



European Topic Centre
Land Use and Spatial Information

Towards the Coastal and Marine Information System of Andalusia, Spain

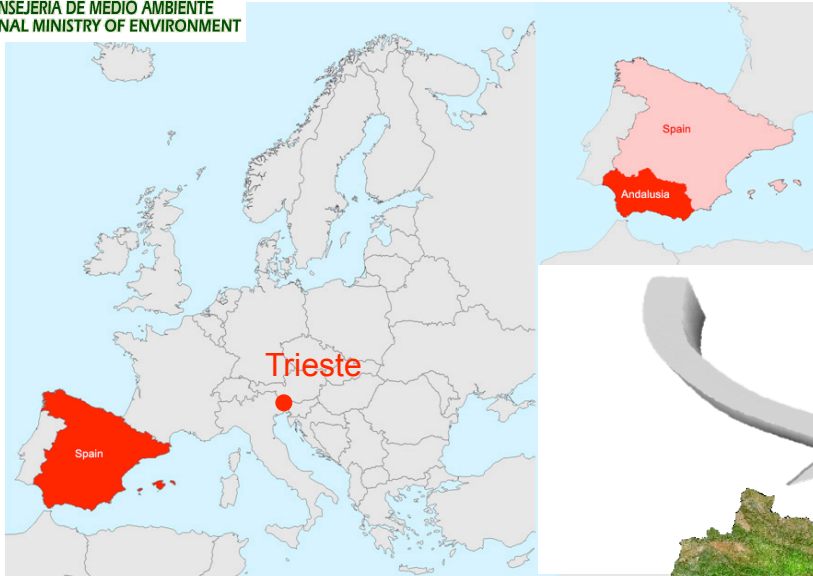
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European Topic Centre on Land Use and Spatial Information
Regional Government of Andalusia – Ministry of Environment
D.G. Sustainable Development and Environmental Information

ICAN – EEA Workshop
Trieste (IT), 16-20 November 2009



JUNTA DE ANDALUCÍA

Andalusia / Spain / EU



Population: 8.385.607 (Jan 2009)

Andalusia covers 17.3% of the Spanish national territory with 87,268 km² as a total surface, which is the largest single region in Spain, with a bigger area than states like Austria, Belgium, Denmark, Ireland or Switzerland!



Main facts

Coastline: 1.101 km

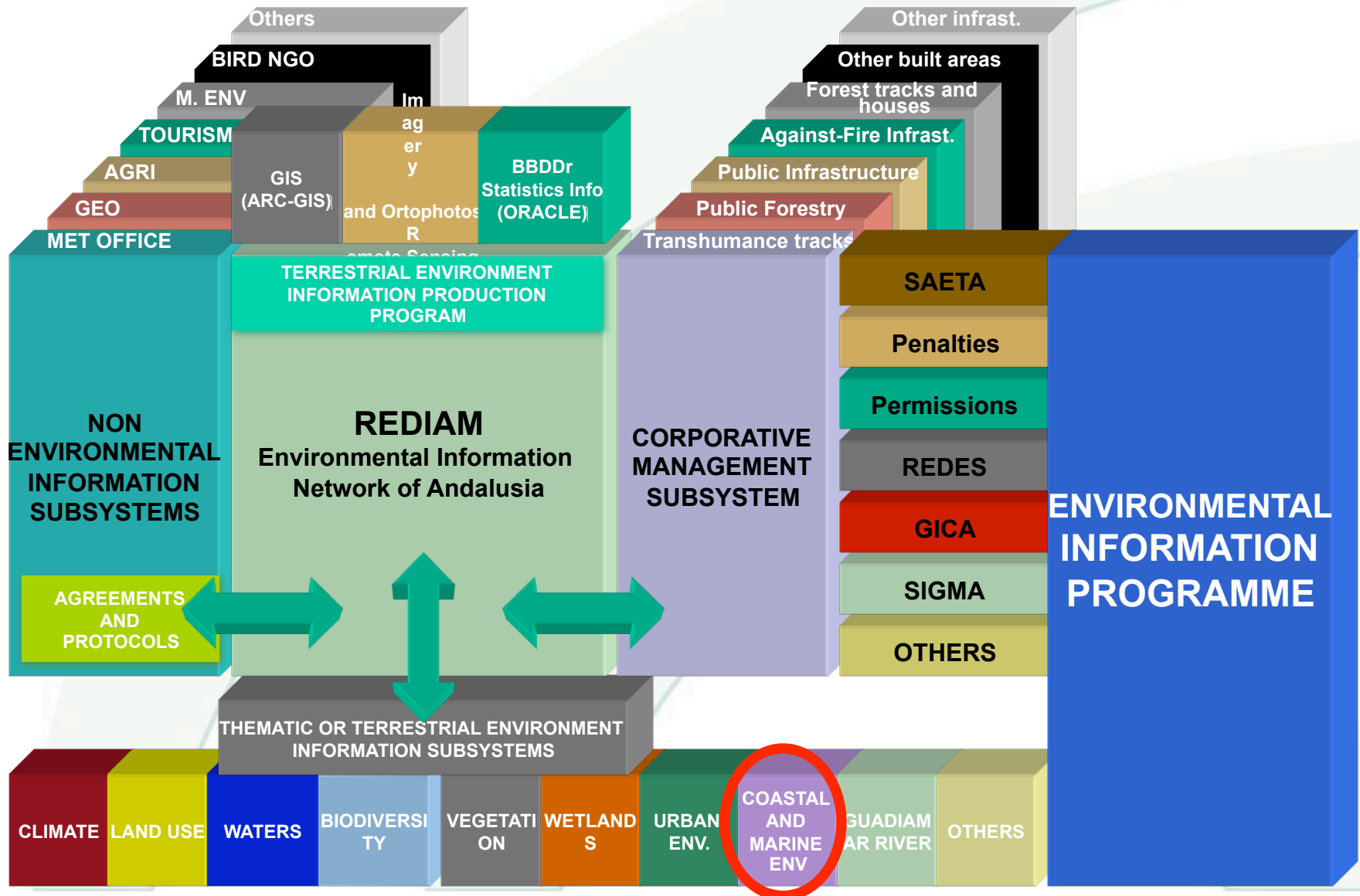
Coastal municipalities: 65 (10% Andalusia)

Coastal population: 2.899.992 (35% from total) (2009)

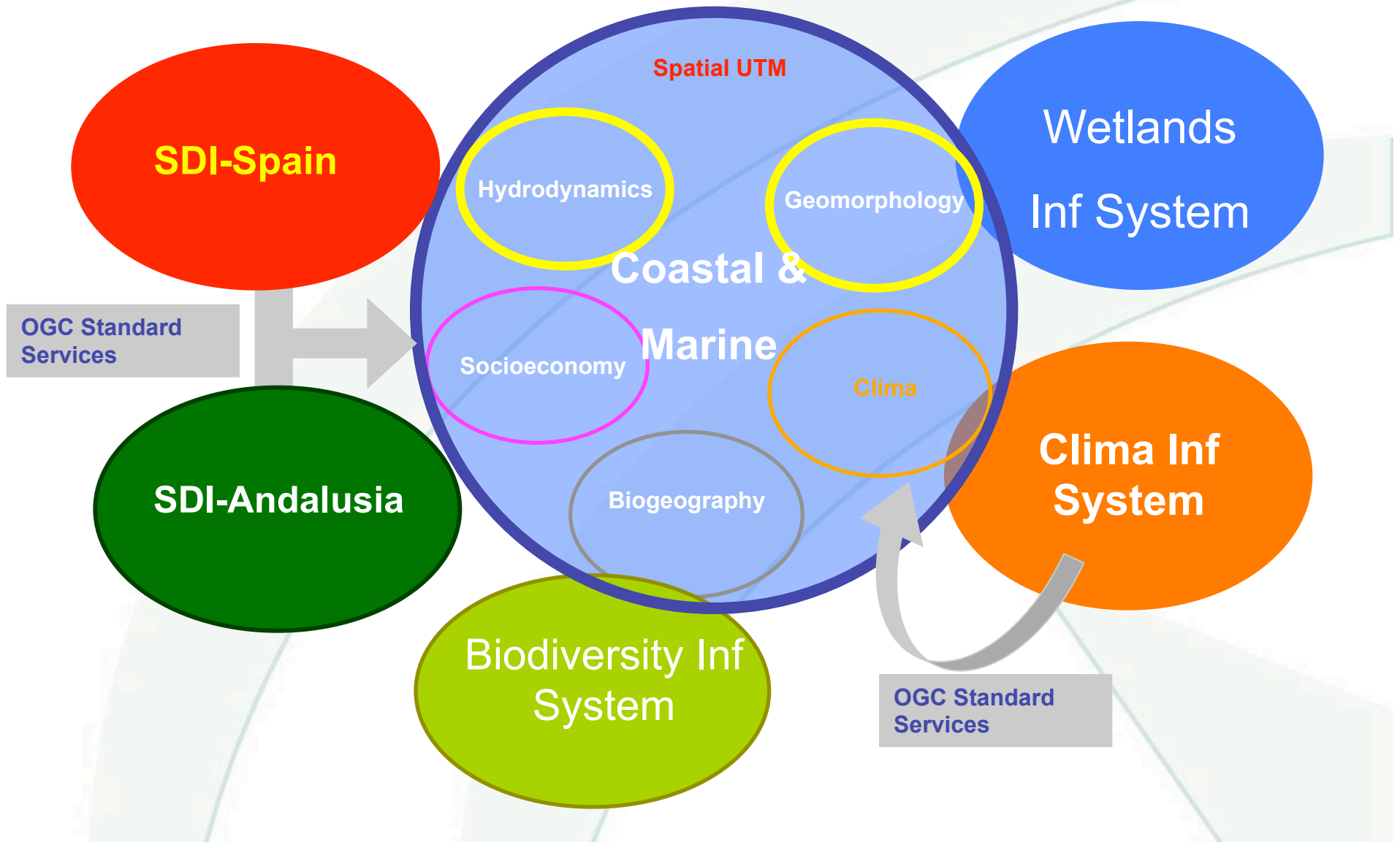
Coastal Natural areas: 60 Natura 2000 sites

Coastal Cities: 5 / 8 Provincial capitals

REDIAM – Environmental SDI



Conceptual and Distributed System



Grouping layer sets

Topic I: Hydrodynamics

- Tidals
- Waves
- Marine Currents
- Sea Level

Topic II: Geomorphology

Structural:

- Geology
- Geomorphological elements
- Litology
- Bathymetry
- Topography
- Soils

Dynamics:

- Sedimentary processes:, Erosión
- Elevation Subsidence
- Coastline

From Wetlands Inf. System

- Relief
- Water bodies
- River Basin Districts

Climate:

- Morpho-climatic

Topic III: Biogeography

- Biological Parameters
- Turbidity (PH, Salinity, Conductivity)
- Temperature, Nutrients

From the Biodiversity Information System

- Species
- Hábitats
- Ecosistemas

Topic IV: Climate

From the Climate Inf System

- Met Stations and data
- Met Data: Rainfall, Wind, Temperaturesa

Topic V: Socio Economy and Territorial Planning

- Administrative Units
- Land use and cover
- Coastal & Marine Infrastructures
- Other infrastructures (roads, train, sewerage, etc)
- Natural Resources Exploitation (Acquiculture)
- Population data (GDP, etc)
- Cultural & Historical Heritage (Arcaeological sites, cultural monuments)

Metadata

Información de los metadatos

Información general >>

Identificador del archivo de metadatos:	ESREDIAM200705220185.xml
Idioma:	es
Conjunto de caracteres de los metadatos:	8859part1
Fecha de creación del metadato:	2007/05/22
Norma de metadatos:	ISO 19115 "NEM"
Version de la norma de metadatos:	2003 "1.0"
Nivel jerárquico:	dataset
Sistema de referencia:	

Información de contacto >>

Organización:	Consejería de Medio Ambiente. Junta de Andalucía.
Puesto:	Servicio de Información y Evaluación Ambiental
Rol:	Autor
Dirección:	Avda. Manuel Siurot, 50
C.P. :	41071
Teléfonos:	955003400 955003500
Fax:	955003775
Area administrativa:	SEVILLA
Ciudad:	Sevilla
Pais:	ES
Correo electrónico:	rediam.cma@juntadeandalucia.es
Recurso en línea:	http://www.juntadeandalucia.es/medioambiente/rediam

Following REDIAM Metadata Structure – ISO 19115

Improvements from last year!

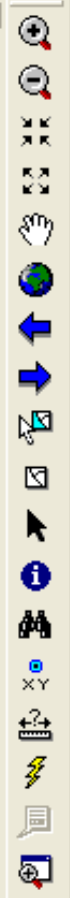
- **New Coastline**
- **New Physical Characterization of the Coast**
- **New Urban Uses**
- **New Coastal DTM**
- **Analysis on Erosion**

- **Vulnerability Index developments**
- **Environmental Indicators**
- **Socio-Economic Indicators**

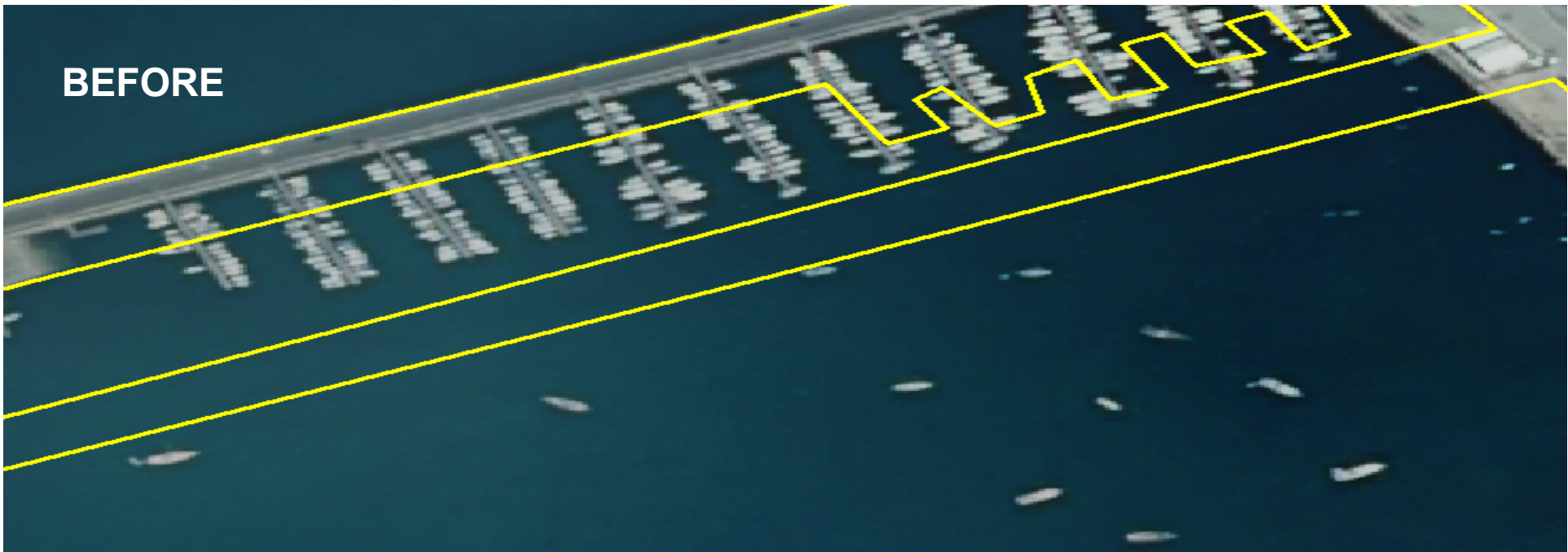
New Coastline for Andalusia

Criteria for digitizing exposed areas to open sea

- **Scale 1:2.500 – 2696 segments**
- **Orthophoto 2007**
- **Exposed zones:**
 - Beaches
 - Cliffs
 - Infrastructures



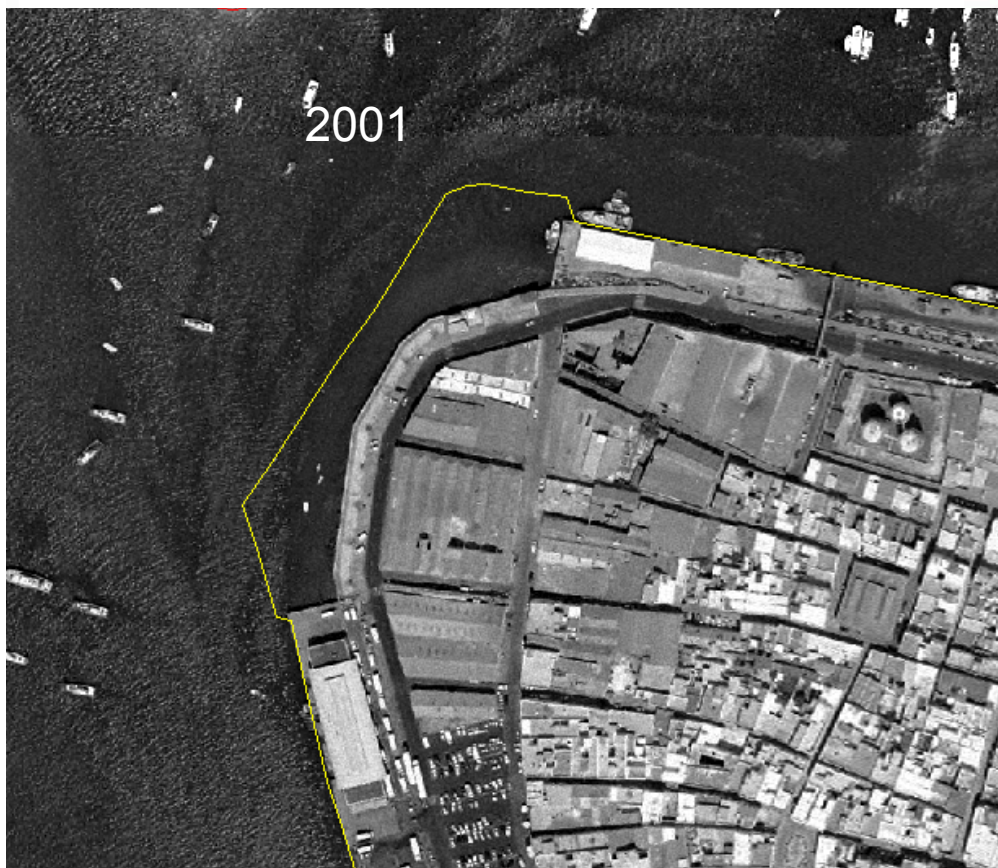
BEFORE



AFTER



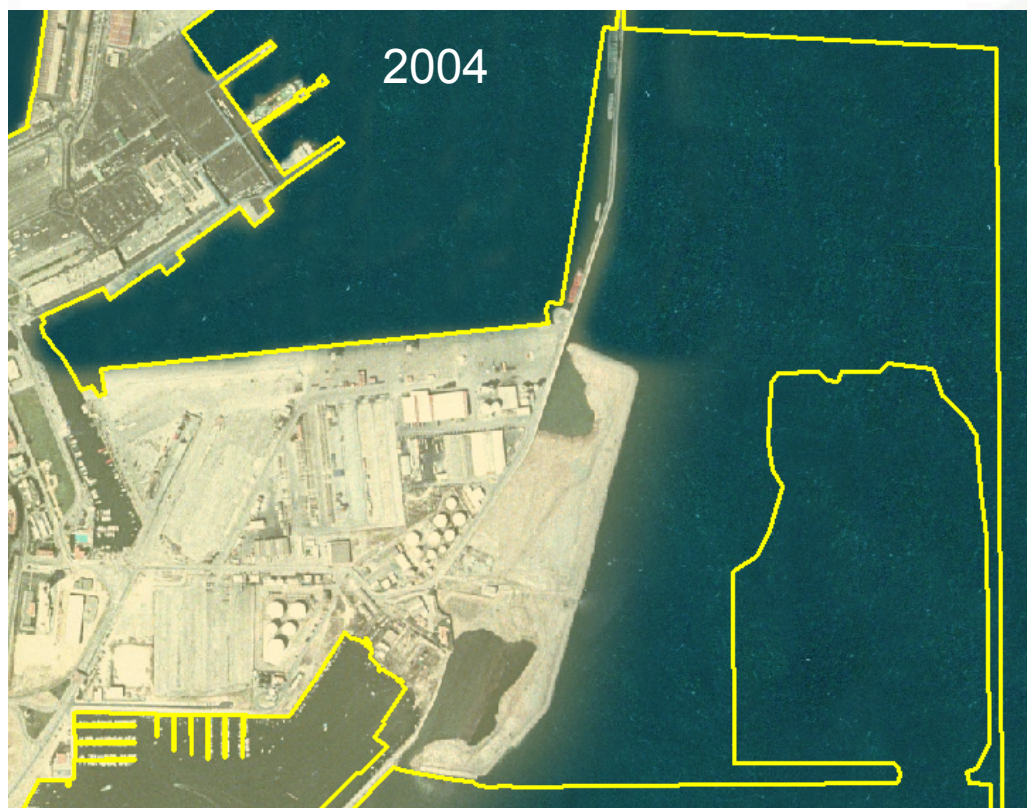
Updating new infrastructures



Isla Cristina Sea Port
(Huelva Province)



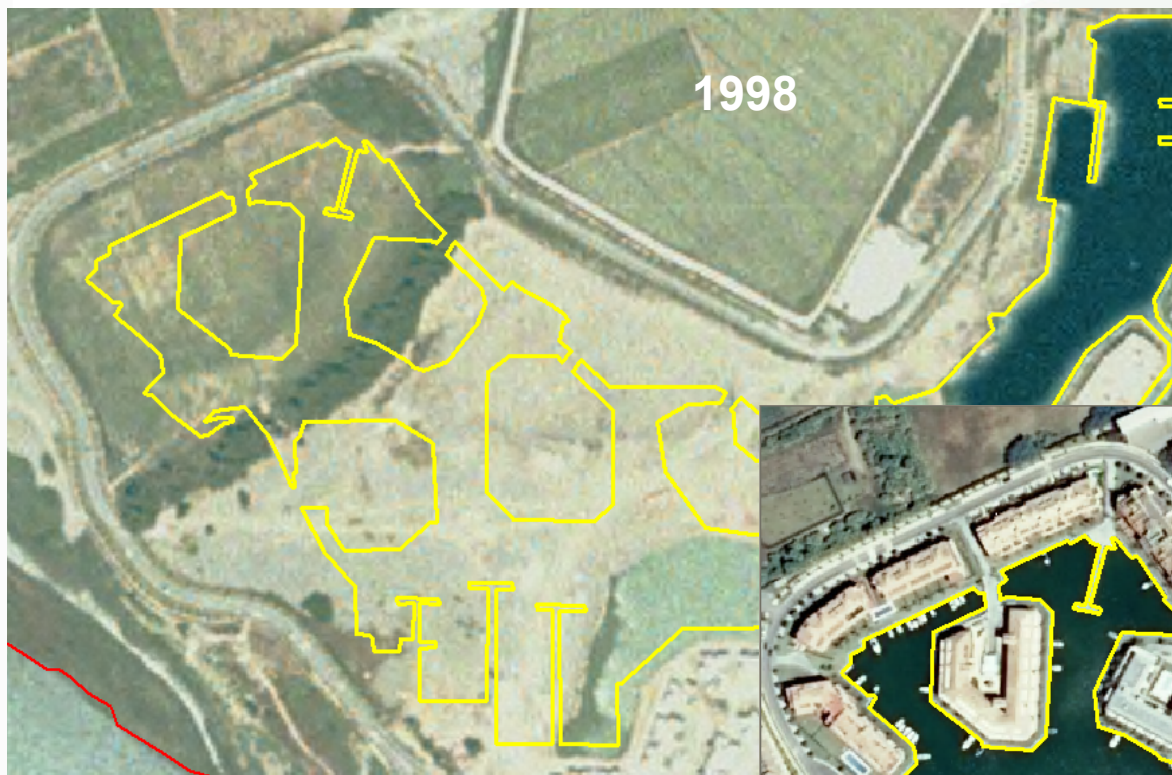
Updating new infrastructures



Algeciras Sea Port
(Province of Cádiz)



Updating new infrastructures



Marina in Sotogrande
(San Roque, Cádiz)

