Biodiversity

The erosion of biodiversity and natural richness has become an issue of global concern. As a producer of energy from natural resources, Total learned environmental stewardship very early. Biodiversity in sensitive areas is given special attention in the Group's operations and through the Total Corporate Foundation for Biodiversity and the Sea, established in 1992. This overview of Total's biodiversity policy highlights fundamental considerations that have shaped our policy, the commitments that we have undertaken, and the measures that we implement in all our activities worldwide to fulfill these commitments. The measures described here exclusively concern our specific action for biodiversity in the context of our local operations, without addressing global climate change.

What is biodiversity?

"Biological diversity means the variability among living organisms from all sources, […] this includes diversity within species, between species and ecosystems". *Convention on Biological Diversity, Article 2.*

Biodiversity refers to all forms of life on our planet and involves three different but interdependent levels:

- **Genes.** Genetic variation among members of the same species (intra-species variation) makes every living being unique.
- **Species.** All the different animal and plant species including fungi and micro-organisms (algae, bacteria, etc.).
- **Ecosystems.** Dynamic complexes formed by a non-living environment (the biotope) and the organisms living within (the biocenosis), with interaction between the two.

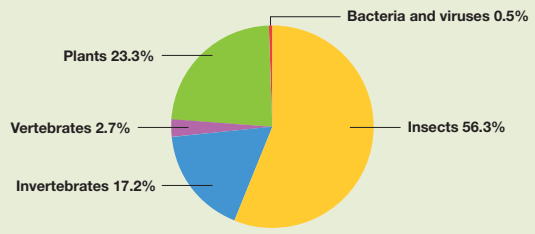
Little-known living species

At present, only 1.75 million of the estimated 14 million species on earth have been classified by taxonomists (scientists specialized in classifying living beings).

75% of the species described belong to the animal kingdom: insects alone make up 50%. Higher plants and mammals have been studied relatively extensively, but scientific knowledge of insects and fungi is still far from complete. Thousands of plants and animals vanish before they can be identified and will never be known.

About 10,000 new species are described each year.

Main groups of species described



Respect for the unknown and its extensive potential

Adaptability: For the majority of living species on earth, our lack of knowledge makes it difficult to evaluate their impact and actual role in the global environment. However, it is clear that high genetic diversity can only improve the adaptability of living species to climatic, ecological and other changes in their environment.

Food and Health: Intra-species diversity fosters new varieties of plants, which may appear spontaneously or through a controlled process of selection. New varieties can have useful properties as crops.

Biodiversity also contributes to our health: more than half of all pharmaceutical molecules are derived from plants and animals. Major medical research programs are under way, particularly to test mushrooms for bio-active compounds that may be effective to treat various types of diseases, notably cancer and diabetes.

Learning: The study of biological phenomena contributes to scientific and technological innovation, in particular through the branch of science known as bionics, which applies this knowledge for the development and improvement of our technological environment.

Enrichment: Biodiversity enriches and beautifies our landscapes, enhancing our quality of life. It is essential to protect all species, as each one offers a specific genetic heritage. It is also vital to preserve ecosystems, which secure both intra-species and inter-species diversity. Tropical rain forests, for example, are home to more than 50% of all the living species inventoried so far. Coral reefs host about 25% of the earth's marine species. And in extreme environments such as deserts, the deep ocean and mangrove forests, with typically less favorable abiotic factors (temperature, water, light, soil and wind), one finds endemic species that exist nowhere else on earth.

TOTAL

The **issue**

At global level

In the past, because of natural factors such as climate change and ice ages or major events such as collisions with meteorites, many species disappeared in waves of extinction within a time span of several million years.
However, since the beginning of life on earth, the number of species has increased: in other words, species have appeared faster than they have disappeared.

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The speed of species extinction

The natural average life-span of a species is about 1 million years, but experts assert that the current rate of species extinction is 1,000 to 10,000 faster than the natural rate.

It is estimated that one plant or animal species disappears from our planet every 15 minutes, and that an area of primary forest equivalent to a football field is cut down every second. In the last few dozen years, “dead zones”, i.e. lacking oxygen, have been increasing in size in all parts of the world (Gulf of Mexico, Baltic Sea, Black Sea, northern Adriatic, etc.).

