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Coastal Environmental Change
During Sea-Level Highstands:
A Global Synthesis with implications
for management of future coastal change

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Quaternary coastal morphology and sea level changes

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The risk of sea flooding in 33 Italian coastal plains

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Abstract

Evaluating the relative sea level rise in Italy is much more than an academic question because we actually live during such a warm phase. This so-called Holocene period should be followed by the next glacial period, unless anthropogenic greenhouse gases alter the natural cyclicity of our climate.

For the risk assessment of coastal flooding by the sea in some Italian areas, it would be too much semplicistic to use global forecast projection of sea level rising as quoted, for instance, in the IPCC reports, without taking into consideration local conditions paleoclimatic appraisal, hydro-isostatic, tectonic and sedimentological evaluations. Italy is, in fact, located in a geologically active area where tectonic, hydro-isostatic and eustatic movements can prevail on sea level rising effects.

There are coastal zones with uplift more than 2 mm/yr and zones with lowering with order of 1 mm/yr. Also, subsiding phenomena due to anthropic causes reach, in some specific areas, rates with order of 1 cm/yr.

The hydro-isostasy, since present day has been underestimated and, only recently, some models were applied to find out the first data. Finally the capacity of fluvial sediments and their coastal transportation by marine currents can remarkably modify the trend of the plains.

A project of ENEA, supported by the Italian Minister of Environment, has begun the investigation on flooding risk in Italian coastal plans.

The project is under development considering the following steps:

- identification of low altitude coastal areas (lower than 5 m above sea level);
- identification of tectonic trend in each selected areas;
- assessment of potential risk considering the socio-economic conditions of the areas.

As far as the first point the investigation, based on a digital terrain model with 20 m cell resolution (SGI), highlighted the presence of 33 areas that currently lies at 0 m above sea level, and therefore potentially at flooding risk. All 33 resulting coastal planes exhibit also areas below the current sea level, in some cases reaching 3 m below sea level.

In the resulting maps, the coastal areas are identified according the following topographical boundaries:

- areas lower 1 m above sea level);
- areas comprised between 1 and 2 m above sea level);
- areas comprised between 2 and 5 above sea level.

Presently, the limits of these areas are under revision, due to the recent availability of a new Italian digital terrain model with 20 m cell resolution (IGM). A preliminary environmental classification of the coastal areas was also developed, according to the following categories:

- marine lagunas;
- salt mars;
- salt-pit zones (from CORINNE land cover)

The second step was addressed to the identification of tectonic trends in the selected coastal planes. The altitude of the maximum tyrrhenian transgression it has been used as representative marker (last interglacial period, 125 ka BP, stage 5e), and the eustatic level was assumed at +7 m (± 1 m). When notches, inner margin or littoral deposits were found at different altitude from 7 m, the discrepancy was assumed as positive or negative tectonic trend. The result of this first surveying has demonstrated that only few planes are effectively prone to coastal flooding; among them the most critical situations are in the Po plain, Versilia, and Fondi-Pontina. More investigations are requested in the Volturno, Manfredonia, ome and Grosseto planes.

Finally, it has preliminarly been investigated the socio-economic impact of coastal flooding in all the selected areas.

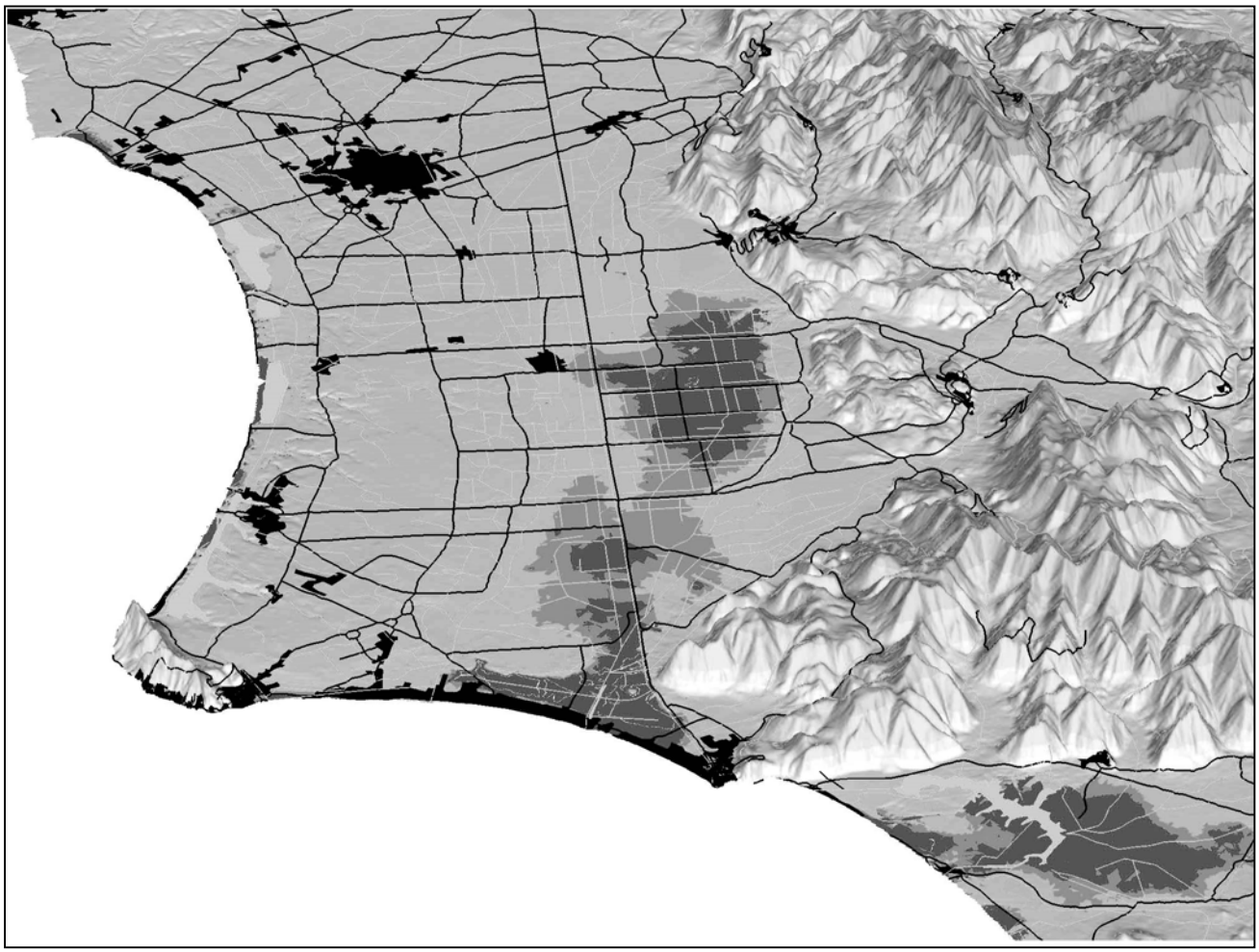

Figure 1. Pontina and Fondi Plains Plain, in grey the coast zone that could be flooded by the sea in a recent future

The result, based on the interaction between physical trends and antrophic exposure (urban settlement, industrial plants, road networks, etc.), is a first scenario of risk prone areas, expressed in qualitative indexes of potential losses.

In conclusion, the present preliminary investigation demonstrated that only developing an integrated approach among all the physical components (eustatic, tectonic, subsidence, sediments dispersion) compared with the socio-economic components of the territory, may allow the realization of a map of susceptible risk areas, prones to be damaged by sea flooding. The final version of the map will be produced on the base of these principles.

References

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