B.O.A. NETWORK
Bio energy Oasis network for the Adriatic park.

Casal Borsetti. A recasted post oil system, the new sustainable land-water bio-energy network.

Politecnico di Milano, Piacenza Scuola , di Architettura e Societa'
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ABSTRACT

“A sea of energy”.
That what the Mediterranean Sea is, for now, not only thanks to its 3.75 billion liters of water in motion, with the hundreds
species of fish, shellfish, birds and marine plants that represent the Mediterranean heritage of marine biodiversity, but also for what lives below and above it: gas, oil and platforms.

From the last decades it occurs a progressive abandonment of the primary industrial activities (iron, chemical, mining, industries, etc.). All of that is because of the processes and the changes taking place in the sector of productive activity, caused by the oil world crisis and by a greater global awareness about pollution.

This process has made the availability of the large areas and the lots of the facilities are no longer used for hosting the equipment production that have been closed, localized in the areas with a strategic value for the development of the territory or relocated to the

areas far from the urban centers and the unknowns.
The regeneration of these areas is a topic of a great interest and importance, for obvious consequence for economical and social aspects, representing unavailable opportunities for a sustainable urban development.

From this framework the thesis work for a reconnaissance survey of the mining facilities and disposal of the different intervention strategies that are applied for their recovery. The vocation is to protect marine biodiversity and exposing new strategies for sustainable bioenergy, through the transformation of the system that includes the mining area of the offshore platforms and the integration of the large coastal parks where the gas-terminal are located.

From a global view, the focus is on the Mediterranean Sea, particularly in the Italian Adriatic shore where are located 122 platforms (136 throughout Italy) divided into systems which are connected each to its own reference pipeline, through which is transmitted the gas extracted in 10 harvest terminals and gas treatment (12 throughout Italy).

The thesis project refers to the ENI (Ente Nazionale Idrocarburi) POSEIDON program (in collaboration with CNR, ISMAR (Institute of Marine Sciences and the Foundation CETACEA.), a marine park project that targets the recasting, for scientific and public purposes, of disused offshore structures, but unlike it, that is focusing attention only on the platforms, the research integrates the relation between the terminal and platform, in a view of the regeneration of both the marine area that coastal.

The strategy identifies a system of platforms and power plants that repeats along the Adriatic coast and can activate a wide scale regeneration.
The section on which we focus is located at the level of the Po Delta, in the Valleys of Comacchio, north of Ravenna.

The structures chosen for the thesis research are a gas treatment plant in the town of Casal Borsetti, and 3 platforms that are part of the “Garibaldi A Cluster” in the Adriatic Sea.

B.O.A. NETWORK (Bio energy Oasis network for the Adriatic park) consist of the recasting and revamping of the old fossil plants in exhibition centers of research and development for sustainable bio-energy, connected with the land and marine environmental tourist infrastructure, to establish a functional communication relationship between visitors, workers and users of the park system.

SHEETS INDEX:

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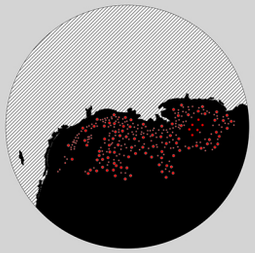
CANADA

LOCATION:
Off the coast of Newfoundland, Sable Island fields off the coast of Nova Scotia, Laurentian fan, Northumberland Strait

ENVIRONMENTAL ISSUE:
07.2000. Oil spill in the Gulf.
01.2000. Guanabara Bay oil spill
1988. Explosion and oil spill of Odissey tank.
15.02.1982. Ocean Ranger oil rig disaster
03.1975. Guanabara Bay biggest oil spill

STATE OF THE ART:
Extensive drilling was done in the Canadian Arctic during the 1970s and 1980s and all the wells which had been drilled were plugged and abandoned. From February 8 2016,
public fundings starting to facilitate the decommissioning for about 1,000 inactive wells in Saskatchewan (AWCP).

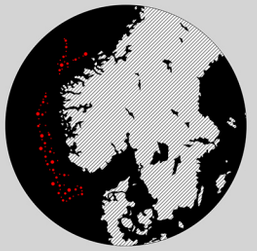


U.S.A.