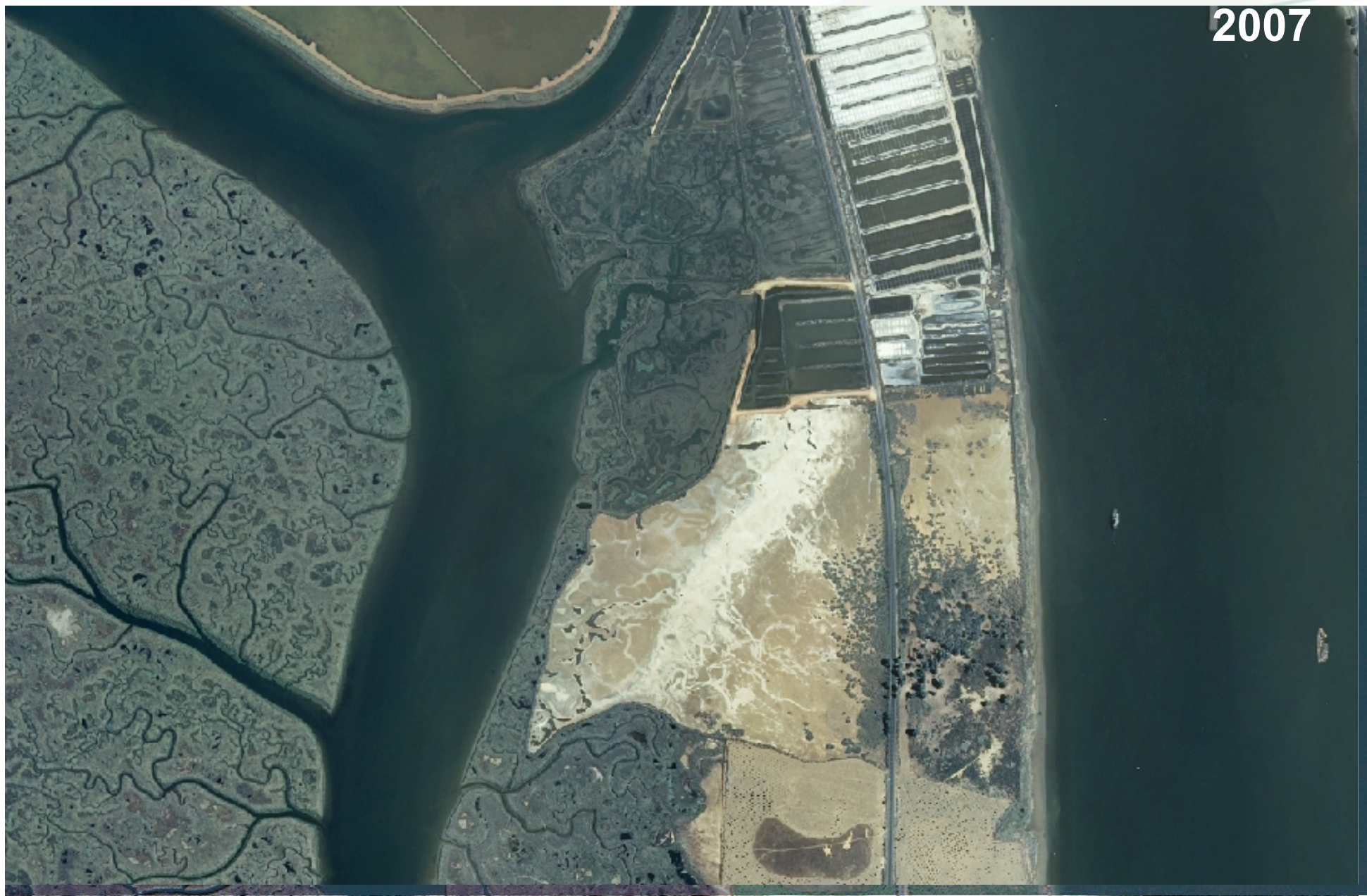


Criteria for digitizing non-exposed areas to open sea (Estuaries and Marshes)

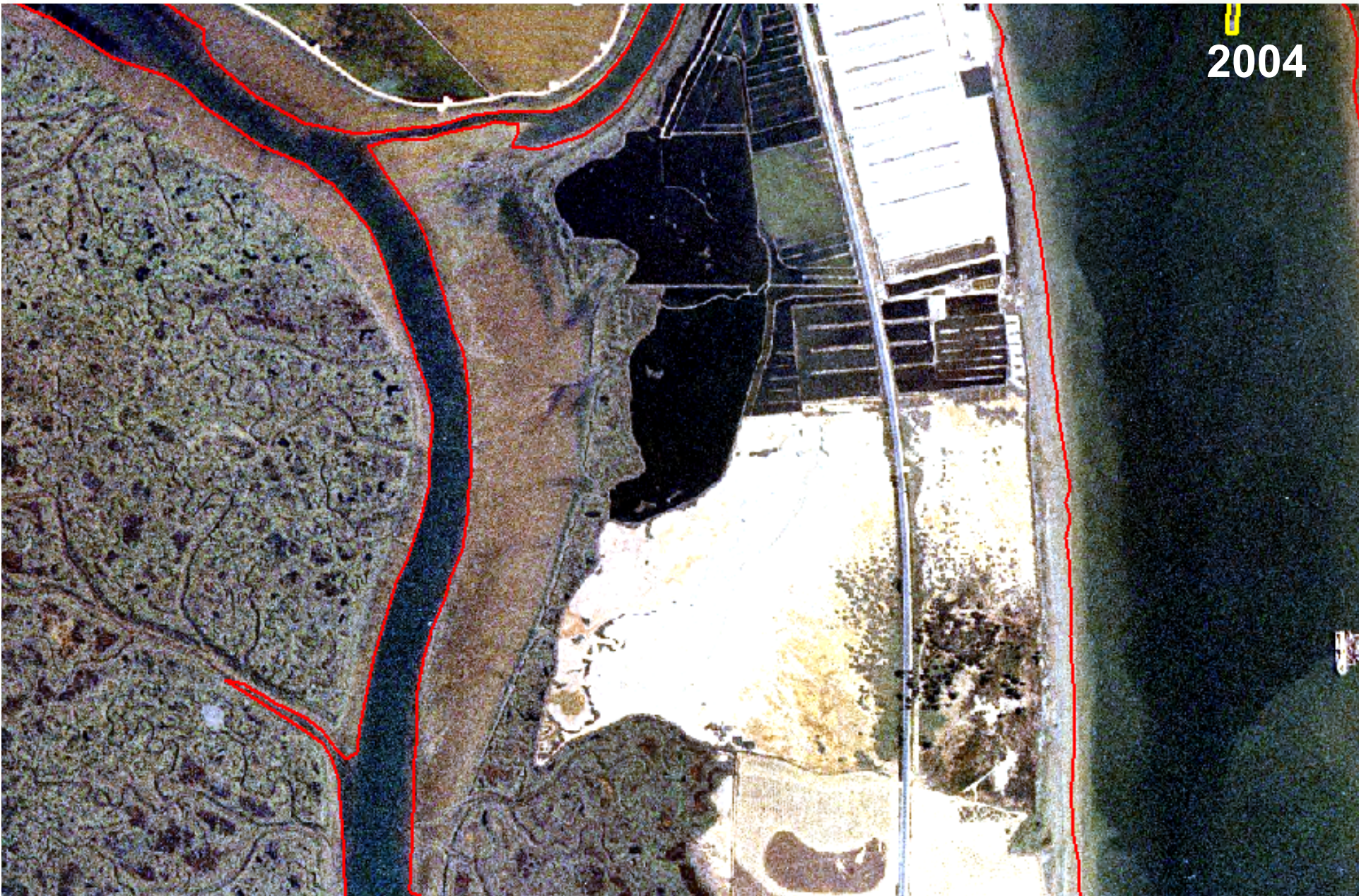
- **Scale 1:2.500**
- **Orthophoto with the lowest tidal range: (1998, 2001, 2004, 2005, 2007)**
- **The estuaries' water level in the selected orthophoto.**

Odiel River's Marshes

2007

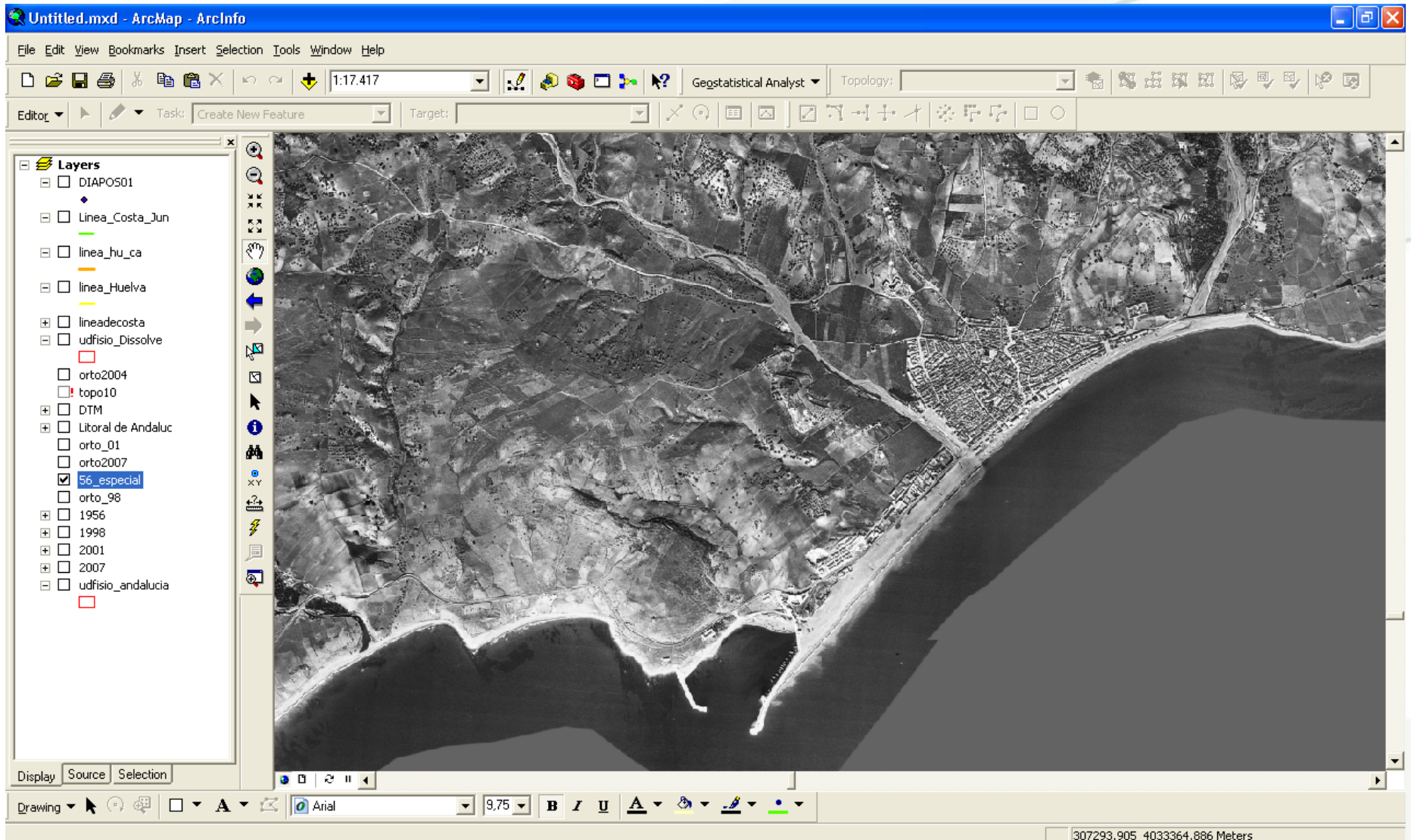


2004

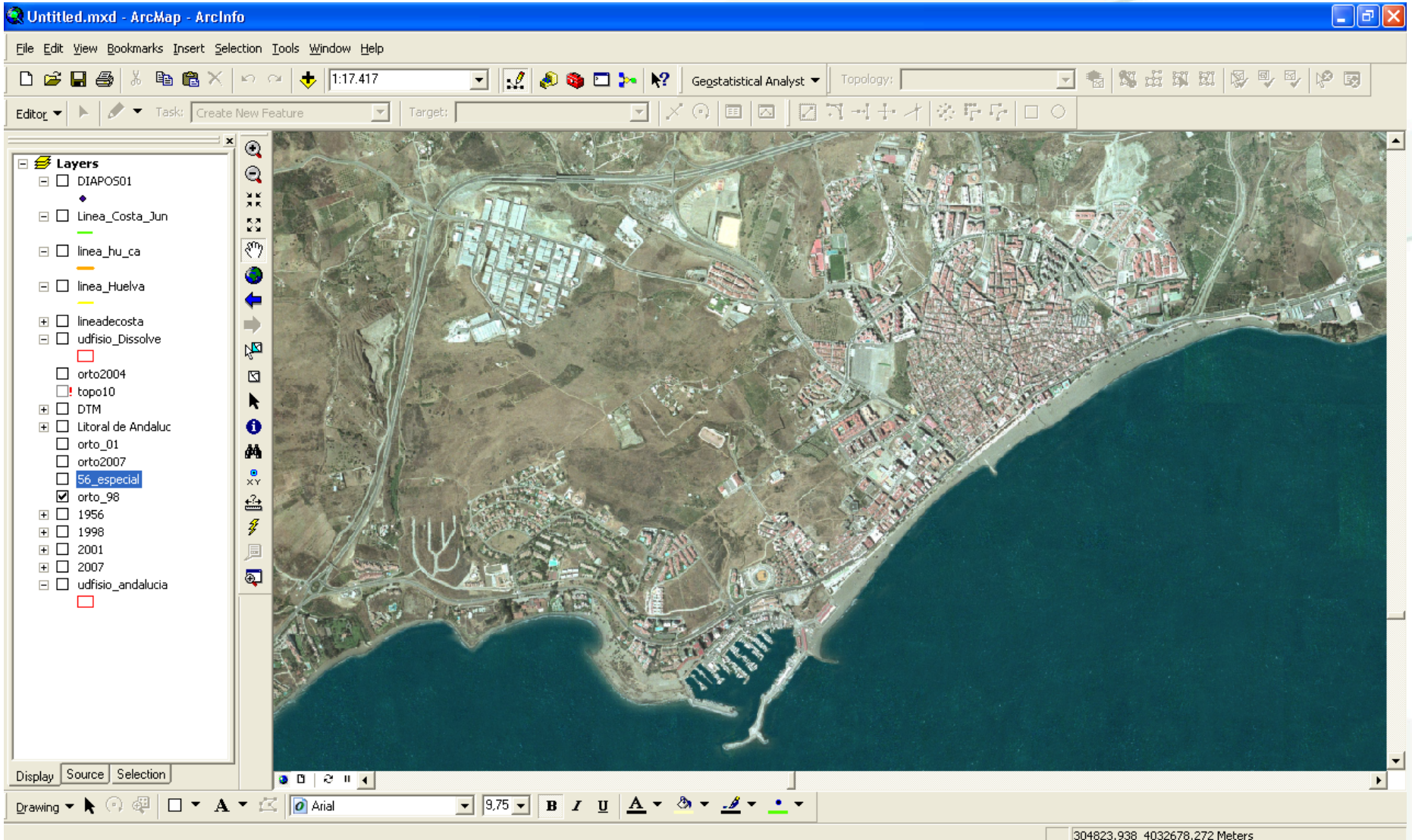


Reviewing the Coastal Physiography

Orthophoto 1956



Orthophoto 1996



Untitled.mxd - ArcMap - ArcInfo

File Edit View Bookmarks Insert Selection Tools Window Help

1:17.417

Gegstatistical Analyst Topology:

Editor Task: Create New Feature Target:

Layers

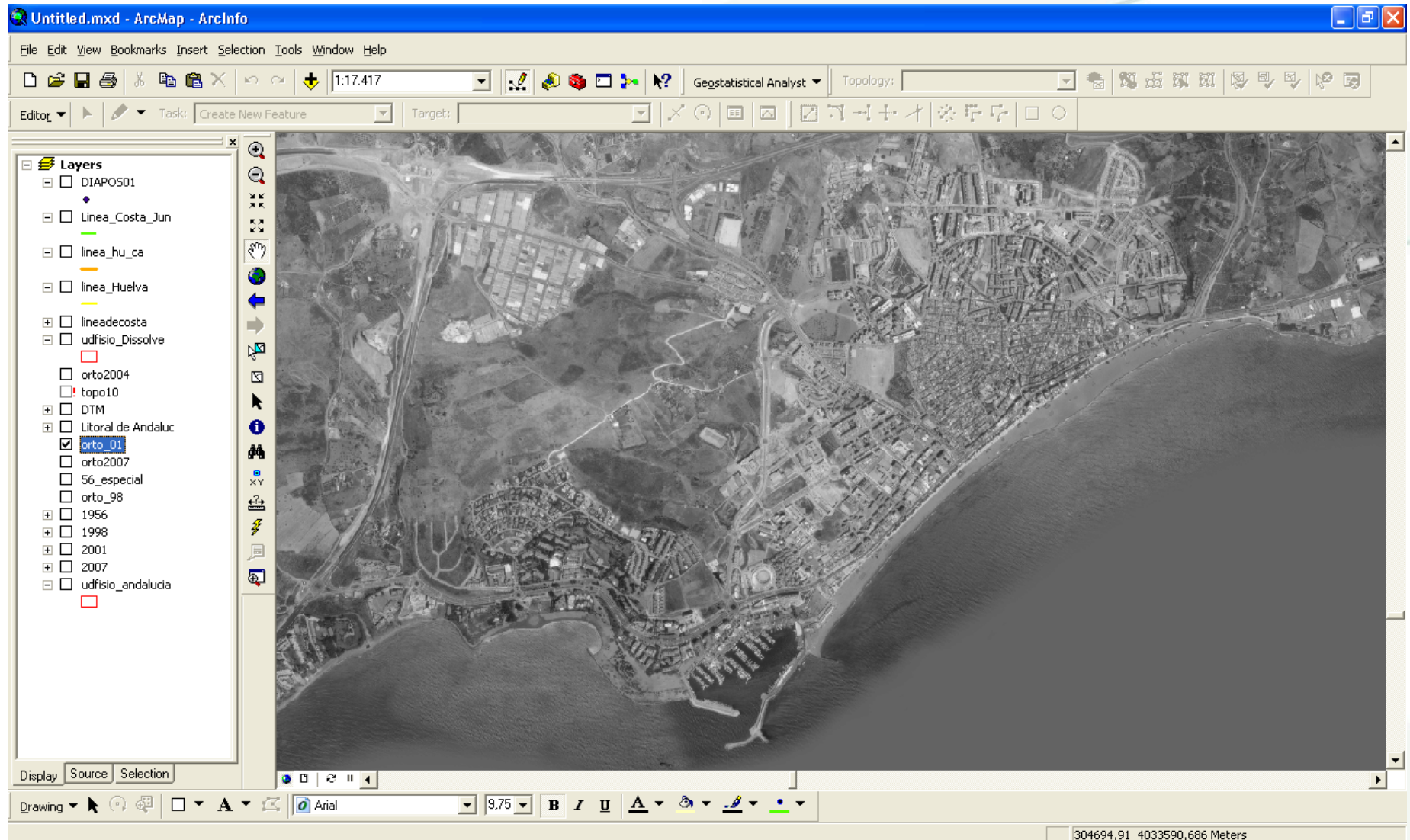
- DIAPOS01
- Linea_Costa_Jun
- linea_hu_ca
- linea_Huelva
- lineadecosta
- udfisio_Dissolve
- orto2004
- topo10
- DTM
- Litoral de Andaluc
- orto_01
- orto2007
- 56_especial
- orto_98
- 1956
- 1998
- 2001
- 2007
- udfisio_andalucia