Human causes of species extinction

Population growth, certain farming practices, intensive fishing, increasing exploitation of other resources, tourism, deforestation, the sharp increase in polluting emissions and modern consumption habits all exert pressure on the environment and deplete biodiversity.

At oil industry level

Due to the nature of the oil and gas industry and because operations are often sited in environmentally sensitive areas, oil companies can generate two kinds of impact on biodiversity:

• direct impact related to the actual industrial operations, e.g. from the footprint of the facilities, emissions, or accidental release of pollutants,

• indirect impact resulting from population influx stimulated by the attraction of potential economic development, e.g. from uncontrolled felling or poaching.

While most direct negative impacts can be prevented or remedied by oil companies, indirect impacts remain more difficult to assess and control.

Indirect impacts can have various causes and involve a number of different players. In addition, these impacts may only become visible some time after actual oil operations have ceased.

Replanting mangroves in Indonesia
after the installation of a buried pipeline

© Laurent Zylberman / Total

International response

Regulatory and other measures have been established to conserve and preserve biodiversity. These measures are essential but insufficient. Full individual and collective awareness of the effects of our acts and our consumer habits on biodiversity is imperative.

Conservation measures

While working towards the same objective, the measures taken over the years to protect biodiversity have focused on two different levels:

- the conservation of species
- the preservation of ecosystems.

Conservation programs are carried out *ex situ* or "off site", e.g. in zoos, arboretums and seed repositories, and *in situ* or "on site", in the natural habitat itself.

Several decades ago, the Antarctic Treaty, the global Ramsar Convention and the Europe-wide Bern Convention already provided for the creation of protected areas, regulated and managed to achieve specific conservation objectives.

In June 1992, the Convention on Biological Diversity was signed by 188 countries at the Earth Summit in Rio de Janeiro. This global framework convention commits the signatories to conserve biological diversity, to use it in a sustainable manner and to share the benefits derived from it.

Various endangered species are protected by laws prohibiting their hunting and trading, and the creation of protected areas contributes to the preservation of ecosystems.

Port-Cros National Park

© Philippe Robert / Port-Cros National Park

Response from the oil industry

IPIECA, the International Petroleum Industry Environmental Conservation Association, has focused on biodiversity issues since 1992. In 2002, IPIECA set up a Biodiversity Working Group (BWG) in partnership with the Association of Oil and Gas Producers (OGP).

The action taken is designed to foster the sharing of best practices and to deepen understanding of the areas where biodiversity and oil industry operations come together. Other key aspects are the promotion of networking and partnerships with bodies such as IUCN - The World Conservation Union and the United Nations Environment Program (UNEP), and communication with stakeholders.

Some lists of protected areas:

• **World Heritage List, UNESCO.** In June 2006, the list included 830 sites: 644 cultural, 162 natural, and 24 mixed sites.

• **List of Biosphere Reserves, UNESCO.** In 2006, UNESCO's Man and the Biosphere (MAB) Program covered 486 sites in 102 countries.

• **United Nations List of Protected Areas (2003).** This list includes more than 102,000 terrestrial and marine sites totalling 18.8 million square kilometers (11.5% of the world's land surface, 1% of the coastal surface and 0.5% of the world's oceans), including some 68,000 protected areas classified by the IUCN.

IUCN Protected Area Management Categories:

I.a. Strict Nature Reserve: Protected areas managed mainly for science.

I.b. Wilderness Area: Protected areas managed mainly for wilderness protection.

II. National Park: Protected areas managed mainly for ecosystem protection and recreation.

III. Natural Monument: Protected areas managed mainly for conservation of specific natural features.

IV. Habitat/Species Management Area: Protected areas (terrestrial or marine) managed mainly for conservation through management intervention.

V. Protected Landscape/Seascape: Protected areas managed mainly for landscape/seascape protection and recreation.

VI. Managed Resource Protected Area: Protected areas managed mainly for the sustainable use of the natural ecosystems.

• **RAMSAR List of Wetlands of International Importance.** The list published in August 2006 includes 1,610 sites totalling 1.45 million square kilometers.

• **Natura 2000.** This ecological network was established to contribute to the preservation of biological diversity within the European Union. It includes sites designated by each member state in application of the European Birds Directive of 1979 and Habitat Directive of 1992.

