Out of sight...
Deep-sea mining
in Spain
“There is a UN decade for Ocean science, which has been agreed to by 193 countries ... Why wouldn’t we give that decade its full run before we start even thinking about disturbing the seabed of the high seas? We are talking a moratorium of 10 years in that case”.

The United Nations Secretary General’s Special Envoy for the Ocean, Ambassador Peter Thomson
January 2019
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About Ecologistas en Acción

Ecologistas en Acción is a Spanish grassroots confederation consisting of over 300 environmental groups. Since 1998 it has carried out awareness campaigns, as well as public and legal complaints in the context of environmental violations.

Ecologistas en Acción understands environmental issues as not separate but closely related to the social questions of economy, health and sustainability. With our increasingly globalized modes of production and consumption these questions need to be addressed both regionally and internationally in order to find adequate solutions that consider social and ecological implications. For Ecologistas en Acción, mining is one such prevalent issue where the economic interests are very often not reconciled with environmental concerns.

In this report, Ecologistas en Acción focuses on the threat posed by deep-sea mining. A threat that could irreversibly destroy part of our oceans’ seafloor, with wide ranging impacts over marine biodiversity—including species in which us humans feed upon—, climate regulation or the capture and retention of greenhouse gases.

Marine Environment Area & Mining Group / Ecologistas en Acción

Find more information at: https://www.ecologistasenaccion.org
Summary

In the last decade and a half, European financing policies for so-called ‘critical raw materials’ have exponentially increased the influence of those who support the concept of bringing mining to the ocean floors in Spain, both in the country’s jurisdictional waters as well as in international waters.

Despite the potential impacts of deep-sea mining, from toxic effects of heavy metals in the food chain – including fishery resources – to the release of greenhouse gases sequestered in the ocean seabed, and the irreversible destruction of marine biodiversity – with consequences even for fields such as medical and pharmaceutical research – certain government agencies and public bodies have continued to support the advancement of this new type of mining.

In the meantime, civil society – including environmental and fishing organizations – as well as the ministerial departments of Fisheries and the Environment have been left out of deliberations and decisions despite the potential for enormous impact of this activity on ocean habitats. In the face of mounting resistance to destructive and polluting onshore mining – which is tied to increased social awareness and scrutiny – deep-sea mining is seen as a new horizon by mining companies and investors eager to move away from control, responsibilities and environmental responsibilities.

In Spain, contacts have been intensified to forge public-private partnerships in which the State would finance the obtainment of licenses in international waters – where the largest known deposits are located –, a process in which the Ministry of Foreign Affairs has played an important role. Public research funding programmes have also intensified the exploration of deposits of potential commercial interest within Spanish jurisdictional waters, locating areas with significant presence of cobalt, lithium, nickel, copper, niobium, vanadium, yttrium, rare earth and platinum group elements, among others.

Until now, the most influential public body in the promotion of submarine mining in Spain has been the Geological and Mining Institute of Spain (IGME), both at international forums such as the International Seabed Authority (ISA), which regulates potential deep-sea mining in international waters, as well as at the ministerial level, supporting the accession of Spain to the small group of countries that have dived into this uncertain activity. Since 2007, Spain has always nominated IGME members for ISA’s Legal and Technical Commission, which, among other roles, must assess the ecological consequences of mining.

This document aims to address over a decade of lack of transparency, offering an overview of the state of deep-sea mining in Spain. The current scenario of absence of specific regulations, the enormous difficulties in exercising control and inspection of both exploration and actual extraction, and views claiming that this activity could be carried out in Spanish jurisdictional waters applying the outdated 1973 Law of Mines and its associated legal framework, calls for an urgent social and political debate on deep-sea mining and its potential consequences for marine biodiversity and the integrity of the seabed, of which still very little is known.

This report – prepared in a collaboration between the Marine Environment Area and the Mining Work Group of Ecologistas en Acción – presents the results of an in-depth research and analysis project through the following sections:

- The introduction briefly explains what deep-sea mining is, the types of deposits that are present in Spanish jurisdictional waters, the extraction methods currently under consideration, the environmental impacts associated with this activity and the regulatory situation in Spain.
The following section presents data on the main known deposits of submarine minerals in Spanish jurisdictional waters so-far identified as areas for potential commercial development: Las Abuelas – a chain of seamounts in the vicinity of the Canary Islands; the Galicia Bank, Cantabria Knoll and El Cachuchu off the Atlantic coast of Galicia and the Cantabrian Sea; and the deposits in the Gulf of Cádiz and Alborán Sea, including the Guadalquivir Bank and Al-Mansour Seamount.

The report systematically presents the positions and reactions regarding deep-sea mining by environmental organizations and the fishing industry, as well as in an emerging political debate on the subject and within the State’s public institutions.

Because of their importance for the advancement of this activity, the report includes a list of the main research projects connected to deep-sea mining that have been carried out during the past decade with Spanish participation.

The report concludes with a section on alternatives and proposals.

Ecologistas en Acción hopes that this report can serve as a contribution to a necessary social and political debate on the challenge posed by the advancement of deep-sea mining, both globally and in the sphere of competence of Spanish administrations.

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1 Criticism of the positions of certain bodies and their personnel in relation to deep-sea mining does not question their broader trajectory or the importance of scientific areas such as marine geology for the understanding of the oceans and our planet.

2 https://deepseaminingwatch.msi.ucsb.edu/
**Introduction: What is deep-sea mining?**

**Deep-sea mining** refers to the extraction of minerals from the seabed. It is also often termed as marine mining or seabed mining. Although related in various ways to other marine extractive industries such as offshore oil and gas platforms — including in terms of environmental consequences — deep-sea mining is different in its objectives, methods and potential impacts.

Most of the deposits that have aroused commercial interest occur in deep waters, but there are also deposits of coastal placers of alluvial origin in estuaries and the proximities of the coastline. However, the three most sought-after types of deposits occur in deeper waters, especially in seamounts and abyssal areas: cobalt-rich **polymetallic nodules** and **ferromanganese crusts** as well as **sulphide deposits**, all three present in Spanish jurisdictional waters.

The logistical challenges of extraction, the enormous costs and potential environmental impacts have so far prevented the development of deep-sea mining, but the increase in prices of certain metals during the last 15 years, the financialisation and speculative nature of the mining industry, the growing resistance to increasingly aggressive and destructive onshore mining projects, and new technological advances have made seabed mining more plausible.

Although it has been mostly countries and conglomerates previously leading offshore oil and gas production — which is becoming increasingly less profitable — that are now pursuing this new horizon, there is mounting pressure for countries like Spain to join in the exploitation of the seabed.

**Types of mineral deposits**

Deep-sea mineral deposits, broadly speaking, are divided into five types, although several of them can be found in overlapping zones. Although international attention has focused on areas such as the Pacific, all these types are present in Spanish jurisdictional waters:

- **Polymetallic nodules** are spherical concretions of up to 20 centimetres that can be found mainly in abyssal plains, and that are mostly made up of manganese and iron, as well as significant concentrations of copper, cobalt, nickel and titanium. They can be found in the Galicia Bank seamount area, off the western coast of Galicia, and in the Cantabrian Sea.

- **Ferromanganese crusts** are formed by precipitation over hard substrates and may include cobalt, tellurium, niobium, rare-earth and platinum group elements. They form ‘scabs’ covering the rocks of the sea floor, especially in seamounts and continental margins. They are found mainly in Las Abuelas, South of the Canary Islands, and in the Galicia Bank, as well as in certain areas of the Alborán Sea and the Gulf of Cádiz.

- **Phosphorite deposits** are sedimentary rocks rich in phosphorus that can hold significant concentrations of yttrium and rare-earth elements. Frequently associated with ferromanganese crusts, they are known to be found in the Galicia Bank and the coastline surrounding Galicia, Las Abuelas and the Gulf of Cádiz.

- **Massive sulphide deposits** are the result of volcanic and magmatic action in hydrothermal processes and, like their land equivalents, frequently present significant concentrations of copper, zinc, silver, gold and lead. There are records of such deposits in the Canary Islands.

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Marine placers are formed by the accumulation of minerals in sedimentary processes in which significant accumulations of tin, niobium, tantalum, titanium, thorium or gold may appear. They are the only ones located within the territorial sea and contiguous area, both in the Galician estuaries and off the coasts of Murcia and Almería.

Extraction methods
Despite the fact that most of deep-sea mining techniques have not been tested on a real scale, in recent years much of European R&D funding (see section on research projects with Spanish participation) has focused on the development of functional prototypes. Although different types of deposits, depths, geomorphology and distances to the coastline determine the proposed technical solutions, these are primarily based on the concept of hydraulic suction systems, through which the material extracted from the seabed—usually by remote-controlled submersible vehicles—is pressurized and pumped to the surface in tubes up to several thousand meters in length. Previously, extraction from the seabed occurs by collector vehicles in the case of nodules or processing machines that excavate and crush ferromanganese crusts and massive sulphide deposits.

