitat loss

C- Environmental contamination

D- Introduction of exotic or invasive species

E- Climate change

F- All the above

21. An animal or plant species is in danger of extinction when their survival is unlikely because its causal factors continue to occur.

A- True

B- False

22. The extinction of one species can cause a chain effect that leads to the extinction of other species in this habitat.

A- True

B- False

23. Which of these can be the natural cause or factor for the extinction of a species?

A- Climate change

B- The introduction of exotic species

C- None of the above

D- All the above

24. How are ecosystem services classified?

A- supporting – provisioning - regulating - cultural

B- retaining - supporting – regulating - cultural

C- regulating – systemic – retaining - cultural

See answers on page 85

5 Waste generation and disposal

"If we keep dumping garbage into the sea, we will become garbage."

Jacques Cousteau

Introduction: the problem of waste

pixabay

5

We have seen that one of the most difficult and urgent issues to be solved nowadays concerns the consequences of the number of natural resources consumed by most contemporary societies. Unfortunately, the extinction of species, the depletion of ecosystems and the degradation of environmental services are only a small part of the problems and dangers we face.

The excessive exploitation of natural resources has as a direct consequence the excessive proliferation of all kinds of waste. Although a large quantity of this waste could be reincorporated into the cycle of nature (through a biodegradation process), the amount and speed at which it is produced saturates the recovery capacity of ecosystems. In addition to this serious situation, there is also a high volume of waste which is not biodegradable, or whose degradation can take hundreds of years, and tons of it are dumped into the environment. Plastic pollution is one of the most visible examples nowadays.

In all cases, solutions must come from the joint efforts of states, organizations and individuals. The following lines are intended to provide a basic overview of this problem and present contributions that we, as individuals and citizens, can make to solve it.

Current legislation in the Argentine Republic

5

Since the mid-twentieth century, when the world began to become aware of environmental problems, the governments of the different countries have been gradually building legislation on the subject. Argentina was no exception and it currently has a series of rules that directly or indirectly regulate environmental problems in general and waste in particular. The following are the most important Argentinian laws, arranged in order of enactment:

Law No. 13,577/49 on National Sanitary Works

The main objectives of this law are the study, design, construction, renovation, expansion and exploitation of water supply and urban sanitation works in the Autonomous City of Buenos Aires and cities and towns of the Argentine Republic, and it also legislates on the exploration, extraction and use of groundwater.

Law No. 20,284/73 on Atmospheric Pollution

This law deals with provisions for the preservation of air resources and supervises, inter alia, all sources capable of producing air pollution.

Law No. 24, 051/91 on Hazardous Waste

This law defines what is considered hazardous waste in our legislation and establishes the guidelines for its generation, handling, transport, treatment and final disposal. It also determines what types of waste are prohibited from importation.

Law No. 25,675/02 on National Environmental Policy

This law establishes guidelines for the definition of minimum budgets for the achievement of sustainable and adequate management of the environment, the preservation and protection of biological diversity and the implementation of sustainable development in Argentina. It also sets a general framework for citizen information and participation in environmental matters, legal liability for environmental damage caused, and the promotion of environmental education.

Each of these laws has in turn derived and amending rules. Together with provincial and municipal laws, they constitute a legal corpus which, although incomplete and perfectible, provides the country with an important environmental legislation.

Waste classification

5

Criteria

Although each country or region adopts the most convenient method for them, there is broad consensus on the importance of sorting and separating waste material to optimize its processing, from an ecological point of view.

After becoming aware of the importance of reducing the amount of garbage generated, the next step for a responsible individual is to actively participate in the classification of waste. To organize and make this task more efficient, two separation criteria, called primary and advanced sorting, have been established.

Primary sorting is defined as the action of separating all municipal solid waste according to whether it is organic or inorganic, while advanced sorting implies discriminating between waste that can be reused and revalued at source and waste that requires special handling for reuse or final disposal.

In addition to those two instances, separation criteria are applied taking into account the quantities generated, the specific characteristics of each type of waste and the possibility that each region or locality has to recycle or reuse the waste it produces.

Types of waste generated

Organic waste

They are primarily separated into:

- *Paper and cardboard*
- *Food scraps*
- *Pruning remains and yard trimmings*

While being separated, it is secondarily taken into consideration that:

- *Paper and cardboard include boxes, magazines, newspapers, sheets of paper, etc.*
- *Paper and cardboard must be clean and separated from food scraps because, when mixed with wet waste, they lose their recycling potential and their commercial value.*
- *Pruning remains and yard trimmings can be recycled as firewood or fertilizer.*

Inorganic waste

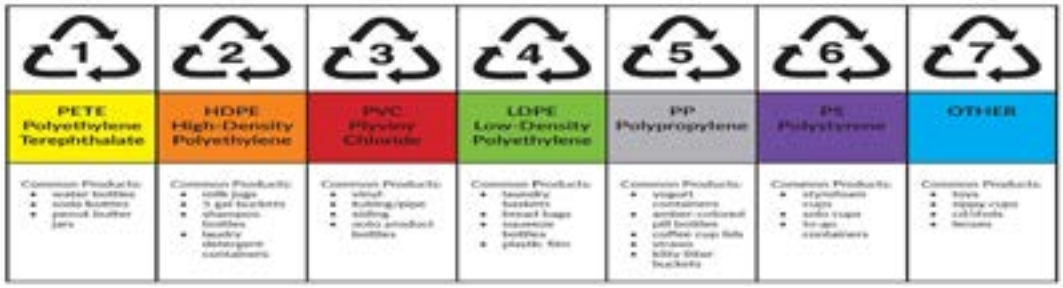
They are primarily separated into:

- *Metals*
- *Glass*
- *Plastics*
- *Rubber*

While being separated, it is secondarily taken into consideration that:

- *Metals include scraps, wires, cables and cans, as long as the latter have not contained paint, oil, grease, etc.*
- *In addition to bottles and jars, glass refers to laboratory materials, replacement glass and ordinary light bulbs, but it does not include mercury, energy-efficient or fluorescent lamps or tubes.*
- *Plastics include (soda, water, edible oils) bottles, non-toxic product packaging, wrappers, plastic films and plastic bags.*

A particular characteristic of plastics is that they can be sorted according to a label assigned by the Argentinian IRAM 13700 standard which identifies each type of plastic depending on its properties. Each plastic object will have one of the following printed symbols.



Each symbol and its acronym refer to the following classification:

PETE: polyethylene terephthalate is the plastic waste with the greatest potential for being recycled.

HDPE: High Density Polyethylene, with which most of the packaging, tools and toys are manufactured. It has a large recycling capacity.

PVC: Polyvinyl Chloride. It is one of the most expensive types of plastic, but because it is heavy and resistant it is used in industrial packaging and equipment. It is completely recyclable.

LDPE: Low Density Polyethylene. It is the one we find in sachets, bags, air bubble covers and kitchen films. It has the great advantage that it can be used as a raw material in the manufacture of other products such as containers, baskets, envelopes, panels, shelves, pipes, bricks or tiles.

PP: Polypropylene. It is the material of bottle caps, yogurt pots, stackable drawers, buckets, etc. It has the great advantage of being 100% recyclable.

PS: Polystyrene. It is the raw material with which Styrofoam is produced. Various products are obtained when it is recycled, such as building materials, panels and insulating fabric, etc.

Other: all plastic resins or blends not included in this list. These are the materials used to manufacture, for example, some bulletproof materials, DVDs, certain parts of computers and other devices, and sunglasses, among others.