LOCATION:
Gulf of Alaska, California, Gulf of Mexico, East Coast, Pacific Northwest Coast, Great Lakes

ENVIRONMENTAL ISSUE:
15.02.1982. Capsizing of Ocean Ranger oil drilling rig.
21.05.2015. Oil spill in Santa Barbara coast.
04.07.2011. Oil spill in Yellowstone river.
04.08.2010. Oil spill and fire in the Deepwater Horizon oil platform.

STATE OF THE ART:
Many environmentalists oppose new offshore drilling in both the Atlantic and the Arctic. Nowaday Gulf of Mexico are full of abandoned rigs that are threatin the environment.The question of how to decommission started with the California's offshore oil platforms example."Rigs to reefs", obtained the support of almost all stakeholders, including oil companies and environmentalists. A law to enable this option was passed by the California State house almost unanimously, and signed by Governor Arnold Schwarzenegger.

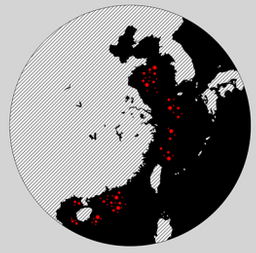


NORWAY

LOCATION:
The Barents Sea,The Norwegian Sea, The North Sea.

ENVIRONMENTAL ISSUE:
012.12.2007 Oil spill from Statfjord platform
27.03.1980. Capszing of Alexander L. Kielland, semi-submersible drilling rig.

STATE OF THE ART:
Excluding subsea steel, there are 715 installations in the North Sea. Only 12% of North Sea installations have been decommissioned to date, reflecting the nascent nature of the decommissioning market. The most common method for removing facilities from the Norwegian shelf is to dismantle them and transport them to land. New technology is being developed to make the work more cost-effective.

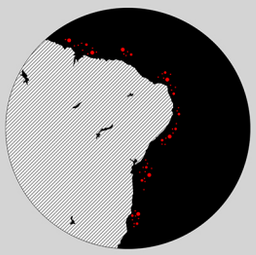


CHINA

LOCATION:
Yellow sea, East China Sea, South China Sea

ENVIRONMENTAL ISSUE:
04.06.2011. Oil spill in Bohai Bay.
19.07.2010. Fires in the port of Dalian.
20.01.2006. Gas Pipeline Explosion in Sichuan.
23.12.2003. Gas Leak in Chongqing.

STATE OF THE ART:
There's no Regional Sea Agreement for decommissioning in the China's sea. The societies and the university are studying the best way for decommissioning those structure and they are asking to themselfelf if it's better for different type of platform if it's better a total removal for kind of platform or the Reeg-to-reefs concept that allow the marine biodiversity that grow on it to survive.



BRAZIL

LOCATION:
Bacia de Santos, Bacia de Campos, Bacia de Espirito Santo.

ENVIRONMENTAL ISSUE:
07.2000. Oil spill in the Gulf.
01.2000. Oil spill in Guanabara Bay.
08,1984. Explosion of Enchova Central Platform.
03.1975. Oil spill in Guanabara Bay.

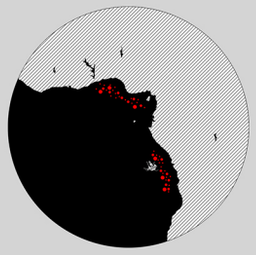
STATE OF THE ART:
In mid-April 2013, there were 122 offshore drilling rigs in Brazil, including 29 under construction and 93 others. Only 5% of the offshore platforms installed in Brazil have been completely removed until now. Many platform structures are reaching, or already exceeding, their project service life, 20 to 30 years on average.

U.K.

LOCATION:
West of Shetland, Morecambe Bay, North Sea

ENVIRONMENTAL ISSUE:
06.07.1988. Piper Alpha gas explosion.
13.08.2011. Oil spill from Gannet Alpha platform

STATE OF THE ART:
98% of production of fossil energy comes from offshore fields. Only installations that fulfil certain criteria (on the grounds of safety and/or technical limitations) are eligible to be leaved in place on the seabed. All other installations must be totally removed from the seabed.
During the next two decades, the industry will begin to decommission many of the installations that have been producing oil and gas for the past forty years. There are approximately 470 installations to be decommissioned.



NIGERIA

LOCATION:
Gulf of Guinea.

