ENVIRONMENTAL QUALITY ASSESSMENT OF THE GUADIANA ESTUARINE SEDIMENTS (SW IBERIAN PENINSULA): EVIDENCE FROM A GIS STUDY

J. Delgado[1], J.M. Nieto[1] and the MEGASIG Team

[1] Departamento de Geología. Facultad de Ciencias Experimentales
Campus 'El Carmen' s/n. 21071-Huelva. E-mail: joaquin.delgado@dgeo.uhu.es

Universidad de Huelva

INTRODUCTION

The lower section of the Guadiana River drains the central-western sector Iberian Pyrite Belt, one of the most important provinces of polymetallic sulphide
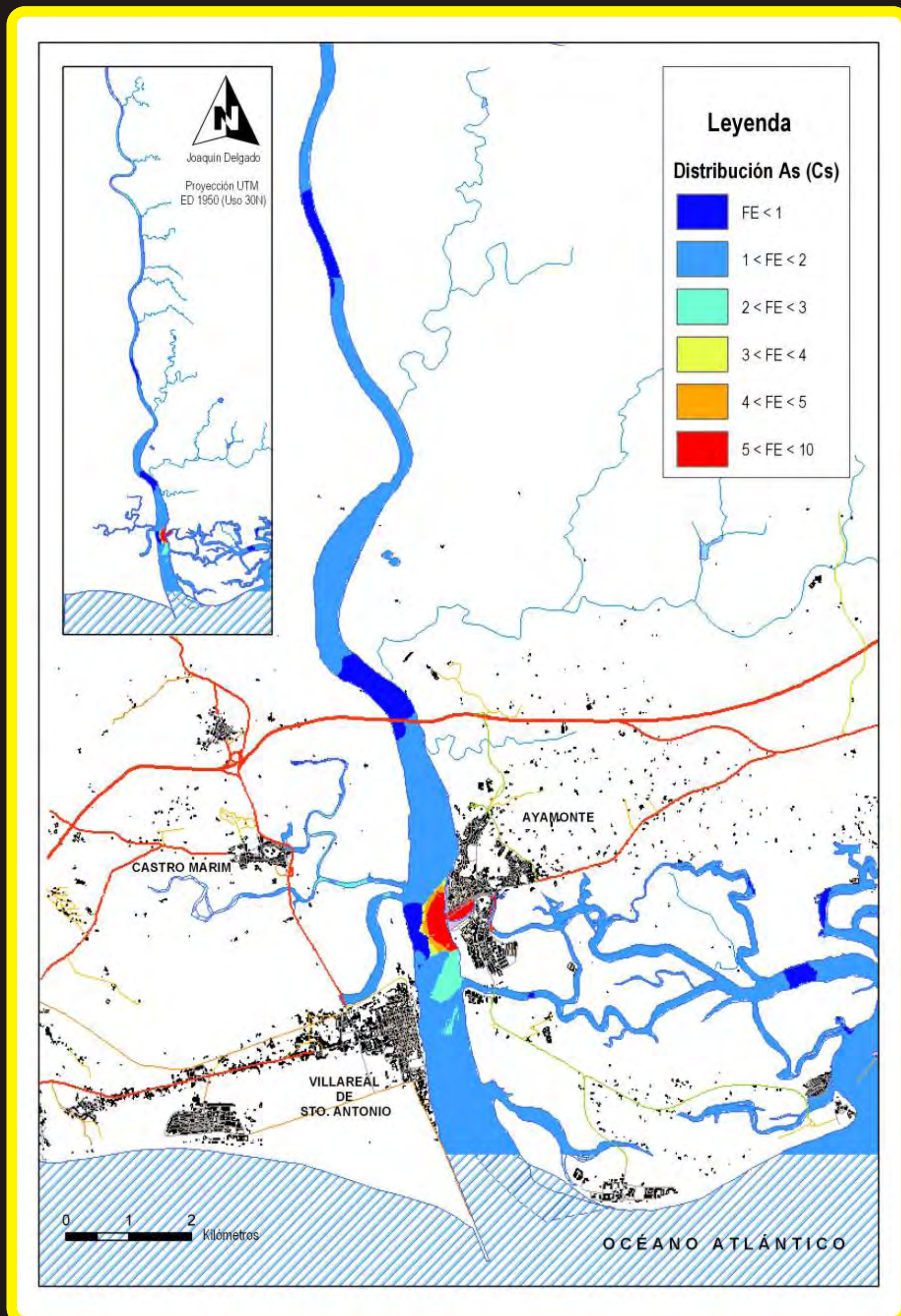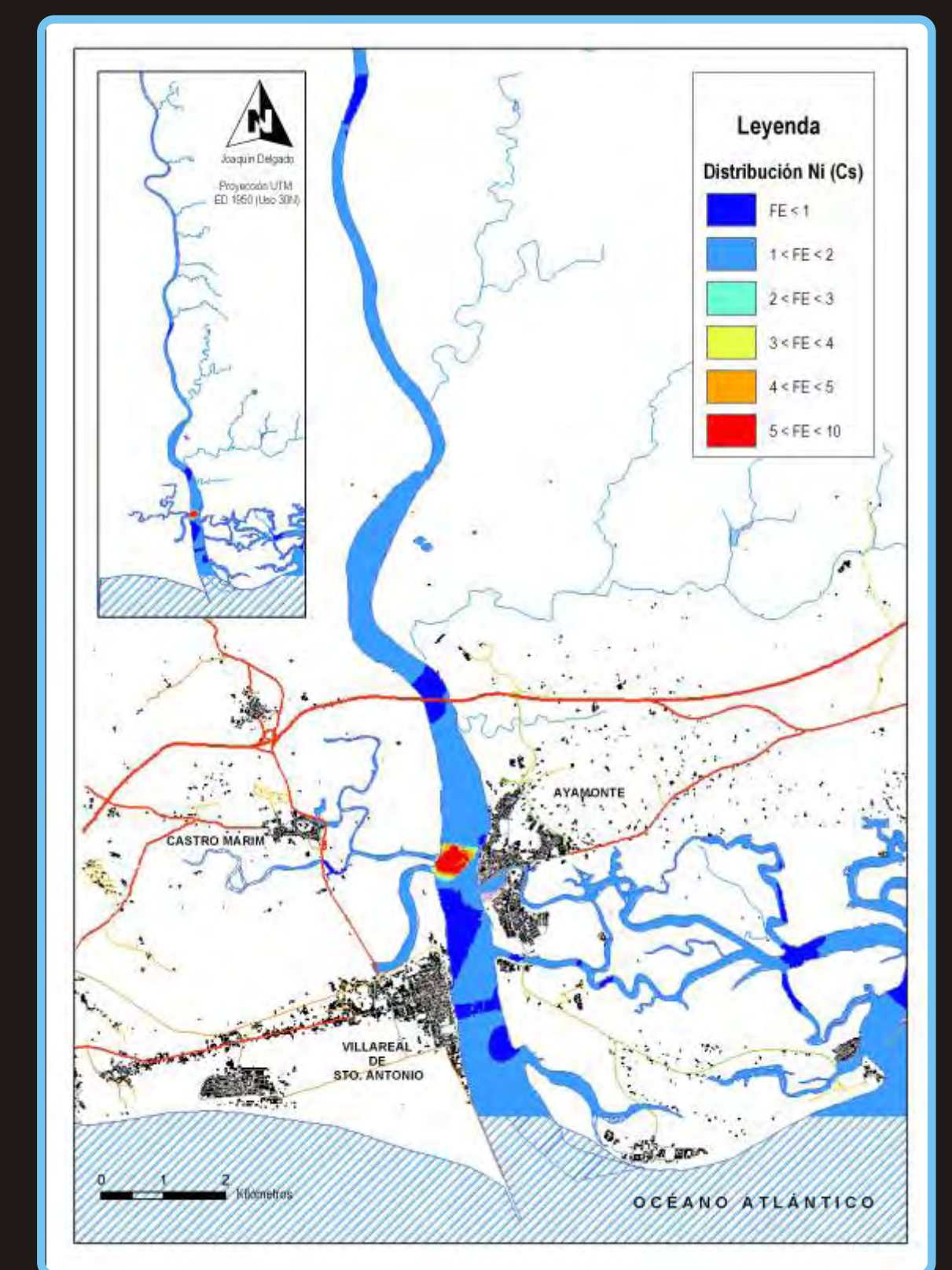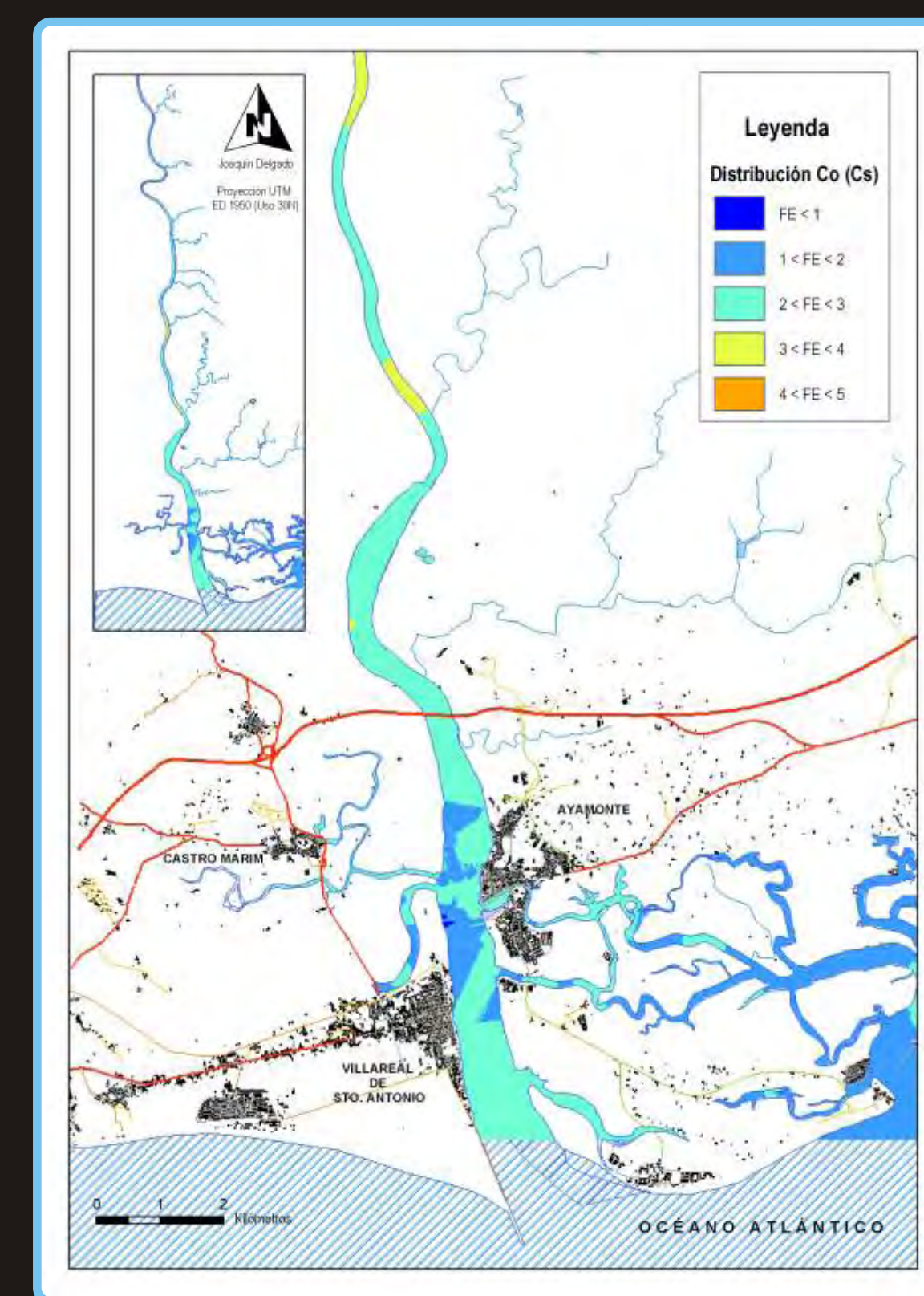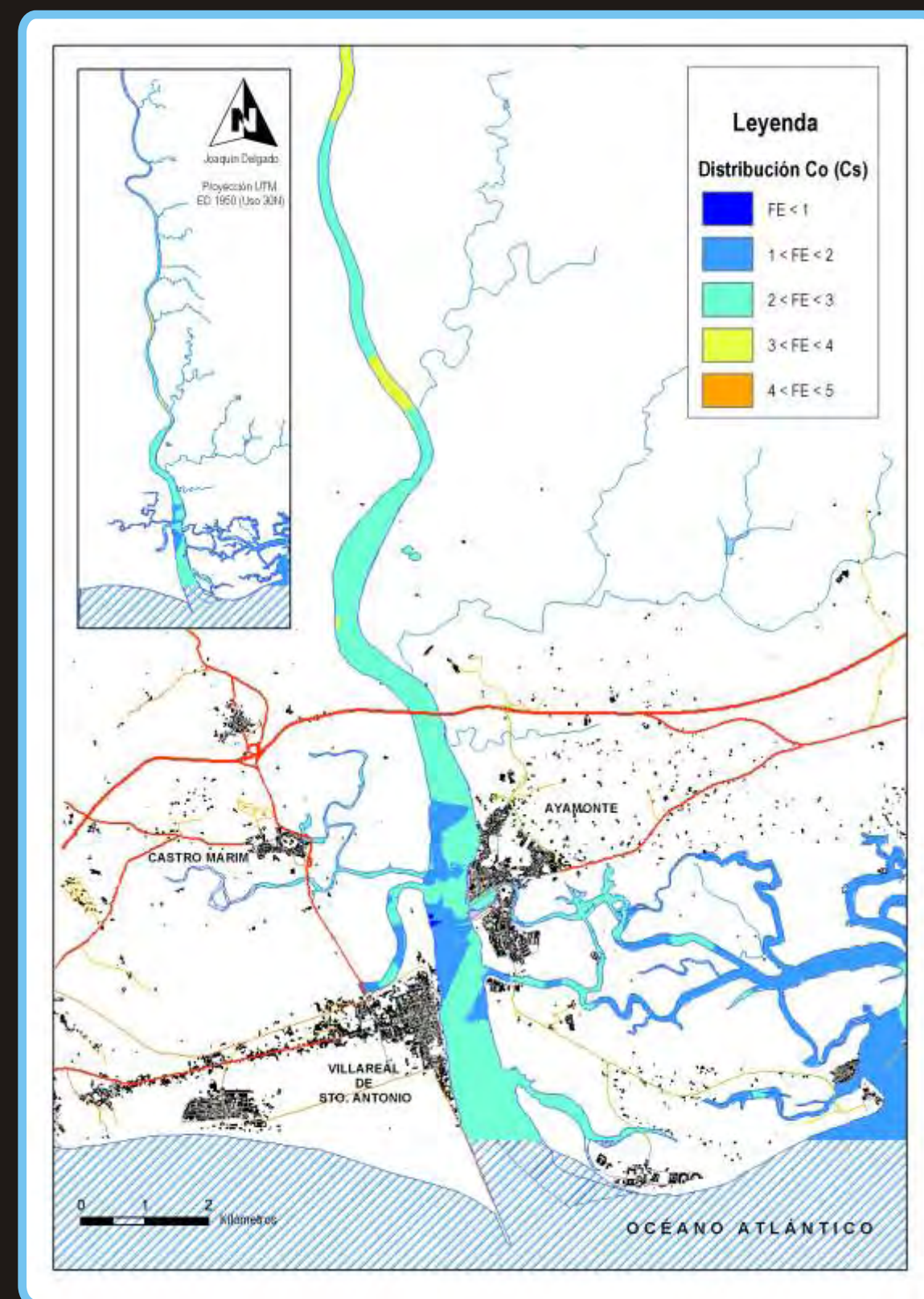
deposits. This work has been developed with the aim of determining the environmental quality of the Guadiana river estuary, and evaluating the possible incidence that some processes resulting from human activities like AMD or urban effluents could produce to the environment.