Display Source Selection

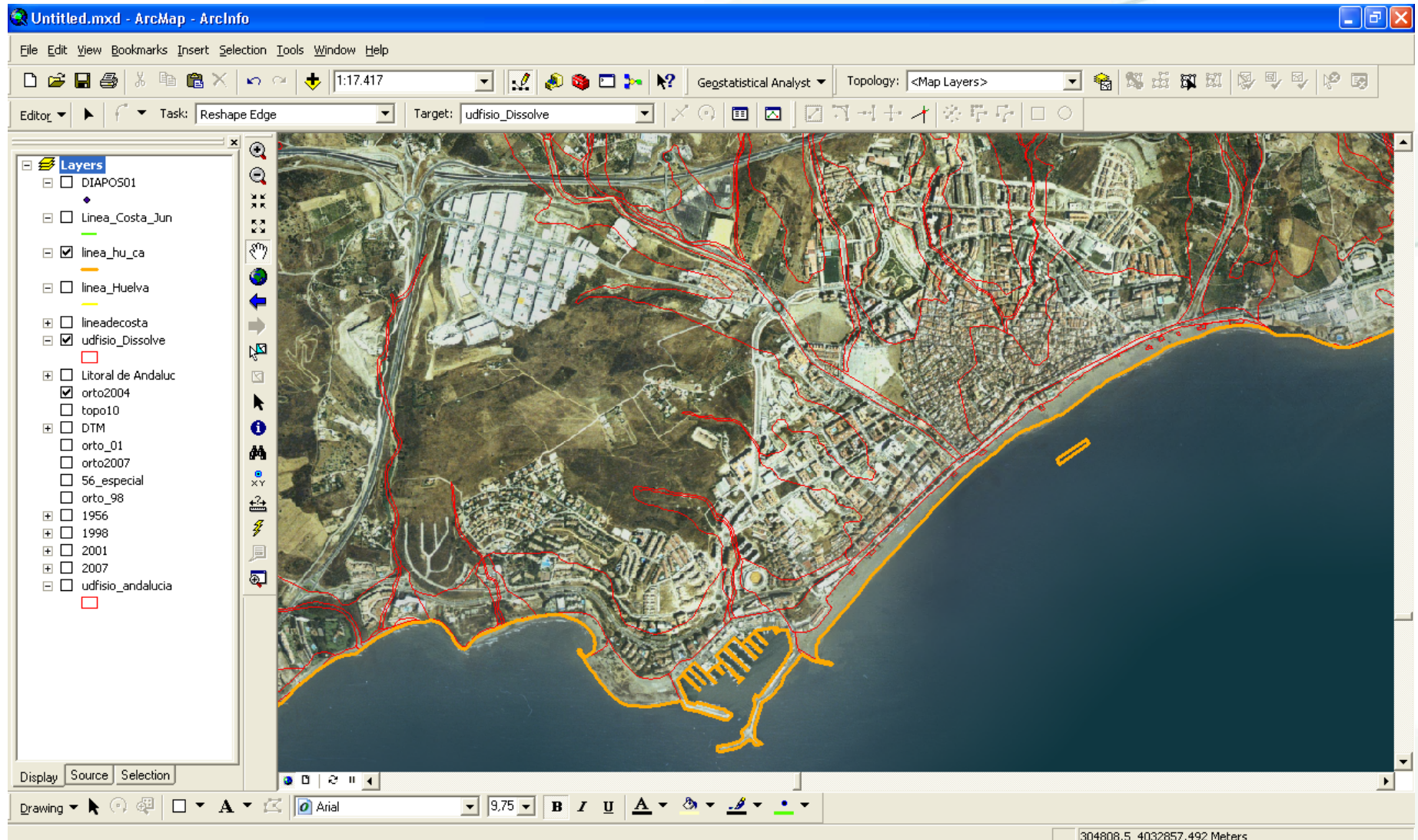
Drawing Arial 9.75 B I U A

304823,938 4032678,272 Meters

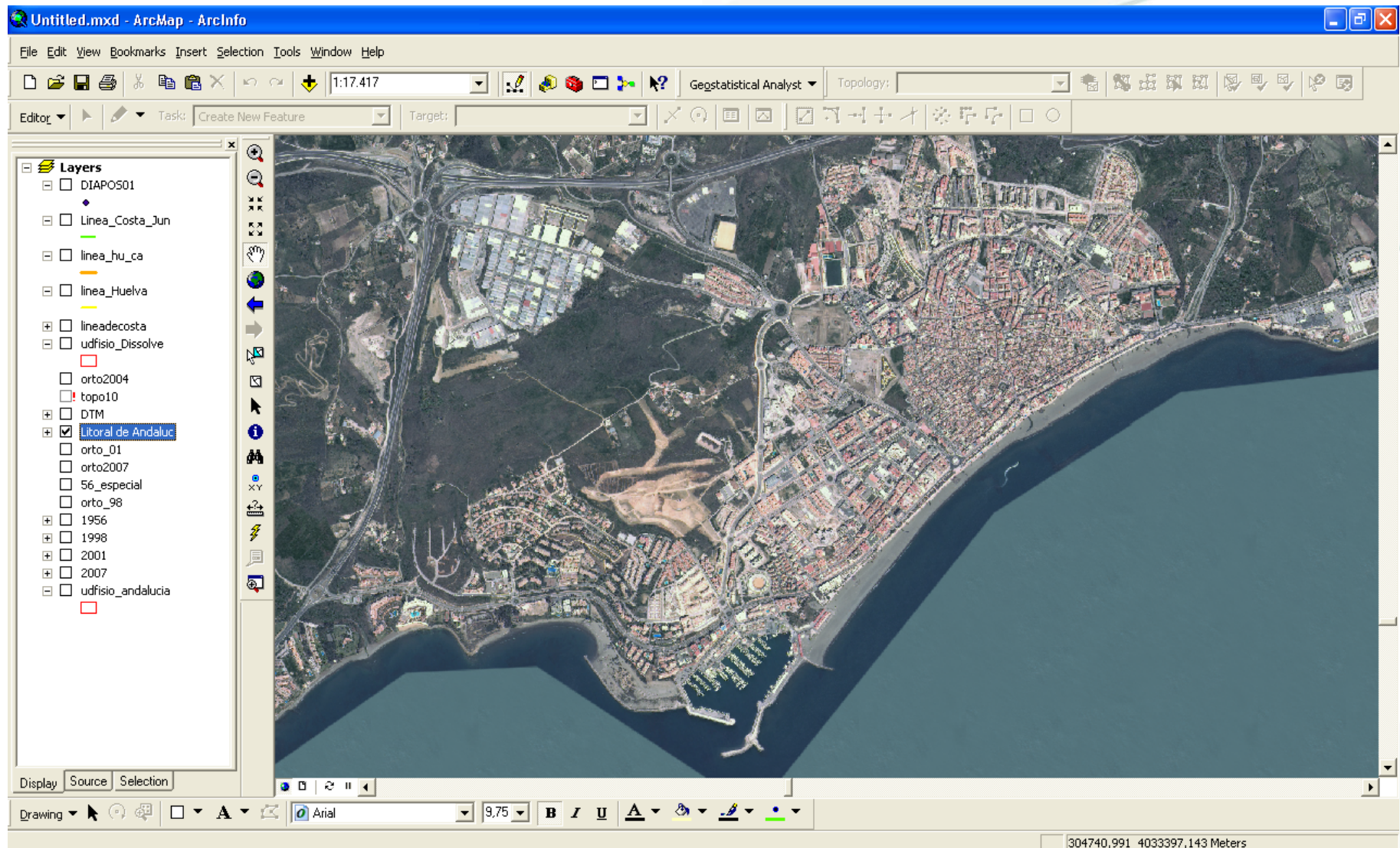
Orthophoto 2001



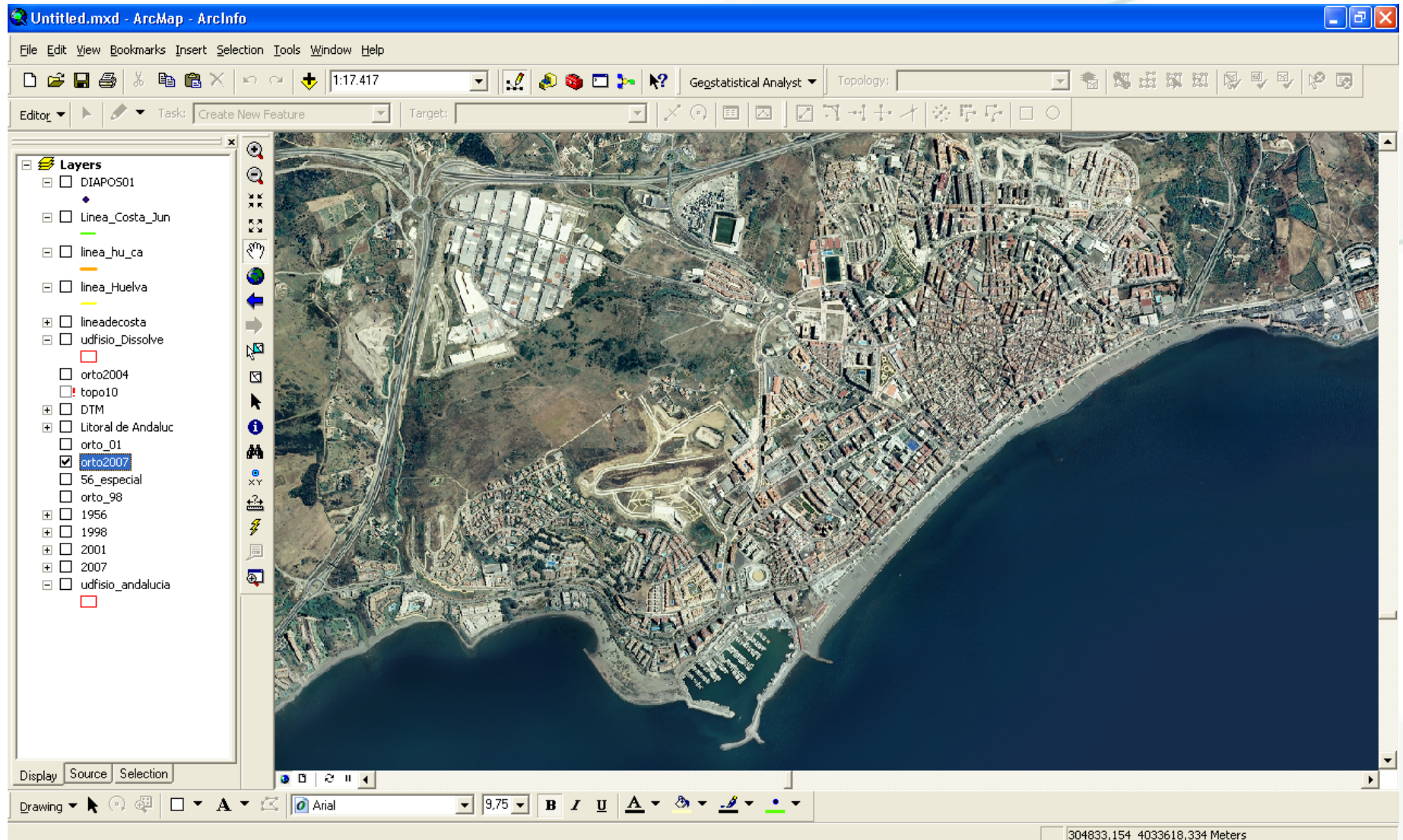
Orthophoto 2004



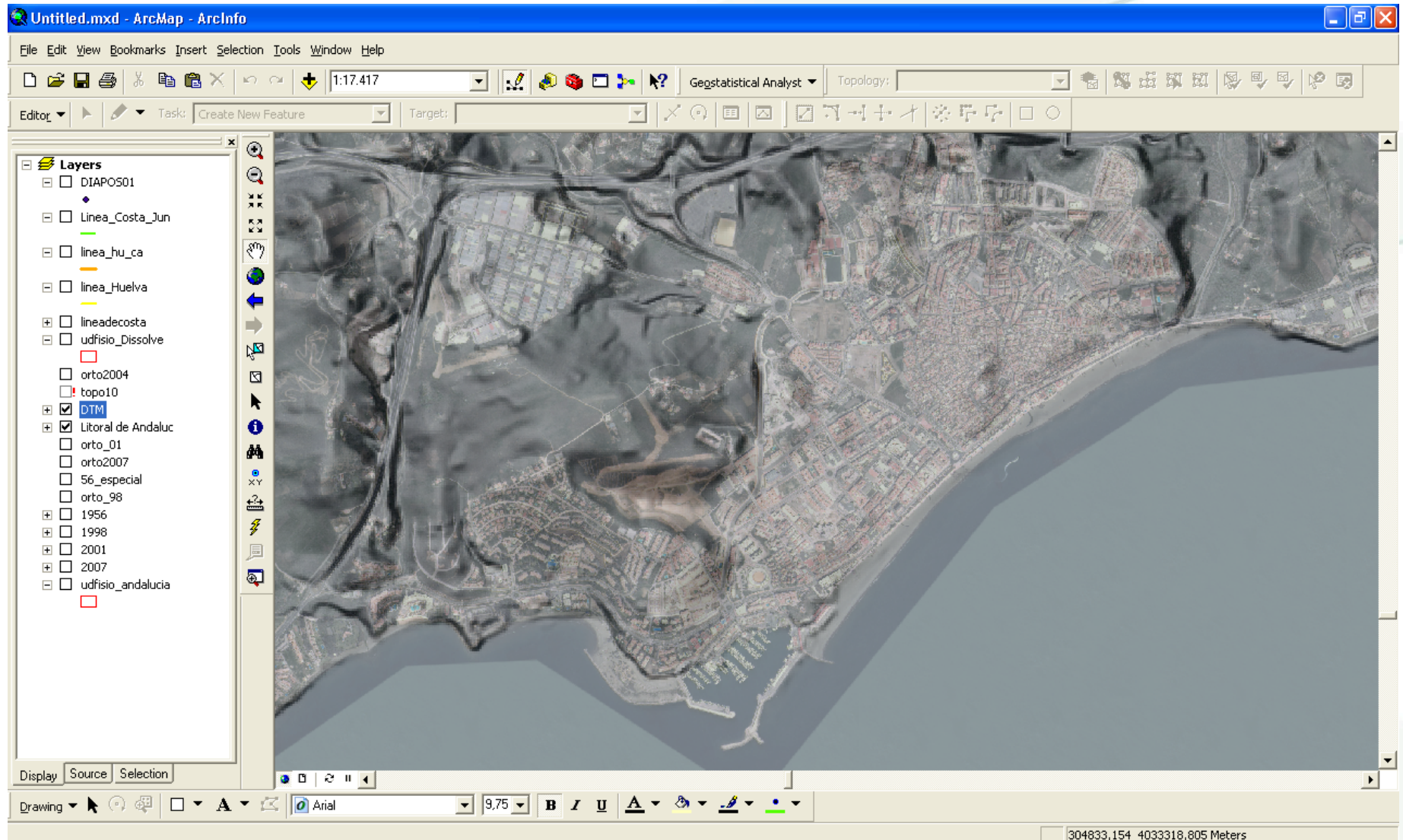
QuickBird 2005



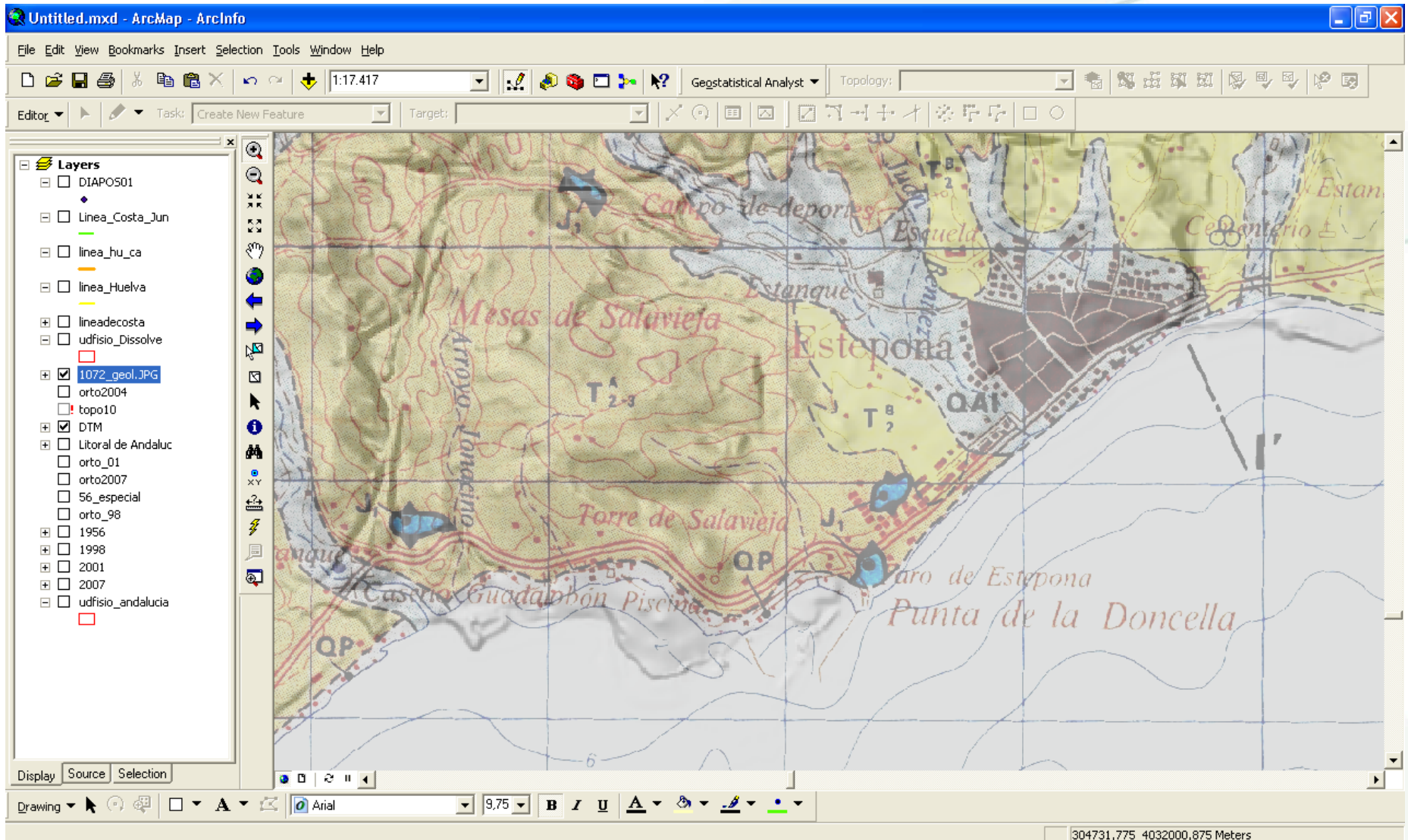
Orthophoto 2007



DTM Shadow & Slope (10 m)



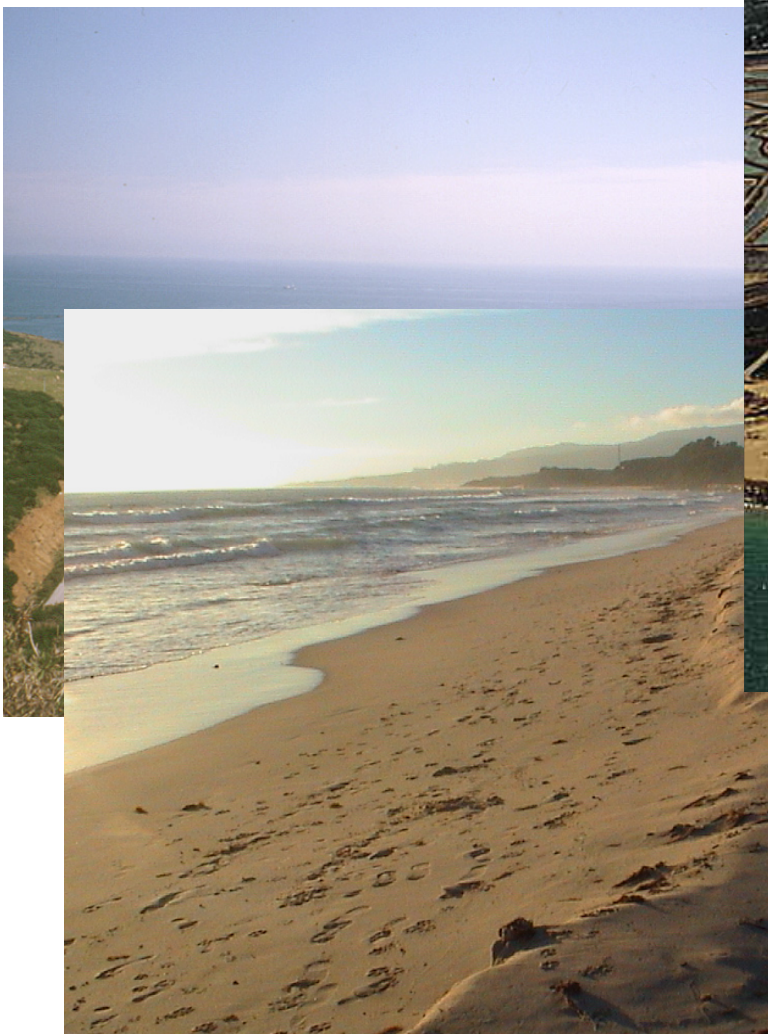
Geologic Maps 1:50.000



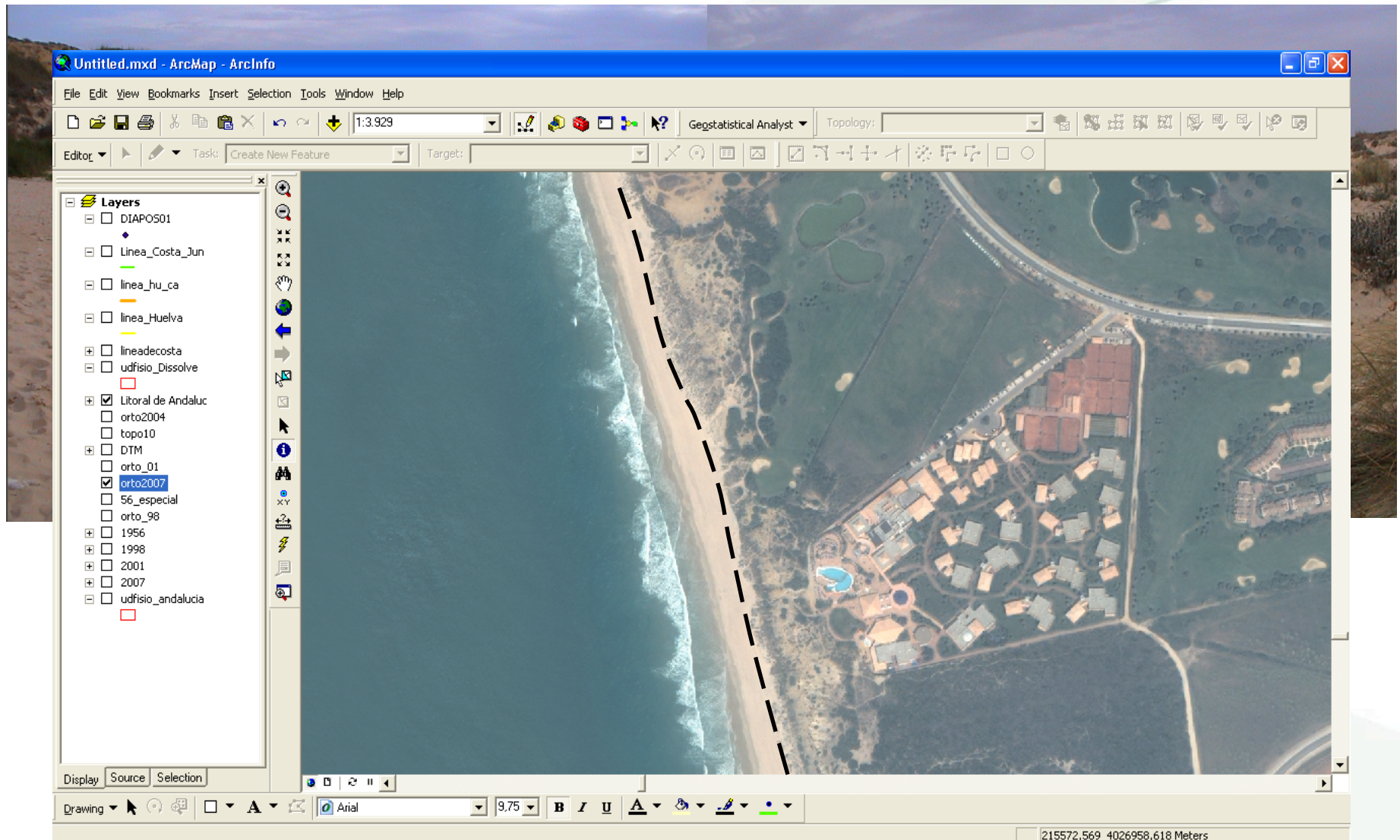
Original and WMS Aerial Photos From 1956 to 2008

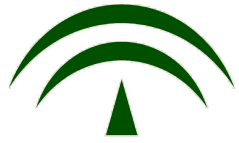


In Situ Pictures from 1956 to 2009



Photos as decision support tool!





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REGIONAL MINISTRY OF ENVIRONMENT

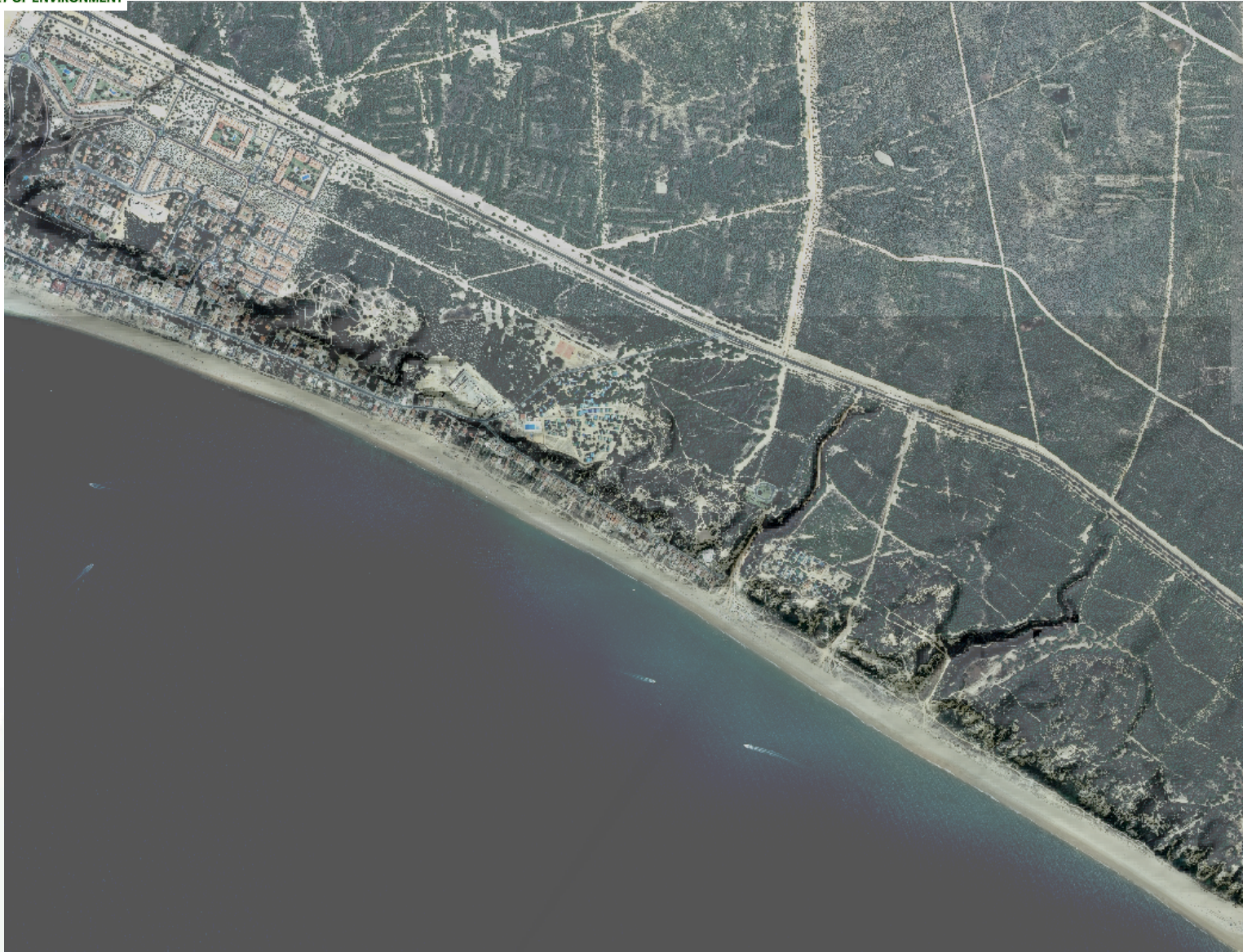
Topographic Maps 1:10.000/50.000



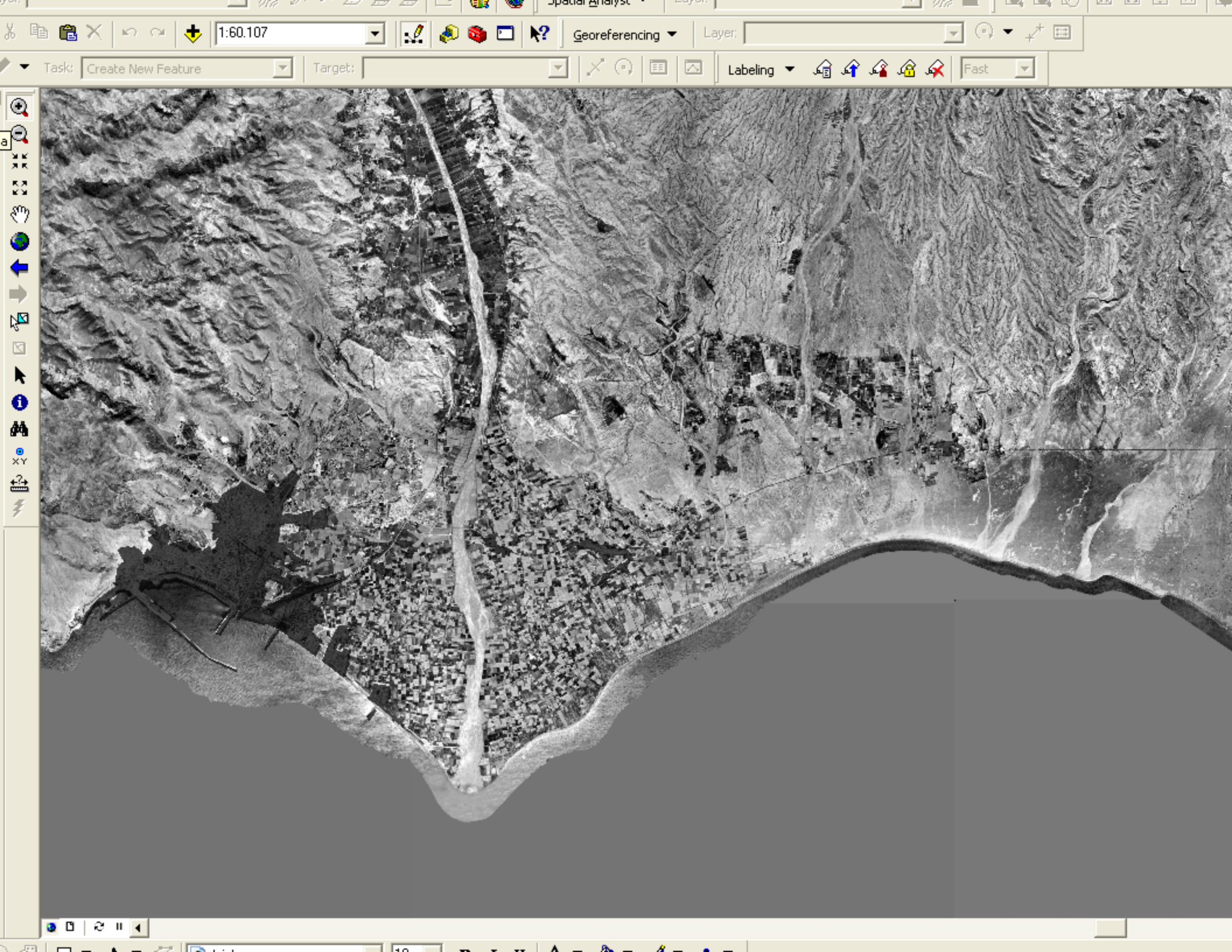
DTM for digitizing and to identify geomorphological units