ENVIRONMENTAL ISSUE:
Oil spills in Nigeria are a common occurrence from 1958
12.01.1998. Oil spill from Mobil Idoho Plantorm.

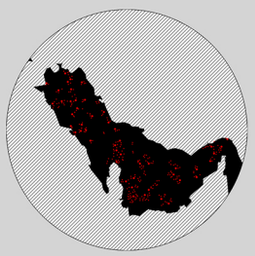
STATE OF THE ART:
Oil companies in Africa consider offshore production as an alternative area of production. The legal decommissioning options for the rigs are to be partial removed, leaved in place, totally removed, or toppling in place.

TUNISIA

LOCATION:
Goulf of Gabes, Medhit Permit, Mediterannean Sea. Complex : El Borma, Ashtart, Sidi el Kilani, Ouedna, Adam and Didon.

ENVIRONMENTAL ISSUE:
14.03.2016. Oil spill from Petrofac rig (UK) near the Kerkennah Islands

STATE OF THE ART:
In 2013 the Tunisian government and Eni start to project a Transmed gas pipeline that crosses Tunisia for 300 kilometres and reaches Mazara del Vallo in Italy. For the future of fossil energy in tunisia there is no social reaction against the platforms working but only after the United Nation meeting, Tunisia promised that it will work to decrease the production of the gas to 41% until 2030 and substitute into the clean energy.

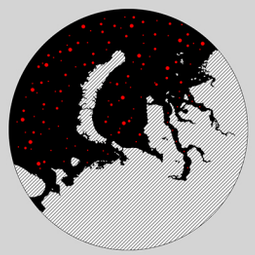


UNITED ARAB EMIRATES

LOCATION:
Sakhalin, Caspian Sea, Baltic Sea, Arctic Sea.

ENVIRONMENTAL ISSUE:
14.06.2013.Oil spill on the UAE's east coast.
1991 The Gulf War oil spill.

STATE OF THE ART:
1.137
offshore rigs till 2010.
In accordance with a number of regional and international regulations, these structures will have to be decommissioned and removed. Over the next 10-20 years, an average of 15-25 installations are expected to be abandoned annually.

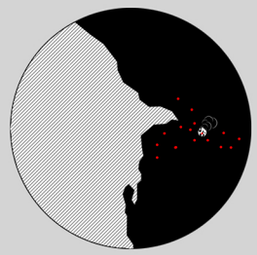


RUSSIA

LOCATION:
Sakhalin, Caspian Sea, Baltic Sea, Arctic Sea.

ENVIRONMENTAL ISSUE:
21.08.2009. Oil spills in the Komi Republic.

STATE OF THE ART:
The demand for new rigs is expected to reach a five year high of 105 units this year, yet at the same time old rigs are being decommissioned at a rate of more than 400 a year. Russia is set to experience a real squeeze on capacity.



AZERBAIJAN

LOCATION:
Caspian Sea.

ENVIRONMENTAL ISSUE:
05.12.2015. Fire on Guneshli platform.

STATE OF THE ART:
Petroleum industry is the most important energy sector of local economy. Oil is produced on-shore and off-shore thansk the many platform in the Caspian Sea. To increase fossil fuel export, develcpers are focusing on alternative energy, like the first offshore wind power project.