If the letter R is added to the acronym (e.g. R-PET), it means that the product was made from or contains recycled plastic.

Special plastics

Their process of separation, processing and disposal must be done carefully, as they are highly polluting and, in general, not biodegradable. The highest volumes correspond to:

- *Used lubricating oils.*
- *Printer ink cartridges.*
- *Batteries.*

5

Biohazardous waste

It refers to all healthcare waste. They require highly specialized handling. They include, for example:

- *Protective equipment (face masks, gloves, caps).*
- *Disposable tools and instruments (syringes, probes, tongue depressors).*
- *Medical care items (dressings, diapers, bandages, cotton).*
- *Waste from surgeries.*
- *Materials contaminated with pathogens.*

To conclude this section, we have included an image which shows a color code designed to facilitate the separation of waste at source, so that, once it is identified, it can be deposited in specific containers for each type of waste.

Types of waste treatment

5

Each community, at the local, regional and/or national level, must have an integrated waste management system for the treatment of urban waste; that is to say, a set of human and material resources, standards, protocols and procedures that guide the activities carried out to manage the waste generated by the community, either for its treatment or final disposal.

The integrated waste management system is always supported by three fundamental pillars:

Reduction of the level of waste produced to the maximum possible extent. It is achieved through changes in technologies and supplies or the reduction of materials used in the packaging and storage of products. One example is the agreements with manufacturers and suppliers to use and promote the use of returnable packaging.

Reuse as much of the discarded materials as possible. This is achieved by promoting projects that involve the reutilization of discarded materials as raw material. This type of projects involves the characterization of the different types of waste, taking into account the volumes generated, the sources of origin, the composition of the waste and its economic possibilities.

Recycling of any material that is technically and economically viable for reuse. This is achieved by defining in advance the final destination of each type of waste, developing training and promotion programs for recycling, and encouraging personal awareness of the social and economic value of this way of waste treatment.

Based on these three pillars, the system seeks to manage or dispose waste in a controlled manner. Experience has shown that the most efficient methodology for integrated waste management is *separation at source*. This strategy significantly reduces the complexity and costs, and increases the efficiency associated with the handling, collection, transfer, treatment and final disposal of waste.

As we have seen in the previous section, primary separation consists of a first basic discrimination of waste depending if it is organic, inorganic, special or compatible with household waste. This classification prepares the treatment of the separated material according to its type.

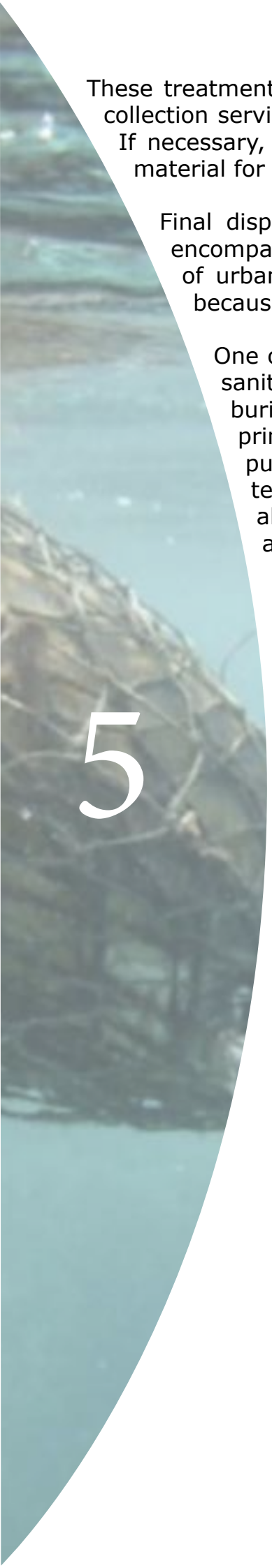
Organic material, for example, could be treated with composting and/ or vermiculture processes, used in brick manufacturing or dumped in environmentally friendly landfills, depending on the possibilities of each place. Despite containing some inorganic components, material compatible with household waste can also be used as sanitary landfills, as long as they do not include metals, plastics, glass, rubber, wood, cables, etc.

When waste is classified as special (batteries, chemical, electronic or biohazardous waste), due to its potential toxicity or hazard, it requires a particular treatment depending on its nature.

5

One of the easiest ways to promote separation at source is to set up special *waste collection center.* These are spaces created by communal or municipal governments to receive, store and classify domestic waste. They have containers (like the ones in the photo at the bottom of the page) identified with the color code shown above. The idea is to place them at easily accessible points, so that each neighbor collaborates with the separation at source of their own waste, prior to its transfer to the treatment plants by a collection service.

https://www.diariodesevilla.es



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These treatment plants are facilities specially designed to receive waste from the collection service (regardless of whether it has been separated at source or not). If necessary, it will be sorted there and then packed according to the type of material for subsequent use into new production processes or for final disposal.

Final disposal is the last stage of municipal solid waste management. It encompasses a set of operations aimed at achieving the permanent disposal of urban waste that cannot be reused or recycled, due to its nature or because it is economically unviable.

One of the best known methods of municipal solid waste disposal is the sanitary landfill. A sanitary landfill is by no means an ordinary garbage burial site. For this method to be effective, a series of sanitary engineering principles have been developed to guarantee the absence of risks to public health and the environment. With the application of current technologies, waste is encapsulated in special containers designed to allow a detection, collection and control system to regulates liquid and gaseous emissions at all times.

Questionnaire

25. How is waste sorted?

A- Primary and advanced sorting.

B- Primary and secondary sorting.

C- Organic and inorganic sorting.

26. Which types of waste are generated by human beings?

A- Organic and inorganic waste.

B- Biodegradable waste.

C- All the above

27. Which of the following is organic waste?

A- Paper and cardboard

B- Plastics

C- Glass

28. Which of the following is inorganic waste?

A- Rubber

B- Metals

C- Pruning remains and yard trimmings

D- Options A and B

E- All the above

29. According to the IRAM 13700 standard, which is the acronym for plastic waste with the highest recycling capacity?

A- PVC

B- PETE

C- PP

D- HDPE

E- None of the above

30. What type of waste is considered inorganic and special?

A- Used lubricating oils

B- Batteries

C- Printer ink cartridges

D- None of the above

E- All the above.

31. What type of waste is considered inorganic and biohazardous?

A- Face masks, gloves, caps

B- Syringes, probes, tongue depressors

C- Polyethylene terephthalate

D- All the above

E- Options A and B

32. Which are three fundamental pillars of the integrated waste management system?

A- reduction – reuse – recycling

B- reduction – refraction – recycling

C- recycling – reduction – retention

33. The easiest way to promote waste sorting at source is the creation of special waste collection centers.

A- True

B- False

34. One of the most popular methods for the final disposal of municipal solid waste is sanitary landfills.

A- True

B- False

See answers on page 85

6

Water contaminants

"Water and air, the two essential fluids on which life depends, have become global garbage cans".

Jacques Cousteau

Water and life

Divers love water and there we find our greatest joy and challenges. It is also the place where many of us acquire or improve our environmental consciousness. Water covers three quarters of the planet's surface and it is the essential element for the development of life. This is largely because it has two unique properties: firstly, when water freezes it dilates (anomalous behavior) and secondly, it is the liquid that dissolves most of the substances required for life (universal solvent). Because of its anomalous behavior, water in lakes and rivers freezes first at the surface and allows life to continue in the depths. Because it is a universal solvent, it can contain and transport air, all kinds of nutrients and minerals. Unfortunately, it is also susceptible to different types of pollution.