METODOLOGY

A sampling of surface sediments was carried out collecting 163 samples with a manual drill. The samples where located in: The estuarine main channel and the tidal channels of: Carrasqueira and Castro Marim in Portugal, and Canela, San Bruno, Carreras in Spain.

Total chemical analysis of major and trace elements were determined by optic ICP.

The analysis results were statistically studied by a principal component analysis to establish possible polluting agents and relations among these agents.
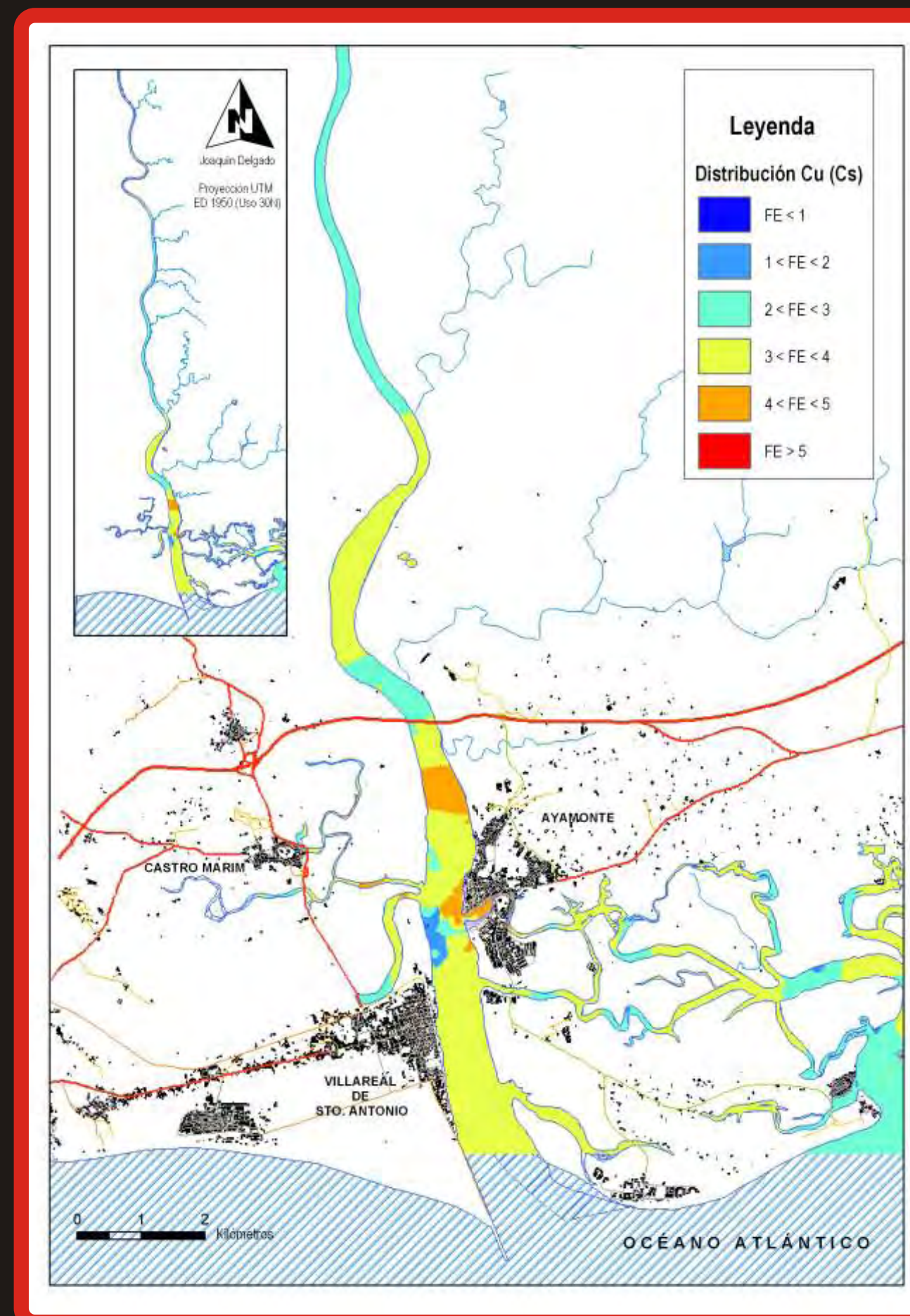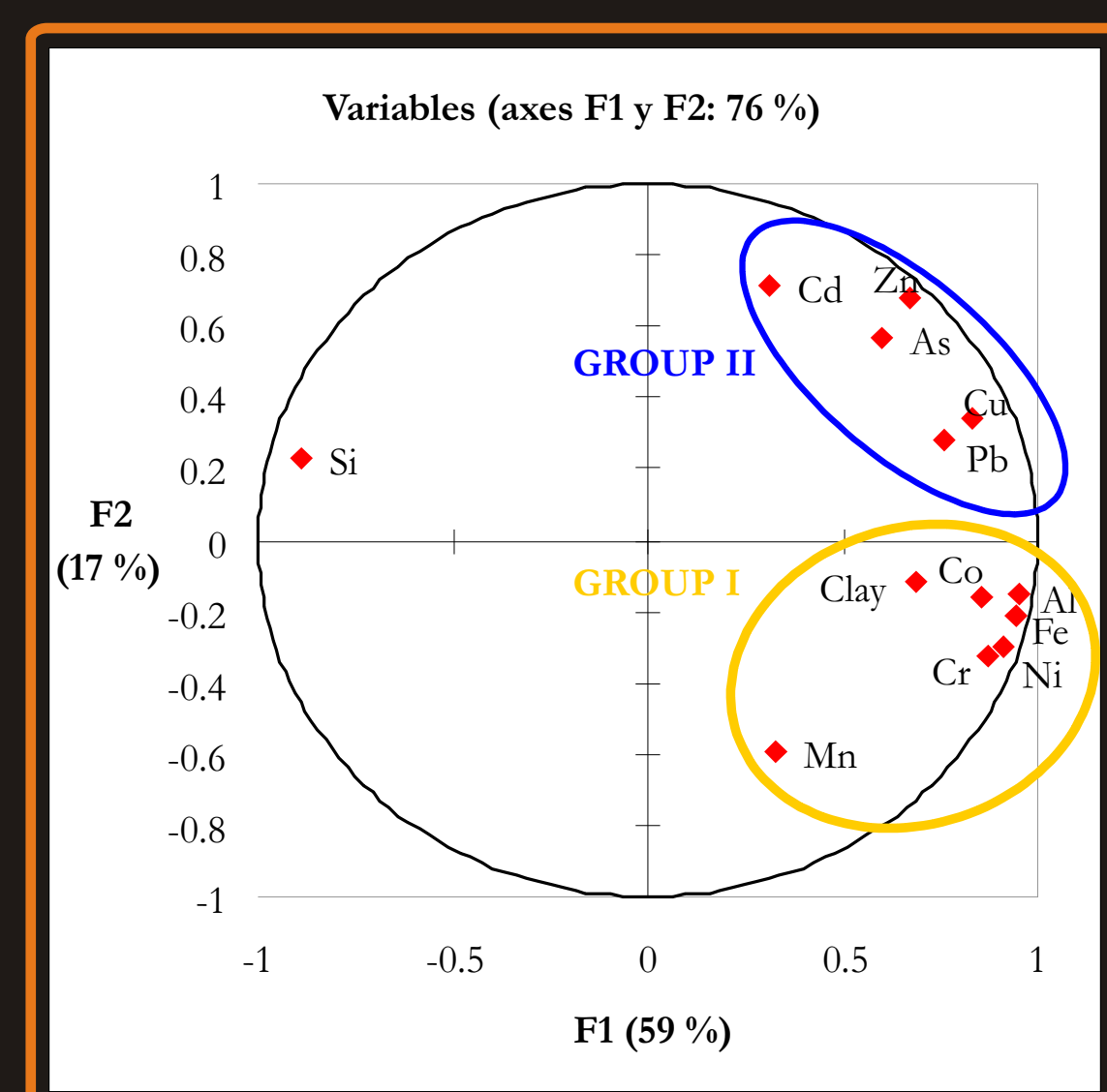
The enrichment factor was calculated for the zone, through comparison of the element concentration and the local background.