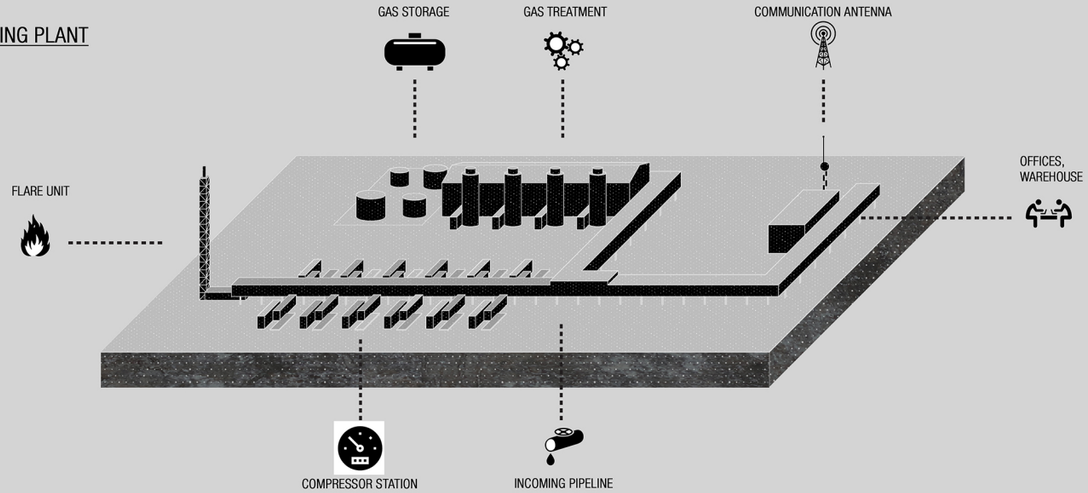
AUSTRALIA

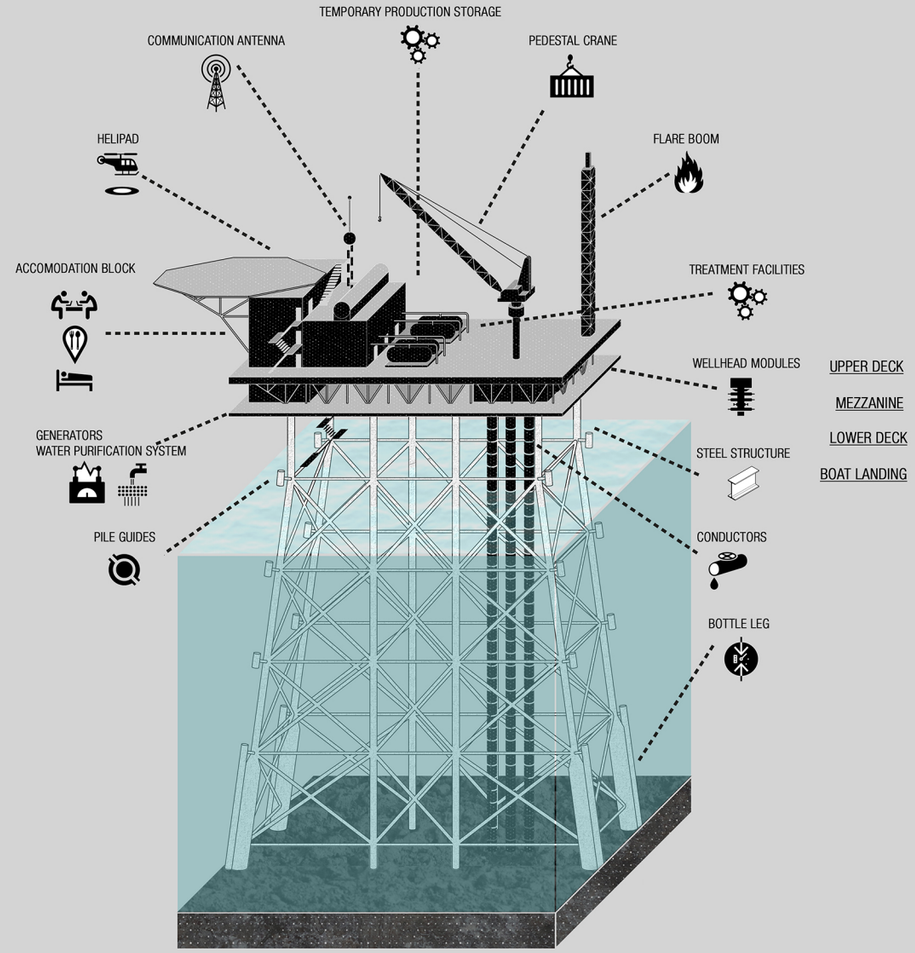
LOCATION:
Bonaparte Basin, Browse Basin, Carnarvon Basin, Perth Basin, Otway Basin, Bass Basin.

ENVIRONMENTAL ISSUE:
21.08.2009. Oil spill in the Montara oil field in the Timor Sea

STATE OF THE ART:
In the next 25 years it is estimated that 100 offshore oil production installations will need to be decommissioned in Australia. A recent online article in the Sydney Morning Herald explored Rigs to Reefs as a solution for Australia's offshore infrastructure.