There are several ways in which water becomes polluted, mostly caused by human activities, but there are also numerous ways to prevent or mitigate these effects. It is necessary to know about both aspects to raise our environmental consciousness and to be able to participate responsibly and actively in this field. The following is a brief list of water contaminants and their possible treatment methods.

6

Water contaminants

Sewage effluents

The term effluent refers to wastewater containing solid, liquid or gaseous residues produced by households and/or industries. In particular, *sewage effluents* come from waste generated by urban conglomerates. From a historical point of view, it can be said that they are the first water contaminants generated by humans. They mainly contain organic matter and a myriad of potentially pathogenic microorganisms. Additionally, they can contain settled solid materials, detergents (especially non-biodegradable ones), fats, oils and elements such as phosphorus and nitrogen. All of these components can cause health and/or environmental problems and that is the reason why this water must be treated before being discharged back into the environment.

One of the treatments consists of temporary disposal of water in aeration lagoons, to cause the natural reduction of settled solids and organic matter. In this method, a longer settling time favors the elimination of pathogenic microorganisms and nitrogenous compounds. It is also complemented with one or more disinfection and filtering methods, which significantly contribute to the elimination of microorganisms. Despite the available methods, nowadays there is an increasing quantity of pharmaceutical substances/drugs that enter sewage treatment plants via wastewater and often cannot be cleaned out there.

Getty Images

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Solid waste

Solid waste is any type of waste generated by human beings from their daily activities and which has a solid form or state, as opposed to liquid or gaseous waste. Because much of what is consumed or used in everyday life generates this type of waste, its percentage in the total sum is very high. In addition, it is not usually assimilated to the rest of nature so large amounts of waste remain in the environment for a long time.

Poor solid waste disposal can contaminate both surface and groundwater. In the case of surface water:

The organic components of the waste cause water to have higher concentrations of bacteria and other microorganisms, to contain drastically lower levels of oxygen necessary for the survival of aquatic species, to be acidified and to become less suitable for human consumption. In the latter case, health problems are not uncommon in communities drinking that water.

Watercourses are frequently clogged and dammed due to the presence of

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garbage, containers, bags, mattresses, debris and/or scrap metal. This makes it difficult, if not impossible, to provide water for consumption and irrigation. When there are heavy rains or flash floods, it also obstructs drainage, because the accumulated waste clogs the natural watercourses and generate floods that destroy towns and farming areas.

In the case of groundwater, waste liquids generated during the decomposition of solid waste cause contamination through two specific processes:

Percolation is the phenomenon that occurs when a liquid moves through a porous medium such as soil.

Leaching occurs when a compound substance dissolves in another substance and this causes the separation of the components depending on their solubility.

Leached and percolated liquids in the soil, which acts as a filtering agent, can reach groundwater sources and seriously contaminate them. In general, groundwater is often vital to communities that rely on it as their only source of drinking water. Their recovery and treatment entail very high economic and social costs.

Plastics

Water contamination is a global problem, suffered by both developed and developing countries. This is especially true in the case of plastic. It is known that a single PETE plastic bottle can take almost a thousand years to decompose. It is therefore vital, in the first instance, to prevent their introduction into ecosystems.

Despite the recent appearance of plastic (which dates back to 1907,

https://elcomercio.pe/mundo/latinoamerica/gigantesco-mar-basura-en-frenta-honduras-guatemala-noticia-470801-noticia/

when Leo Baekeland invented Bakelite, considered the first thermosetting plastic), it is currently the main component of the waste found on beaches and in aquatic environments and, therefore, it constitutes its main threat. The existence of the Great Pacific Garbage Island is well known, although there are also others in the North and South Atlantic Ocean. Once they enter the sea, these materials are fragmented into countless particles, called micro plastics, which accumulate and move along with the ocean currents. Consequently, micro plastics and plastic fibers can be found in virtually all marine habitats around the world. The various densities of the elements cause the ocean currents to distribute them in different depths of the water column and favor their concentration in certain areas. These micro plastics are ingested by sea animals and enter the food chain affecting other animals (their feeding and reproductive behavior, and even causing their death) and human beings themselves.

But not only the sea has this problem. Micro plastics, resulting from poor quality packaging, can contaminate food, hygiene products and even bottled water. We can also get to consume them directly from our taps.

The impact of this type of contamination on aquatic environments and their biodiversity is an important field of scientific research worldwide. In Argentina, the National Council of Scientific and Technical Research (CONICET), together with researchers from the universities of Mar del Plata, Córdoba and La Plata, among others, has conducted several studies on the possible effects of the intake of macro and micro plastics in a wide variety of native marine organisms.

Regarding to possible solutions to the problems with solid waste and plastics, we refer to what has already been said in chapter five of this manual.

https://www.noticiasnet.com.ar/nota/2019-5-24-12-16-0--chau-sorbetes

https://www.infobae.com/america/medio-ambiente/2019/05/17/la-peticion-para-prohibir-el-uso-de-los-sorbetes-consigue-una-firma-por-minuto/

Other types of contamination

https://www.elespanol.com/reportajes/20171110/261003901_3.html#img_17

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The three contaminants mentioned above are not the only ones affecting the aquatic environment. A great variety of human activities and products endanger it, and consequently, ourselves. Some of them are mentioned below:

- *Hydrocarbon. When an oil or fuel spill occurs, the local effects on wildlife and aquatic life are immediately noticeable, but, in the medium term, the extent of the damage is enormous and difficult to repair.*

- *Pesticides, artificial fertilizers and other chemicals used on farmland are leached by rainwater and absorbed by the soil, generating groundwater contamination.*

- *Microbiological contamination, which can be artificial or natural (viruses, bacteria and protozoa), mainly affects drinking water sources; hence, its treatment is essential.*

- *Suspended solids are all those substances which are not dissolved in water and that can, when divided into micro particles, damage and even kill all kinds of aquatic organisms.*

- *Chemicals. In the 21st century, industries of all kinds operate with an infinite number of chemical products, which they then dispose directly, without any care or processing, in nearby water sources. At a personal level, additives of some skin-care products such as sunscreens can damage certain water organisms such as corals.*

6

- *Eutrophication. In any natural body of water, there are aerobic microorganisms (which need oxygen to live) and anaerobic microorganisms (which can live without oxygen), depending on the suspended biodegradable matter. An excess of aerobic microorganisms promoted by an increase in the nutrient load can consume the available oxygen and cause their own death and that of native species. Subsequently, their remains will generate toxins and harmful substances such as ammonia and sulfides.*

- *Nutrients surplus. Paradoxically, wastewater, fertilizers and sewage water can contain very high levels of nutrients. This overabundance disturbs the natural balance and stimulates the growth of algae and weeds in the water, which in turn causes it to stop being potable and even clogs filtering systems for water purification.*

Ralph Schill

All these problems have a more or less complex specific solution. One of the most effective actions will always be the prevention and control at source of water contaminants.

Photo: © WWF/Troy Mayne.

Questionnaire

35. Sewage effluents come from waste generated by urban conglomerates.

A- True

B- False

36. Which ocean hosts the largest floating island of plastic waste?

A- Arctic

B- Atlantic

C- Antarctic

D- None of the above

37. What other way of contamination do we know?

A- Hydrocarbon

B- Oxygen absorbers

C- Pesticides

D- Microbial contamination

E- Chemicals

F- Nutrients surplus

G- All the above

See answers on page 85

7 Responsible tourism

"He who returns from a journey is not the same as he who left."