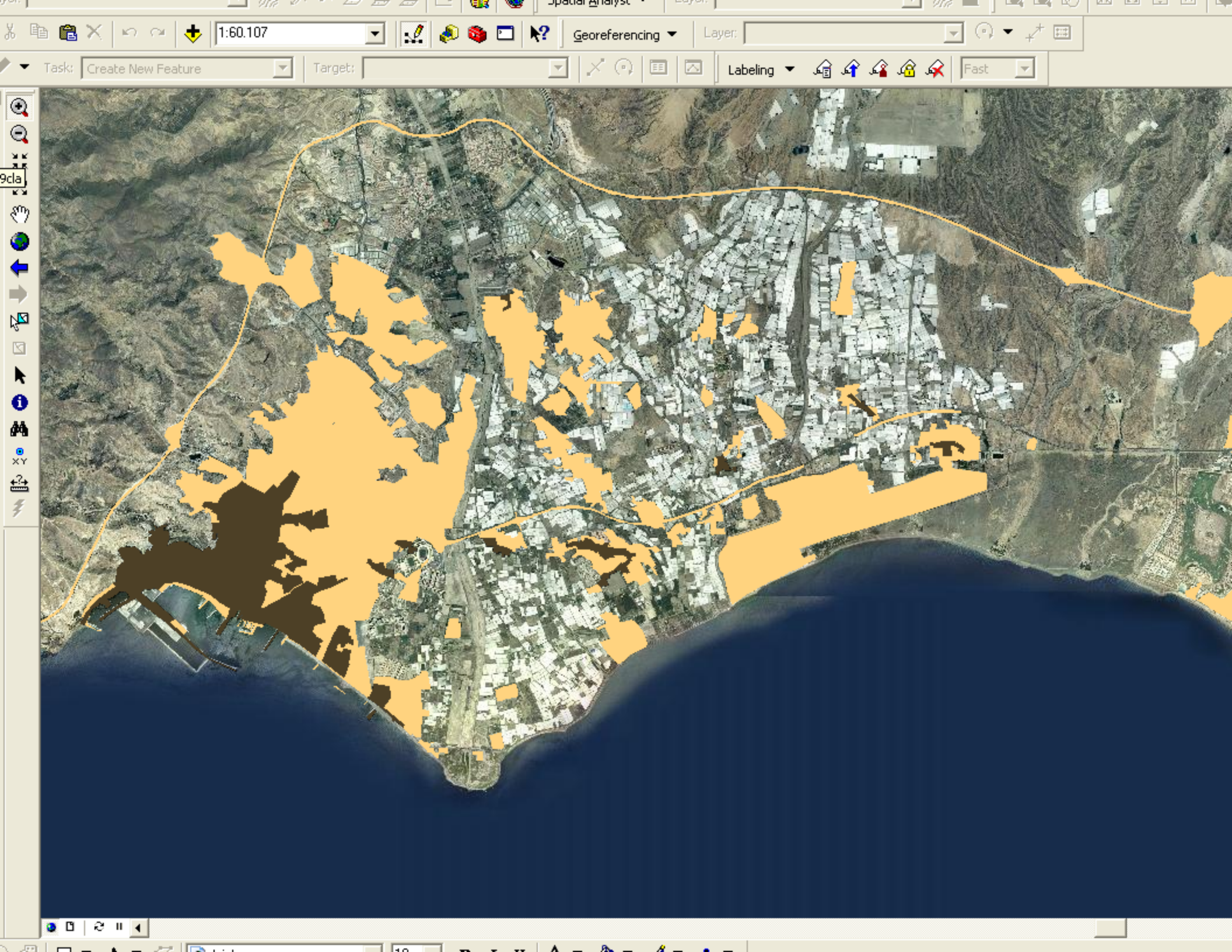


DTM for digitizing and to identify geomorphological units interpretación



Updating the Urban Uses





1:60.107

Georeferencing

Layer:

Task: Create New Feature

Target:

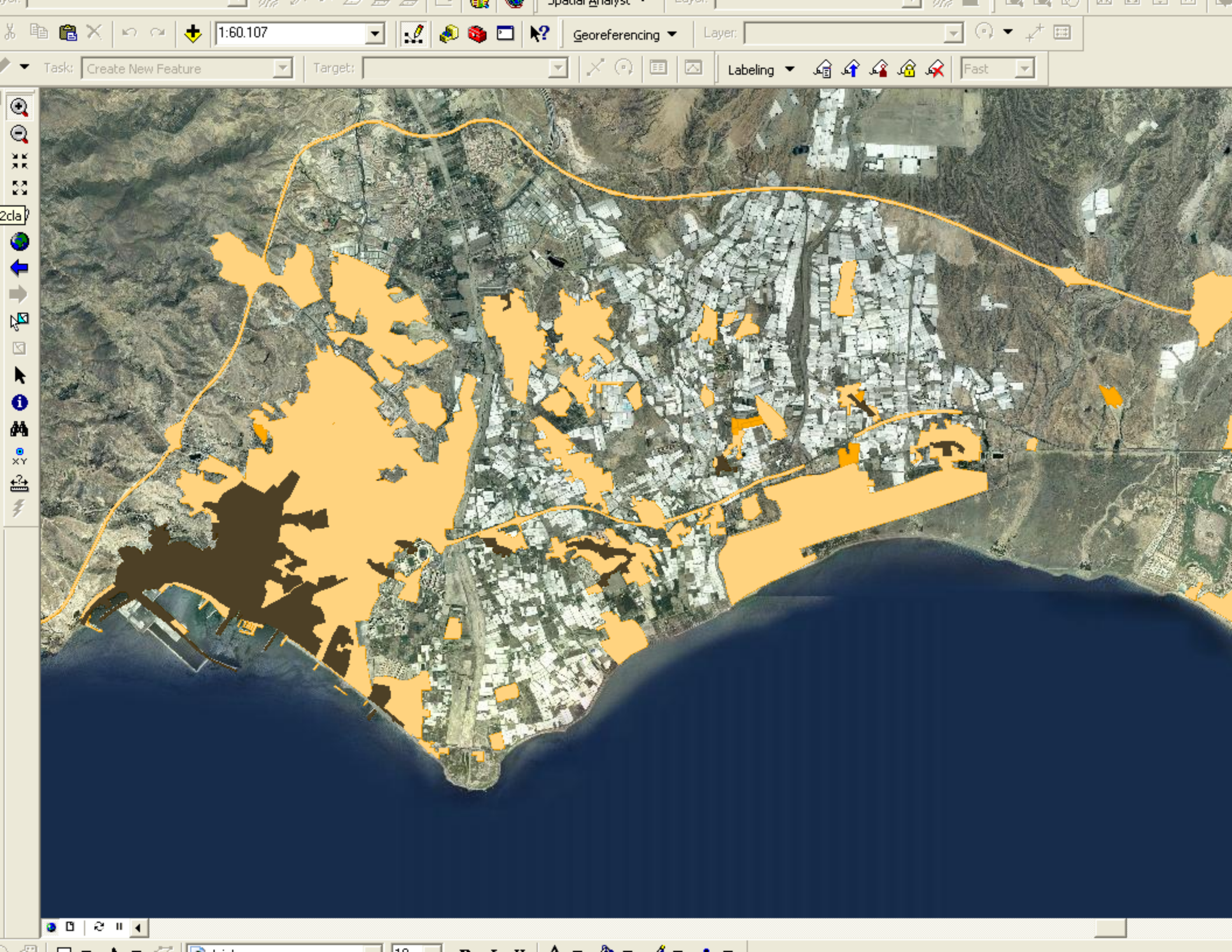
Labeling

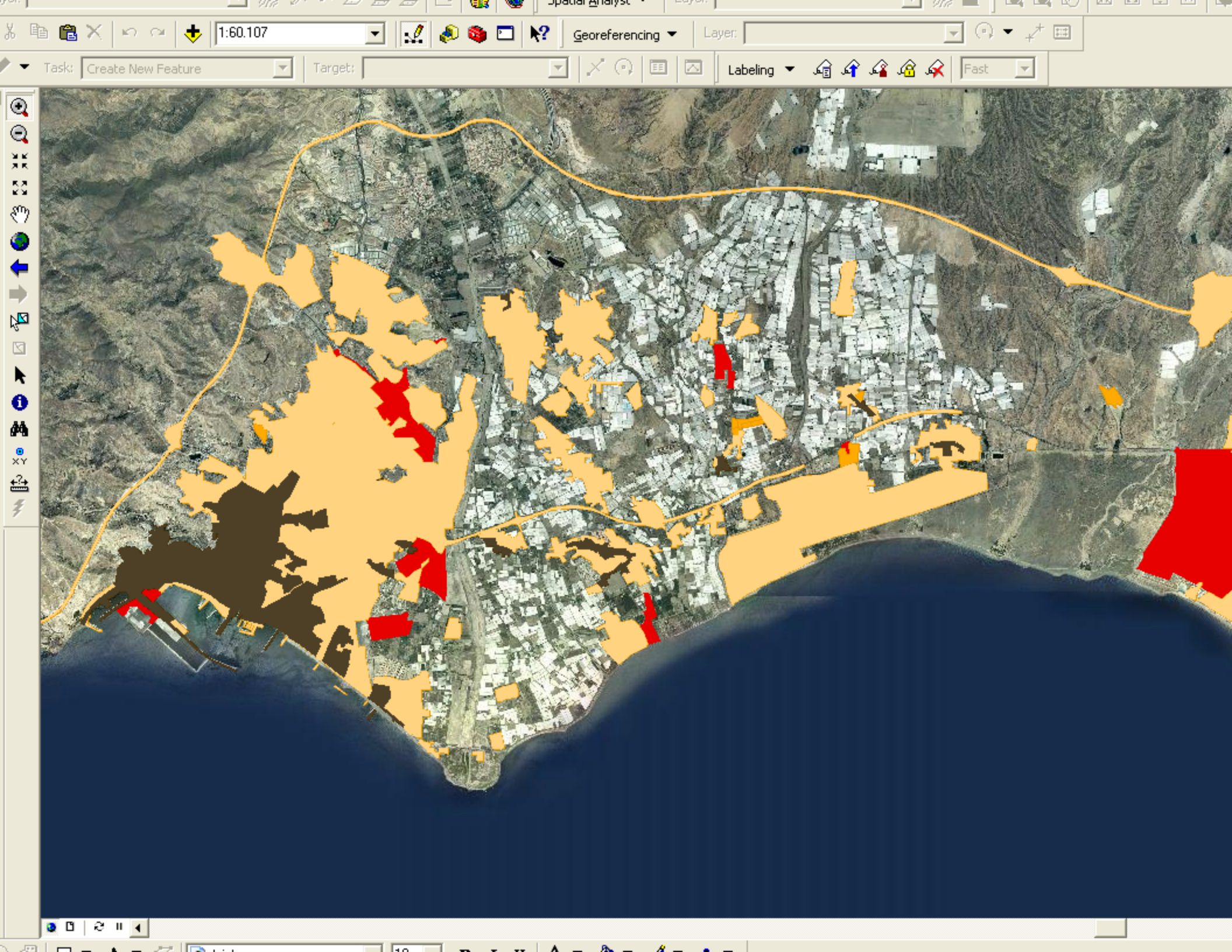
Fast

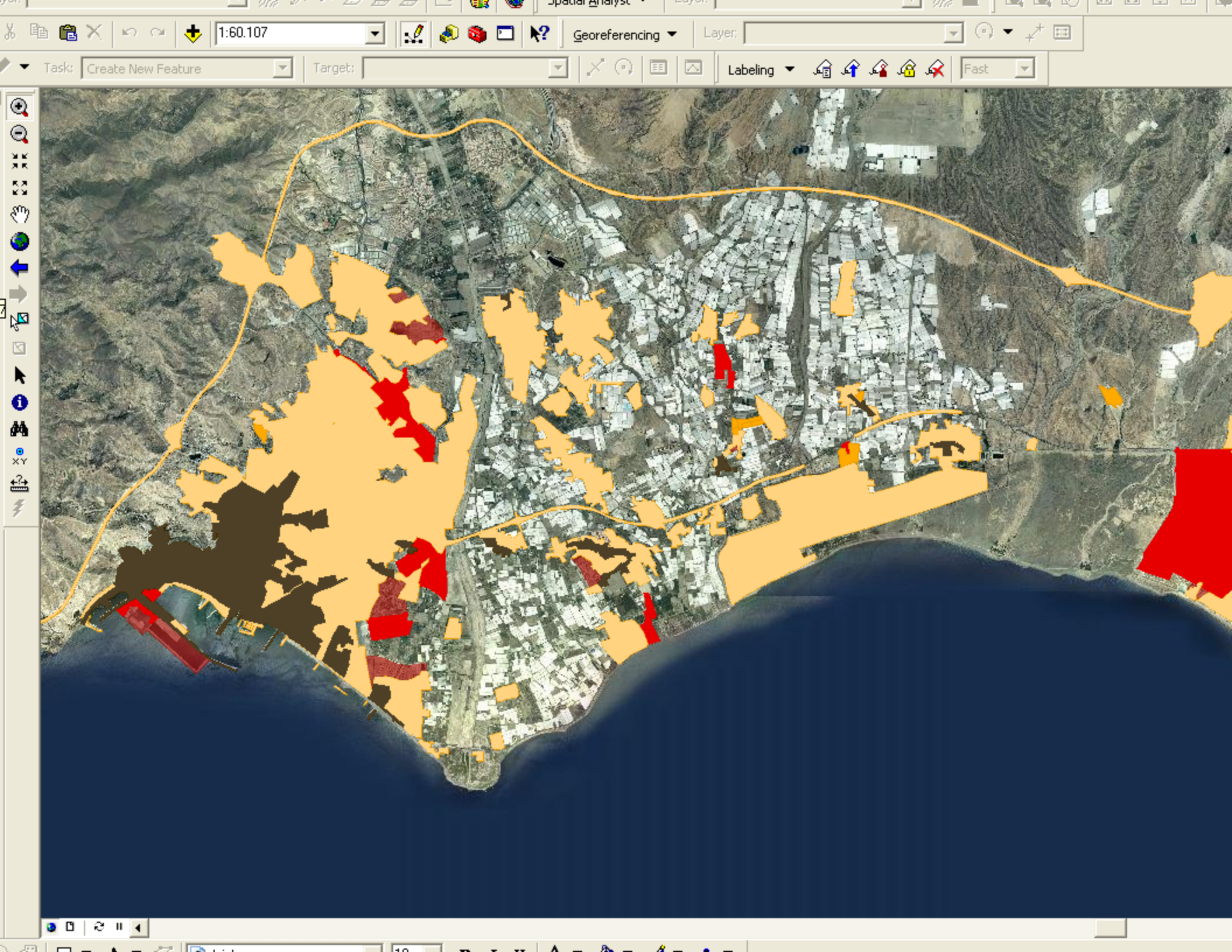
9cla

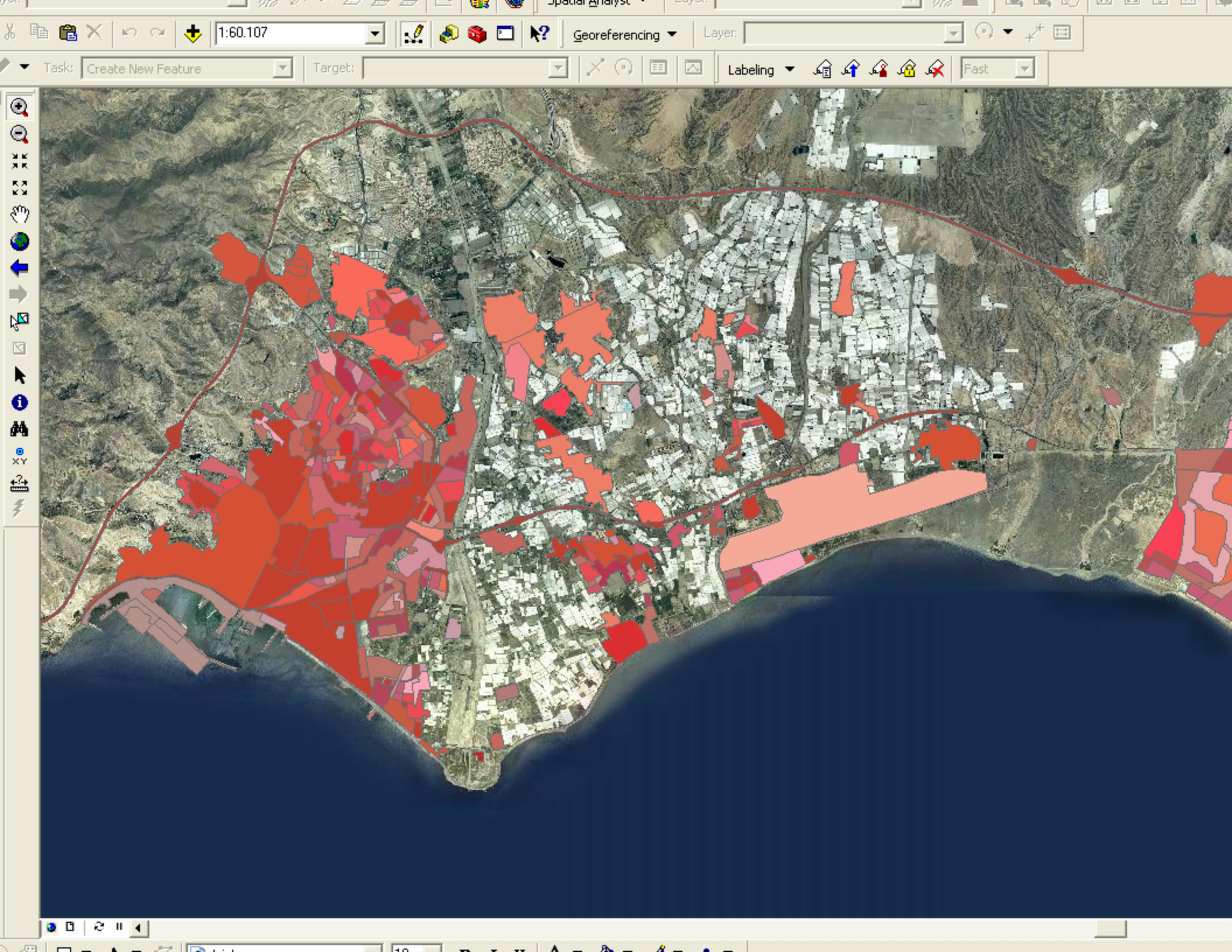
Spatial Analyst

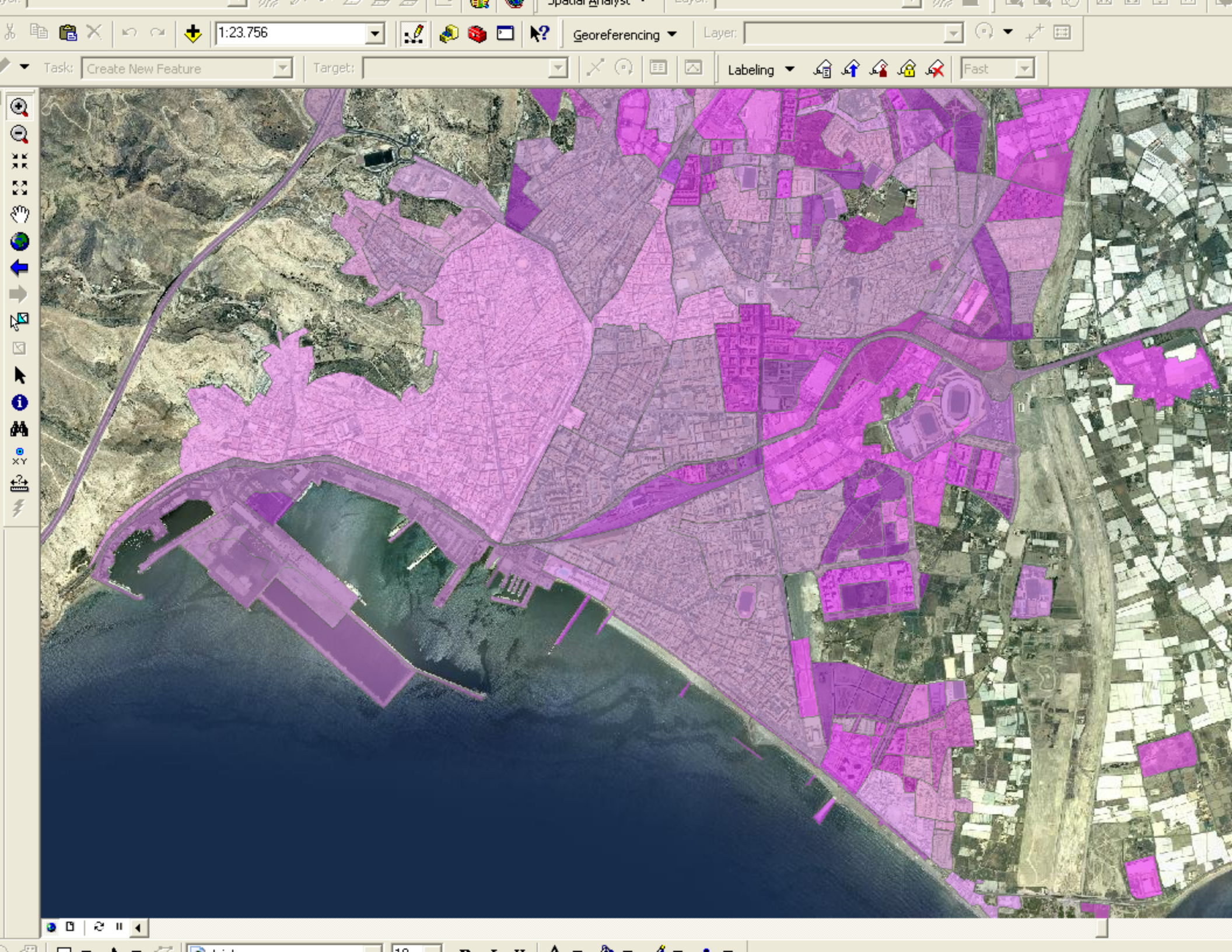
Layer:



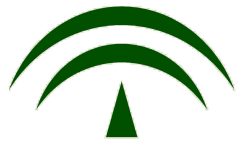






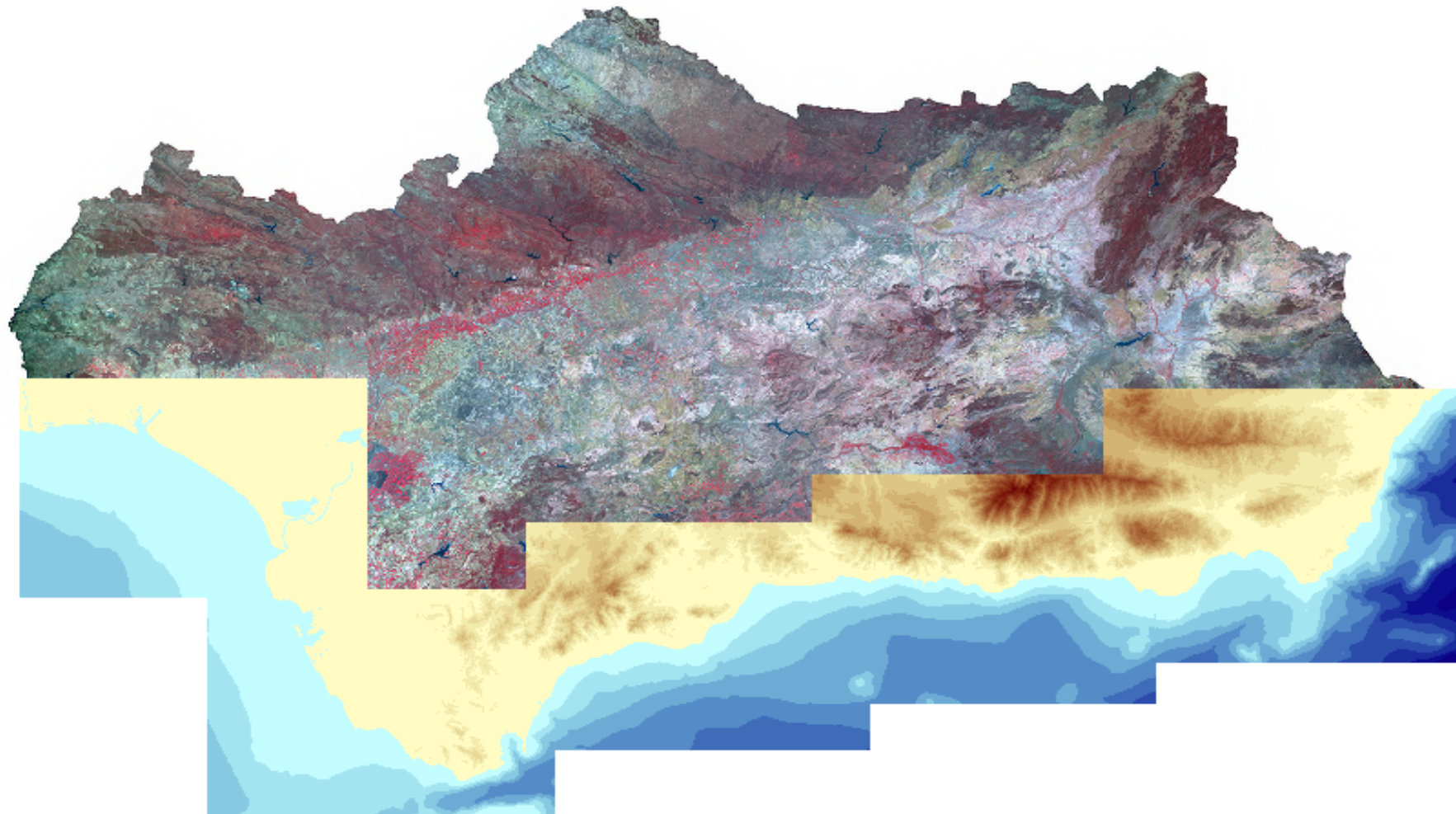


Land / Sea Digital Terrain Model



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REGIONAL MINISTRY OF ENVIRONMENT

Land/Sea DTM

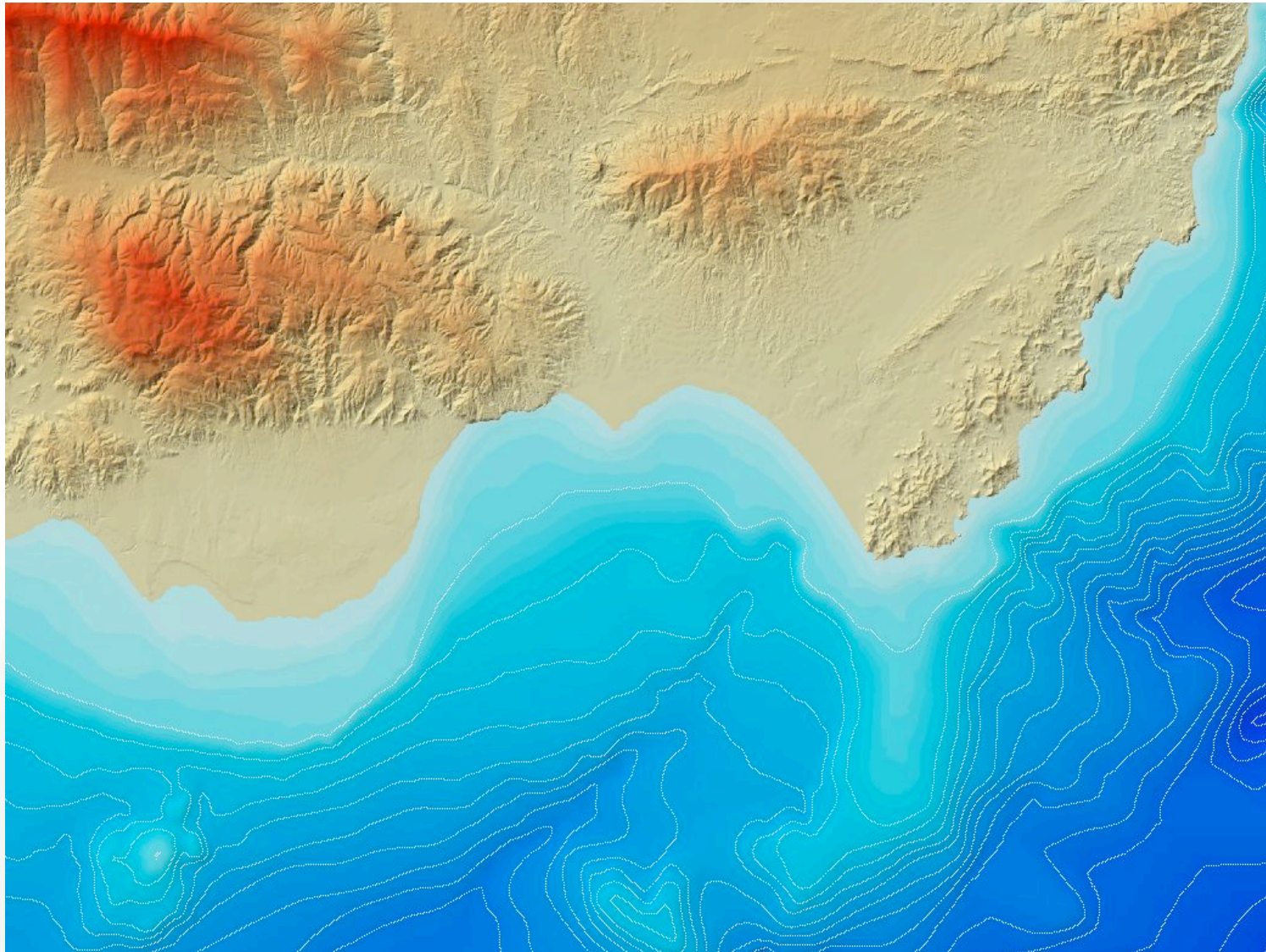


889
665
441
218
94
0
7
3

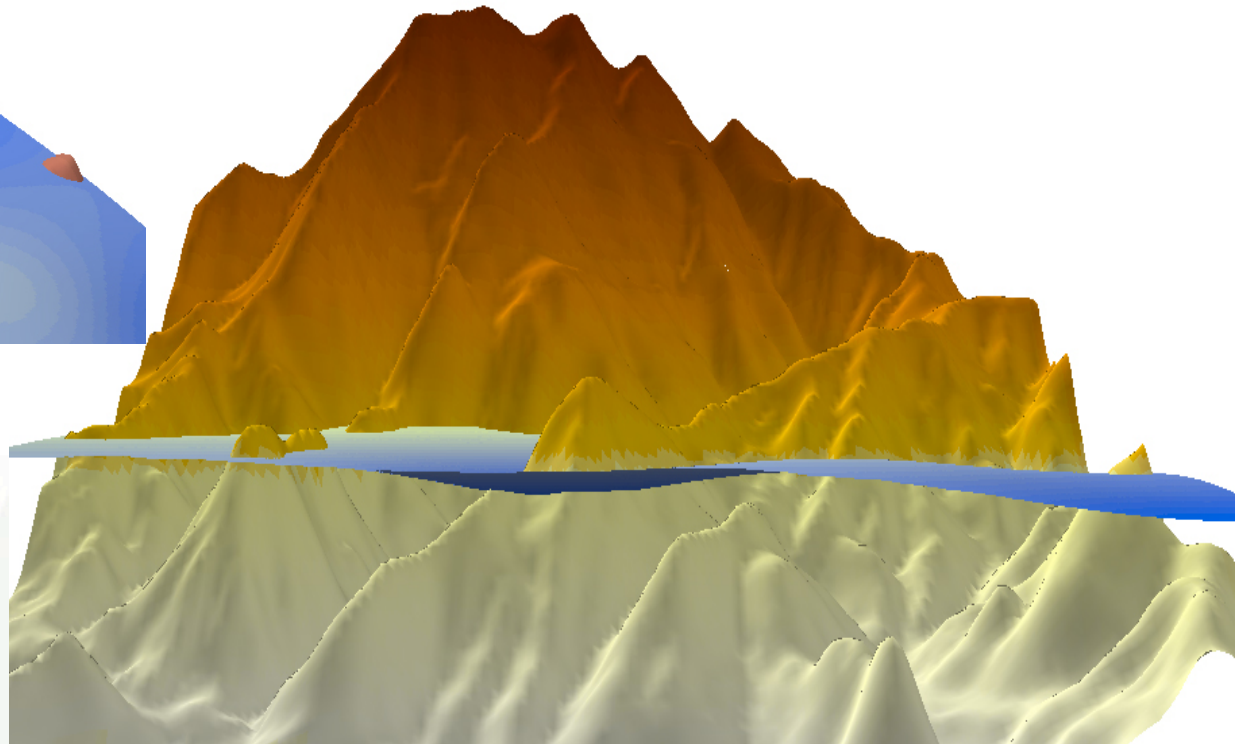
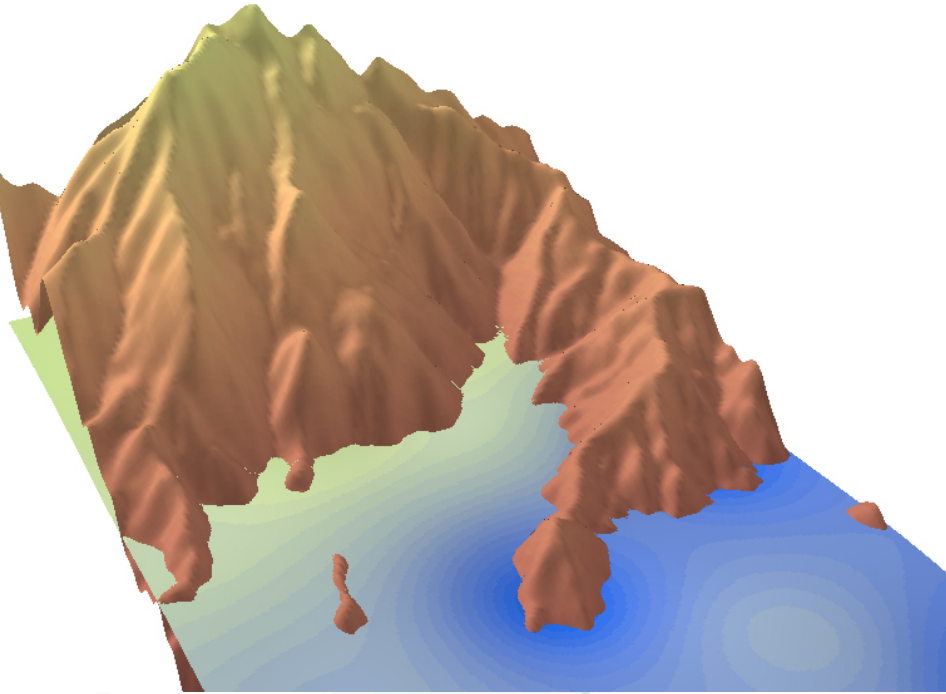
9
43
66
90
14
37
61
85
08
32
56
80

e cu

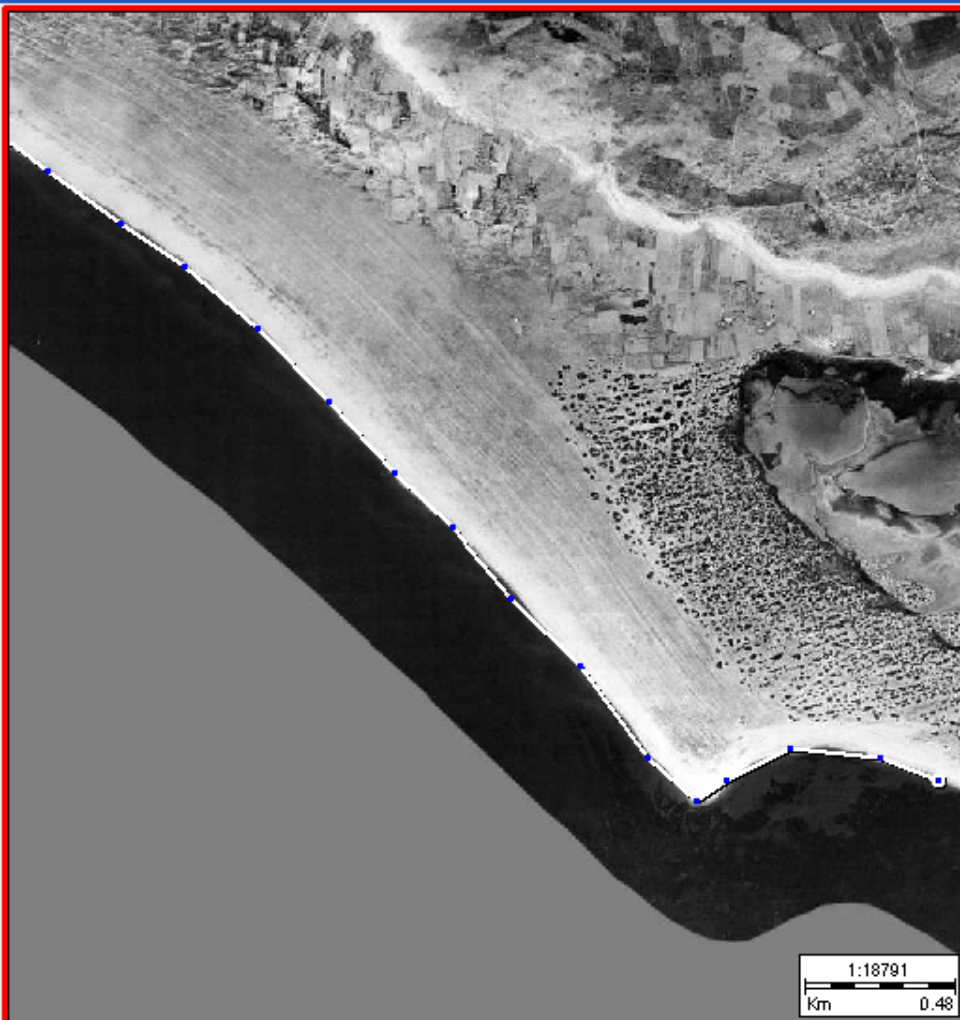
Land / Sea DTM – Almería Coast



Continental and Sea Surface: Two irregular surfaces



Monitoring Coastal Erosion



Capas Entidades

- Entidad 0
- Entidad 1
- Entidad 3
- Entidad 5

SHP

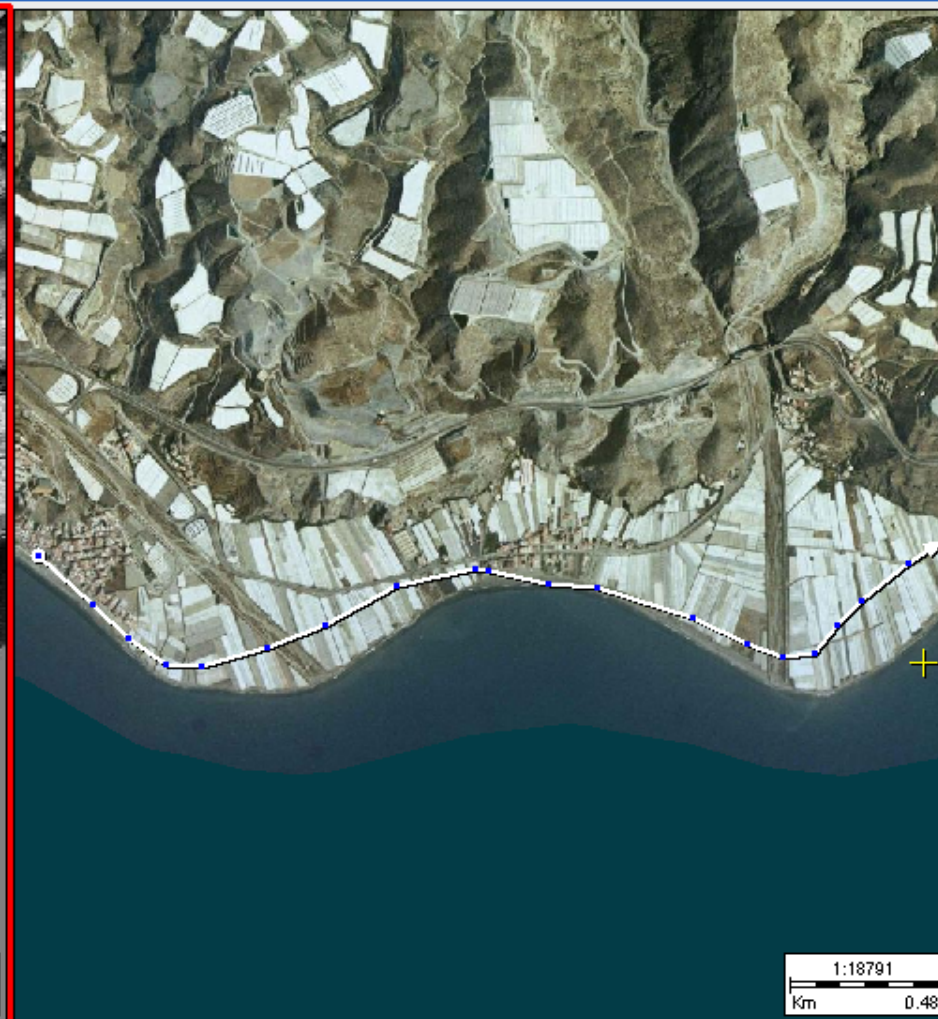
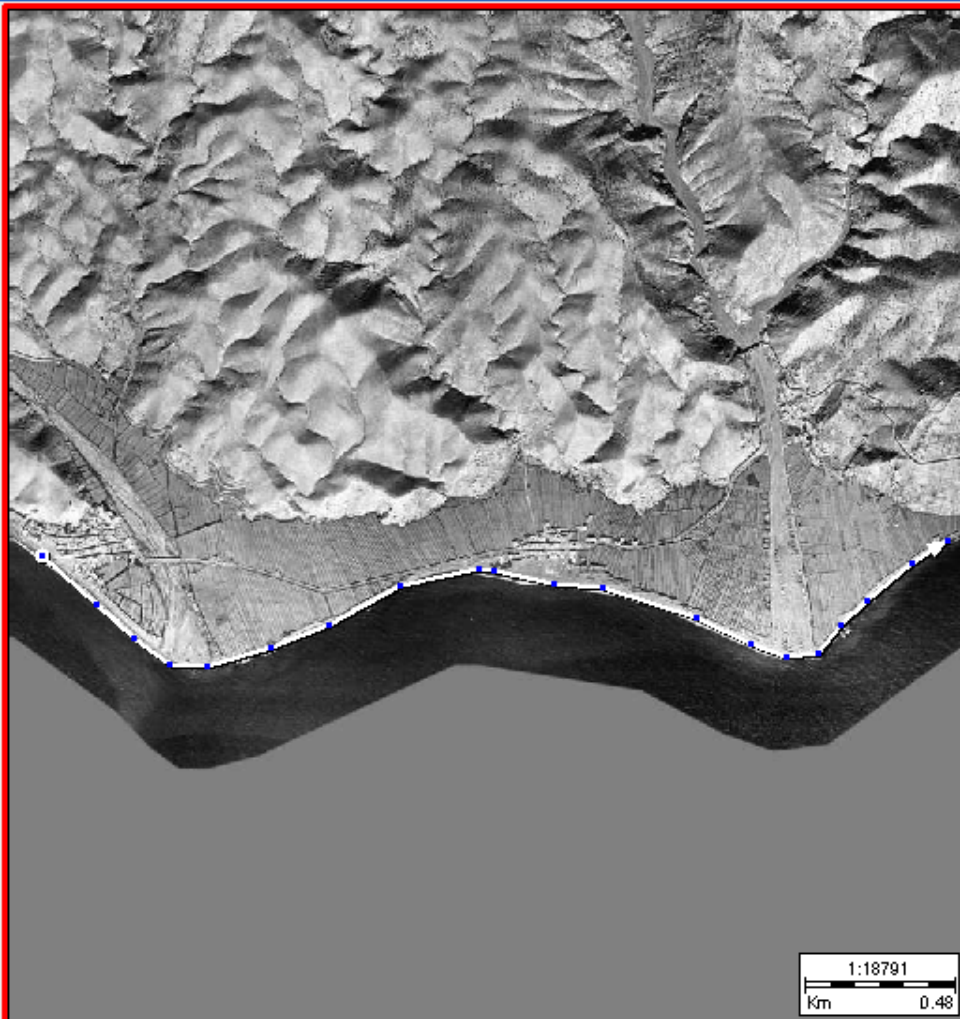
PTH SHP

Navigation and interaction icons: mouse, hand, zoom, globe, info, print, camera, layers, refresh, 2D, 2.5D, 3D, back, forward.



Mapa indice Detalle

UTM x: 521213.94, UTM y: 4059215.25
Huso: 30, Altitud: 0.00 m.

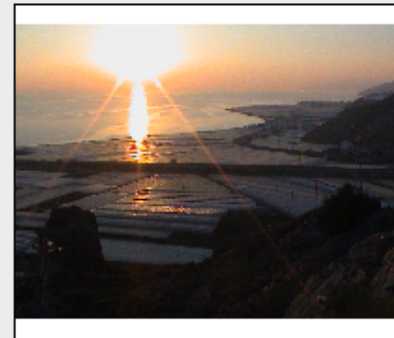


Capas | **Entidades**

- Entidad 0
- Entidad 1
- Entidad 2
- Entidad 3

Editing tools: Erase, Copy, Paste, Undo, Redo, Save (SHP), Print (PTH), Close (X).

Navigation and interaction tools: Mouse, Hand, Zoom In, Home, Info, Print, Camera, Layer visibility, Refresh, 2D, 2.5D, 3D, Previous View, Next View.



Mapa indice | **Detalle**

UTM x: 487576.56, UTM y: 4066797.00
Huso: 30, Altitud: 0.00 m.