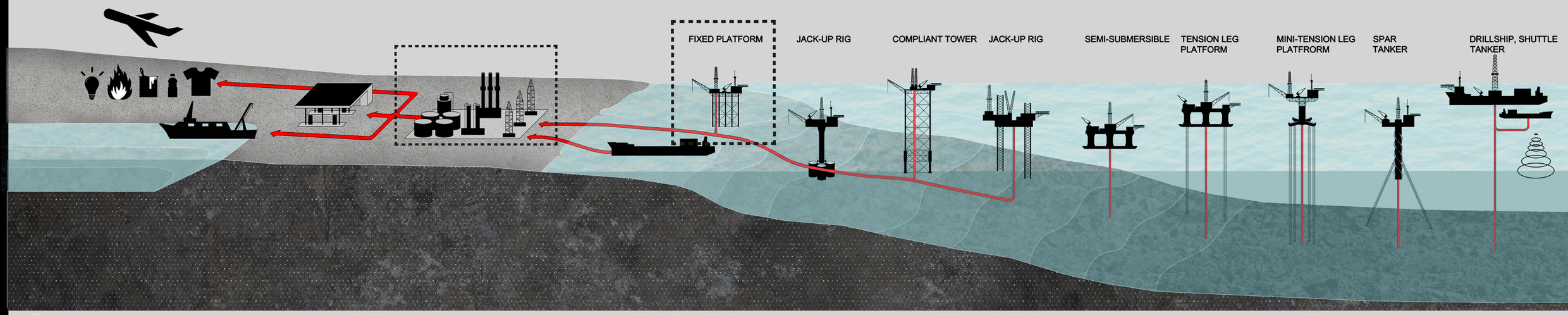
GAS PROCESSING PLANT





GAS PLATFORM

NATURAL GAS PRODUCTION SYSTEM



MARKETING

Fuel for transportation, energy for heating and lighting,
lubricants for machines, petrochemicals required to make a variety of daily items.

MANUFACTURING

Refining, processing and blending hydrocarbons to make fuel, lubricants and petrochemicals.

TRANSPORTING AND TRADING

Moving hydrocarbons using pipelines, ships, truck and trains.

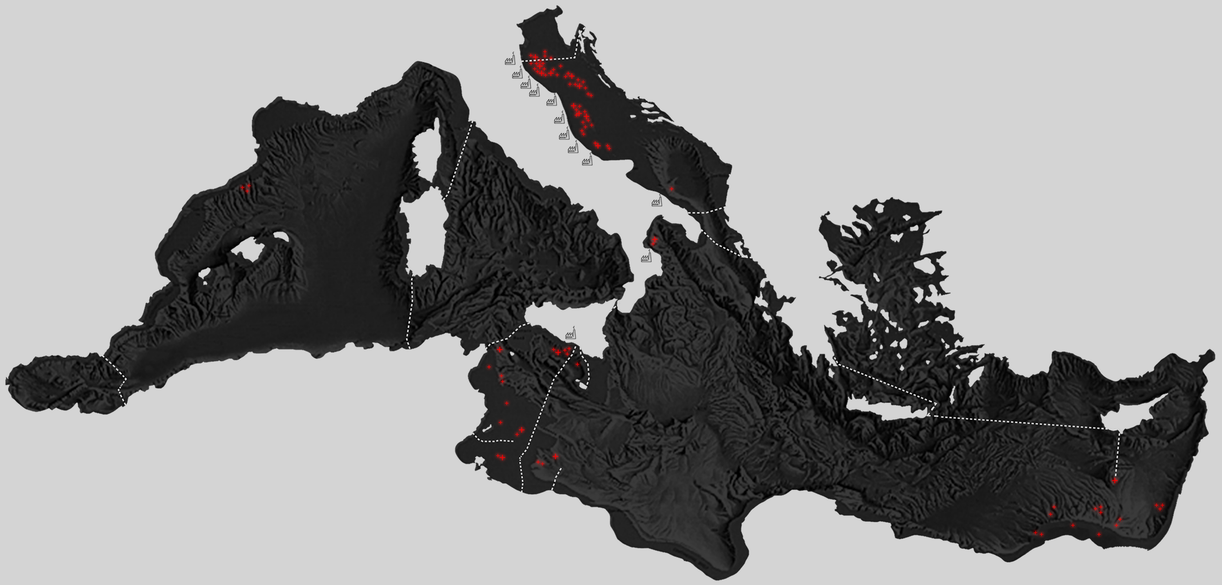
DEVELOPING AND EXTRACTING

Once the hydrocarbons has been found, the rigs work to bring them to the surface

FINDING

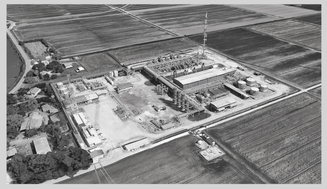
First, there's the acquiring exploration rights, than there's the searching for hydrocarbons beneath the earth's surface.