Buddhist proverb

Environmental consciousness, touristic consciousness

7

Traveling is one of the most enriching activities we can do. Whether we travel for work, pleasure or relaxation, there will always be something to discover or learn: new landscapes, new cultures, new people. It can be said that travel is historically constitutive of the human being, but this special way of traveling called *tourism* began in the 19th century and developed rapidly during the 20th century. At present, the UN has a specific organization for that activity: The World Tourism Organization (UNWTO), which defines tourism as all those activities of people traveling to and staying in places outside their usual environment for leisure, business or other purposes for not more than one consecutive year.

https://www.cubanos.guru/delfin-mujer-agua/

Tourism in contemporary society has become an enormous source of economic resources and jobs, but also of environmental problems. Fortunately, the impact of tourism is now evaluated beyond its socioeconomic repercussions and includes the environmental aspect. The concept of ecological footprint has been defined for the tourism industry (among other industrial fields) as the traces of pollution and other environmental effects produced by our trips. Becoming environmentally conscious necessarily implies recognizing our impact on the ecological footprint and doing everything possible to reduce it.

When we travel, and we divers travel a lot, our awareness and thus our attitude towards our surroundings can make all the difference. Not only in practice, but also in the promotion of responsible tourism.

Tourism and fauna

In recent times, consideration for the rights of wild and domestic animals has been growing. Many historically normalized activities have been questioned and reformulated. Tourism is also being reconsidered around the world, taking into consideration animal welfare.

Nowadays, it is common sense to reject animal abuse, but unfortunately, many times in our trips we unknowingly participate in activities that mistreat and damage species and their environments. Identifying these activities and the harm they cause is part of the development of our environmental consciousness.

In the particular case of marine fauna, there are orcas, dolphins, sea lions and seals held captive in supposed sanctuaries, which are exhibited as the protagonists of shows sold as being educational or ecological but that in fact endanger the integrity of the individual animal, its species and its habitat. The same happens if due precautions are not taken while watching those animals in their natural habitat.

7

Foca jugando - YouTube

Tourism and fauna protection

Below are some simple recommendations to keep in mind during our trips in order to actively contribute to the protection of local wildlife and animals in general, as well as to effectively reduce our ecological footprint:

- *We must not touch or alter in any way the natural behavior of underwater organisms.*
- *We must not feed wild animals, neither in their natural habitat nor in captivity, because the food we offer them can seriously harm their health or behavior, and even put the safety of the specimens and the people who feed them at risk.*
- *If the animal is captive and feeding it is a tourist attraction or part of a performance, we must refuse to participate in it.*
- *When looking for accommodation or gastronomic places, it is advisable to choose the ones that respect the environment and to avoid places that have captive wild animals as attraction or decoration.*
- *We need to pay close attention to places that are advertised as sanctuaries or conservation centers, because not all of them are. We should first learn about the actual animal welfare conditions in that place and whether they are, in fact, a priority. In this sense, swimming with dolphins or other marine animals in captivity and shows where specimens perform unnatural actions or postures are sure indicators of abuse.*
- *We should not accept being taken photos with animals prepared for that purpose, which are offered as a souvenir.*
- *We must not leave waste from our activities in the environment and, as far as possible, collect all the garbage we find, especially plastics, to protect natural environments.*
- *Where legislation provides for this, we must warn the authorities about cases of animal abuse.*

https://pensarnacional.com.ar

A widespread activity is the sighting of animals in their natural habitat. Its advantages are undeniable: on the one hand, it encourages environmental consciousness because people are truly close to nature and, on the other, animals live in freedom and in their own environment. We must not forget that human intervention always generates impact. With that in mind, the recommendations for tourists are:

- *Do not get too close to animals; this prevents us from interfering with their natural behavior or from making them frightened of our presence. Keep in mind that while certain frightened animals run away, others attack.*
- *Let animals approach us, only when they wish to and if they want to.*
- *When we are near an animal, do not make sudden movements and try to speak quietly or, better yet, be silent.*
- *Do not approach breeding areas, as we can be attacked by the animal that defends its offspring or we can endanger their development.*
- *Avoid using the camera flash, since it can harm or scare animals. Depending on their species, animals could respond to this stimulus either escaping or attacking us.*

7

The problem of souvenirs

Ralph Schill

We have completely normalized the fact that we can buy all kinds of handicrafts or *souvenirs* made with animal parts in tourist places. We think this custom is a harmless and even friendly activity, but the truth is that many times this item that we bring back as a souvenir from our vacations is the final link in a chain of illegal trafficking of wild animals.

Illegal animal trafficking networks make as much money as arms or drugs ones and have a devastating effect on the survival of organisms such as sharks, elephants, sea turtles, rhinoceros, toucans, small apes and many others.

This type of trafficking benefits from the ignorance of consumers (i.e., tourists) about the origin and the consequences of this trade. Once again, environmental consciousness becomes fundamental and its field expands. Even on vacation, our attitude can be the key to the survival of many species.

The general slogan is:

Not to buy *souvenirs* made with animal parts or take animals as souvenirs.

7

On many occasions, the lack of knowledge of the language or customs of the place make us hesitate when we are offered regional products. In those cases, the following must be taken into account:

Ralph Schill

- *If we are not sure of the origin of a certain object, we must always avoid buying them.*
- *We should be suspicious of those articles made with bones, skins, feathers or something similar.*
- *If the product offered contains parts or components derived from endangered species, we must outrightly refuse to purchase it. This attitude is key.*

The problem is more complex than it seems, because, in addition to the environmental issue, it comes into play an action that can be criminal. Although laws vary from country to country, it is important to note that for most countries it is illegal to sell the following materials of animal origin (or products derived from them): ivory, turtle shells of any species (terrestrial or aquatic), corals, feline or reptile skin. It is essential to pay close attention to the manufacture of objects such as jewelry, mirrors, combs, coats, hats and ornaments in general, because they may contain illegal components that might go unnoticed at first sight.

The marketing of live wild animals is also prohibited in several countries. The rare animals offered in markets or pet shops usually come from traffickers who capture them in the wild and cause serious ecological damage. When they come from breeding grounds, it is common that they do not receive the costly specific care required by each particular species, not to mention that it is difficult for a wild animal to reproduce in captivity, which leads to new captures to sustain the business growth.

As far as wildlife protection is concerned, a responsible tourist should:

- *Inform the tour operator, the hotel manager or the local authority if they are suspicious about the legality of a product.*
- *Kindly explain to the seller that you do not want to buy products containing animal parts. We should keep in mind that, in many cases, the seller is the most vulnerable link in the chain.*
- *Share our knowledge and warn other people traveling with us about this problem.*
- *Do some research when looking for a souvenir so as to choose environmentally friendly alternatives, such as wooden objects, handicrafts made of fabric, paper or vegetable fibers and even things typical of the cultures we visit, such as music or gastronomy (provided that these do not include endangered species).*

7

Ralph Schill

Tourism and responsible scuba-diving

7

Thanks to an huge number of technical resources, divers have the joy and privilege of being able to travel underwater environments, but we also have the obligation to protect them.