The extracted materials are processed on ships or platforms, extracting the ores of commercial interest—cobalt, copper, rare earths, etc.—in a similar way as it is done in mineral processing plants used in on-shore mining, often implying the use of toxic chemicals for separation—cyanide, sulphuric acid, etc. Depending on the type of deposit, on-board processing could be fully completed at sea or would involve the preparation of a pre-concentrate that should be re-processed on shore—e.g., this would be the case massive sulphide deposits—transporting dehydrated ores in cargo ships.

Only a fraction of the extracted seabed materials would have enough commercial value to justify the logistical costs of its transfer to shore, so most of the material extracted along and possibly a fraction of the processing chemicals would be discarded to the sea as waste, generating mine tailings plumes—clouds or spots of suspended particles—with high amounts of heavy metals. Proposed systems suggest reinjecting this mining waste into the ocean depths or their direct discharge to the sea.

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4 See: https://chinadialogueocean.net/6682-future-deep-seabed-mining/
5 Certain Spanish corporations—such as CIDAUT and FIDAMC foundations and Coronis Computing—have participated in international projects for the development of deep-sea mining technologies.
Environmental and economic impacts

The seabed is home to an immense biodiversity of species and habitats that is still largely unknown. Underwater mining activities would entail the destruction of species, habitats and ecosystems to an extent that impacts on commercial fish populations is foreseeable—particularly in relation to the impact of toxic substances on the food chain. Also of concern in the context of climate change is the release of sequestered greenhouse gases from the ocean floor that this activity could entail.

Numerous bodies and entities, such as the European Parliament⁷, the European Commission⁸, the British Parliament⁹, the International Union for Conservation of Nature (IUCN)¹⁰, the Long Distance Advisory Council (LDAC)¹¹, the Pelagic Advisory Council (PeLAC)¹², NAFO¹³, WWF¹⁴, Greenpeace¹⁵, Fauna & Flora International¹⁶ and Deep Sea Coalition¹⁷—an alliance of 80 organizations of which Ecologistas en Acción is a member—among others institutions, have documented and warned about the known or probable impacts of deep-sea mining, including:

- The impact of waste plumes with high concentrations of heavy metals could reach hundreds of thousands of kilometres from the extraction areas, affecting different depths. Their toxicity could affect the entire food chain through bioaccumulation and biomagnification processes¹⁸.
- The excavation of sediments at the seabed would also create plumes or columns of suspended particles that would affect filter feeders, suffocating them not only in contiguous areas but also hundreds or thousands of kilometres away, depending on currents¹⁹.
- The combination of toxic effects and the disruptions caused at the base of the food chain in areas with high abundance of species consumed by humans can have impacts on health and fishing productivity, both on local and indigenous communities and on commercial fishing fleets—e.g., for tuna catches in the Pacific Ocean²⁰.

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²⁰ Long Distance Advisory Council (2019). “LDAC Opinion...”.
The physical destruction of the seabed in enormous areas—a concession for nodules could exploit 9,000 km² in 30 years—would imply the fragmentation and loss of structure and ecosystem functions of marine habitats, while habitat-dependent life forms—such as those in nodule fields—would never recover.

In seamounts—areas of special importance and vulnerability—serving as a habitat and pantry for millions of species—many still unknown—, sponge and deep coral ecosystems formed over thousands of years would be destroyed. Disturbance of these areas would affect migratory species—fish, whales and seabirds—with consequences that are difficult to predict. This would also affect sighting tourism, a sustainable source of income for local communities.

The oceans are the planet’s main carbon sink, capturing a quarter of CO₂ emitted by human activity. The disturbance of the seabed could imply the release of greenhouse gases—particularly methane and carbon dioxide—sequestered for millions of years, thus contributing to climate change, while suppressing or limiting the capacity of carbon-fixing organisms—such as phytoplankton—and, thus, reducing current absorption capacity.

Massive sulphide deposits now being targeted are associated with underwater hydrothermal vents which play a key role regulating climate and ocean geochemistry. Their disturbance could affect the amount of available nutrients and, therefore, the entire food chain.

In the case of continuous operations that would be carried out 24 hours a day, all year round, for decades, the impacts caused by noise and light pollution along thousands of meters separating seabed from surface must be considered. They could especially affect whales and other animals that are dependent on echolocation systems.

The seabed is home to numerous endangered species. Some of them, such as the scaly-foot snail (Chrysmallon squamiferum) was included in the IUCN Red List precisely because of the threat posed by deep-sea mining.

The destruction or extinction of these species could prevent the discovery of new medicines, associated with life forms present only in the deep ocean. As an example, the test for COVID-19 was developed using an enzyme isolated from a microbe found in deep-water hydrothermal vents now being targeted for deep-sea mineral extraction.

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4 See: https://www.earth.columbia.edu/articles/view/2586
6 Howard, P.; Parker, G.; Jenner, N.; Holland, T. (2020). An assessment...
Legal status in Spain

Spain lacks specific legislation on deep-sea mining, with general mining legislation being theoretically applicable. Article 132 of the Spanish Constitution declares *the natural resources of the economic zone and the continental shelf* as assets in the public domain. Previously, Law 22/1973, of July 21, on Mines, indicated in article 2.1 that *the deposits of natural origin and other geological resources existing in the national territory, territorial sea and continental shelf*, are assets in the public domain, the investigation and exploitation of which the State may directly assume or assign. Article 3.3 of Law 22/1988, of July 28, on Coasts, also includes among the assets of the State’s maritime-land public domain *the natural resources of the economic zone and the continental shelf*.

Royal Decree 2857/1978, of August 25, which approves the General Regulation for the Mining Regime, reiterates and specifies the above in its article 1.1:*

The activities of exploration, investigation, use and benefit of all the mineral deposits and other geological resources that (...) exist in the national territory, territorial sea, continental shelf and seabed subject to national jurisdiction or sovereignty, in accordance with Spanish laws and international conventions in force ratified by Spain, will be regulated by the Mining Law and this Regulation.

Notwithstanding the above, Law 34/1998, of October 7, on the hydrocarbon sector, created a special regime for hydrocarbon research permits and concessions for the exploitation of hydrocarbon deposits, independently of mining rights, referring in its article 32 to the activities in the marine subsoil: *The activities object of this title that are carried out in the subsoil of the territorial sea and in other seabed areas that are under national sovereignty will be governed by this law, by the current legislation of coasts, territorial sea, exclusive economic zone and continental shelf, and by international agreements and conventions to which the Kingdom of Spain is a party. Based on this precedent, it is time to separate the regulation of other resources of the seabed, including minerals, from the scope of general mining legislation, as this report will suggest in its proposals section.*

Regarding the protection of the seabed, article 5 of Law 42/2007, of December 13, on Natural Heritage and Biodiversity, imposes the duty of the Administration to ensure the conservation and rational use of natural heritage throughout the national territory and in maritime waters under Spanish sovereignty or jurisdiction, including the exclusive economic zone and continental shelf. The “Strategic Plan for Natural Heritage and Biodiversity 2011-2017” (approved by Royal Decree 1274/2011, of September 16) recognizes in its diagnosis of pressures and impacts that threats related to *the exploration and exploitation of the marine subsoil* cause the deterioration and loss of ecosystems and ecological processes in the coastal and marine environment.30

The Natural Heritage and Biodiversity Law also established the statute of Marine Protected Areas - MPAs (article 33), later developed by Law 41/2010, of December 29, on Protection of the Marine Environment, which created the Spanish Network of Marine Protected Areas. Although the management criteria are established by a General Plan, no steps have been taken to ban seabed mining research or exploitation activities in MPAs. The first MPA to be declared in Spain, El Cachuchu, has in fact been subject to geominning research campaigns while other spaces declared as MPA or Sites of Community Importance (Natura 2000 Network) are also areas of interest for deep-sea mining.

Annex 1 of the Law for the Protection of the Marine Environment (which transposes the Marine Strategy Framework Directive 2008/56 / EC, of June 17, 2008), explicitly refers to the extraction of

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minerals, including metallic minerals, as a human activity in the marine environment that can **cause conditions of special importance**. In view of the foregoing, *Royal Decree 79/2019, of February 22, which regulates the compatibility report and establishes the criteria for compatibility with marine strategies*, establishes **seabed mining** as one of the activities **that must have a compatibility with marine strategies report**. On the other hand, Law 41/2010 also establishes a general prohibition of depositing materials or other objects on the seabed (article 35), which would likely include plumes and other waste generated by deep-sea mining.

Deep-sea mining research projects so-far carried out in Spanish waters have not been subject to administrative authorizations—likely claiming an alleged exploratory or superficial nature—but it may be a matter of time before the first requests for research permits or even mining concessions for deep-sea mining are submitted under the framework of Law 22/1973. The regulatory gap and the lack of precedents create a situation that could, in fact, lead to the authorization of the first projects in the absence of a necessary debate on this new kind of mining that bears little resemblance to the conventional on-shore activity that the 1973 law sought to regulate. Added to this is the lack of clarity on the environmental procedures to which such permits should go through—including environmental impact assessment—and the difficulty for both administrations and civil society to exercise control over the impacts in remote and inaccessible areas.