Total and **biodiversity**

Total made a very early commitment to protect biodiversity, with particular focus on sensitive environments. The St. Fergus Dunes Management Committee in Scotland was formed over 25 years ago, the Total Corporate Foundation for Biodiversity and the Sea was established in 1992, and an environmental management system was put in place more than ten years ago.

Total applies national and international conventions and regulations which are integrated into the Group's internal rules as well (Health, Safety Quality & Environment Charter, Code of Conduct…). For the preservation of biodiversity, Total has defined a specific policy.

Total's biodiversity policy

Preserving biodiversity is an integral part of Total's commitment to sustainable development.

The Group is conscious of the potential impact of its activities and of the products it manufactures on the environment in general and on biodiversity in particular, and is committed to taking all necessary measures to minimize that impact. These measures are based on the following principles:

1. Minimizing the impact of our activities on biodiversity is a specific objective throughout the life of our installations, from the construction phase through to site rehabilitation after the completion of activities, and throughout the lifecycle of our products.

2. The preservation of biodiversity is integrated into the Group's Environmental Management System (EMS) and treated in the Baseline Survey as well as the Environmental and Social Impact Assessment, both of which precede all new projects and major modifications to existing installations.

The approval procedure for projects ensures that the impact on biodiversity is taken into account at the outset, and that appropriate monitoring is carried out during operations.

3. Total considers that areas with particularly rich or fragile biological biodiversity require specific care and attention.

Such areas are typically:

- protected areas (as defined by IUCN, UNESCO or international conventions such as RAMSAR)

- ecosystems in the inter-tropical zone (forests, coral reefs, deltas)

- extreme environments (deserts, Arctic areas, mangroves, deep offshore zones).

For potential projects in areas where biodiversity involves key issues, Total examines each case separately, basing decisions on specific studies, seeking to take into account all the complex factors of sustainable development, and proceeding with a constructive attitude built on open dialogue with all stakeholders concerned.

4. Total strives to provide information and raise awareness among its employees, customers and the general public to enhance knowledge and understanding of ecosystems and the species that live in them.

To this end, Total is involved in a number of research projects, via its research centers, the Total Corporate Foundation for Biodiversity and the Sea, and various partnerships.

Conscious of being unable to address these issues alone, Total will continue to develop appropriate partnerships at all levels in order to obtain the desired performance in this field.

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Biodiversity in practice

The potential impact of our activities on biodiversity is systematically factored into our approach to environmental management and considered at every stage of operations.

1. During the preliminary phases
Protected areas or sensitive zones in or close to the planned site of operations are identified, notably to establish the environmental risks involved in the planned activity.

2. Before any industrial operations begin
The baseline study determines the critical aspects of biodiversity in the zone of operations, with particular emphasis on protected areas and sensitive zones.

The environmental impact assessment takes into account all potential impact on biodiversity and specifies the measures necessary to reduce and/or offset that impact.

3. During industrial operations
An Environmental Management System is implemented on site to keep controlling impact and ensure that the measures applied are effective.

4. At site closure
Site rehabilitation is carried out, taking into account the site's original state and possibilities for re-establishing ecosystems.

To support this approach, a new corporate guide for the preservation of biodiversity is currently being tested at three pilot sites within the Group.

Key questions to consider for every project:

1. What risks do our operations involve for biodiversity?
2. Are we working within or near a sensitive area?
3. How can we minimize the environmental footprint of our activities?
4. What measures can we take to offset possible damage to sensitive areas (e.g. reforestation, the creation of natural areas fostering the development of rare species, environmental awareness programs for local inhabitants, …)?
5. How can we avoid introducing non-native species?
6. Who among our local stakeholders and our partners can we actively involve in our efforts to protect biodiversity?
7. In what ways can we constructively foster or protect biodiversity in the area of our activities?
8. How can we best measure and monitor the impact of our activities on biodiversity?
9. What potential secondary impacts could our activities generate and what measures can we take to prevent or minimize these?
10. What measures should we take to facilitate site rehabilitation at the end of operations?