THE MEDITERRANEAN RIGS SYSTEM



Garibaldi A Cluster

Location : Zona Marina
Coast distance : 17 km
Grant date : 13/9/1970
Expiration date : 14/9/2015
Grant surface : 152.94 kmq
Operator : ENI
Mineral : GAS
Coordinate : 44.523727, 12.51205
Installaizon year : 1991
Heigh (sim) : 32 m
Sea depth : 24 m
Dimension : 11 x 11 m
Harbourmaster : Ravenna
Typology : Cluster
Power station : Casalborsetti
Connected Wells : 3



Porto Corsini MWT/A

Location : Zona Marina
Coast distance : 8 / 7 km
Grant date : 1/1/1987
Expiration date : 1/1/2027
Grant surface : 131.25 kmq
Operator : ENI
Mineral : GAS
Coordinate : 44.51238, 12.359295 / 44.511783, 12.359541
Installaizon year : 1987 / 1968
Heigh (sim) : 54 m
Sea depth : 13 m
Dimension : 23 X 22 / 167 x 27 m
Harbourmaster : Ravenna
Typology : Truss structure with 4 legs
Power station : Casalborsetti
Connected Wells : 0 / 8

Porto Corsini MWC/B

Location : Zona Marina
Coast distance : 8 km
Grant date : 1/1/1987
Expiration date : 1/1/2027
Grant surface : 131.25 kmq
Operator : ENI
Mineral : GAS
Coordinate : 44.508964, 12.372787 / 44.509278, 12.373809
Installaizon year : 1987 / 1968
Heigh (sim) : 54 / 31 m
Sea depth : 14 m
Dimension : 30 x 165 / 90 x 27 m
Harbourmaster : Ravenna
Typology : Truss structure with 8 / 12 legs
Power station : Casalborsetti
Connected Wells : 12 / 8

Garibaldi D

Location : Zona Marina
Coast distance : 18 km
Grant date : 13/9/1970
Expiration date : 14/9/2015
Grant surface : 152.94 kmq
Operator : ENI
Mineral : GAS
Coordinate : 44.478183, 12.546062
Installaizon year : 1993
Heigh (sim) : 30 m
Sea depth : 25 m
Dimension : 37 x 21 m
Harbourmaster : Ravenna
Typology : Truss structure with 8 legs
Power station : Casalborsetti
Connected Wells : 12

Garibaldi C/K

Location : Zona Marina
Coast distance : 18 km
Grant date : 13/9/1970
Expiration date : 14/9/2015
Grant surface : 152.94 kmq
Operator : ENI
Mineral : GAS
Coordinate : 44.531601, 12.51528 / 44.532077, 12.516137
Installaizon year : 1992 / 1998
Heigh (sim) : 62 / 80 m
Sea depth : 25 m
Dimension : 48 x 26 / 29 x 31 m
Harbourmaster : Ravenna
Typology : Truss structure with 8 / 4 legs
Power station : Casalborsetti
Connected Wells : 12 / 0

Agostino A

Location : Zona Marina
Coast distance : 17 km
Grant date : 3/12/1970
Expiration date : 3/12/2015
Grant surface : 23.48 kmq
Operator : ENI
Mineral : GAS
Coordinate : 44.54018, 12.495518
Installaizon year : 1970
Heigh (sim) : 50 m
Sea depth : 23 m
Dimension : 46 x 22 m
Harbourmaster : Ravenna
Typology : Truss structure with 8 legs
Power station : Casalborsetti
Connected Wells : 12