*Cosmic jellyfish at a depth of 3.000 metres, NOAA Okeanos Expedition, Utu seamount (2019)*
What is at stake? Deep-sea mining in Spain’s Exclusive Economic Zone

Much of the international attention to deep-sea mining has focused on the most advanced projects, located mainly in the Pacific, that hosts the highest concentrations of certain types of deposits with potential commercial interest – polymetallic nodules, ferromanganese crusts and massive sulphides. These vast areas of interest for deep-sea mining are located in international waters, attracting governments and corporations from all over the world, and not only nearby coastal states.

In recent years and under EU policies of “critical raw materials” interest in mineral deposits located in areas over which European states have direct authority has been awakened. In this context, the seabed within Spain’s Exclusive Economic Zone is subject to intense research led and financed by public organizations, exploring the possibilities of future mining.

Although there are known occurrences of underwater mineralizations in the territorial sea (12 nautical miles), over which Spain has full sovereignty, the main deposits with potential commercial interest are located in the area of the Exclusive Economic Zone (EEZ): an extension separated by up to 200 nautical miles from the baseline in which the coastal State has special rights to exploit marine resources, including minerals.

Beyond the EEZ lie international waters in which the control over deep-sea mining is exercised by the International Seabed Authority (ISA). Some known mineral deposits are found on the limits between Spain’s EEZ and the proposed areas for an extended continental shelf (beyond 200 nautical miles), as is the case of Mount Tropic, in the proximities of the Canary Islands – currently claimed both by Spain and Morocco in their respective proposals made before the UN.

This section presents the main deposits with potential commercial interest located within the EEZ and proposed extended continental shelf of Spain. These deposits are the ones over which Spain would have eventual regulatory powers and, at the same time, the most significant in terms of geographical proximity. The known deposits of the Gulf of Cádiz will also be mentioned given the fact that, even within the EEZ of Portugal, their exploitation would be equally problematic due to their relative proximity to the Spanish coast. In a presentation on the potential of deep-sea mining by several researchers from IGME and the Polytechnic University of Madrid in 2013, the presence of seamounts

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32 See: https://www.eleconomista.es/internacional/noticias/10317767/01/20/Tropic-el-tesoro-submarino-de-minerales-estrategicos-para-la-tecnologia-verte-que-enfrenta-a-Espana-y-Marruecos.html
33 Manzanares, A.M. et al. (2013). “Potencial de la minería submarina: Aplicación SIG para el estudio previo de contratos de exploración de costras de ferromanganeso con alto contenido en cobalto en los fondos marinos internacionales conforme al
with high [mining] potential and a large area located in the area of the Gulf of Cádiz and in the west of Portugal stood out, in the same way as in the south of the Canary Islands and the Galicia Bank, the latter wholly belonging to the Spanish EEZ.

Canary Islands Seamount Province

The Canary Islands Seamount Province (or “Las Abuelas de Canarias”) are a group of more than 100 volcanic seamounts located mainly southwest of El Hierro and northwest of Lanzarote and at depths between 100 and 4,400 meters. The largest mountains (Bimbache, Echo, Paps, Drago, Las Hijas, ...) are within the Spanish EEZ. However, Mount Tropic—located 250 nautical miles (463 km) southwest of the island of El Hierro—has received the most attention due to its deposits of economic significance, and is also in dispute between Spain and Morocco—and Western Sahara, which is part of the dispute—as a result of the overlapping of the parties’ proposals for an extended continental shelf.34


The known deposits are mainly ferromanganese crusts, although there are also areas of phosphorites, manganese nodules—in Mount Tropic—and massive sulphide deposits—south of El Hierro. It has been estimated that cobalt-rich crusts with commercial interest extend over an area of over 16,000 km², covering almost all the elevations of these seamounts as well as other areas between Gran Canaria and Fuerteventura, northwest from Lanzarote and in the vicinity of La Palma and El Hierro.36

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34 See: https://www.eleconomista.es/internacional/noticias/10317767/01/20/Tropic-el-tesoro-submarino-de-minerales-estrategicos-para-la-tecnologia-verde-que-enfrenta-a-Espana-y-Marruecos.html

35 “Marine minerals” layer at: https://www.emodnet-geology.eu/map-viewer/

36 González, F. J. et al. (2015). “Primer catálogo...
In addition to the widespread presence of cobalt, research carried out in the Canary seamounts showed significant occurrences of nickel, copper, niobium, vanadium, rare earths, yttrium, hafnium and platinum group elements. In 2017 the existence of a deposit of 2,600 tons of tellurium on Mount Tropic was announced, with enrichments 10,000 times higher than the average values in Earth’s crust.

The seamounts to the south of the Canary Islands have been the focus of most deep-sea mining research in waters under Spanish jurisdiction or areas proposed for the extended continental shelf, not only by Spain, but also by other countries.17 Javier González, IGME researcher and chief of several of these campaigns, acknowledged in 2017 the lack of transparency in relation to these campaigns: We had not spoken about it so far to avoid generating alarm because people think they are going to start a mine and they will pollute everything. Further stating: Our task as scientists is not to start up mines, but to research. Then it is the State that uses the results of that research to make decisions.38

Although they lack any form of environmental protection, these seamounts host pristine underwater habitats, including vulnerable coral species and sponge fields. Several researchers have warned about the impacts that deep-sea exploration and mining could have on these delicate habitats.39 Only the Concepción Bank (north of Lanzarote) and the area between Gran Canaria and Fuerteventura have so-far been acknowledged as Sites of Community Importance (SCI) within the Natura 2000 Network.

**Galicia Bank and deposits in the Cantabrian Sea**

Galicia Bank is a seamount located some 97 nautical miles (180 km) off the western coast of Galicia at depths between 500 and 1,000 metres. To the west lies the abyssal zone, with 4,000 metres falls. The Galicia Bank has been declared a Special Conservation Area (ZEC) and a Site of Community Importance (SCI), as well as a Marine Protected Area within the OSPAR Network. It houses extensive cold-water coral fields and more than 700 catalogued species, including 6 endangered species.40

This marine region hosts extensive areas of ferromanganese crusts, polymetallic nodules and phosphorites, with high cobalt contents and presence of lithium. Some authors41 have considered that these crusts and nodules –along with those of Madeira, Canary Islands and Azores– could be susceptible to commercial exploitation, particularly in the case of the nodules due to their very high cobalt concentrations –up to 1.8%.42 The recent Pan-European submarine Map of “Critical elements for energy” indicates the existence of cobalt deposits –deposits are defined has having an average content greater than 500 g/t and potential resources exceeding 200Mt– as well as lithium occurrences and other “critical” minerals present in polymetallic nodules.43

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1 See: https://www.abc.es/sociedad/abci-choco-paises-disputan-tesoro-minero-aguas-canarias-201704172218_noticia.html
2 See: https://www.abc.es/sociedad/abci-cobalto-esta-concentrado-proporcion-muchismo-mayor-telurio-201704222017_noticia.html
4 See: https://www.lavozdegalicia.es/noticia/sociedad/2014/07/22/montana-sera-descubierta-con-telurio.html
Main seabed mineral deposits of economic interest in the Cantabrian Sea and Atlantic coast of Galicia.

Source: EMODnet-Geology.

In an interview in 2017 with Javier González Sanz, IGME researcher and main author of the studies on the mining potential of the Galicia Bank, stated that *in the west of Galicia a seamount has also been studied with manganese mineral deposits with strategic metals and it has turned out to be quite promising*, even acknowledging that the area requires special protection.\(^{44}\)

In the Cantabrian Sea there are two other areas that have raised interest as potential deposits of cobalt, lithium and other metals. In the Cantabria Knoll –75 nautical miles (137 km) north from Estaca de Bares– and in El Cachuchu (or Le Danois Bank) –35 nautical miles (65 km) from Ribadesella– nodules and ferromanganese crusts have been found with characteristics similar to those in Galicia Bank.\(^{45}\) El Cachuchu was declared as a Marine Protected Area and Special Conservation Area in 2011 for its high ecological value, while Cantabria Knoll lacks any environmental protection whatsoever.

In 2009 Spain submitted its request for an extended continental shelf off the coast of Galicia,\(^{46}\) which is currently under study by the Subcommittee of the Commission on the Limits of the Continental Shelf of the United Nations Convention on the Law of the Sea. In the proximities of the proposed extended continental shelf lie other known deposits of cobalt.