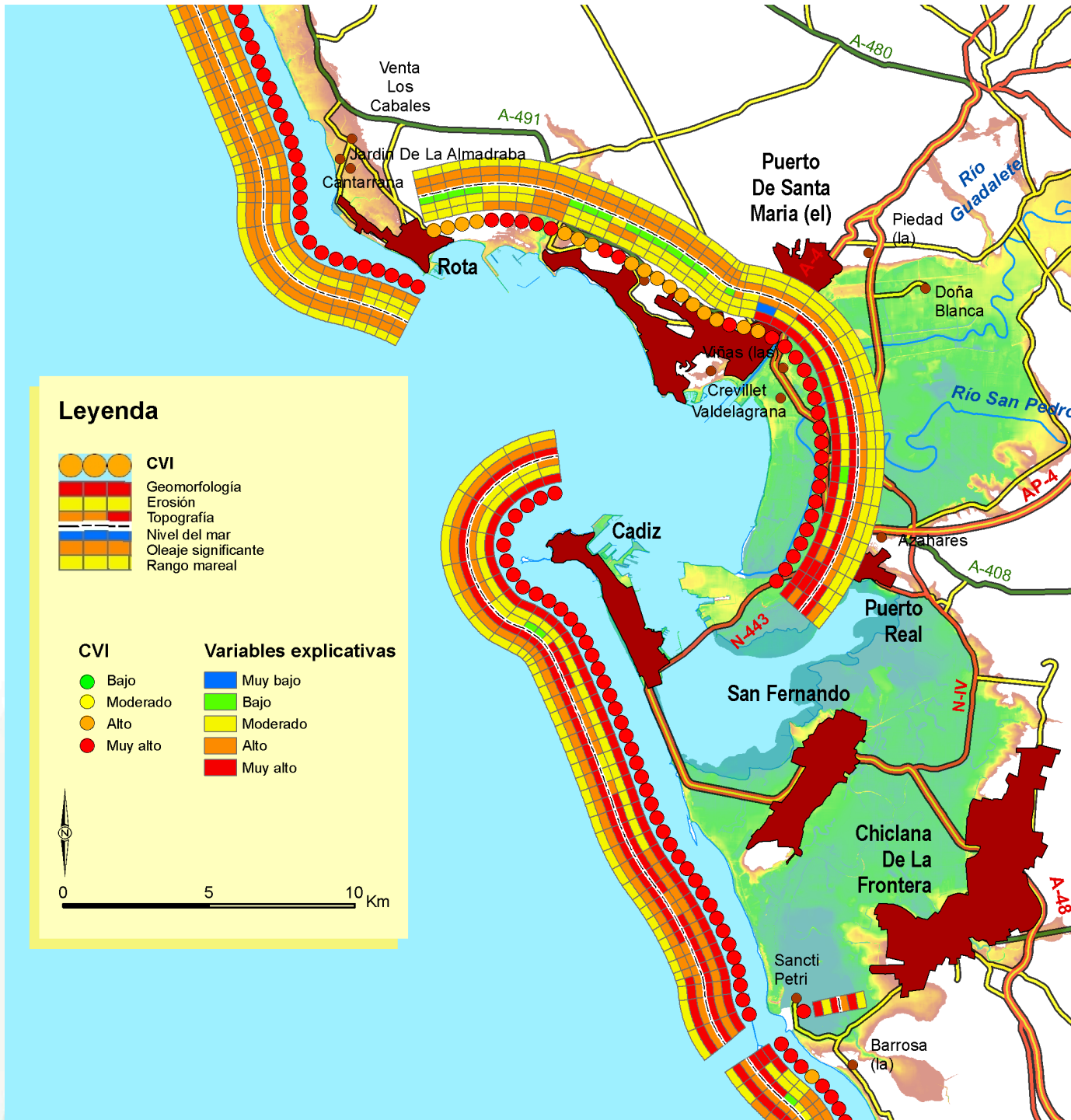
Vulnerability Index for the Coastal Areas

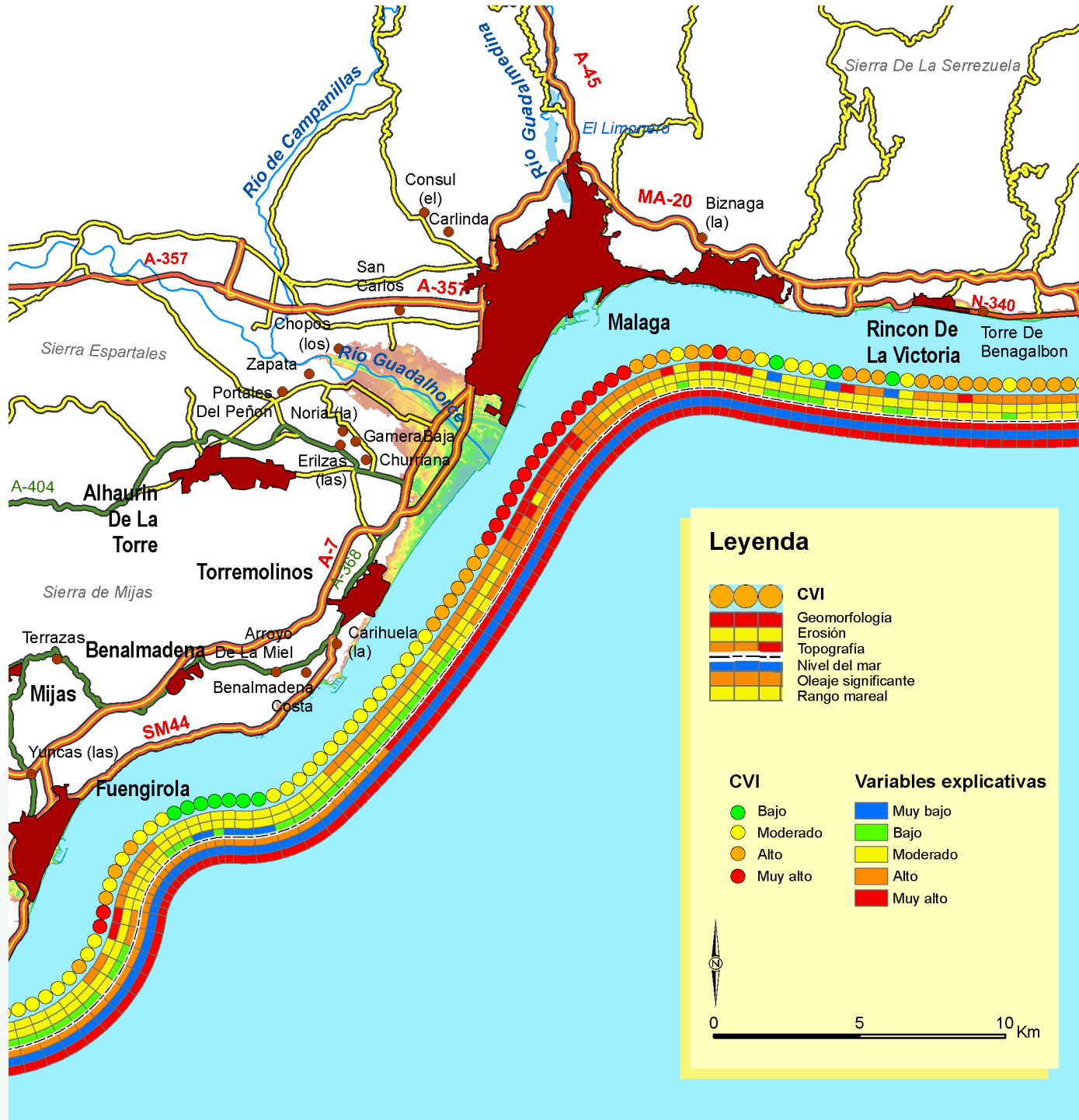


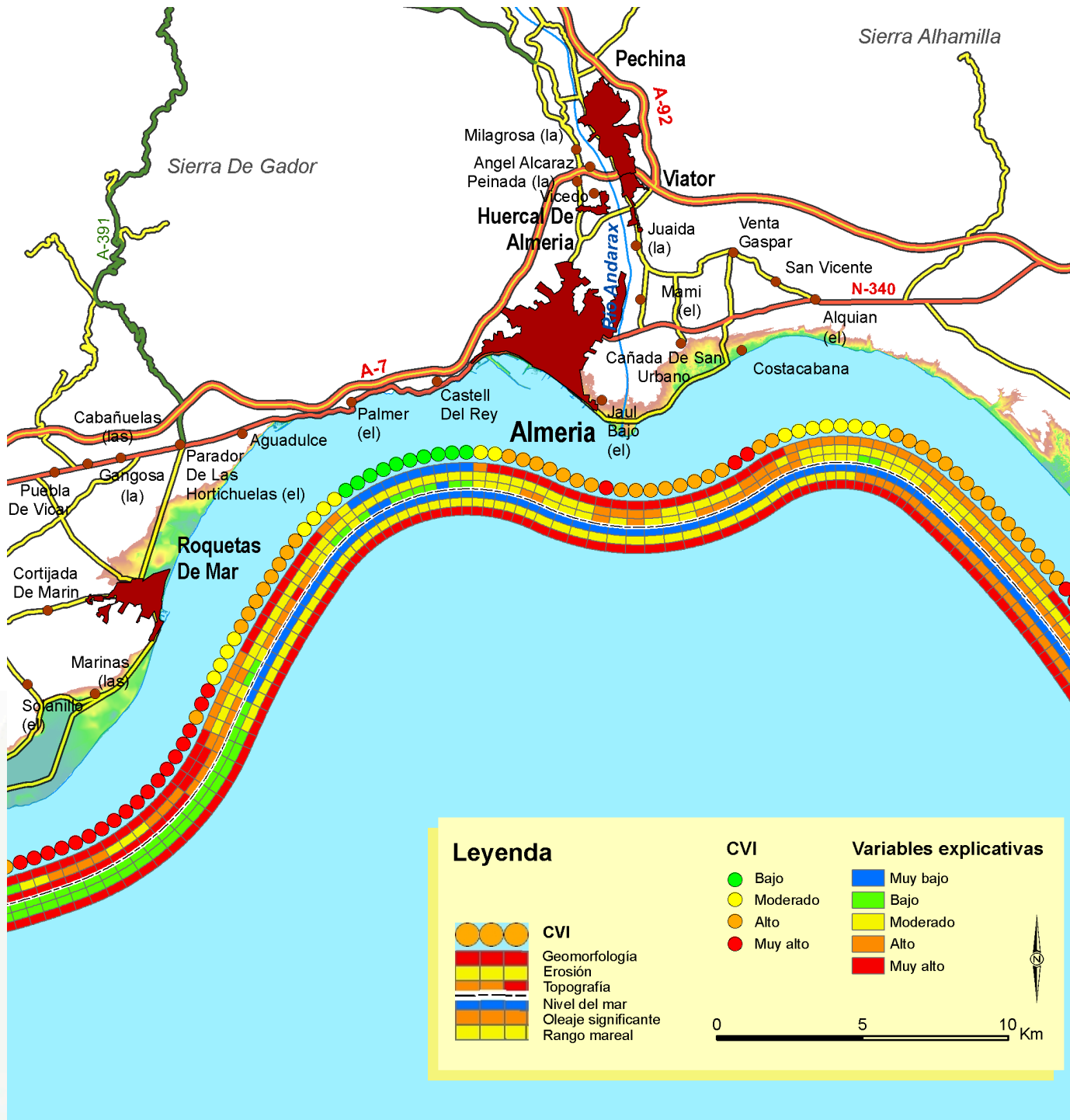
Leyenda

<p>CVI Geomorfología Erosión Topografía Nivel del mar Oleaje significativo Rango mareal</p>	<p>CVI</p> <ul style="list-style-type: none"> Bajo Moderado Alto Muy alto 	<p>Variables explicativas</p> <ul style="list-style-type: none"> Muy bajo Bajo Moderado Alto Muy alto
--	--	--

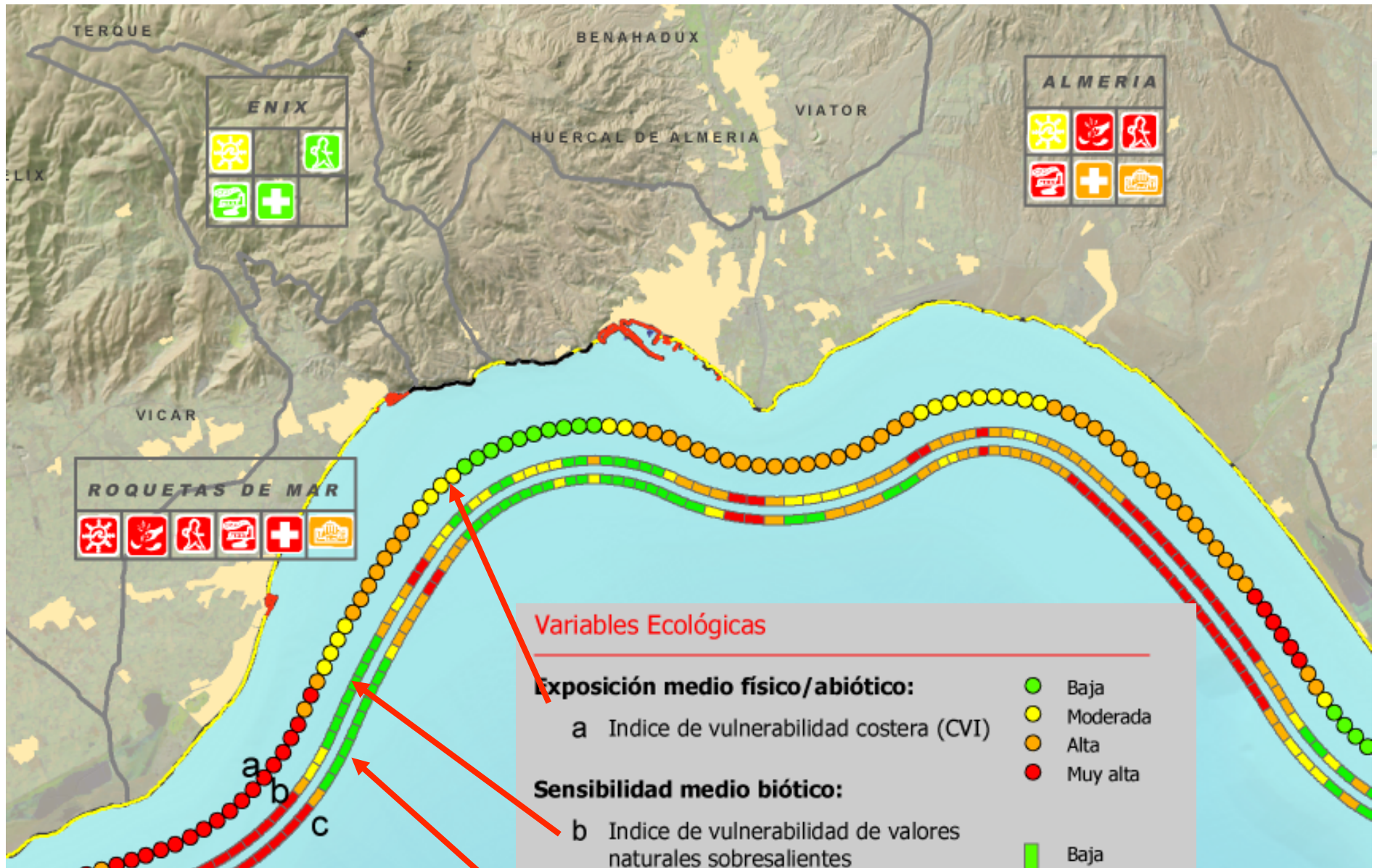
0 5 10 Km





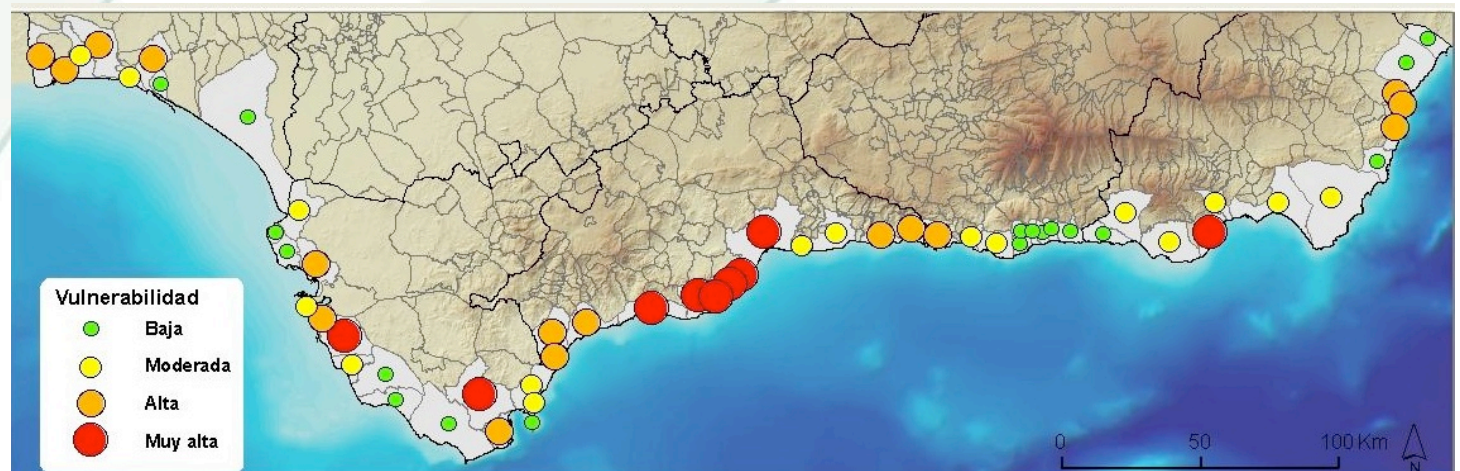
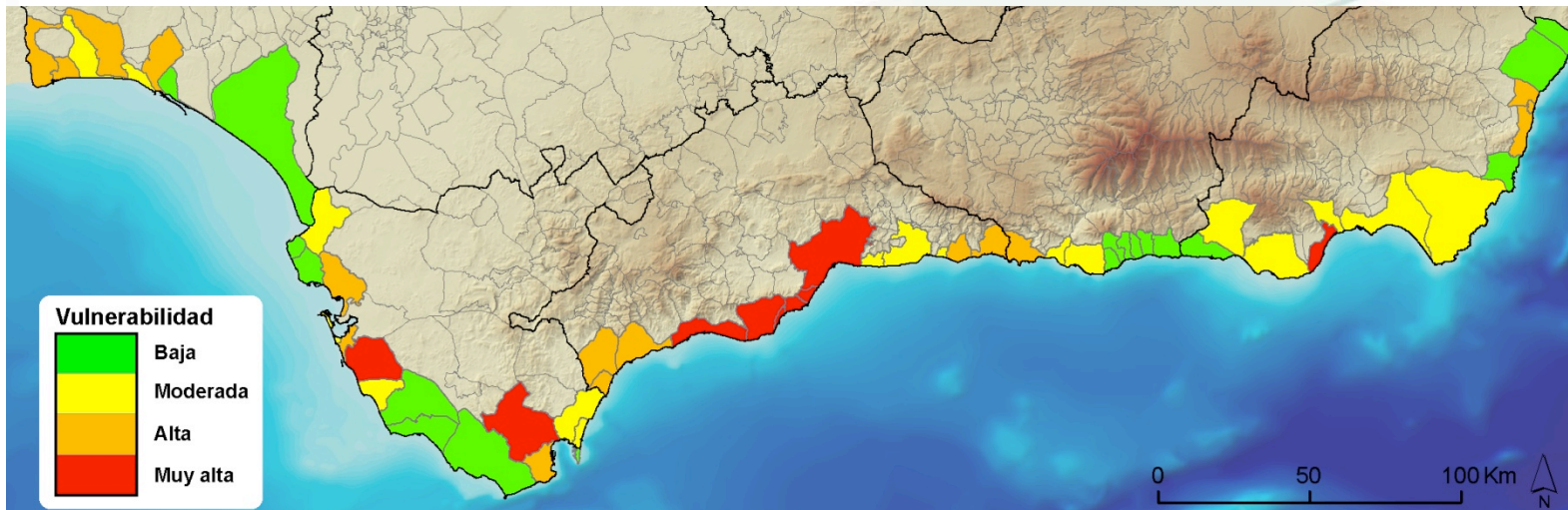


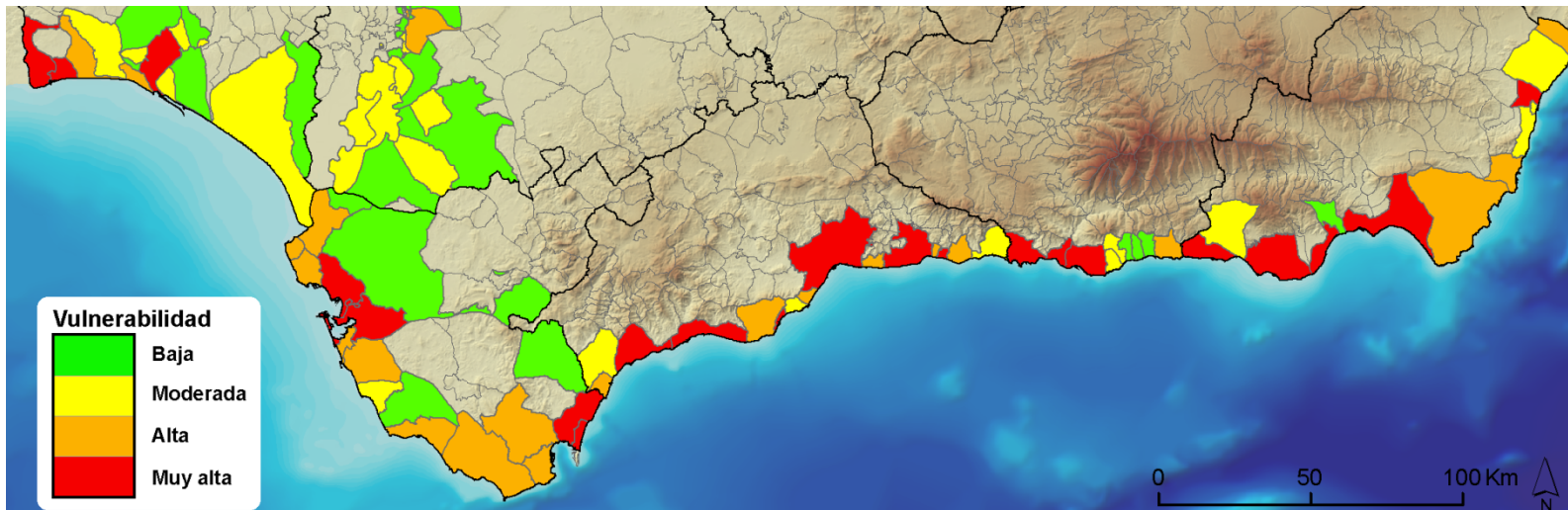
Ecological indicators



Socio-economic indicators

Coastal Indicator on Pressures: Number of Hotels' Beds, Number of tourists and beach length by coastal municipality





Altitud metros	Clase
0-2	2
2-4	4
4-6	6
6-8	8
>8	10

$$I = \sum_{\text{municipal}} (\text{valor asociado al uso residencial}_{\text{pixel}} \times \text{distancia línea costa}_{\text{pixel}}) / (\text{altura}_{\text{pixel}})^2$$

Distancia euclídea metros	Valor ponderado
0-500	16
500-1000	8
1000-2000	4
2000-4000	2
>4000	1

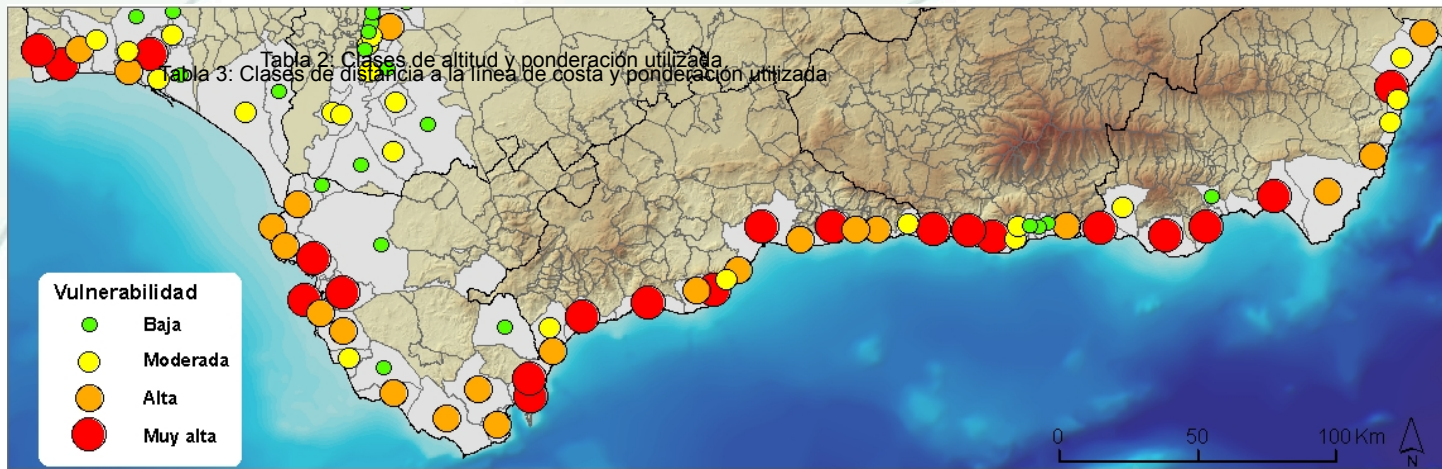
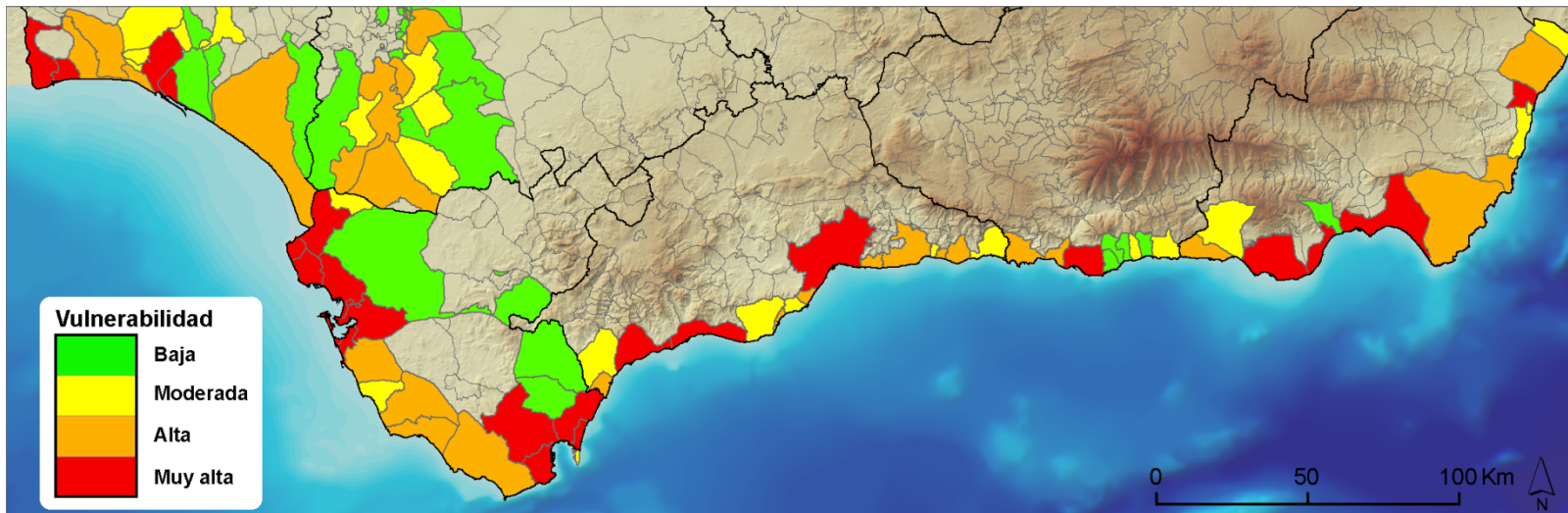


