

PORTO DI GENOVA - ITALY

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The Port of Genoa (44.40-44.43°N, 8.75-8.94°E) (Fig.1), located in the Gulf of Genoa, lays over a surface of 7 km² along about 20 km of coastline; its water depth varies between 9 and 15 m, with a maximum of 50 m in the Multedo Oil Terminal for super-tankers.

The harbour receives domestic and industrial effluents both through the watercourses and through sewage treatment waters discharges. Therefore, significant amounts of nutrients are released in a semienclosed basin, producing a phosphorus and nitrogen enrichment.

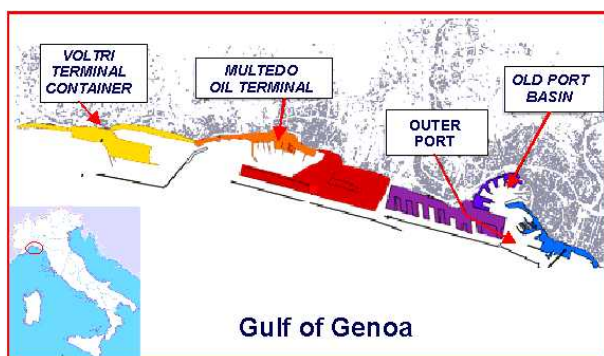


Figure 1: Study area location

On the ground of its morphology, the port of Genoa can be subdivided in three different areas, with peculiar characteristics, separated from the sea (Fig. 1). Every area can be considered as an unitary system.

Old Port area

This is the old area of the port of Genoa. It includes the ferry terminal, a small tourist port and a restructured zone, converted into exhibition area (Aquarium, congress centre, cinema). In the outer port some shipyards are present.

It has a surface area of 2,7 km² and a mean water depth of 13 m. Sewage treatment water discharge flows in this dock, remaining in the surface layer (about 0,5 m) of the inner part because of its low

salinity. It carries great quantity of phosphorus and nitrogen, above all as ammonium.



Figure 2: Old Port area

Multedo Oil Terminal

Multedo Oil Terminal is one of the biggest over Italy and Mediterranean; it is well sheltered from the sea by a long breakwater, a quite water channel and a large airport's esplanade. It has a surface area of 1,4 km² and a mean water depth of 15 m. A highly polluted watercourse (Chiaravagna) flows in the Oil Terminal, bringing a large amount of nutrients to the basin.



Figure 3: Multedo Oil Terminal

Voltri Container Terminal

Voltri area can be considered one of the most important terminal container of the Mediterranean sea.

It has a surface area of 2,1 km² and a mean water depth of 15 m. This basin doesn't receive any freshwater input, but on the outside of its entrances flow two sewage treatment water discharges, that can enriches its waters of nutrients.



Figure 4: Voltri Container Terminal

Impact of the anthropogenic activities affects the three harbour basins to a different extent, in response to local water renewal and position with respect to the pollution sources. Adverse effects, such as pollutant accumulation in the sediment, generally occur in the more confined areas, like the Old Port Basin. This area, in fact, presents a very complex morphology and isn't directly connected to the sea. Besides it receives a freshwater discharge, with an high contaminants loading, that accumulates in the basin.

A fraction of this loading can be transferred to the Sea through the outer port.

The same effect can be found in the Multedo Oil Terminal. Voltri Container Terminal, instead, presents lower nutrients concentration, due to the lack of significant terrestrial pollution sources.

LaguNet (<http://www.dsa.unipr.it/lagunet/>) is a scientific observational network studying the fluxes of nutrients and other contaminants from lagoon catchments to the near coastal environment. The objectives of LaguNet are to support and encourage co-operation of research groups studying lagoons, wetlands and saltmarsh systems situated along the Italian coast and to evaluate the application of the LOICZ (Land Ocean Interactions in Coastal Zones, a core project of IGBP)

biogeochemical flux model and typology classification to such sites.

The methodology has been applied by LOICZ to approximately 170 coastal environments worldwide; it is based on a mass balance approach and provides important information on the flux of nutrients and ecosystem functions; the approach used is applicable to a majority of coastal ecosystems with data that are normally available from conventional monitoring campaigns. In this way it is possible to compare and to group aquatic systems having different characteristics based on properties related to biogeochemical cycles and to the ecosystem functions that result from these processes.



Figure 5: LaguNet sites around the Italian peninsular

On the basis of this experience and considering the paucity of LOICZ sites in the Mediterranean and Southern Europe it was decided to apply this methodology to a series of Italian coastal environments where sufficient data are available.

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