**Gulf of Cádiz and Alborán Sea**

The Gulf of Cádiz and the Alborán Sea host a number of nodule deposits associated with carbonate chimneys and ferromanganese crusts, at depths between 500 and 3,500 metres. Some nodule deposits, linked to the oxidation processes by the Mediterranean outflow currents,\(^{47}\) have been the

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\(^{44}\) See: [https://www.abc.es/sociedad/abcibi-cobalto-esta-concentrado-proporcion-muchisimo-mayor-telurio-201704222017_noticia.html](https://www.abc.es/sociedad/abcibi-cobalto-esta-concentrado-proporcion-muchisimo-mayor-telurio-201704222017_noticia.html)


subject of recent research campaigns (2019) off the coasts of Granada and Almería. Unlike the deposits of the Galicia Bank and Las Abuelas de Canarias, these potential deposits are located a short distance from the coast, and are partly caused by erosion and on-shore mining activity in the mineralized areas of the Iberian Pyrite Belt. Consider, for example, how the Tinto and Odiel rivers transport 47% of the zinc and 15% of the copper contributed by all of the world’s rivers to the seas and oceans, as a consequence of continued mining activity in their basin.

Sediments from the Iberian Pyrite Belt contributed to the formation of deposits of coastal placers in the vicinity of Huelva and Cádiz –including significant concentrations of titanium– which could eventually be subject to commercial dredging. In addition, the Pan-European Map of Submarine “Energy-Critical Elements” indicates the existence of cobalt deposits associated with ferromanganese crusts in the Alborán Sea –within the Spanish EEZ–, particularly in the Al-Mansour seamount and off Cabo de Gata, and also in the Guadalquivir Bank in the Gulf of Cádiz, where polymetallic nodules with lithium and cobalt were detected –albeit with lower enrichment than in Canary and Galician deposits.

Although Spanish research papers say nothing on potential environmental impacts, a team led by Nélia Mestre at Algarve University carried out a study from the same Spanish oceanographic vessels evidencing the toxicological impacts on molluscs caused by the resuspension of sediment plumes in Portmán Bay (Murcia), simulating the effects of deep-sea mining. Both the Gulf of Cádiz and the Mud Volcanoes of the Gulf of Cadiz are protected areas, the former a Marine Protected Area (OSPAR) and the latter as a Site of Community Importance (Natura 2000).

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48 See: https://www.granadahoy.com/provincia/Estudian-posibilidad-submarina-Costa-granadina_0_1390061481.html
49 See: https://www.laverdad.es/murcia/geologos-probable-fondo-20190127002939-ntvo.html
50 See: http://www.life-etad.com/index.php/es/drenajes-acidos-de-minas-amd
51 See: https://www.icog.es/TyT/index.php/2017/05/llega-la-era-de-la-mineria-submarina/
Social debate: the fishing industry and the environmental movement

In recent years, the growing interest on the possibilities of deep-sea mining has led to reactions from both the environmental movement and the fishing industry, considering the impacts of this activity on the marine environment. This section includes some of the public positions of these actors in Spain, whose involvement has paralyzed related projects in areas where they were more advanced.

In September 2017, the Scientific Advisory Committee of ARVI-Cooperativa de Armadores de Pesca del Puerto de Vigo (Fishing Vessel Owners Cooperative of the Port of Vigo) issued the report “Coexistence of fishing activity with the gas, oil and deep-sea mining industries”. ARVI’s concern aroused not just from potential projects in Spanish jurisdictional waters, but from much more advanced ones in fishing grounds frequented by its members, including phosphate mining projects in Namibia. The conclusions of this report warn that deep underwater mining activity involves significant damage to the seabed as well as the fauna that inhabits these areas and the quality of the water column. And demand the development of agreed maritime spatial zoning plans and clear, inclusive legislation, focused on all activities carried out in fishing grounds or marine areas of interest.

This first pronouncement of ARVI had a significant impact, being widely reported in the press. It also led the Long Distance Advisory Council (LDAC), whose President (Iván López) and Secretary General (Alexandre Rodríguez) are part of ARVI, to debate and approve at its October 2018 and March 2019 meetings an “LDAC Opinion on Deep-sea Mining” (adopted by consensus in May 2019), in which several recommendations were made:

1. A moratorium on mining of the deep-sea needs to be in place in international waters without exemptions until the risks are fully assessed and understood;
2. No deep seabed mining in the international areas of the world’s seabed under the jurisdiction of the International Seabed Authority should be permitted unless a very clear case can be made that society must mine the deep-sea for the benefit of humankind as a whole and not simply because it may be economically viable and profitable to an individual company or country.
3. The case for deep sea mining needs to be evaluated in light of commitments to conserve and sustainably use the oceans, through strengthening the resilience and taking action for the restoration of marine ecosystems, as well as initiatives to transition to circular economies, sustainable methods of consumption and production and related efforts as called for the in the UN 2030 Agenda on SDGs.
4. That the European Commission and Member States stop funding, facilitating or promoting the development of deep-sea mining and deep-sea mining technology and support the above-mentioned objectives.

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53 See: http://www.arvi.org/coexistencia-de-la-actividad-pesquera-con-las-industrias-del-gas-el-petroleo-y-la-mineria-submarina/
56 See: https://www.farodevigo.es/mar/2019/06/03/ivan-lopez-mineria-submarina-demonstrado/2116793.html
57 Long Distance Advisroy Council (2019). “LDAC Opinion on Deep-sea Mining”.
The environmental movement has also joined forces to tackle deep-sea mining through international coalitions such as the Deep Sea Conservation Coalition, which includes Ecologistas en Acción and international groups such as Greenpeace, Friends of the Earth, Oceana, Bird Life or WWF.

In Spain, research campaigns related to deep-sea mining have been denounced by Ecologistas en Acción in specific places such as the Canary Islands, where a broad movement against oil and gas extraction had already developed, and also in general terms. In 2018, the Ben Magec-Ecologistas en Acción federation asked institutions and political parties in the Canary Islands to adopt motions against deep-sea mining in the proximities of the archipelago, where it continuously monitors the presence of marine prospecting vessels. In June 2019, Greenpeace Spain also issued a report on the impacts of underwater mining as part of an international campaign.

Social opposition to oil and gas rigs in the Canary Islands raised conscientiousness within existing movements on the threat posed by deep-sea mining in the same areas (Image: Ecologistas en Acción).

Political debate
Although the need to establish specific rules for deep-sea mining in Spanish jurisdictional waters has occasionally emerged in the political debate, no government or party has yet formulated concrete proposals. Spanish actors who most strongly defend the advance of deep-sea mining—IGME in particular—seem to consider that the legal status quo—with the provisions of Law 22/1973, of July 21, on Mines— are already adequate to regulate deep-sea in Spanish waters.

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Announcements regarding research on strategic minerals—including hafnium and tellurium—in Mount Tropic and other seamounts near the Canary Islands led to the presentation of several related Parliamentary initiatives in April 2017 at the Spanish Parliament by representatives of Ciudadanos, Nueva Canarias and Unidas Podemos. All Government’s responses were prepared directly by IGME.

Ciudadanos MP Melisa Rodríguez Hernández presented a question regarding measures to guarantee the efficient use and environmental sustainability of the mineral deposits of Mount Tropic and on the legal status of the area, and whether the Government intended to establish specific legislation on deep-sea mining. In its response of June 13, 2017, the Government stated that at this stage it is far from classifying these areas as deposits capable of being exploited. A more detailed investigation is necessary during a resource pre-exploration phase, especially in such a difficult deep-sea context. In relation to the legislation on deep-sea mining, the Government stated that the legislation on energy and mines, including Law 22/1973, of July 21, on Mines, and Law 34/1998, of October 7, on the Hydrocarbons Sector, contains regulatory provisions for activities in the seabed, without disregard to those contained in environmental regulations.

Nueva Canarias MP Pedro Quevedo presented at the same time three questions regarding the “status of the waters in which signs of the presence of an important tellurium deposit in the southwest of the Canary archipelago have been found”, on the knowledge of the Government about this deposit, and on the information given to Canarian authorities. In an reply provided on May 31, the Government indicated that a marine geology exploration campaign on the seamounts is necessary, as they are not yet mapped in detail or sampled for minerals, as well as funding for laboratory procedures and studies to determine the presence of tellurium, cobalt, rare earths and other strategic elements. These studies can be carried out in collaboration with Canarian institutions such as the Technology and Renewable Energy Institute (ITER), the Canary Volcanological Institute (INOLCAN) or the Canary Islands Oceanic Platform (PLOCAN), which are already cooperating with IGME in marine geology projects.

Also in April 2017, the Unidos Podemos-En Comú Podem-En Marea MP Juan Antonio López de Uralde requested the appearance of the Minister of Energy, Tourism and Digital Agenda and the IGME director—none of which took place due to expiration of the initiatives—and asked another question on the research carried out in the vicinity of the Canary Islands. In a reply issued on June 13, 2017 the Government recognized that, as a result of IGME studies, it has knowledge on the abundance of strategic elements such as cobalt, nickel, rare earths or platinum in the Canary Islands seamounts. Among the most abundant strategic elements are Mn [manganese] (16%), Fe [iron] (23%), Co [cobalt] (4700 ppm), Ni [nickel] (2800 ppm), V [vanadium] (2400 ppm), Cu [copper] (600 ppm), Mo [molybdenum] (400 ppm), elements of the platinum group (250 ppb) and rare earth elements (REEs) (2800 ppm). The Government indicated that, currently, there is no specific legislation on deep-sea mining in Spain. For future deep-sea mining operations in waters under national jurisdiction, it would be advisable in environmental and mining terms to follow the guidelines of the International Seabed
Authority, adapting its regulations to national legislation within the European framework. An environmentally sustainable mining operation requires previous geological and environmental studies.