Last of all, there were created element distribution maps by a geostatistical method of kriging (with software Arcmap 8.3) using the EF
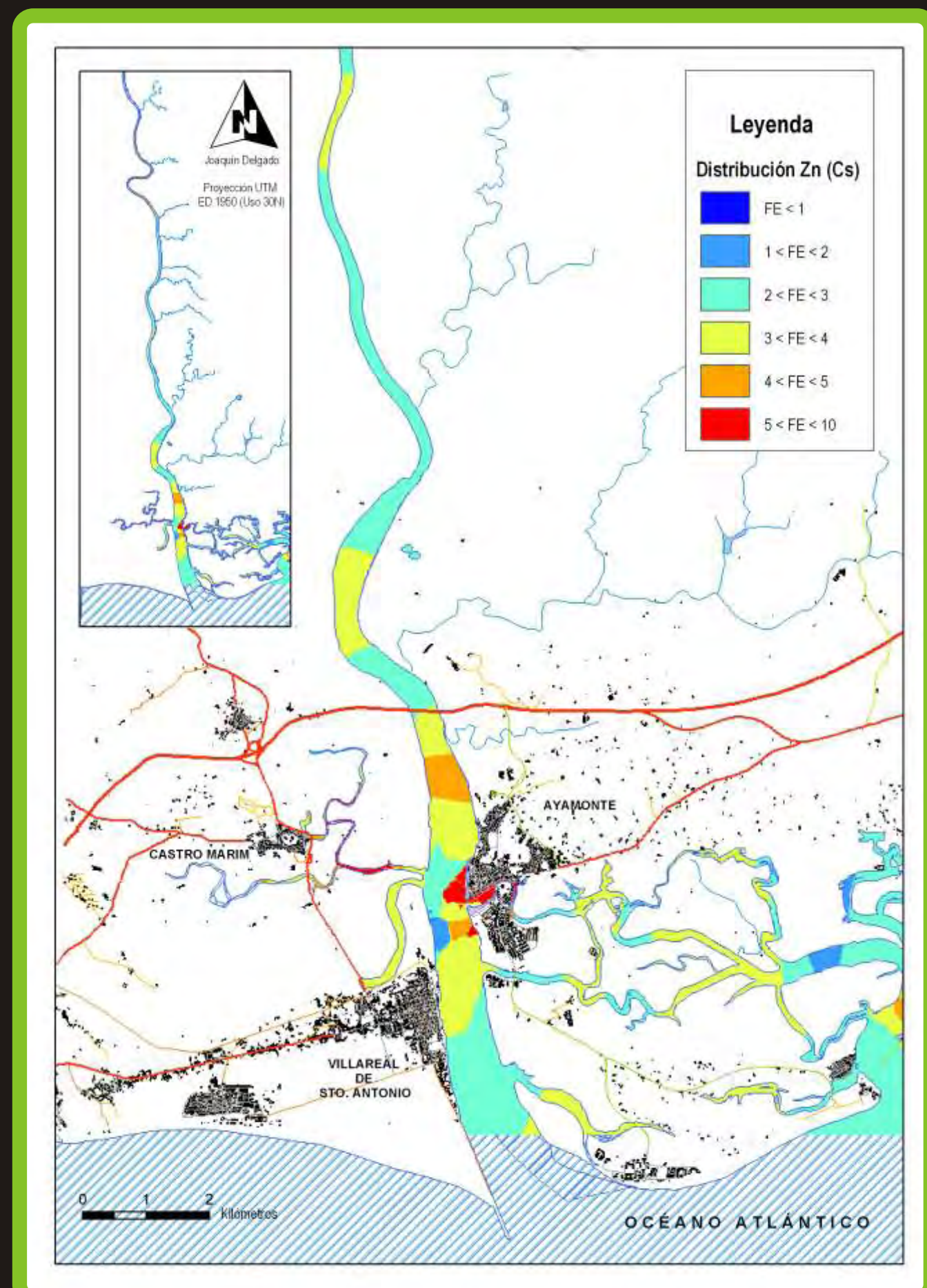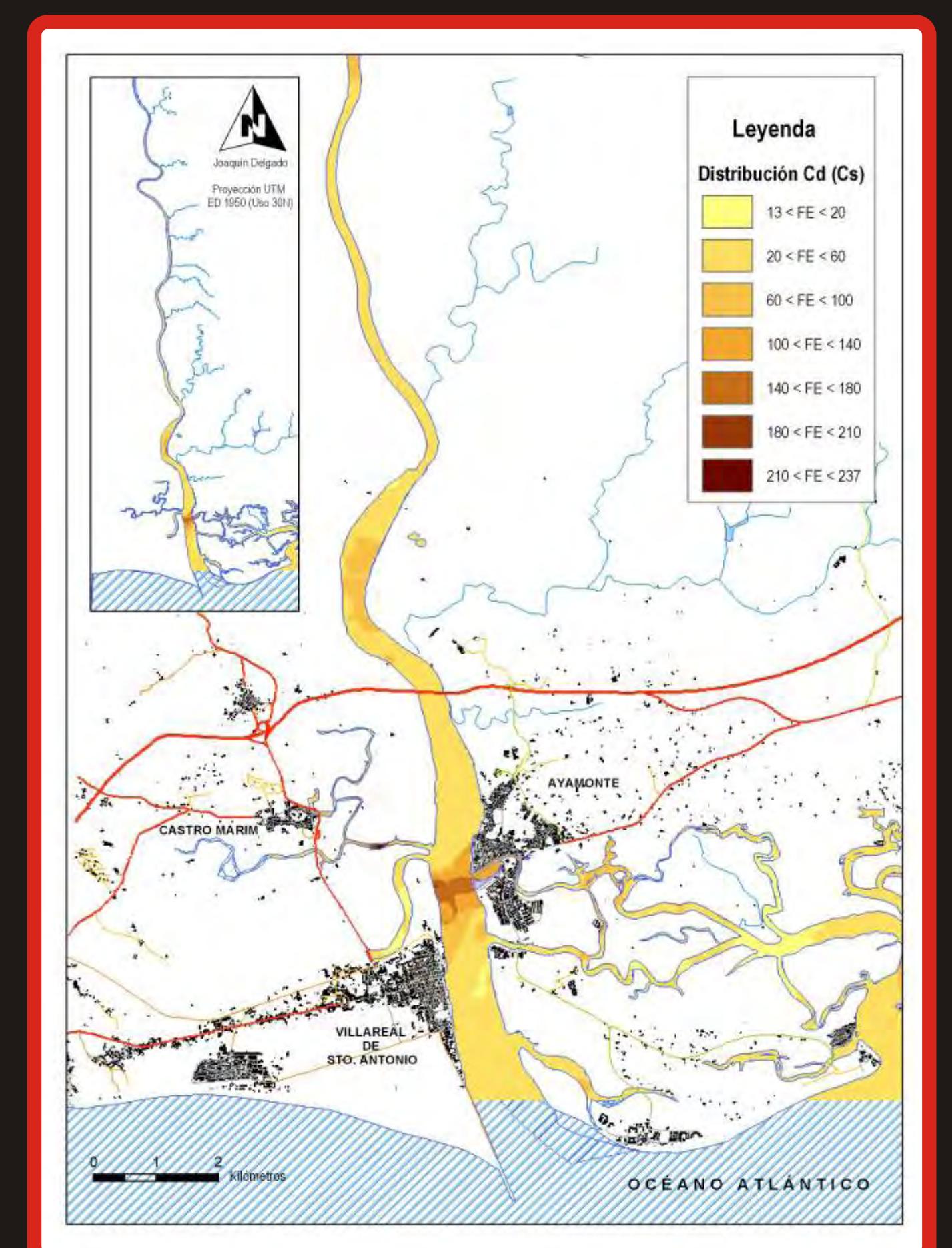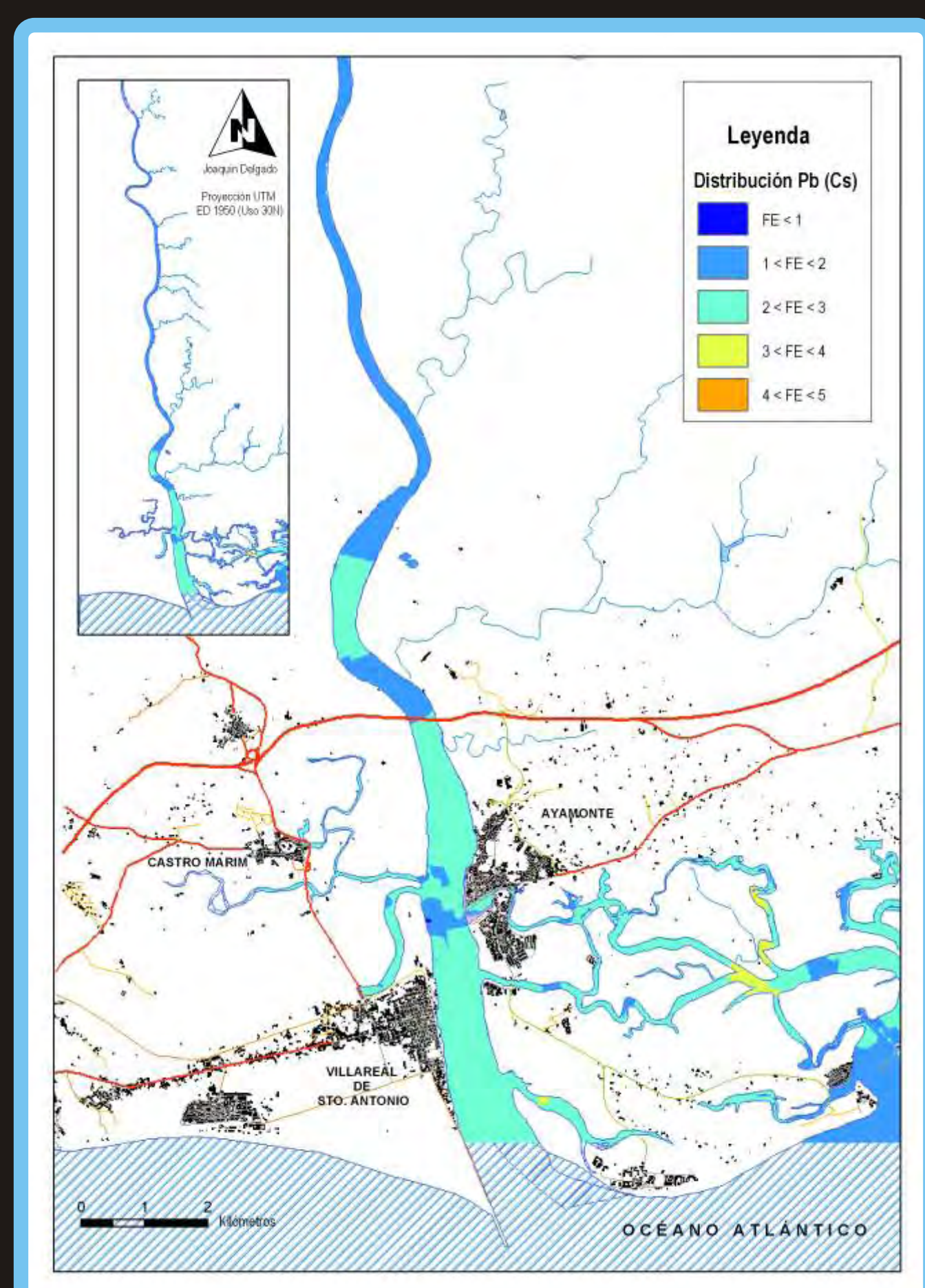
RESULTS