Agostino C

Location : Zona Marina
Coast distance : 18 km
Grant date : 3/12/1970
Expiration date : 3/12/2015
Grant surface : 23.48 kmq
Operator : ENI
Mineral : GAS
Coordinate : 44.547174, 12.494523
Installaizon year : 1992
Heigh (sim) : 56 m
Sea depth : 25 m
Dimension : 51 x 26 m
Harbourmaster : Ravenna
Typology : Truss structure with 8 legs
Power station : Casalborsetti
Connected Wells : 12

Garibaldi B

Location : Zona Marina
Coast distance : 18 km
Grant date : 13/9/1970
Expiration date : 14/9/2015
Grant surface : 152.94 kmq
Operator : ENI
Mineral : GAS
Coordinate : 44.487009, 12.531292
Installaizon year : 1993
Heigh (sim) : 50 m
Sea depth : 26 m
Dimension : 46 x 22 m
Harbourmaster : Ravenna
Typology : Truss structure with 8 legs
Power station : Casalborsetti
Connected Wells : 13

Agostino A Cluster

Location : Zona Marina
Coast distance : 17 km
Grant date : 3/12/1970
Expiration date : 3/12/2015
Grant surface : 23.48 kmq
Operator : ENI
Mineral : GAS
Coordinate : 44.540685, 12.496197
Installaizon year : 1991
Heigh (sim) : 32 m
Sea depth : 24 m
Dimension : 11 x 11 m
Harbourmaster : Ravenna
Typology : Cluster
Power station : Casalborsetti
Connected Wells : 3

Agostino B

Location : Zona Marina
Coast distance : 15 km
Grant date : 3/12/1970
Expiration date : 3/12/2015
Grant surface : 23.48 kmq
Operator : ENI
Mineral : GAS
Coordinate : 44.554372, 12.471569
Installaizon year : 1971
Heigh (sim) : 50 m
Sea depth : 22 m
Dimension : 46 x 22 m
Harbourmaster : Ravenna
Typology : Truss structure with 8 legs
Power station : Casalborsetti
Connected Wells : 11

ITALY

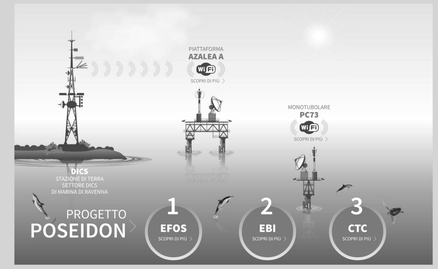
LOCATION:
Adriatic Sea, Ionian Sea, Strait of Sicily

ENVIRONMENTAL ISSUE:
1992. Explosion and oil spill of Haven Tanker in Genoa.
10.04.1991. Collision of AGIP ABRUZZO tanker and Moby Prince Ferry.
29.09.1965. Capsizing and explosion of Paguro platform.

STATE OF THE ART:
During th Referendum in 2017 81% of the votants made understand the wanted of going out to drill in the italians seas, but wasn't reach the quorum and the government want will continue to invest on those resources.
The decommissioning options are: Leave-in-Place Option, Partial Removal Option, Topple-in-Place Option, Complete Removal Option, In-Situ Complete Removal, Complete Removal/Jacket Hopping.

POSEIDON ENI PROJECT

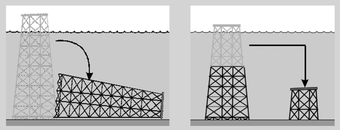
Poseidon will be the **first marine park** project in Europe to **reuse**, for **scientific** and **public** purposes, **disused offshore structures**; the first in terms of high technological content, location and widespread reception and transmission of marine environmental data. Poseidon is divided into three interrelated sub-projects: EFOS, EBI and CTC, dedicated respectively to **signal transmission**, to the **monitoring** of marine flora passing through sonar systems, and to the collection and study of signals sent from **animals** carrying two-way transmitters.



PARTIAL REMOVAL

"REEG-TO-REEF"

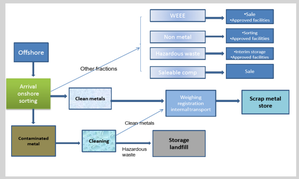
The platforms are massive structures that are now encrusted with marine organisms, providing a rich habitat for economically valuable rock fish. They have become popular with sea lions, recreational human divers, and many other marine life forms. Removal would be costly, likely over a billion dollars, and have substantial environmental impacts, including emissions to air and water, as well as destruction of this habitat.