The Socialist Parliamentary Group also requested in July 2017 the appearance in Commission of the Minister of Economy, Industry and Competitiveness to report “on the discovery of tellurium reserves in seamounts located 250 miles southwest of the Canary Islands” (213/000566), a request later withdrawn, although the same PSOE MPs Patricia Blanquer, Tamara Raya and Sebastián Franquis requested a report on the same issue.

An octopus at a depth of 2,440 metres (Image: NOAA).

Regarding the progress of research off the Galician coast, in December 2017 the Unidos Podemos-En Marea MP Alexandra Fernández Gómez asked the Government about geomining research carried out to the west of Galicia and the Government’s position on deep-sea mining. In its February 2018 reply, the Government stated: Currently, only scientific research of the seabed is carried out in Spain by the Public Research Bodies (…) to obtain knowledge for their management and environmental protection. There is no record of any initiative for the practice of extractive deep-sea mining in Spain.

At the same time, the Alternativa Galega de Esquerdas en Europa MEP made a proposal to halt all hydrocarbon exploration and mining projects on the seabed as well as a written question (E-

\[\text{http://www.congreso.es/l12p/e6/e_0062231_n_000.pdf}\]
003641/2018) regarding the financing of deep-sea mining research. EU Industry Commissioner Elżbieta Bieńkowska indicated that approximately €47 million had been invested in 2013-2020.

The European Parliament also adopted on January 16, 2018 the “Resolution of 16 January 2018 on international ocean governance: an agenda for the future of our oceans in the context of the 2030 SDGs” (2017/2055) in which it urges the Commission to call on Member States to stop sponsoring deep-sea mining exploration and exploitation licenses in Areas Beyond National Jurisdiction and on and not to issue permits for deep-sea mining on Member States’ continental shelf; and Calls on the Commission and the Member States to support an international moratorium on commercial deep-sea mining exploitation licences until such time as the effects of deep-sea mining on the marine environment, biodiversity and human activities at sea have been studied and researched sufficiently and all possible risks are understood. The resolution was approved with 558 votes in favour, 25 against and 83 abstentions.

In May 2018, the Unidos Podemos–En Comú Podem–En Marea MPs Alberto Rodríguez Rodríguez and Josep Vendrell Gardeñes presented in the Spanish Parliament a motion at the Energy, Tourism and Digital Agenda Commission, “relative to the environmental protection of the seabed of the Canary Islands after the discovery of hafnium deposits”. The explanatory statement pointed to deep-sea mining as a solution to the growing demand for rare minerals, key to the technological industry, that entails a high impact and the pollution of adjacent marine areas, and on the multitude of different species during their migratory routes. In another motion “for the protection of the subsoil and its resources” presented by the same group in February 2019, attention was drawn to how lack of regulation for the exploitation of resources of the marine seabed demands a reform that addresses an activity that is expected to have exponential development in the coming decades, and urged the Government to promote within a maximum period of six months the reform of the Law 22/1973, of July 22, on Mines. The parliamentary procedures of both motions were not completed.

Various initiatives related to deep-sea mining were registered in the Canary Islands Parliament. In March 2017, Coalición Canaria MP Mario Cabrera González formulated several initiatives, including questions “on the scientific campaign of the Geological and Mining Institute to detect deep-sea ferromanganese deposits,” and again, in January 2018, several initiatives on the “Proliferation of activities related to deep-sea mining in the Canary Islands”. In May 2017, the Parliament of the Canary Islands—with the only abstention of the Partido Popular MPs—approved a motion presented by Grupo Nacionalista Canario supporting the right of the Government of the Islands to decide, by means of a binding report, on the approval of any deep-sea mining project in the proximities of the islands.

Spanish positions at the International Seabed Authority
Spain has been an active member of the International Seabed Authority since December 20, 1996. In general terms, Spanish positions at the ISA are defined by the General Directorate for International
Economic Relations (DGREI), within the Minister of Foreign Affairs, European Union and Cooperation, and in close collaboration with IGME as a technical advisory body. Within DGREI, the responsibility falls with the General Sub-Directorate for Multilateral Economic Relations and Air, Maritime and Terrestrial Cooperation as well as the Department of International Legal Advice. Formally, the permanent representation at ISA is exercised by the Spanish Ambassador to Jamaica.

Spain is one of the EU countries that over the last decades have been especially active within ISA, forming part of the organization’s Council –an executive body made up of 36 States–, along with France, Germany, the Netherlands, the United Kingdom or Belgium, even presiding the Assembly. But, unlike these other EU countries –all active in obtaining licenses in international waters, and particularly in those with abundance of polymetallic nodules in the Pacific– Spain has not sponsored any application. In general, applications for deep-sea mining have come mainly from countries with previous significant experience in offshore oil and gas rigs.

During General Assemblies, Spanish delegations are usually made up of the Spanish Ambassador to Kingston in his/her capacity of Permanent Representative to ISA, the Embassy’s Deputy Head of Mission in his/her capacity of Deputy Permanent Representative, the member appointed by Spain in the ISA Legal and Technical Committee –since 2007 a member of IGME– and a representative of the Spanish Oceanographic Institute, IEO –in recent Assemblies it has been Mr. Carlos García Soto, IEO Coordinator of International Relations. The delegation’s positions are formally defined by the General Directorate of International Economic Relations of the Ministry of Foreign Affairs but generally follow IGME’s pro-extractivist stance. However, statements compiled for this report show how positions held by Spain have been variable, depending not so much on the political colour of governments, but on the diverging perspectives held by different individuals and institutions that participate representing Spain.

The reason for Spain’s decision to entrust IGME with Spain’s participation in the ISA Legal and Technical Committee –or the process for such designation– has not been made public, especially in the light of this body’s public positions on deep-sea mining within Spain. IGME’s interests as a recipient of public funds for research in deep-sea mining make the weight of this body in defining Spain’s international positions problematic at least. In 2016 Spain nominated Adolfo Maestro González –chief scientist of IGME’s Geological Resources Research Department– for the ISA Legal and Technical Commission (2017-2021). Maestro has been part of the EuroGeoSurveys –a European consortium of mining and geological research agencies– marine geology expert group, together with Luis Somoza. Previously, Eusebio Lopera Caballero (2007-2012 and 2012-2017), also an IGME researcher, had held the position.

The ISA Legal and Technical Commission has an important role in the preparation of the “Mining Code” that will regulate deep-sea mining, and includes among its functions the preparation of environmental impact assessments of mining activities making recommendations to the Council of the organization.

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83 Sobrino Heredia, J. M. (1999). “El régimen jurídico de la explotación de los fondos marinos y oceánicos y los intereses de España,” Anuario da Facultade de Dereito da Universidade da Coruña, 3, p. 619: “España, cuya Plataforma continental natural es muy reducida, estuvo, desde en un principio, interesada en participar en el régimen que se negociaba respecto a la exploración y explotación de los fondos marinos, y ello desde la perspectiva de Estado importador y consumidor de los minerales que iban a poder extraerse de tales fondos (níquel, cobalto, manganeso y cobre) naturalmente interesado en que se aprovechasen al máximo esos recursos submareales; por otro lado, su escaso desarrollo tecnológico en este ámbito, tanto a nivel de empresa pública como privada, descartaba toda posibilidad de explotación directa por su parte, y le dejaba un amplio margen de maniobra en las negociaciones que se iniciaban.”
84 https://undocs.org/pdf?symbol=es/ISBA/22/C/2
regarding the protection of the marine environment; and the preparation of the rules, regulations and procedures taking into account all relevant factors, including the evaluation of the environmental consequences of mining activities. The positions defended by IGME representatives in the Commission during the last decade are unknown, as they are not public.

In February 2010, Spain organized in Madrid one of the few public “awareness” seminars on deep-sea mining carried out with ISA (and the first in Europe). The event was promoted by the Ministry of Foreign Affairs and Cooperation and IGME, and included the participation of ISA Secretary General Nii Allotey Odunton, the Spanish Secretary of State for Foreign Affairs Ángel Losada and the Permanent Representative of Spain to ISA Jesús Silva. The official report presented to ISA states that Spain, a traditional maritime power, has a special responsibility in promoting scientific research in marine geology and in exploring the deep ocean floor in coordination with other countries, promoting its infrastructure through joint projects.