All marine, lake and river aquatic ecosystems are extremely fragile. What at first glance may look like a rock or a plant is usually a delicate creature that can die from any small change in the environment. For example, the simple breaking of a piece of coral, which takes decades to grow, can be fatal. This implies a great responsibility on our part during the dives.

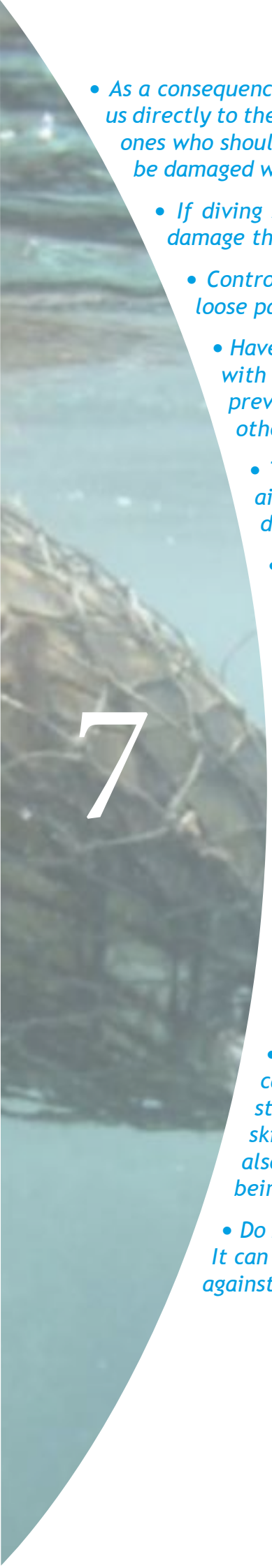
https://www.lavanguardia.com/natural/20180424/442911673052/coral-garabou.html

Scuba-diving, taking care of the environment

Apart from respecting all the safety regulations essential for the activity, responsible diving must include a series of practices necessary to protect the environment and reduce its ecological footprint. Some of them are:

- *Hire responsible operators that comply with strict conservation and environmental protection standards. If these rules are not complied with, inform the appropriate person.*

- *Keep in mind that the first dives must always be done in pools or in beach areas with sandy bottoms so that, when learning to move delicately in the water, there is no possibility of damaging the flora and fauna of the place.*



7

- *As a consequence of the previous point, we should be careful if the operator takes us directly to the dive point without previous preparation, because they are the first ones who should contemplate that the ecosystems are extremely delicate and can be damaged with a minimum contact of divers who do not control their buoyancy.*
- *If diving starts from the coast, respect the established paths so as not to damage the vegetation or habitats of seabirds and small coastal organisms.*
- *Control the equipment before diving to avoid possible damage caused by loose parts that could be dragged along the bottom.*
- *Have a good control of the buoyancy. Proper ballast calculation together with a good control of the BCD, which facilitates neutral buoyancy, will prevent us from damaging plants, corals and small habitats with fins or other parts of the equipment.*
- *Try to move as gently as possible. In addition to comfort and lower air consumption, this helps animals to be less frightened and minimize damage to the beds of the sea and other water bodies.*
- *Keep a safe distance from plants and animals. We must enjoy the environment by being mere observers. Seeing and never touching is the motto of every responsible diver.*
- *Practice all the techniques that allow us to dive through the bottom without lifting sediment with our fins. Swimming with frog kicks, controlling buoyancy with our breath or rising with the tips of our fingers, allow us to move smoothly and avoid touching anything other than rock or sand.*
- *If we are diving with current, we must try not to grab the corals or other specimens, and be careful not to harm the organisms of the bottom or even ourselves (keep in mind that, in the bottom, we can find stone fish, scorpions, fire corals or other species that cause serious skin injuries).*
- *Avoid taking souvenirs or capturing a living being from the seabed. The best option to keep the memories of our trip, without endangering the ecosystem, is photography.*
- *Do not touch, ride, chase or harass animals. The damages we can cause to them are innumerable and range from a high degree of stress, which can even kill them, to the loss of protective layers of skin that defend them from parasites and other organisms. There are also many dangers for the diver, from finding poisonous species to being attacked by an animal defending its lair.*
- *Do not point at animals directly with our flashlights during night dives. It can harm, disturb and/or alter their natural mechanisms of protection against predators.*

- *Do not feed animals. In addition to the risk of poisoning them by altering their diet, we can cause a dependence on humans that will modify their behavior and interactions between them and with the ecosystem where they live. In some cases, aggressive behavior is generated against other species or even humans.*
- *Collect all our waste and whatever we could find. It is of the utmost importance to make this personal contribution.*
- *Promote the above recommendations, in addition to complying with and demanding compliance with them. We can all be educators: do not hesitate to point out to other divers, whether novice or experienced, the harm they can cause if they touch or disturb animals.*
- *Participate in the activities proposed in dive sites to reduce the impact of our ecological footprint on marine ecosystems. For example, there are organized beach and seabed cleaning days, which usually invite divers to collect debris from the bottom of the coastal area.*

Remember that we are only guest observers in this underwater world!

7

Shipwrecks and other artificial reefs

Artificial reefs appear when the remains of large structures manufactured by humans, such as ships, planes or vehicles which have sunk accidentally or intentionally, are transformed into a new habitat for a large number of underwater species that colonize them. Shipwrecks in general, and artificial reefs in particular, become points of interest for diving but also place responsibility on divers, since many times they force us to consider environmental as well as historical and archaeological issues.

https://pixy.org

Each country regulates the activities that can be carried out on shipwrecks in its seas, rivers or lakes. There are lists of shipwrecks in national and international waters considered sites of historical value, archaeological interest and/or underwater species reserves. In Argentina, any wreck site older than 100 years is protected by the National Law 25.743 for the Protection of Archaeological and Paleontological Heritage and the UNESCO Convention for the Protection of Submerged Cultural Heritage, 2001 (ratified by Argentina in 2010).

When diving near a wreck site it must be taken into account that, apart from all the recommendations for the care of the flora and fauna that were already mentioned, the context must not be altered by any means, and no remain should be removed or extracted. The collection of historical and archaeological artefacts is generally strictly controlled or prohibited by the laws of each country, in order to protect their cultural, archaeological and historical heritage. Let us not lose sight of the fact that these laws, like conservation laws, are enforced by national and international courts, with the sole purpose of protecting the resources that belong to the public heritage of each country.

Before organizing a dive in a wreck site, responsible divers must always find out if the excursion requires any specific permit, if it is restricted to scientific research, or if it is forbidden.

7

Questionnaire

38. Nowadays there are shows with marine fauna (seals, orcas, dolphins) that are sold as educational or ecological acts, which can endanger the integrity of the animals.

A- True

B- False

39. What are the basic recommendations to keep in mind during our trips?

A- Be correctly informed on the type of food we should take to feed wild animals

B- Book in advance a place events with captive animals to capture the best photos

C- A and B are correct

D- None of the above

40. Illegal animal trafficking networks make as much money as weapons or drugs trafficking networks.

A- True

B- False

41. When exotic or endangered animals are offered for sale, we should:

A- Contact the airline in advance to arrange an adequate space for their transportation

B- Categorically reject the purchase and make the corresponding complaint

42. Apart from respecting all the safety regulations required to do the activity, responsible diving must include a series of practices necessary to protect the environment and reduce its ecological footprint:

A- Hire responsible operators

B- Properly control our buoyancy

C- Keep at a close distance from animals

C- A and B are correct

E- All the above

F- None of the above

43. Artificial reefs are large structures produced by humans.

A- True

B- False

44. In Argentina, how old should shipwrecks be to be considered under the National Law 25,743 on the protection of Archaeological and Paleontological Heritage?