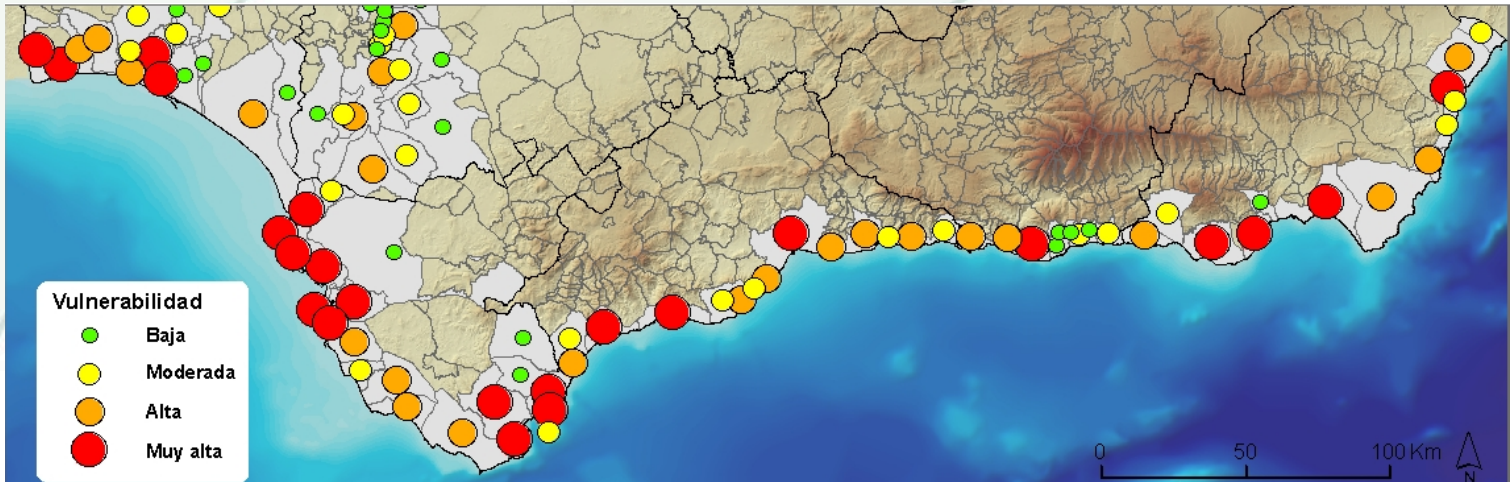
Tabla 2: Clases de altitud y ponderación utilizada
 Tabla 3: Clases de distancia a la línea de costa y ponderación utilizada

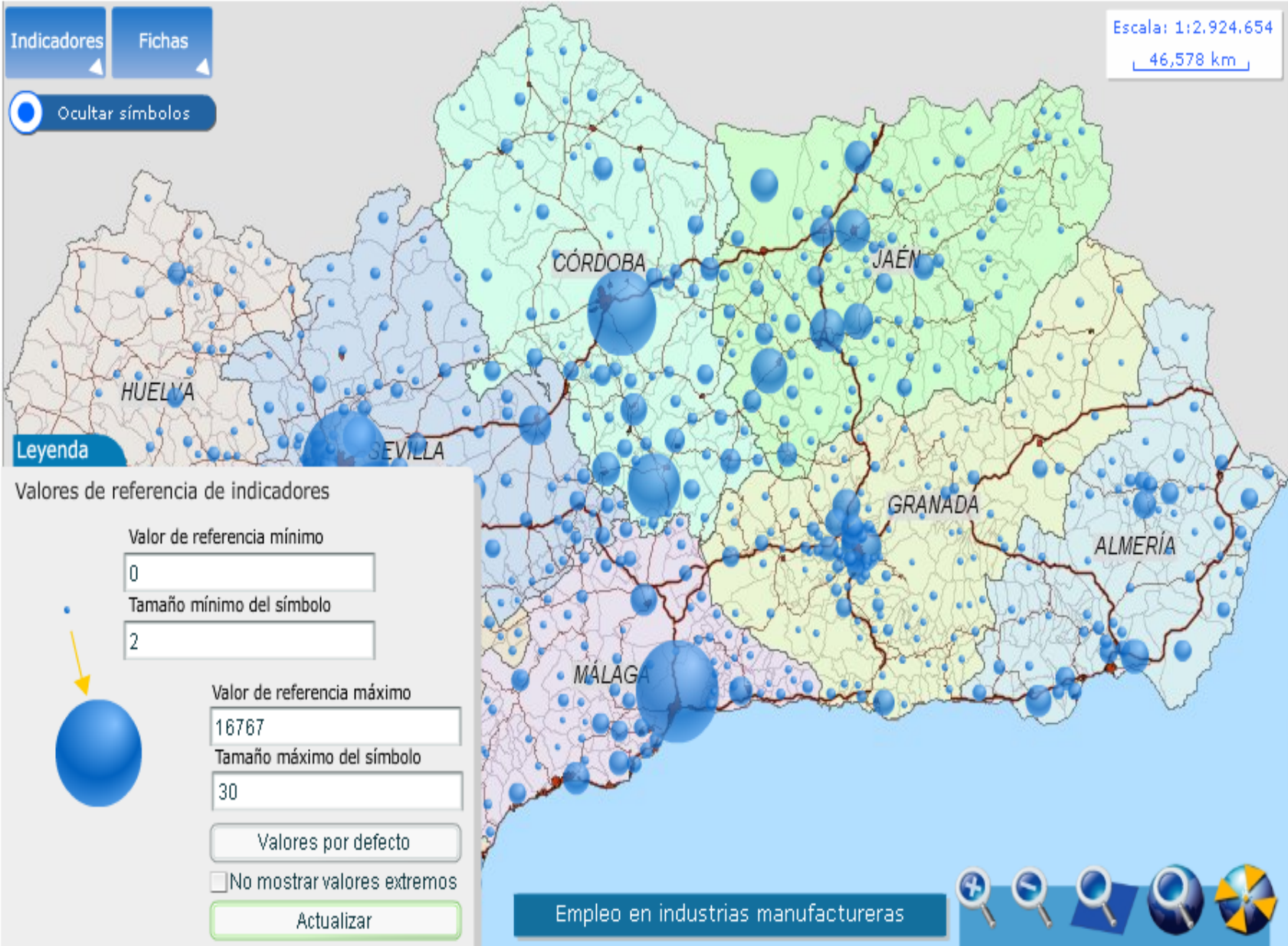


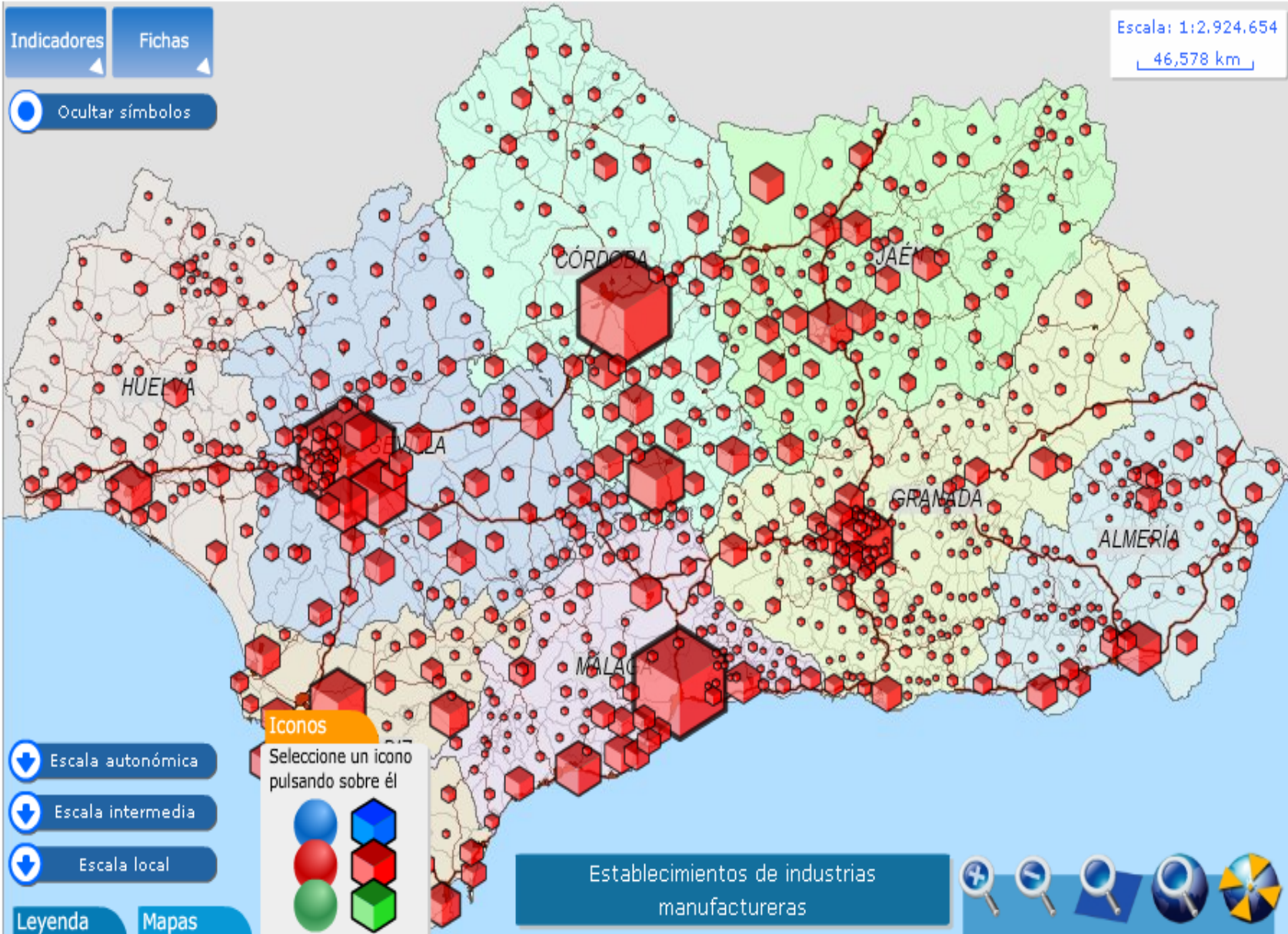
Altitud metros	Clase
0-2	2
2-4	4
4-6	6
6-8	8
>8	10

$$I = \sum_{\text{municipal}} (\text{valor socioeconómico urbano/infraestructuras}_{\text{pixel}} \times \text{distancia línea costa}_{\text{pixel}}) / (\text{altura}_{\text{pixel}})^2$$

Distancia euclídea metros	Valor ponderado
0-500	16
500-1000	8
1000-2000	4
2000-4000	2
>4000	1







Making our viewer faster & improving functionalities

Coastal Morphology



Coastal Morphology



Información asociada a la entidad



Tipo de entidad: linea de costas

LENGTH	431.681
NOMBRE	PLAYA DE GETARES O SAN GARCIA
PLAYAS_TXT	Playa magnitud mediana
ACANT_TXT	
DUNAS_TXT	Dunas pequeña magnitud
URBANO_TXT	
INFRA_TXT	
OTROS_TXT	
PROVINCIA	CÁDIZ
MUNICIPIO	ALGECIRAS
COD_INE	11004
UNI1	Playas
CODIG_1	1
UNI2	Playas con dunas
CODIG_2	13
UNI3	Playa con dunas
CODIG_3	131
UNI4	Playa con dunas
CODIG_4	1310

Capas Entidades

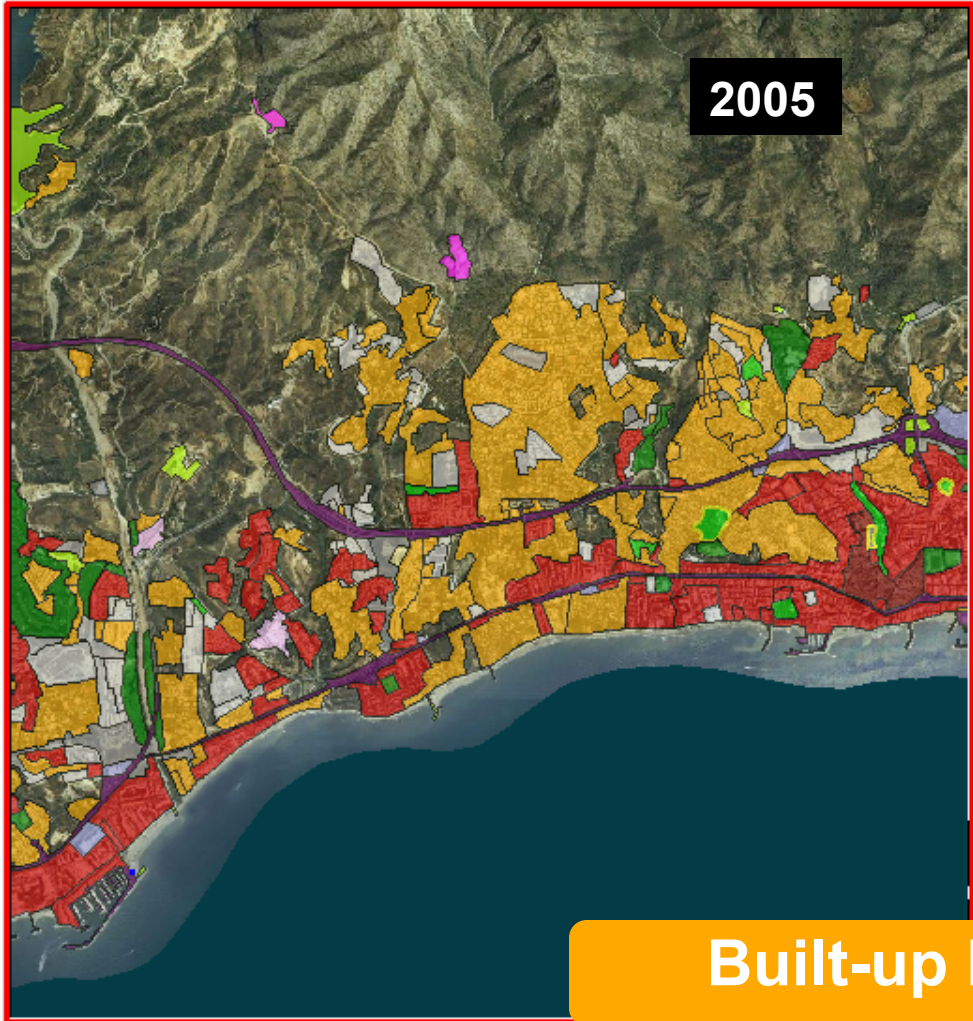
- Ortofotos
 - Vuelo Americano 1956
 - Fotomosaico 1:10.000 (color)
 - Ortofoto 1998-99 color (1m)
 - Ortofoto 2002 bn (0.5m)
 - Ortofoto 2004 color (1m)

DENOMI03	MATORRAL DISPERSO CON PASTIZAL
NIVEL03_1	4.000000000000
NIVEL03_2	42.000000000000
NIVEL03_3	422.000000000000
NIVEL03_4	4221.000000000000
NIVEL03_5	42211.000000000000
FID_BASE91	25709
COD_UC91	439
DENOMINA91	OTROS CULTIVOS LEÑOSOS EN REGADIO
NIVEL91_1	3.000000000000
NIVEL91_2	31.000000000000
NIVEL91_3	312.000000000000
NIVEL91_4	3122.000000000000
NIVEL91_5	31225.000000000000

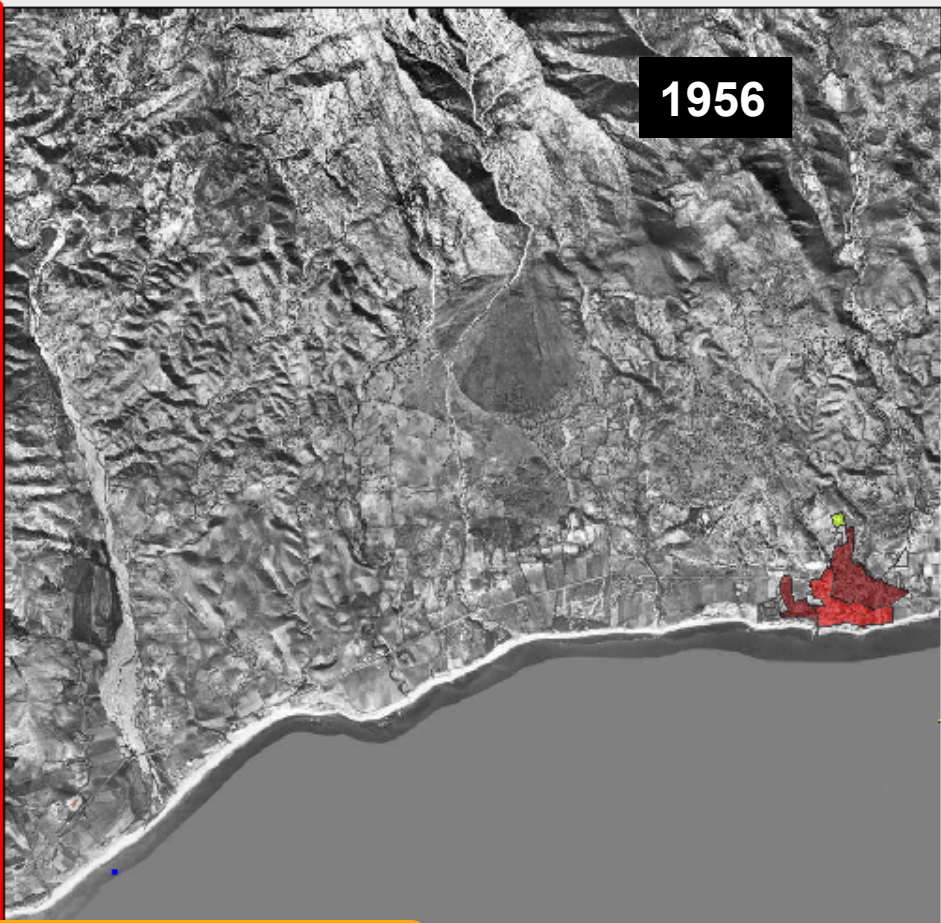


Land Use Evolution

UTM x: 436060.06, UTM y: 4065998.25, Huso: 30, Altitud: 64.77 m.