During his speech at the seminar, Ambassador Rafael Conde, Director General of International Economic Relations of the Ministry of Foreign Affairs and Cooperation, indicated that we must design a road map for Spain to become more fully engaged in this deep-sea mining, that would involve the creation of a public-private partnership combining research institutes and corporations. Progress in defining such a strategy or “road map” remains unknown. The representative of the Ministry of Industry, Tourism and Commerce, Eduardo González García, explained that the role of the Sub-Directorate General of Mines had been limited to the institutional presence in ISA –through IGME– and to prepare reports when foreign research vessels conducting prospection activities in Spanish jurisdictional waters. The Permanent Representative at ISA and Ambassador to Jamaica, Jesús Silva, indicated that up to the present moment, lack of technology to operate at great depths has prevented the exploitation of mineral resources in deep waters (...) but very soon it may be profitable and there

87 http://www.igme.es/salaprensa/document/DOSSIER%20DE%20PRENSA_Seminario%20sobre%20Fondos%20Marinos%20como%20nueva%20frontera%20de%20invers%C3%B3n_24%20al%2026%20de%20feb%202010.pdf
88 https://www.fundacionareces.tv/ciencias-de-la-vida-y-de-la-materia/fondos-marinos/rafael-conde/
89 https://www.fundacionareces.tv/ciencias-de-la-vida-y-de-la-materia/fondos-marinos/eduardo-gonzalez/
are already countries that are taking positions, like China, India, Germany, Korea or Japan. **Spain has to start positioning itself** and is still on time to get on board.⁹⁰

In contrast with the public stance of IGME and the Ministry of Foreign Affairs, during the ISA General Assembly at its 2018 meeting, the IEO’s Coordinator of international relations Carlos García Soto, held a more cautious position, warning that deep-sea mining may cause the disappearance of marine ecosystems before we can even catalogue them.⁹¹ The IEO representative stated that since Spain has never applied for a deep-sea mining license this places the State in a unique situation to lead global environmental protection, building upon the strength of the European [Parliament] declaration [on a moratorium], especially considering 2020, which will be the key year for deep-sea mining, given the prospect for the adoption of the “Mining Code” by ISA.

This position seems to have conditioned the Spanish position during the 25th session of the Council (2019), in which the Representative of Spain addressed the presidency⁹² indicating:

> In a context of uncertainty on the effects of ocean mining on the marine environment, the delegation of Spain supports the idea that exploitation contracts should not be approved in a given area until a regional environmental management plan has been implemented in the said zone; Likewise, it is suggested that the interpretation and application of the precautionary criterion be uniform and in tune with international practice; It also considers appropriate the creation of an independent review mechanism in relation to the environmental plans submitted by the contractors; And supports the proposals to strengthen the environmental capacity of the Secretariat and the Legal and Technical Commission, given the supervision and inspection functions of the latter.

**Domestic positions of Spanish public bodies**

In the domestic sphere, as in the international sphere, IGME—a public body currently dependent on the Ministry of Science and Innovation—has been the most active institution in promoting deep-sea mining in Spain. Its influence on the DGREI of the Ministry of Foreign Affairs has not only conditioned the Spanish position in relation to mining in international waters, but has also mobilized the Ministry itself to try to attract companies to potential “public-private partnerships” for deep-sea mining.⁹³

Within the IGME, Mr. Luis Somoza (Department of Research in Geological Resources) has been one of the most prominent voices defending deep-sea mining, calling for Spain to participate in the “race” in international waters by requesting their own licenses in the Pacific (we should be present),⁹⁴ while downsizing probable environmental impact (What is being attempted is high-tech mining that does not have much of an environmental impact)⁹⁵ and emphasizing the alleged inevitability of deep-sea mining:

> **The citizen must know this. If you want mobile phones, green cars, green technology, you have to go down to the bottom of the sea.**

IGME’s influence over the Ministry of Foreign Affairs is not limited to the mining sphere at ISA, but is rather a consequence of the role played by this body during the last decade in the processes of defining Spain’s extended continental shelf proposals. Mr. Luis Somoza was appointed as Scientific Coordinator of the extended shelf project by the Ministry, participating, along with other IGME members, in the

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⁹⁰ https://www.publico.es/ciencias/espana-zarpa-rezagada-oro-submarino.html
⁹¹ https://www.efeverde.com/noticias/mineria-submarina-desaparicion-ecosistemas-catalogacion/
⁹³ https://www.laspuertas/materia/fondos/marineros/rafael-conde/
⁹⁴ https://www.oei.es/historico/divulgacioncientifica/reportajes068.htm
delegations to the UN for the extended continental shelf proposals for the Cantabrian sea, western Galicia and the Canary Islands areas. 96 Four of IGME members who are part of these Spanish UN delegations (Teresa Medialdea Cela, Francisco Javier González Sanz, Ricardo León Buendía and Luis Somoza Losada himself) were co-authors of the 2013 presentation “Potential for deep-sea mining”. 97

In contrast with the explicit positions held by IGME and supported by the Foreign Ministry, other ministerial departments, in particular those responsible for Fisheries and the Environment, have not expressed public positions on the subject, possibly because they have not been included in the discussions of recent years at ISA. All this despite the imminent approval of the ISA “Mining Code” and other relevant international issues such as the binding instrument on marine biodiversity of areas beyond national jurisdiction (BBNJ). 98

Only the Ministry of Defence has publicly organized activities on deep-sea mining, including a research report commissioned in 2018 by the Spanish Institute for Strategic Studies (CESEDEN) as part of the review of its National Maritime Security Strategy;99 or the inclusion in the Naval Thought Forum, organized by the Navy in 2018 under the theme “Marine resources: future trends”,100 of a conference by Luis Somoza on “Interest (fight) for Energy and Mineral Resources in the Oceans”.

The inclusion of deep-sea mining as a component of the European “blue economy” policies has often lead to the inclusion of this activity among national and regional implementation measures, but, currently, without any implication beyond its conceptual normalization. For example, in a 2018 agreement between the Ministry of Industry, Commerce and Tourism and the Autonomous Community of the Canary Islands to finance the activities of the “Operational Strategy for the Internationalization of the Canary Islands Economy 2016-2020)”, the document supported identifying the business opportunities of the Canary Islands in the blue economy sphere, specifically in the sectors of (...) deep-sea mining, among others; within the EU blue growth strategy framework.101 Another example is the “Study on the Blue Economy in the Valencian Community: Situation, potential and definition of bases for its promotion”,102 prepared in 2017 by the Regional Ministry of Finance and Economic Model of the Valencian Government. The study includes deep-sea mining among the main activities of the blue economy in the Valencian Community, albeit concluding that there are no significant deposits off its coasts.

100 https://www.youtube.com/watch?v=A-m7Y3bM3E4
Marine geo-mining research as spearhead

The main boost to deep-sea mining has come from public funding –both from EU and Spanish funding agencies or, occasionally, from other countries– and has been led mainly by public research institutions –including IGME, CSIC and public universities. This section presents the main actors and funders of projects with Spanish participation –in progress or finalized. Most of these projects have the advancement of knowledge on deep-sea mining among their stated purposes, while others focused on geological or oceanographic research have generated collateral contributions.

Projects supported by Spanish research programmes

**EXPLOSEA: Exploration of submarine hydrothermal vents and associated mineralizations and geobio-systems**

- Dates: 2016-2020
- Funding: **160,000 Euros** (Spanish Ministry for Science and Innovation, CTM2016-75947-R)
- Leadership: Instituto Geológico y Minero de España (IGME)
- Web: [http://www.igme.es/explosea/](http://www.igme.es/explosea/)

Project focused on deposits with volcanic/hydrothermal activity, including the Canary Islands. Coordinated by Luis Somoza, research professor at IGME’s Geological Resources Research Department. Its campaigns were carried out from CSIC’s research ship “Sarmiento de Gamboa” and the Spanish Navy’s “Hespérides” Oceanographic Research Vessel. The project’s public outreach materials have emphasized the potential for deep-sea mining in Spanish waters

**SUBVENT: Submarine fluid venting on the continental margins of the Canary Islands and the Gulf of Cádiz**

- Dates: 01/01/2013-31/12/2016
- Funding: **171,990 Euros** (Spanish Ministry for Science and Innovation, CGL2012-39524-C02)
- Leadership: Instituto Español de Oceanografía and Instituto Geológico y Minero de España

Project focused on the study of fluid emissions related to the presence of hydrocarbon, hydrothermal or magmatic deposits. Developed in deep waters of the Gulf of Cádiz and the Canary Islands. Interest in fluid emissions is related to their role in the production of “important mineralizations”. The use of a remotely operated submersible (ROV), the “Luso”, through a cooperation agreement with Portugal, allowed the discovery of new deposits to the west and southwest of the Canary Islands. This information was incorporated into the EMODnet-Geology cartography.

Projects supported by third country research programmes

**MarineE-tech: Marine ferromanganese deposits-a major resource of E-tech elements**

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This British-Brazilian project is coordinated by the UK National Oceanography Centre (NOC) and the British Geological Survey aimed at the study of ferromanganese deposits to enable the extraction of metals with technological applications. The project has two study areas: one in the Northwest Atlantic, with expeditions to Mount Tropic and the Madeira-Tore complex; and another area off the coast of São Paulo (Brazil). The project is co-funded by UK Research and Innovation, the UK Department for Business, Energy and Industrial Strategy (Newton Fund) and the State of São Paulo.