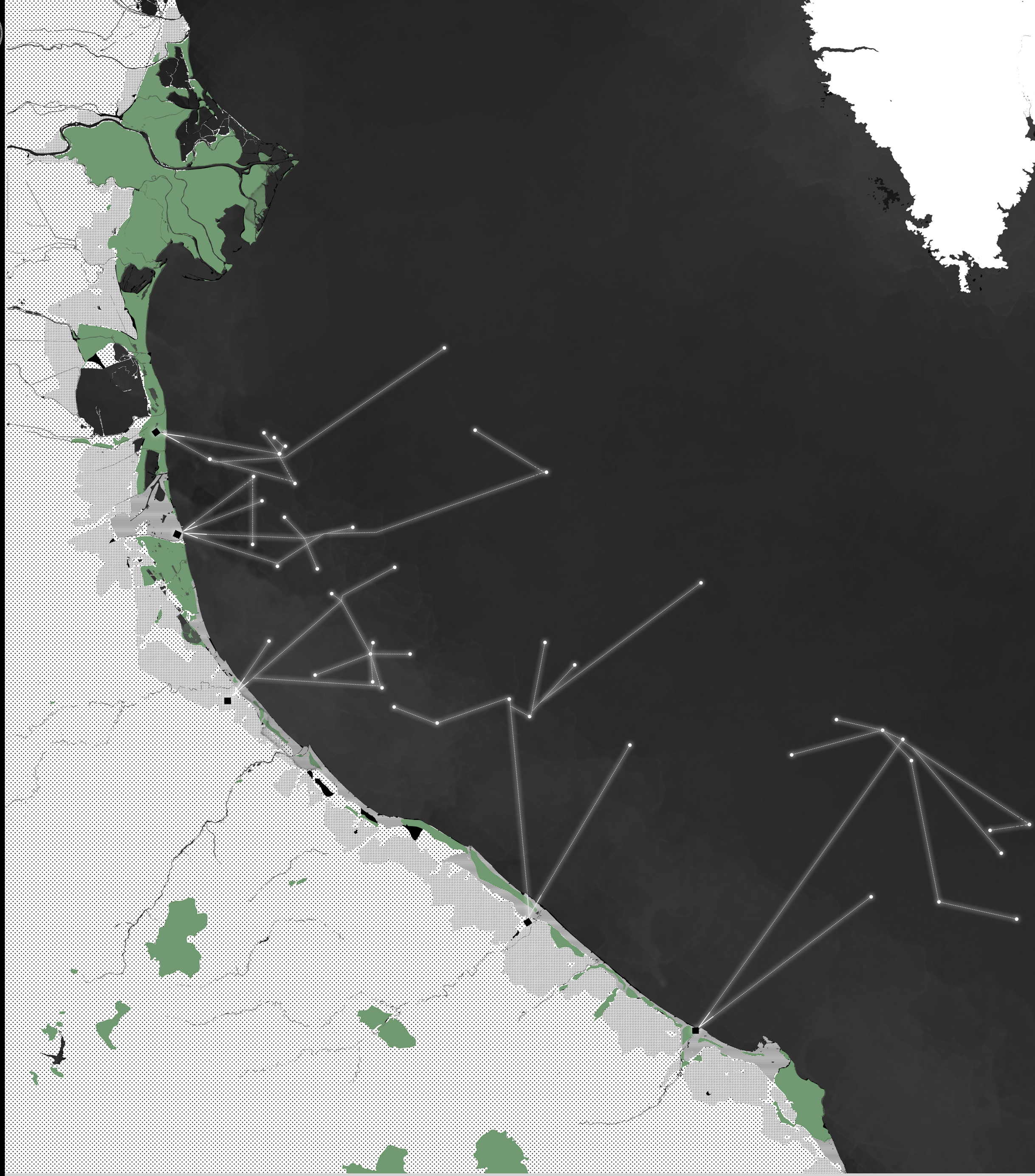


COMPLETE REMOVAL

RECYCLING

There are many environmental concerns to be taken into account throughout the
decommissioning process, from planning and carrying out shutdown operations on a
field or an installation to waste disposal. The platform can be decommissioned by been strip in place or cutted and strip in the dockyard.





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