The Yariapo X1 drilling site in Bolivia during operations

© DR / Total

Yariapo X1 in the course of rehabilitation

© DR / Total

Research & Development

Total is engaged in a variety of biodiversity-related research programs. They are conducted with local or international partners and concern both terrestrial and marine ecosystems. In all cases, the results of these studies and R&D programs are intended to be shared and widely circulated. Reports are notably published in Total's international magazine *Energie* and in the scientific journals of our partners such as Ifremer *(Institut français de recherches pour l'exploitation de la mer)*, the French research institute for the sea. Three recent programs are described below.

• **The BioZaire Program:** Initiated in 1999 in partnership with Ifremer, this study and survey program covered a vast area offshore Gabon and Angola, along the subsea channel carved by the river Zaire, hence the name of the program. Its aim was to enhance knowledge and understanding of deepsea benthic ecosystems. "Deepsea" means water depths of 400 to 4,000 meters, and the deepsea environment is characterized by extreme physico-chemical conditions: low temperature, high pressure and the absence of light preventing photosynthesis. The first two oceanographic campaigns, BioZaire 1 and 2, provided a very satisfactory description of the benthic fauna and its physico-chemical environment. At the same time, Total and Ifremer designed a program to study the ability of the benthos[1] to regain balanced conditions after disturbances.

Victor, Ifremer's ROV, used in the BioZaire research campaign to study deepsea benthic biodiversity

© Ifremer

BioZaire 3 (end 2003-early 2004) supplemented the previous campaigns with an additional trawl-sampling program to study the megafauna[2] and studies of the spatial distribution of benthic organisms in relation to the trophic[3] input.

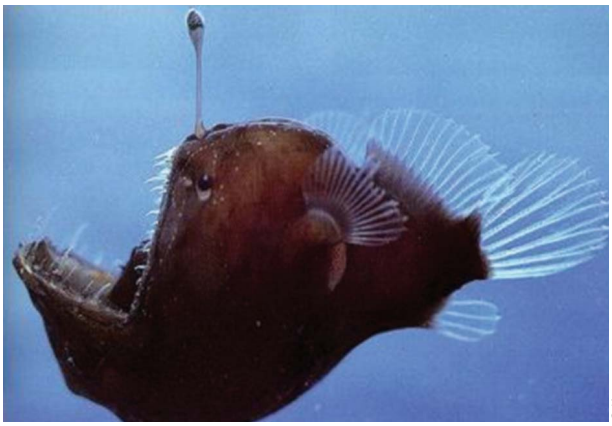
[1] Benthos: Collective term for organisms living in, on or near the bottom of bodies of water.

[2] Megafauna: Large-size species.

[3] Trophic: Pertaining to nutrition.

• **Recolonization of the seafloor:** At the N'Kossa site in Congo's offshore, in 180 meters of water, Total carried out a study to assess the impact of drilling activities on the marine environment and to monitor changes in this environment in terms of space and time. For the study, sampling was carried out in the vicinity of the site, which essentially involves two production platforms and one barge. The results recorded during the successive campaigns (in 1995, 2000, 2002 and 2003) revealed a significant reduction over time in the impact of production operations, with recolonisation by the species initially present.

Deepsea fish



© Ifremer

• **The Proteus project:** This initiative was officially launched in 2003 with the participation of UNEP (United Nations Environment Programme) and WCMC (World Conservation Monitoring Centre). The aim is to develop an electronic Biodiversity Information System (BIS) providing both operational personnel and decision-makers with reliable and relevant information. The recently updated plan for 2006-2008 includes the development of a mapping tool for areas particularly rich in biodiversity.

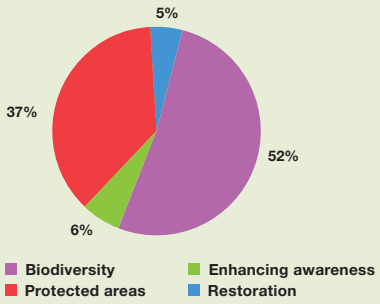
Bivalves and shrimps in water depths of 4,000 m

© Ifremer

The Total Corporate Foundation for Biodiversity and the Sea

In the wake of the Earth Summit in Rio and in response to the priority expressed by employees Group-wide for special engagement in environmental protection, the Total Corporate Foundation for Biodiversity and the Sea was established in 1992.