The analysis evidences a distribution in two preferring groups: Group I is formed by elements associated to the clay fraction of sediments. Group II are elements related to AMD processes typical of internal sites of the basin.

Enrichment factor value: 4 levels in function of the background value:

Poorly Elements (EF < 1): Cr
Slightly enriched Elements (1< EF < 2): As and Ni
Enriched Elements (2 < EF < 10): Co, Cu, Pb and Zn
Strongly enriched Elements (EF > 10): Cd

The spatial analysis [AcrGis 8.3], shows three associations of elements characterized by different sources :
Cu, Pb "Diffuse" Contamination of mining origin.
As, Cd, and Zn "Diffuse" Contamination of mining origin and presence of others punctual sources of contamination.
Co, Cr and Ni elements of geogenic origin, although Ni presents a punctual contamination source.

- As, Cd, Cu, Pb and Zn were found in relatively high concentrations near the coastal localities, as confirmed by the GIS mapping.

- The GIS tecnique evidences the high values of most important metals and metalloids probably responsible of contamination and the relation between thes elements and human activities.

- This technique is a powerful tool mapping the distribution of elements in the study area, and helping in the identification of the possible sources of these contaminants.

ACKNOWLEDGEMENTS

REFERENCES

Pérez. M, Usero. J, García. I, y Cabrera. F. (1991). Trace metals in sediments from the "Ría de Huelva". Toxicol. Environ. Chem., 31-32: páginas 275-283.

V. Van Alsenoy, P. Bernard and R. Van Grieten. (1993). Elemental concentrations and heavy metal pollution in sediments and suspended matter from the Belgian North Sea and the Scheldt estuary. The Science of The Total Environment, Volume 133, Issues 1-2, 28, Páginas 153-181.