Although no Spanish institution is part of the project, IGME signed in 2016 a Memorandum of Collaboration with the NOC for marine geological research, including the exploration of mineral resources, and participation in joint campaigns such as the upcoming JC142 expedition. As a result of this agreement, IGME participated as a guest in expedition “JC142” on board the British research ship “James Cook”, exploring the Mount Tropic area between October 29 and December 8, 2016. 400 mineral samples of crusts and ferromanganese nodules, phosphorites and volcanic rocks were taken using an unmanned mini-submarine.

The NOC requested a research permit from the Ministry of Foreign Affairs and Cooperation to work on the Spanish continental shelf beyond 200 nautical miles, which was granted before the study.

Projects supported by European Union programmes

EU policies on “critical raw materials” have prioritized research initiatives and projects that advance data and technologies for extractivism. The EU’s Blue Growth and Blue Economy Strategy lists deep-sea mining as one of 5 new priority areas, while documents on “International Ocean Governance” indicate that the European Commission intends to continue supporting deep-sea mining. Several R&D funding programmes have included specific objectives to promote deep-sea mining.

Although the recent European Commission “Biodiversity Strategy for 2030” makes an appeal for the EU to defend a moratorium on deep-sea mining in international waters until its impacts are well known, the same document states that the EU will continue to finance environmentally friendly technologies for deep-sea mining.

Although several projects financed by Member States are indirectly financed by EU funds (i.e., 70% of SUBVENT by ERDF funds), the projects in this section include those that have been the subject of direct calls: Horizon 2020 and the 7th Framework Program (FP7), European Maritime and Fisheries Fund, etc. Practically all European projects on deep-sea mining have had the participation of Spanish partners.

108 http://www.congreso.es/l12p/e3/e_0038926_n_000.pdf
111 https://ec.europa.eu/environment/nature/biodiversity/strategy/index_en.htm
EMODnet-Geology: Marine Minerals

- Dates: since 2009 to present
- Funding: 925.00 Euros (2009-2012); 4,200,000 Euros (2013-2016); unknown (2017-2019); unknown (2019-), several agencies, including European Maritime and Fisheries Fund
- Leadership (in Spain): IGME
- Web: https://www.emodnet-geology.eu/

EMODnet-Geology is a project financed by a service contract from the European Agency for Small and Medium-Sized Enterprises (EASME) and a consortium of geomining research institutes from various European countries (EuroGeoSurveys, which includes IGME). The project has been carried out since 2009 with funding from different programmes and more recently from the European Maritime and Fisheries Fund (EMFF) for 2014-2020 (DG MARE) and renewed in 2019. One of its working groups focuses on “Marine Minerals” and is led by Geological Survey Ireland, with the active participation of IGME. Within this project, in 2015, the “First catalogue of submarine mineralizations in Spain” was launched, while the GeoERA MINEDeSEA project, led by IGME (see below), started off from the data generated at the EMODnet-Geology marine minerals programme.

MINEDeSEA: Seabed Mineral Deposits in European Seas: Metallogeny and Geological Potential for Strategic and Critical Raw Materials

- Dates: 1/01/2017-31/12/2021
- Funding: 783,285 Euros (232,636 from UE – Horizon 2020)
- Leadership: Instituto Geológico y Minero de España (IGME)
- Other Spanish participants: Instituto de Geociencias (CSIC-UCM)
- Web: https://geoeramindesea.wixsite.com/mindesea/ | https://twitter.com/MINDeSEA
- Cordis: https://cordis.europa.eu/project/id/731166

This is a subproject partially carried out within a Horizon 2020-funded project formed around a partnership of European geomining research institutes (“GeoERA: Establishing the European Geological Surveys Research Area to deliver to the Geological Service for Europe”) with a budget of 30 million euros, of which 10 million come from EU funds. The GeoERA project involved financing 15 European collaborative geomining research subprojects, including MINEDeSEA. The project is led by Francisco Javier González (IGME) and seeks to identify and map the main potential areas for deep-sea mining, and to influence national and European legislators by developing “publicly acceptable” ways for the exploration, exploitation and use of deep-sea mineral resources.

Blue Nodules: Breakthrough Solutions for the Sustainable Harvesting and Processing of Deep Sea Polymetallic Nodules

- Dates: 01/02/2016-31/07/2020
- Funding: 7,991,137.5 Euros (Horizon 2020)
- Leadership: IHC Mining BV (The Netherlands)
- Spanish participants: Universitat Politècnica de Catalunya (Lab. de Aplicaciones Bioacústicas)
- Web: https://blue-nodules.eu/
- Cordis: https://cordis.europa.eu/project/id/688975

This project focuses on polymetallic nodules, developing a system to extract 2 million tons per year at depths of up to 6,000 meters. Led by IHC—a Dutch specialized in offshore resources, with interests in nodules exploration in the Pacific—the project developed an underwater vehicle (Apollo II) that was
tested in the Alborán Sea from the “Sarmiento de Gamboa” research vessel.\textsuperscript{112} The Minister of Science, Innovation and Universities visited the ship before leaving for the last test expedition in 2019.\textsuperscript{113}

¡VAMOS!: ¡Viable and Alternative Mine Operating System!

- Dates: 01/12/2015-31/01/2020
- Funding: 9.200.000 Euros (Horizon 2020)
- Leadership: BMT Group Limited (UK)
- Spanish participants: La Palma Research Centre for Future Studies SL
- Web: https://www.vamos-project.eu/
- Cordis: https://cordis.europa.eu/project/id/642477

This project aims at developing a prototype of a robotic vehicle for underwater mining. The proposed technology is applicable to both flooded areas –i.e., former open-pit mines– and coastal areas, but with similar characteristics to technologies used for deep-sea mining. The project included the La Palma Research Center, which defines itself as a geoscience ideas laboratory.

**ROBUST: Robotic subsea exploration technologies**

- Dates: 01/12/2015-31/01/2020
- Funding: 5.986.722,5 Euros (Horizon 2020)
- Leadership: TWI Limited (UK)
- Spanish participants: Coronis Computing SL (a Universitat de Girona spin-off), Median SCP, Median Sustainability SL
- Web: http://eu-robust.eu/
- Cordis: https://cordis.europa.eu/project/id/690416

A project for the development of mapping technologies for deep-sea mineral deposits. The Spanish contribution focuses on underwater 3D mapping. A prototype was presented in Girona during the EMRA’17 European Seminar (Workshop on EU-Funded Marine Robotics and Applications).

**MIDAS: Managing Impacts of Deep-sea Resource Exploitation**

- Dates: 01/11/2013-31/10/2016
- Funding: 12.349.937,79 Euros (UE: 8.997.112 Euros, FP7)
- Leadership: Seascapes Consultants Limited (UK)
- Spanish participants: Universitat de Barcelona, Coronis Computing SL (a Universitat de Girona spin-off), Median SCP, Median Sustainability SL
- Web: https://www.eu-midas.net/
- Cordis: https://cordis.europa.eu/project/id/603418/

This project was aimed to assessing the impacts of deep-sea ‘sustainable’ mining, develop good practices guidelines for the industry and advance regulatory legislation. Among its research test sites were the island of El Hierro (Canary Islands) and the bay of Portmán (Murcia).

**DS\textsuperscript{3}F: Deep Sea and Sub-Seafloor Frontier**

- Dates: 1/01/2010-30/06/2012
- Funding: 1.139.188,78 Euros (UE: 1.000.000 Euros, FP7)
- Leadership: Universitaet Bremen (Germany)

\textsuperscript{112} https://blue-nodules.eu/second-blue-nodules-field-trial-succesfully-accomplised/
This project focused on seabed sampling and prospecting. Although not focused on deep-sea mining, its final document\(^{114}\) dedicates a section to mining and calls for a European strategy for the exploration of deep-sea mineral resources that increases scientific, industrial and logistical capacities.

**Blue Atlantis: Innovative Mining of Marine Mineral Resources**
- Dates: 01/04/2015-31/03/2020
- Funding: Unknown
- Leadership: Working Group Marine Mineral Resources (Germany)
- Spanish participants: Fundación CIDAUT and Fundación FIDAMC

This project proposed to create a testing area for deep-sea mining in the vicinity of the Azores archipelago. It has the support of the “European Innovation Partnership on Raw Materials” but the sources of funding have not been publicized. Among other activities, it includes a line to work on issues of “acceptability and public perception” of deep-sea mining. It is associated with two other projects, with matching partners: ALBATROSS and SeaFlores.