The Foundation's fields of action



As the Group's activities often involve the marine environment, the Foundation focuses on two main themes - biodiversity and the sea - with the following objectives:

- contribute to the protection of sensitive zones
- enhance knowledge and understanding of ecosystems
- participate in the rehabilitation of degraded zones
- sponsor and fund research programs
- provide information and raise public awareness of the importance of biodiversity
- strengthen the environmental culture within the Total Group.

The Foundation is organized around a Board of Directors made up of 12 members, including 7 from outside the Group, backed by a Project Evaluation Committee that meets 3 times a year.

The Foundation's budget for the period 2003-2007 amounts to €8 million. Funded by Total, this budget is devoted to projects managed directly by the Foundation as well as projects proposed by Total subsidiaries or individual Group employees. In all cases, projects are carried out in partnership with independent outside organizations that have recognized competence in the relevant field.

The Foundation works with numerous partners such as Port-Cros National Park, the French Coastal Protection Agency, the oceanographic institute Ifremer, the marine anti-pollution research centre Cedre, the French National Museum of Natural History, and IUCN- The World Conservation Union.

Corals

© Robin South G / Total

Examples of the projects undertaken by the Foundation and its partners

Many research, protection or restoration objectives demand time and continuous involvement. The Foundation therefore usually extends its support for timeframes of 2 to 3 years, which may be prolonged in certain cases.

The **research** initiatives supported by the Foundation include the Coral Reef Biodiversity Program conducted in different marine settings. The aims are to collect data, evaluate the economic and cultural significance of coral biodiversity, study the role of protected areas, enhance understanding of the bleaching phenomenon known as "white death", and improve monitoring of coral reef zones.

The Foundation is also engaged in a research program with Port-Cros National Park to control the invasive Caulerpa taxifolia seaweed, and in an initiative with Cedre to develop tools for detecting submerged oil accumulations after an accidental spill.

For biodiversity **preservation**, the Foundation currently supports, among others, a project to safeguard the dugong in the United Arab Emirates. The project involves setting up protected areas for this marine mammal, now threatened with extinction. And in Qatar, the Foundation is partnering Total Qatar and the Friends of the Environment for an inventory of insects.

Total and **biodiversity**

In France as in other countries where the Group works, the Foundation contributes to the **rehabilitation** of sites rich in biodiversity. In addition to participating in the rehabilitation of the Atlantic coast after the sinking of the Erika, the Foundation has conducted programs ranging from the restoration of several small islands in Brittany, to provide nesting places for seabirds, to the restoration of the Salins d'Hyères (southern France) and of a coastal park in Essaouira (Morocco), whose lagoon complex hosts many species of birds.

Information and awareness programs for both the general public and specialists are also part of the Foundation's activities. They include the organization of biodiversity seminars on the island of Porquerolles in southern France, and the publication of educational games and documents as well as eco-maps of the French coastline.

Eco-restoration of the Salins d'Hyères

© C. Gérardin / Port-Cros National Park

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Looking ahead...

Total's action plan includes a wide range of measures to cover the multi-dimensional aspects of biodiversity.

1. A mapping tool is being developed to situate all Total sites in clear geographic relation to sensitive areas listed by IUCN, UNESCO and the United Nations. Every Total site that may impact such areas will be responsible for ensuring that the management system in place provides for all necessary measures. Regularly updated when additional information on sensitive areas becomes available, this new tool will serve as further support in the decision chain for new projects and for response in the event of an accident.

2. A practical guide has been completed to help the Group's managers translate biodiversity complexities into concrete operating rules and procedures. It is currently being tested at several pilot sites within the Group.

3. Research is a continuing commitment for Total, for better understanding of biodiversity and the related issues, including the potential impact of Total's activities and products on the natural environment.

Through information sharing, Total will continue to ensure that this knowledge benefits a wide range of stakeholders, including the scientific community and the oil industry as a whole.

4. Total will continue to work together with other members of the oil industry and with external stakeholders, particularly to identify meaningful indicators for biodiversity performance. The priority focus will be on areas where the Group's operations may affect existing protected areas requiring purpose-designed measures to minimize risks.

5. The Group aims for constant improvements in integrating biodiversity considerations into site rehabilitation, also seeking to offset impacts with specific positive action.

Total will continue to work with governments, NGOs, international, national and local experts as well as local communities to acquire the most meaningful data and establish the most suitable procedures in all cases.

Read more: **www.total.com**

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