A- 50 years old

B- 200 years old

C- 100 years old

D- All of the above

45. When diving near a shipwreck, or if we happen to find evidence of a wreck site, under no circumstances should we collect, extract or alter its remains.

A- True

B- False

See answers on page 85

8 Some conclusions

"Nature never says one thing
and wisdom another"
Juvenal

We have provided a brief overview of the core issues concerning the care and protection of the environment, both in terms of the problems we face today and the possible solutions.

In short, we realized that our perspective changes when we acquire a clear environmental consciousness. And that knowledge helps us understand how to use resources responsibly and to what extent human activities alter ecosystems. We have also learned that, if we are environmentally conscious, we will take a deeper and more critical look at the generation and disposal of waste and do everything necessary to prevent water pollution. We are confident that this awareness will have positive consequences on all our actions as tourists, in general, and as responsible divers, in particular.

However, it will be in vain to learn all this just as academic knowledge and to limit our good deeds to the moment we travel. Environmental consciousness should encourage us to make active contributions and to go through a continuous process of personal and community change, promotion, education and participation.

8

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At a personal level

Although sometimes it may not seem obvious, our individual behaviors are extremely important. We have noticed that our daily actions and our personal attitudes have a great environmental and social impact in the short, medium and long term.

A summary of the actions and attitudes to be taken as citizens and travelers may be the following:

8

- *Reduce the use of disposable containers, and choose glass or metal ones whenever possible.*
- *Avoid using all types of plastic utensils (bags, cups, straws, cutlery, plates, etc.).*
- *Buy cleaning and personal care products that are certified to be environmentally friendly (biodegradable).*
- *Do not throw garbage on public roads and in any natural environment (forests, hills, fields, seas, rivers or lagoons).*
- *When choosing products, pay attention to the amount of wrapping material they are delivered with, and request the seller to use as little packaging as possible.*
- *Classify, reduce, reuse and recycle waste.*
- *Make responsible use of drinking water. Use the minimum necessary.*
- *Do not introduce foreign exotic species into natural habitats.*

pixy.org

- *Do not move wildlife into urban areas.*
- *When travelling, use environmentally friendly sunscreens.*
- *Carry a bag to collect waste that we may find during our excursions.*
- *Participate in cleaning days of beaches, rivers, forests, trails, etc.*
- *During an excursion in a natural environment, whether aquatic and terrestrial, keep in mind that even a cigarette butt, thrown carelessly away, can take up to ten years to degrade and has a great polluting capacity.*
- *Do not take souvenirs of our trips that include animal parts or snail shells.*
- *Avoid eating traditional food that contains endangered species.*
- *Do not buy wild species to have as pets (turtles, parrots, reptiles, etc.).*

This short list is just a start. It will be extended throughout time and with commitment.

At a community level

Individual environmental consciousness will always be necessary, but never enough. It must be slowly spread among the community. It is important to bear in mind that each of our small personal actions can cause a domino effect, for better or for worse. Then, our goal should be to promote environmental consciousness and its benefits.

We can encourage our neighbors, friends, family or acquaintances to take care of the environment and help them realize the problems we have but, more importantly, the changes we can make in our daily practices. For example, we can talk to them about how valuable it is to separate, reuse, recycle and reduce the use of disposable packaging. Bear in mind that all human communities are in themselves educational institutions; the idea is also to provide education on sustainable living for the future generations.

8

There are many actions and campaigns organized by municipal or local governments to address environmental problems in the community; we should take advantage of opportunity to participate in them and to encourage others to do it too. Social media outreach is also a powerful tool for raising awareness.

https://pxhere.com

We can make a difference by providing people around us with guides containing the necessary information for them to participate in current debates about our environmental problems. An informed and conscious citizen will be able to do their bit to:

- *Identify the problem.*
- *Find the best way to solve it.*
- *Recognize the benefits of a strategy to take care and make sustainable use of the environment.*

There will even be those who are interested in putting these challenges on the political agenda. Ultimately, a conscious, active and educating community can make a big difference.

pixabay.com

Training centers

Diver training centers are ideal places to promote environmental consciousness. They can directly inform students about all the ecological consequences of our activity and, especially, train them on how to prevent them. A training center of excellence will not only provide technical and safety skills, but also train environmentally responsible divers, focusing primarily on with three key points:

- *Do not remove any living or inert being from the environment. On the contrary, collect any waste we can find.*
- *Control our buoyancy so as not to cause damage to underwater beds.*
- *Use a specific container for cleaning and maintaining the diving equipment, only with environmentally friendly products, and keep it separate from natural waters.*

A training center can (and should) also participate in, and even organize, community outreach and awareness campaigns such as beach and seabed cleanups.

In other words, there is a lot to do and not much time left to protect our planet. If every person, every group and every community make its contribution, we will still be able to live in a sustainable world for all.

8

https://www.subaquaticamagazine.es/buzos-de-diferentes-paises-senalan-que-las-jornadas-de-limpieza-de-fondos-con-voluntarios-son-casos-de-intrusismo-profesional/limpieza-fondos/

Questionnaire

46. The following personal actions have a great environmental and social impact:

Avoid using all types of plastic utensils (bags, cups, straws, cutlery, plates, etc.)

Classify, reduce, reuse and recycle waste.

Make responsible use of drinking water. Use the minimum necessary.

Do not introduce foreign species into natural habitats.

Carry a bag to collect waste that we may find during our excursions.

Participate in cleaning days of beaches, rivers, forests, trails, etc.

Do not take souvenirs of our trips that include animal parts or snail shells.

Do not buy wild species to have as pets (turtles, parrots, reptiles, etc.).

A- True

B- False

47. An informed and conscious citizen will be able to do their bit to:

Identify the problem.

Find the best way to solve it.

Recognize the benefits of a strategy to take care and make sustainable use of the environment.

A- True

B- False

48. A training center of excellence will not only provide technical and safety skills, but also train environmentally responsible divers, focusing primarily on with three key points:

Control our buoyancy so as not to cause damage to underwater beds.

Use a specific container for cleaning and maintaining the diving equipment, only with environmentally friendly products, and keep it separate from natural waters.

Do not remove any living or inert being from the environment. On the contrary, collect any waste we can find.