**ALBATROSS: Alternative Blue Advanced Technologies for Research on Seafloor Sulfides**
- Dates: 01/01/2015-31/12/2020
- Funding: Unknown
- Leadership: ERAMET SA (France)
- Spanish participants: Fundación CIDAUT and Fundación FIDAMC
- Web: https://ec.europa.eu/growth/node/28263

A geomining research project in three massive sulphide deposits located in the exclusive economic zone of Wallis and Futuna, a French overseas community in the Pacific Ocean. It is associated with the SeaFlores project, which would focus on demonstration of extraction technologies.

**SeaFlores: Breakthrough Solutions for Seafloor Mineral Extraction and Processing in deep water environment**
- Dates: 01/01/2015-31/12/2025
- Funding: Unknown
- Leadership: Technip (France)
- Spanish participants: Fundación CIDAUT and Fundación FIDAMC
- Web: https://ec.europa.eu/growth/content/breakthrough-solutions-seafloor-mineral-extraction-and-processing-deep-water-environment_en

A complementary project to the two previous ones, seeking to create a generic design and a pilot demonstration experience of a system for the extraction of massive sulphides.

Alternatives and proposals

Necessary destruction?
Less than a decade ago, the United Nations Environment Program had anticipated that this year, in 2020, 5% of mineral raw materials—including cobalt, copper and zinc—would come from the seabed, and that in 2030 the amount would be 10%.

Although the prediction has not been fulfilled, it illustrates a narrative that continues to drive increasing public and private investment in deep-sea mining, in line with a speculative financialisation of extractivist prophecies that turns a blind eye on the irreversible impacts that such activities would entail. From the point of view of international law, underwater mining could only be allowed if it can benefit humanity. We already know it won’t.

Deep-sea mining is literally a “race to the bottom”: a new green and blue Eldorado in which financial conglomerates can continue with the excesses that have devastated and polluted large areas of land and where, finally, destruction will be removed far away from public scrutiny. In the short term, deep-sea mining could possibly conceal its environmental and economic impacts, but the magnitudes of its future consequences at a planetary scale are unpredictable.

For decades, the scenario of exploiting the minerals on the ocean floor has been something like a self-fulfilling prophecy: the hypothetical possibility of exploitation (and destruction) of some of the most delicate and inaccessible areas on the planet seems to have led us inexorably towards the materialization of such hypothesis. The hypothetical horizon of deep-sea mining has pushed technical ingenuity to the limit, demonstrating human capacity to find solutions to the most difficult problems—even those that should never have arisen. The advanced state of the “Solwara” project, in Papua New Guinea waters, shows that deep-sea mining is already possible. But is it desirable? It is necessary?

In contrast with the determined commitment and financial support that these extreme challenges benefit from, other prophecies in the process of fulfilment—such as the inevitable peak of production of certain minerals, with or without deep-sea mining—have not moved us to use this same ingenuity and adaptation capacity to seek and implement real solutions to our raw material supply problems. Such solutions would not only turn the destruction of the seabed unnecessary, but would likely end the profusion of new and larger onshore low cost mining projects.

Alternatives to deep-sea mining
A number of explorable and applicable alternatives would make the consideration of deep-sea mining as an option for raw materials supply unnecessary. Among these, the following can be highlighted:

→ A firm commitment to circular economy, drastically reducing the demand for primary raw materials, particularly metals.

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Establish policies and regulations for the mandatory recycling of waste with metallic contents (among others). Currently, recycling rates for lithium, tellurium and rare earths is under 1%, rates for copper are between 43-53%, those for nickel between 57-63% and for cobalt 68%. It is irrational to even contemplate— and justify— deep-sea extraction of materials that are discarded by millions of tons every year without any effort to recycle them.

Promote urban mining. Extracting metals such as copper or gold from electronic waste can be up to 13 times cheaper than extracting them from a conventional onshore mine, and even more so when compared to a hypothetical offshore deep-sea operation. It is irrational to promote deep-sea mining before all discarded metals have been reprocessed from landfills, mining sludge deposits and elsewhere.

Support the logistic and regulatory infrastructure for effective recycling, shifting for this purpose all the public funding currently spent on the mining industry.

Ban and penalize planned obsolescence and forms of consumption that promote perceived obsolescence, promoting the design and production of goods with a long lifespan and easy and guaranteed reparationability throughout it (durable goods vs. consumer goods).

Take measures towards degrowth, reducing pathological consumption patterns.

Establish standards to ensure that the design of products with metal content facilitates the recycling or reuse of these components at the end of their lifespan; and to ensure that their recycling or reuse is carried out, including the establishment of deposit-refund measures.

Support R&D on alternative techniques for obtaining metals, including phytomining – extraction in polluted soils through hyperaccumulator plants– and other processes to obtain metals from polluted water. It is irrational to create new problems —such as those that deep-sea mining would generate— without solving existing ones first. Degraded soils, waste deposits—including mine tailings dams, with high metal contents and catastrophic risks of failure— and the presence of metals in rivers and seas are problems that can be transformed into solutions.

Promote measures aimed at drastically reducing the use and need for cars— combustion or electric— as they generate a high demand for raw materials. Measures should include the promotion of public transport, the use of bicycles and other alternative forms of transport, vehicle sharing systems, etc.

Promote R&D on technologies that do not depend on materials with high metal contents, such as hydrogen cells and hybrid ion capacitors.

Proposals for transparency, participation and good governance in international waters

Based on current scientific knowledge and the precautionary principle, Spain must push for a moratorium on deep-sea mining in international waters until the evidence on environmental...
impacts is known. Consistent with this position, it should adopt (by Royal Decree) a moratorium in its jurisdictional waters communicating it to ISA Member States.

- Spanish participation at the ISA must be governed by transparency, balanced participation and good governance, ending more than a decade in which Spanish positions have been conditioned by IGME representatives who have promoted deep-sea mining minimizing its environmental consequences.

- Spain must guarantee the participation of experts on environmental impacts of deep-sea mining in the delegations to ISA General Assemblies, as well as in the Legal and Technical Committee. In 2020 Spain must nominate a member for the period 2021-2025. After more than a decade and a half of IGME monopoly in this body, another body that allows a balanced contribution to the deliberations should take up this position –for example, the IEO, with extensive experience in the areas of competence of the Committee.

- The Government must facilitate the participation of social organizations, both environmental and of the fishing and tourism sectors, as observers in ISA and provide transparency in regards to the documentation generated as part of Spain’s participation in its bodies.

- Spain must promote a debate on the governance and management of conflicts of interest within ISA, ensuring the impartiality and rigor of environmental monitoring and compliance with imposed rules and conditions.

- Spain must support guarantees for transparency and participation in future ISA mining regulations, including open-access Remote Electronic Monitoring by means of live streaming of images and sensor data in all research operations and, eventually, deep-sea mining operations, enabling its control by civil society and by competent authorities alike.

Proposals on deep-sea mining in Spanish jurisdictional waters

- Enforcement of a moratorium on deep-sea mining in Spanish jurisdictional waters by Royal Decree or other legal instrument.

- End public funding of research projects focused on deep-sea mining –beyond the geological study of the seabed–, stop the participation of public bodies in deep-sea mining research projects, ban the use of State owned oceanographic research vessels for such projects, and end all authorizations for deep-sea mining research by vessels from other countries in Spanish jurisdictional waters.

- Modification of the Mining Law of 1973 and its associated regulations to prevent this law to be used to permit deep-sea mining or exploration in the future, so that any such operation would require a specific and distinct legal framework from that of on-shore operations.

- Adapt the regulations on environmental impact assessment to ensure that any scientific research activity, research permits and, eventually, deep-sea mining operations must undergo an environmental impact assessment.

- Establish legal prohibition of extractive activities, including deep-sea mining and oil or gas rigs in protected marine areas, particularly in areas within the network of marine protected areas (RAMPE) and marine Special Conservation Areas and Sites of Community Importance within the Spanish Exclusive Economic Zone –and on Spain’s future extended continental shelf.

- Declaration of Las Abuelas de Canarias, Galicia Bank and Cantabria Knoll seamount areas as Marine Protected Areas considering their ecological importance, following the precedent of El Cachuchu.
Conclusions
Instead of opening a new frontier of industrial mining in deep waters, encouraging speculative investments and the extractive sector, efforts should be directed towards the transition towards a circular model of production, consumption and reuse of raw materials that is socially and environmentally responsible, and include the transition to an economy with lower demand for raw materials that is driven by renewable energy with renewable materials.

Rather than supporting and investing in scientific projects to find materials that can be exploited on the seabed, the focus should be on scientific research on the biological and geological richness of deep waters and their valuable ecosystems. The destruction of the seabed would breach international obligations that ensure the protection of the marine environment for the benefit of humanity as a whole.

Far from taking for granted the non-existence of habitats and ecosystems in deep waters, each time a new study is carried out, the richness and vulnerability of these habitats are stressed in relation to the scale and characteristics of the kind of extractive practices that are being proposed. We lack information to carry out a comprehensive environmental impact assessment and, in addition, continuing issues with ISA governance as a regulatory body have been raised. All this clearly highlights that a moratorium on deep-sea mining is essential.