A- True

B- False

See answers on page 85

Image Zone

9 Appendix

Closing our eyes to nature only
makes us blind in a fool's paradise.
Jacques Cousteau

Protected marine areas in Argentina

9

The Argentine Republic is among the countries with the largest number of ecologically diverse regions on the planet. In order to preserve and protect this priceless wealth, the National State of our country has created a National System of Protected Areas (SNAP, in its Spanish acronym) which includes natural reserves and parks. Within this group, protected maritime areas cover approximately 4.9% of the national territory. The following information on these protected aquatic ecosystems can be found on the website of the Ministry of Environment and Sustainable Development:

- *Argentina has 61 coastal and marine protected areas (MPAs), including national parks, provincial and municipal reserves, biosphere reserves (MaB) and Ramsar sites. The legal instruments for the creation of these areas are also diverse: municipal ordinances, provincial provisions, resolutions, decrees and laws, national laws and, in the case of Tierra del Fuego, a provincial Constitution.*
- *The MPAs are registered in the Federal System of Protected Areas (SiFAP, in its Spanish acronym).*

Actions

- *In August 2013, by means of Law 26875, the Namuncurá - Burdwood Bank Marine Protected Area (AMPNBB, in its Spanish acronym) was created. It is the first marine area outside the provincial jurisdiction. The AMPNBB encompasses the water column and benthic areas of the submarine plateau known as Burdwood Bank, which comprises nearly 28,000 km^2 circumscribed by the 200 m isobath. It is characterized by having endemic benthic species (especially deep-water corals), a high concentration of nutrients and oxygen saturation, which allows it to host a greater biodiversity than the surrounding waters. The enforcement authority is the Office of the Chief of Cabinet of Ministers, and the Secretariat of Environment and Sustainable Development of the Nation (SAyDS, in its Spanish acronym) has been designated as technical secretariat. The AMPNBB has a management plan, approved in December 2016.*
- *In November 2014, Argentina enacted Law 27037 which establishes the National System of Marine Protected Areas (SNAMP, in its Spanish acronym). The regulation provides the legal framework for the creation of marine protected areas outside the provincial jurisdiction.*

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- *In that context, in addition to the project GCP/ARG/025/GFF Strengthening for the Management and Protection of Coastal- Marine Biodiversity in Key Ecological Areas and the Implementation of the Ecosystem Approach to Fisheries (EAF), Frente Valdés was recognized as an area of biological and ecological importance in accordance with the criteria of the Convention on Biological Diversity (CBD), which was expressed in the document 'Identifying areas of high conservation value as potential marine protected areas'. Work is currently being done on the characterization of the environment, with the idea of reaching a consensus of the contributions and opinions among the different sectors in order to include the Frente Valdés protected area.*

- *This material served as the basis for the preparation of the document National System of Marine Protected Areas: foundations for its implementation (SNAMP - 2016), carried out jointly with civil society organizations, technical staff of the Ministry of Environment and Sustainable Development of the Nation and the Administration of National Parks, which describes the guidelines for a national policy on marine protected areas and presents sites relevant to the biodiversity of the Argentine Sea.*

- *The creation of the Namuncurá - Burdwood Bank Marine Protected Area significantly increased knowledge of this strategic marine space. Sixteen national research campaigns were carried out using different platforms. In order to systematize the information, both from recent and historical campaigns, a geoportal was created within the framework of the project GCP/ARG/ 025/GFF Strengthening for the Management and Protection of Coastal-Marine Biodiversity in Key Ecological Areas and the Implementation of the Ecosystem Approach to Fisheries. This project is integrated into the Naval Hydrography Service portal and it allows viewing of sampling stations, campaign reports and sampling gear, among others. ("Marine Protected Areas", 2020)*

One of the most beautiful and important Marine Protected Areas is undoubtedly the Y*aganes National Marine Reserve, National Marine Park and Strict National Marine Reserve.* The following is the information provided by the National Parks Administration on this reserve on its website:

- *The Yaganes Marine Protected Area is located south of the island of Tierra del Fuego and borders on the Republic of Chile, in the geographical area of the Drake Passage at the southern end of the Argentine Exclusive Economic Zone.*

9

- *The seabeds of the entire marine protected area is under the category of Strict National Marine Reserve, which guarantees the highest degree of protection possible under the terms of Law No. 27037. In zones 1 and 2, the water column has been categorized as National Marine Reserve, which enables the sustainable use of the resources while respecting the specific conservation objectives of the area, within the framework of a management plan. In addition, the marine protected area has a zone over the water column which is regarded as National Marine Park in order to guarantee controlled scientific, educational and recreational uses, admitting tourism as the only economic activity under the parameters established in its respective management plan.*

- *From an oceanographic point of view, the area comprises important zones of two productive fronts of high biodiversity, corresponding to the Subantarctic and the Cold Estuarial Front (Beagle Channel). It also includes a portion of the slope, as well as canyons and seamounts that contain high biodiversity and are extremely vulnerable.*

- *Furthermore, it should be stressed that it is the area of physical and biological connection between the Pacific and Atlantic Oceans. It is influenced by the Antarctic Circumpolar Current and it constitutes a representative sample of the Southern Slope region and the Drake Passage.*

- *Regarding benthic zones, Yaganes is distinguished by the involvement of marine environments of the continental slope and deep ocean basins (more than 4,000 m) where the presence of canyons and seamounts associated with high marine diversity stands out. Among the area's outstanding conservation values are the cold water corals grouped in coral gardens which are considered ecosystem engineers, since they generate structures that increase the diversity of the communities over time, with a great variety of associated fauna, such as sponges, anemones, cephalopods, echinoderms and fish, among others.*

- *The area also includes spawning and breeding areas for species of commercial interest such as the Southern hake, the Hoki and the Patagonian toothfish.*

- *Finally, in terms of pelagic species, Yaganes is considered an Important Bird Conservation Areas (AICA, in its Spanish acronym) because of its intense use as feeding areas by gray-headed albatrosses, wandering albatrosses, white-chinned petrels and snares penguins, among other seabirds.*

- *In addition, the area is used for feeding by juvenile elephant seals that breed in Península Valdés and there are records of the presence of many species of marine mammals such as Hourglass dolphins, orcas, sperm whales, Sei and Fin Whales, among other species. (Yaganes National Marine Reserve, National Marine Park and Strict National Marine Reserve, 2020).*

Finally, we cannot fail to mention two other parks located on the Atlantic coast which are also very important in terms of marine ecosystems. These are:

- *Monte León National Park. Located in the province of Santa Cruz (35 km south of the city Comandante Luis Piedrabuena and 210 km north of Río Gallegos), on the coast of the Argentinean Sea. It belongs to the Patagonian steppe ecoregion and it has an area of 620 km². In 1997, the National Parks Administration decided to incorporate it, within the coastline of Santa Cruz, into the protected areas, due to it high biodiversity.*

- *The Southern Patagonia Coastal Marine Interjurisdictional Park. Located in the province of Chubut, it belongs to the ecoregions of the Patagonian Steppe and the Argentine Sea. It has an area of 1,050 km². It was created by a treaty signed on August 8, 2007 by the National Government and the Province of Chubut. On January 5, 2009, by Law 26,446, the National Congress enacted the treaty for the creation of the park.*

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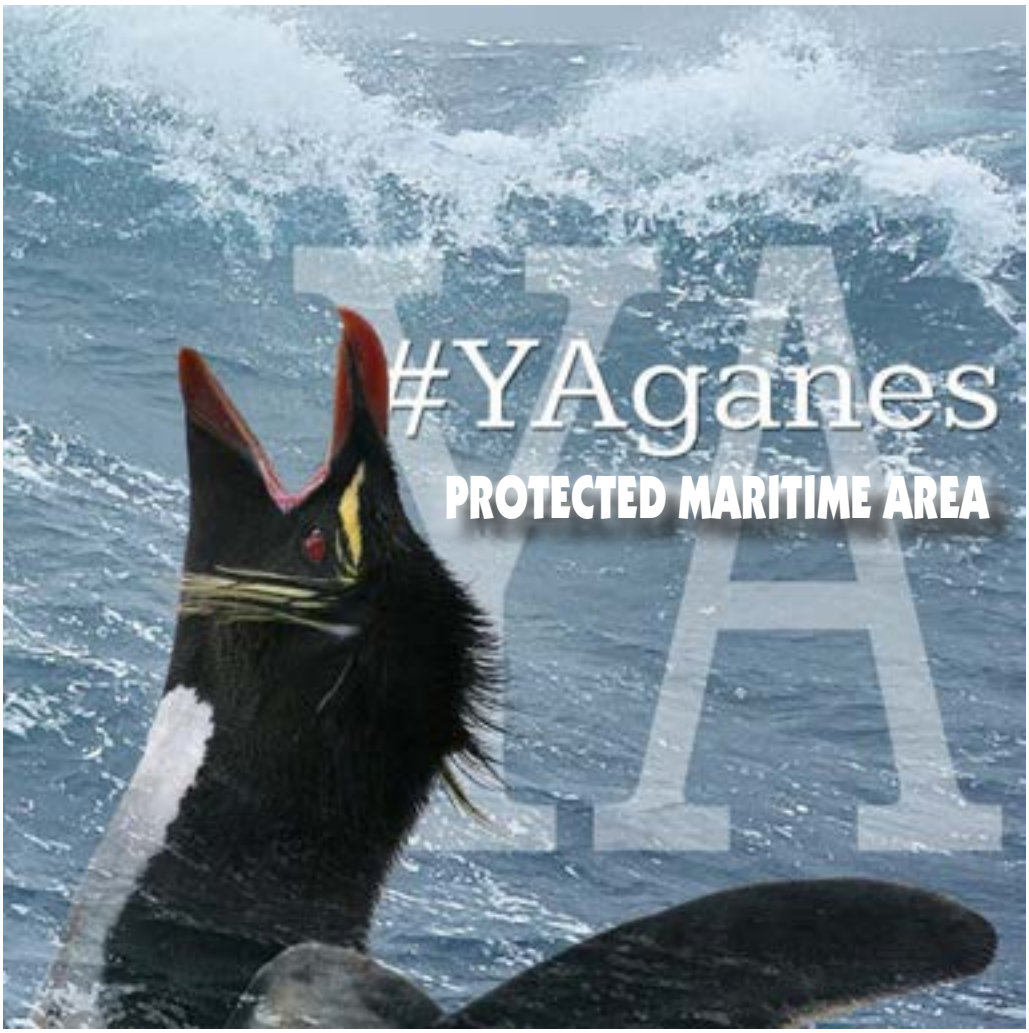


https://marpatagonico.org/en/author/prensa-mar-patagonico/page/4/

Questionnaire

49. How many coastal-maritime protected areas does Argentina have?

A- 61

B- 87

C- 145

50. What area of the country do coastal-maritime protected areas cover?

A- 4.9%

B- 7.2%

C- 13.5%

51. Which coastal-maritime park is an area used for their feeding by right whales, orcas and sperm whales?

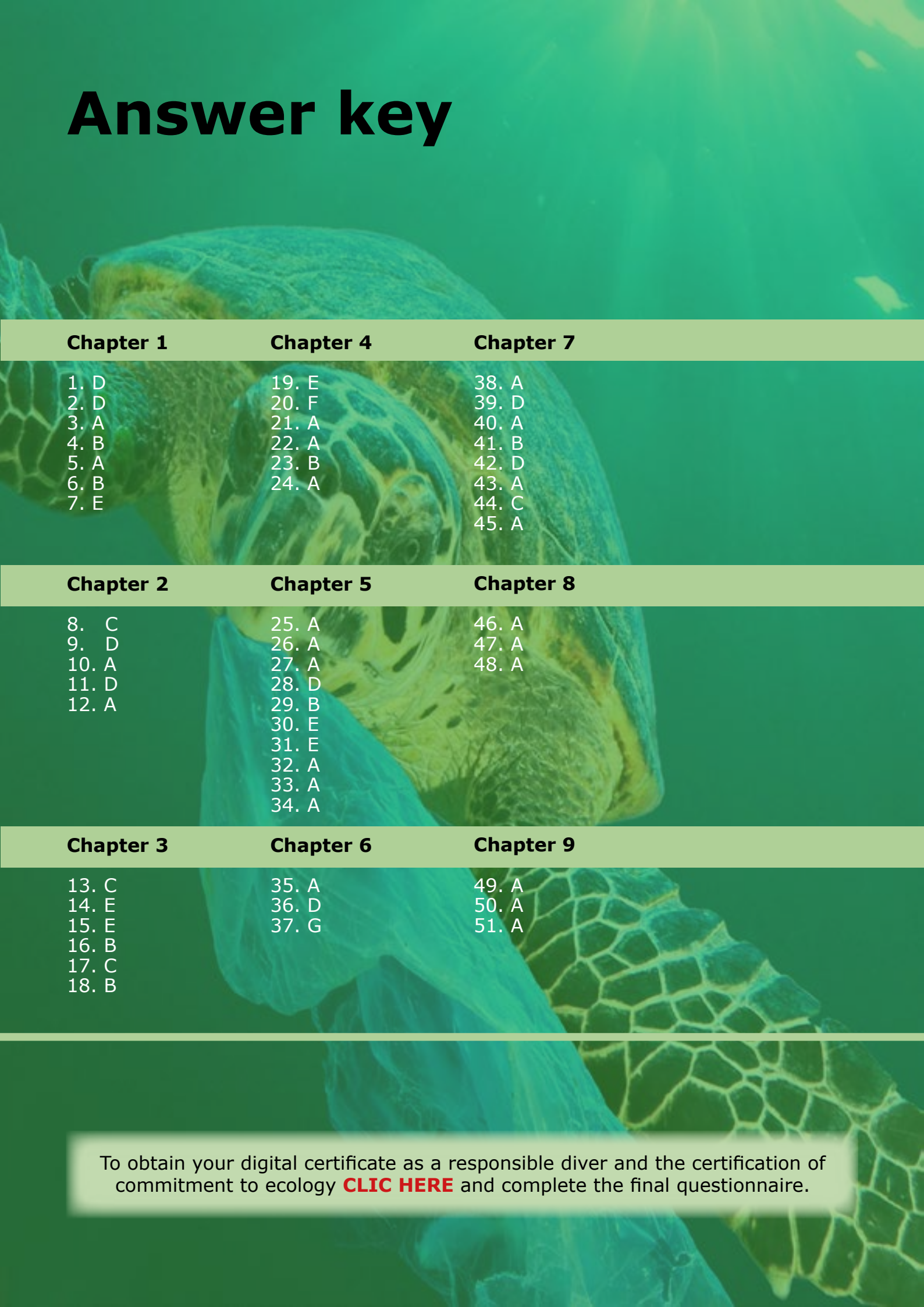
A- Yaganes Marine Protected Area

B- Monte León National Park

C- None of the above

See answers on page 85

Answer key



Chapter 1

1. D
2. D
3. A
4. B
5. A
6. B
7. E

Chapter 2

8. C
9. D
10. A
11. D
12. A

Chapter 3

13. C
14. E
15. E
16. B
17. C
18. B

Chapter 4

19. E
20. F
21. A
22. A
23. B
24. A

Chapter 5

25. A
26. A
27. A
28. D
29. B
30. E
31. E
32. A
33. A
34. A

Chapter 6

35. A
36. D
37. G

Chapter 7

38. A
39. D
40. A
41. B
42. D
43. A
44. C
45. A

Chapter 8

46. A
47. A
48. A

Chapter 9

49. A
50. A
51. A

To obtain your digital certificate as a responsible diver and the certification of commitment to ecology **CLIC HERE** and complete the final questionnaire.

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