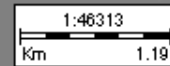


2005



1956

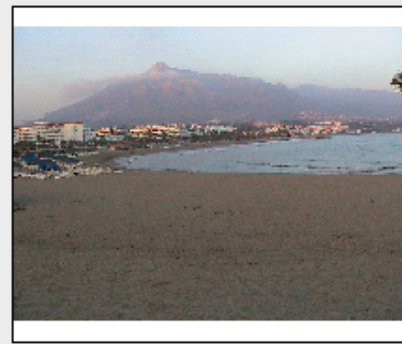
Built-up Evolution



Capas

Entidades

- 2005
- Mascara
- Multimedia
 - Fotos
 - Topónimos 2D/3D
 - Topónimos SIGLA

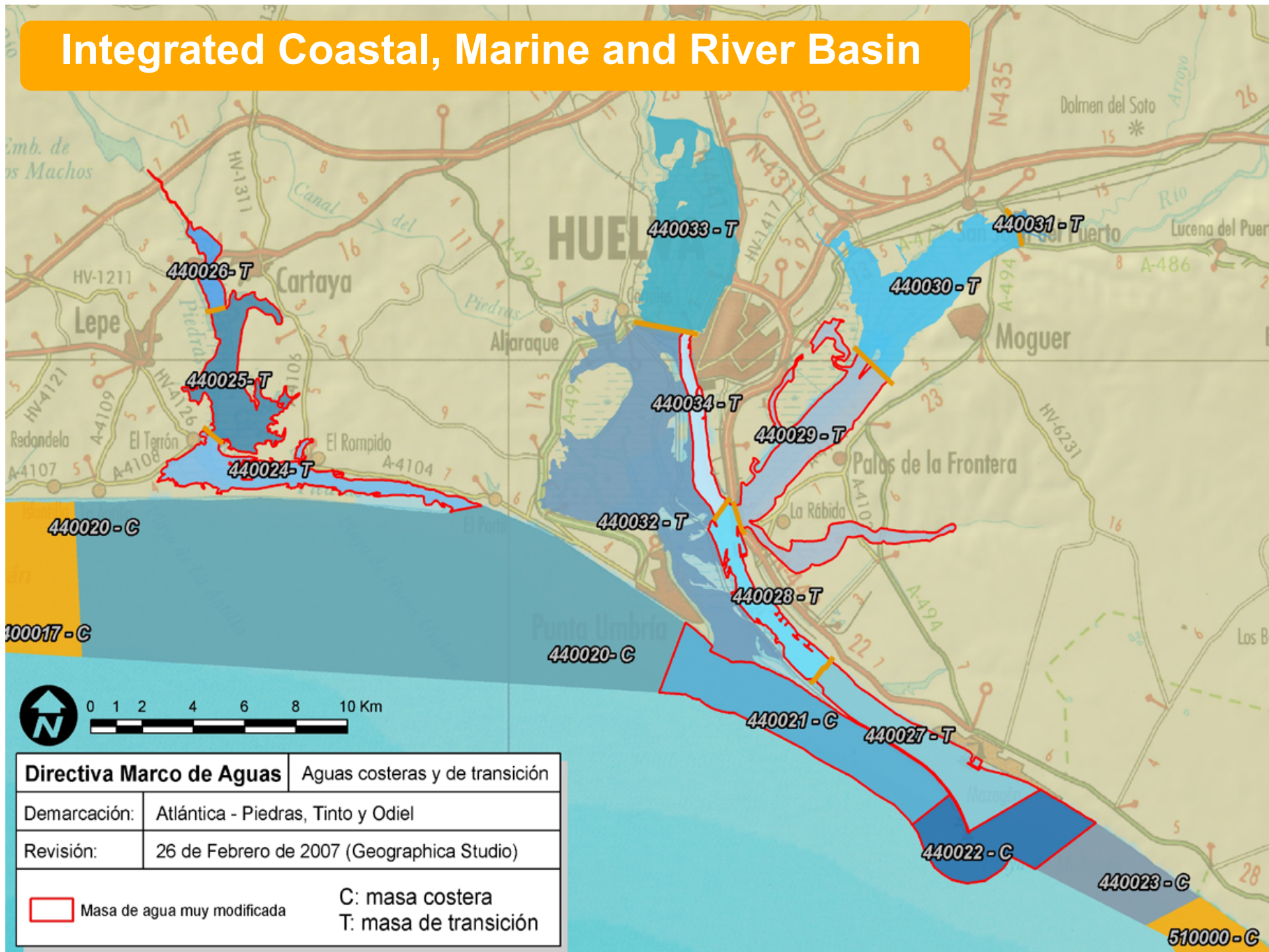


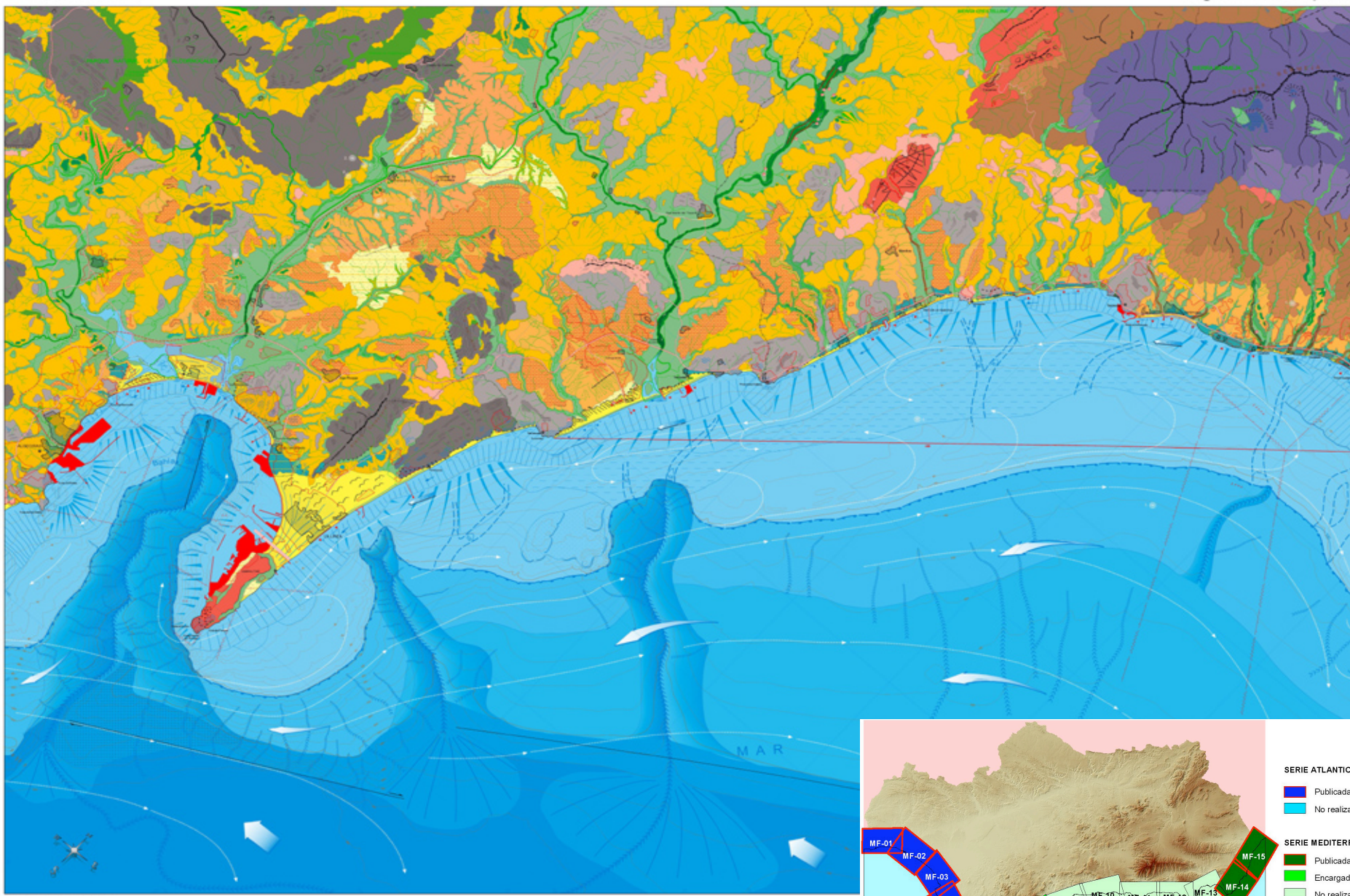
Mapa indice

Detalle

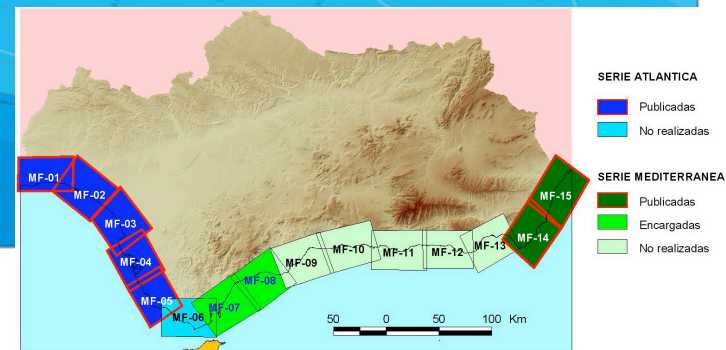
UTM x: 332147.58, UTM y: 4041304.67
Huso: 30, Altitud: 0.00 m.

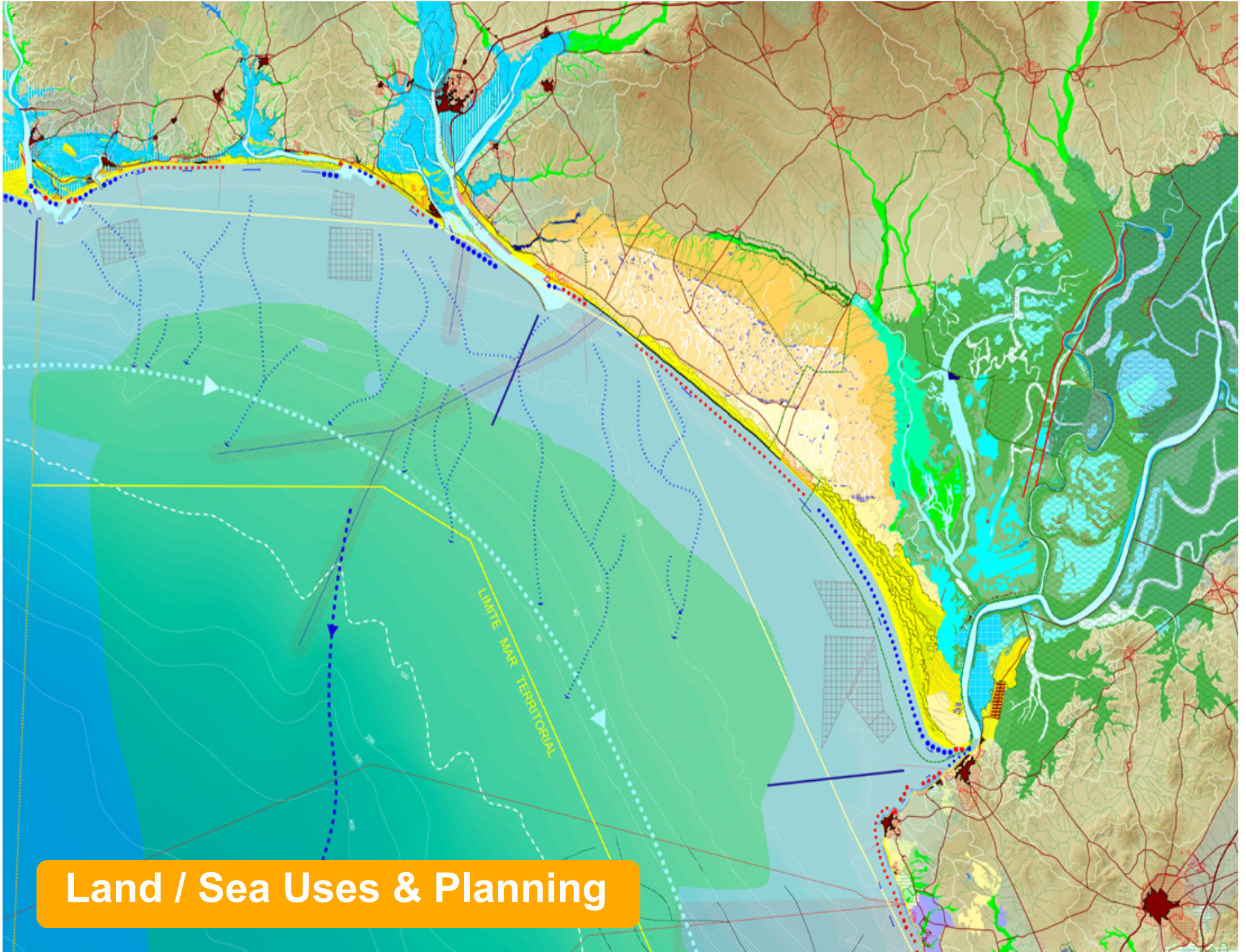
Integrated Coastal, Marine and River Basin



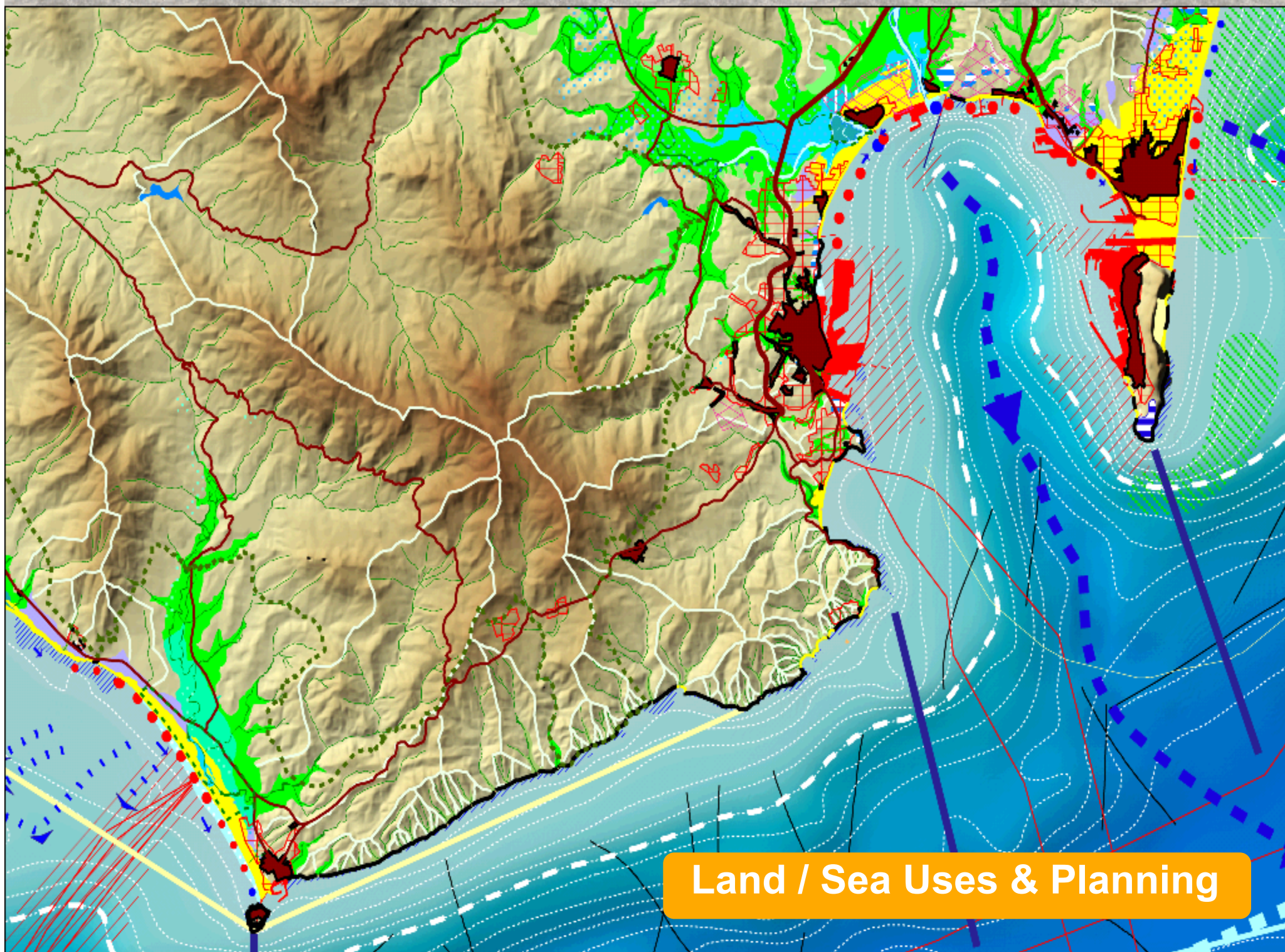


Physiographic Map



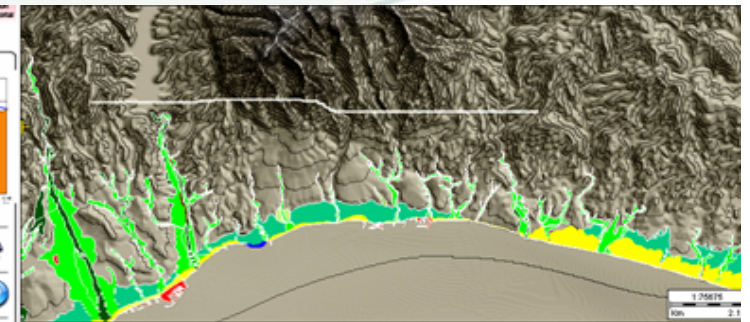
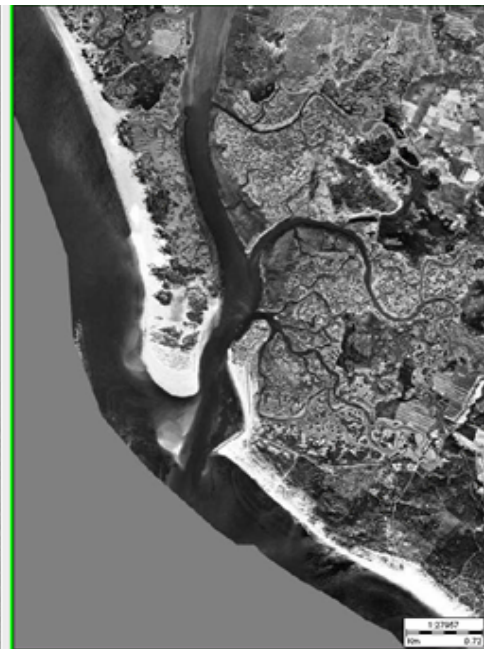


Land / Sea Uses & Planning

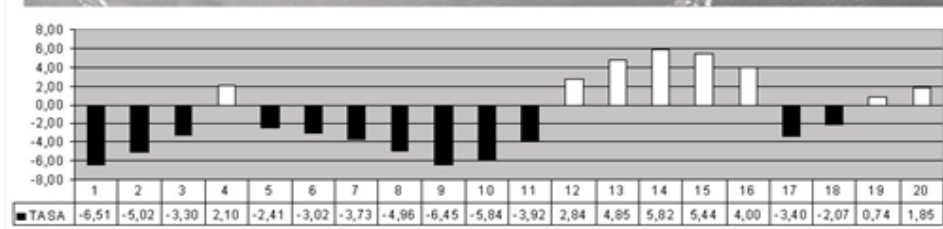
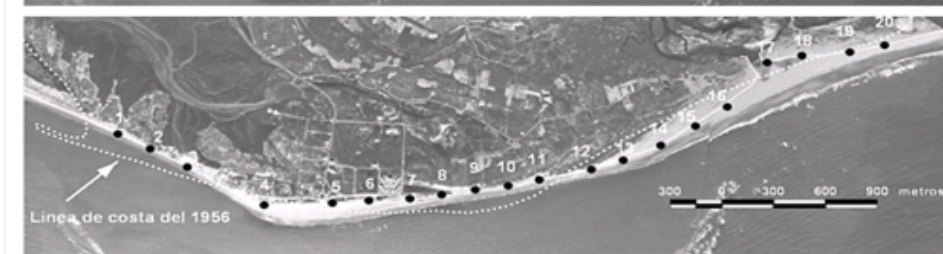


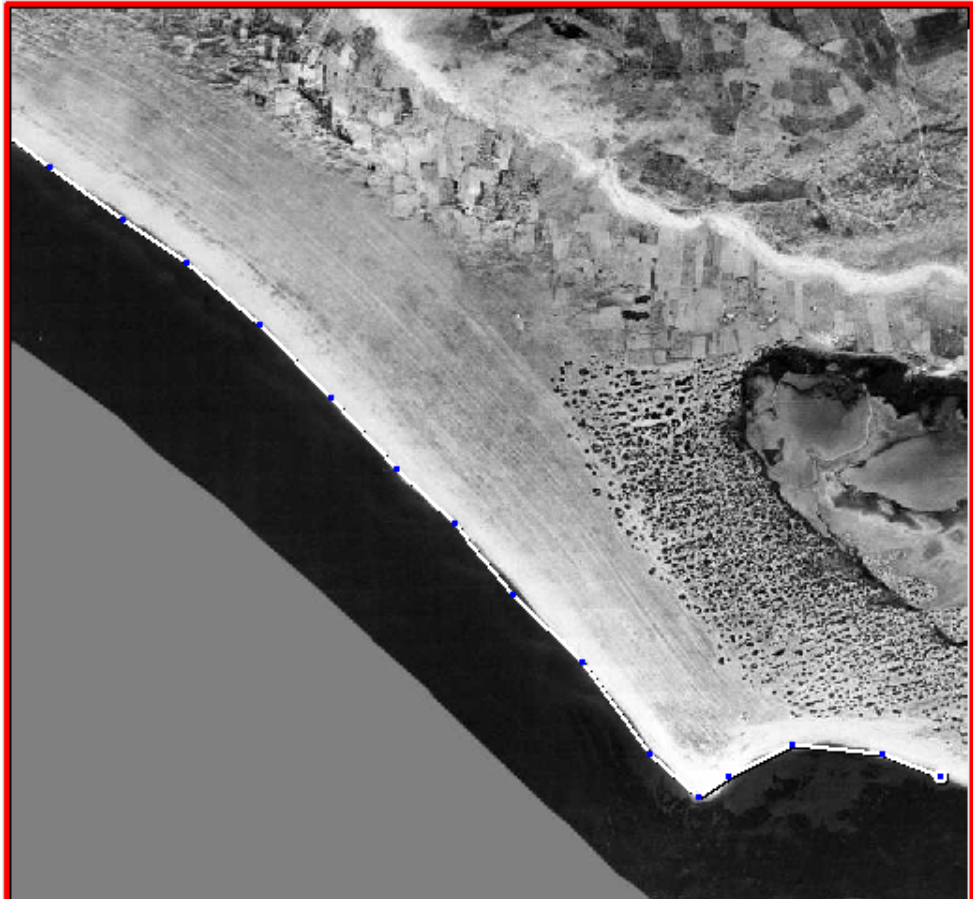
Land / Sea Uses & Planning

Sea Level Rise Impacts

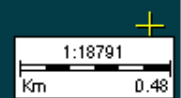


UTM x: 759138.25, UTM y: 4634766.06, Husos: 25, Altitud: 8.68 m.





Coastal Erosion



Capas Entidades

- Entidad 0
- Entidad 1
- Entidad 3
- Entidad 5

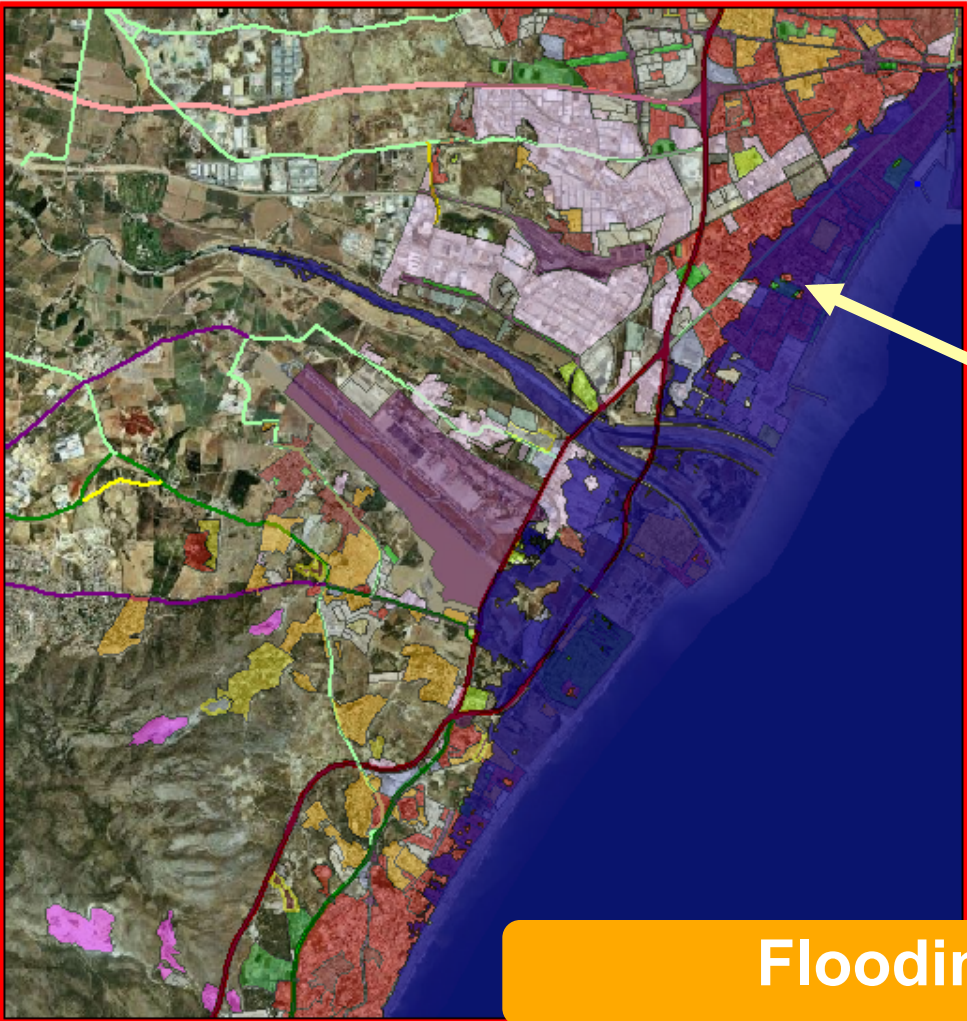
Editing tools: Erase, Copy, Paste, Undo, Redo, Save (SHP, PTH), Close.

Navigation tools: Mouse, Hand, Zoom, Home, Info, Print, Camera, 2D, 2.5D, 3D, Previous, Next.



Mapa indice Detalle

UTM x: 521213.94, UTM y: 4059215.25
Huso: 30, Altitud: 0.00 m.



Tipo de entidad: 2005

AREA	313700.11838
PERIMETER	3020.17387
URB_TRANS0	384
URB_TRANS1	384
COD_NEW02	5.000
NIV_1	1.000
DESC_N1	ESPACIO RESIDENCIAL
NIV_2	12.000
DESC_N2	RESIDENCIAL PLURIFAMILIAR
NIV_3	121.000
DESC_N3	RESIDENCIAL PLURIFAMILIAR CONTINUO O EN BLOQUE
NIV_4	1210.000
DESC_N4	RESIDENCIAL PLURIFAMILIAR CONTINUO O EN BLOQUE
COD_NEW05	5
NIV05_1	1.000
DESC05_N1	ESPACIO RESIDENCIAL

Flooding Risk

Km 1.73

Capas Entidades

- Mascara
- Multimedia
 - Fotos
 - Topónimos 2D/3D
 - Topónimos SIGLA
- indun.shp

Navigation icons: mouse, hand, zoom, globe, info, print, camera, 2D, 2.5D, 3D, back, forward.



Mapa indice Detalle

UTM x: 365169.30, UTM y: 4053945.35
 Huso: 30, Altitud: 69.40 m.

SIGLA

Sistema de Información Geográfica del Litoral de Andalucía

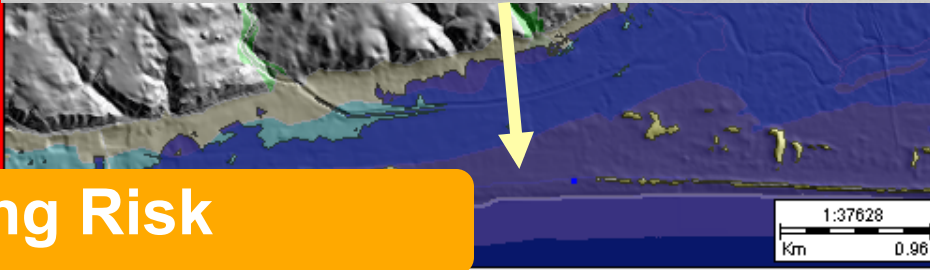
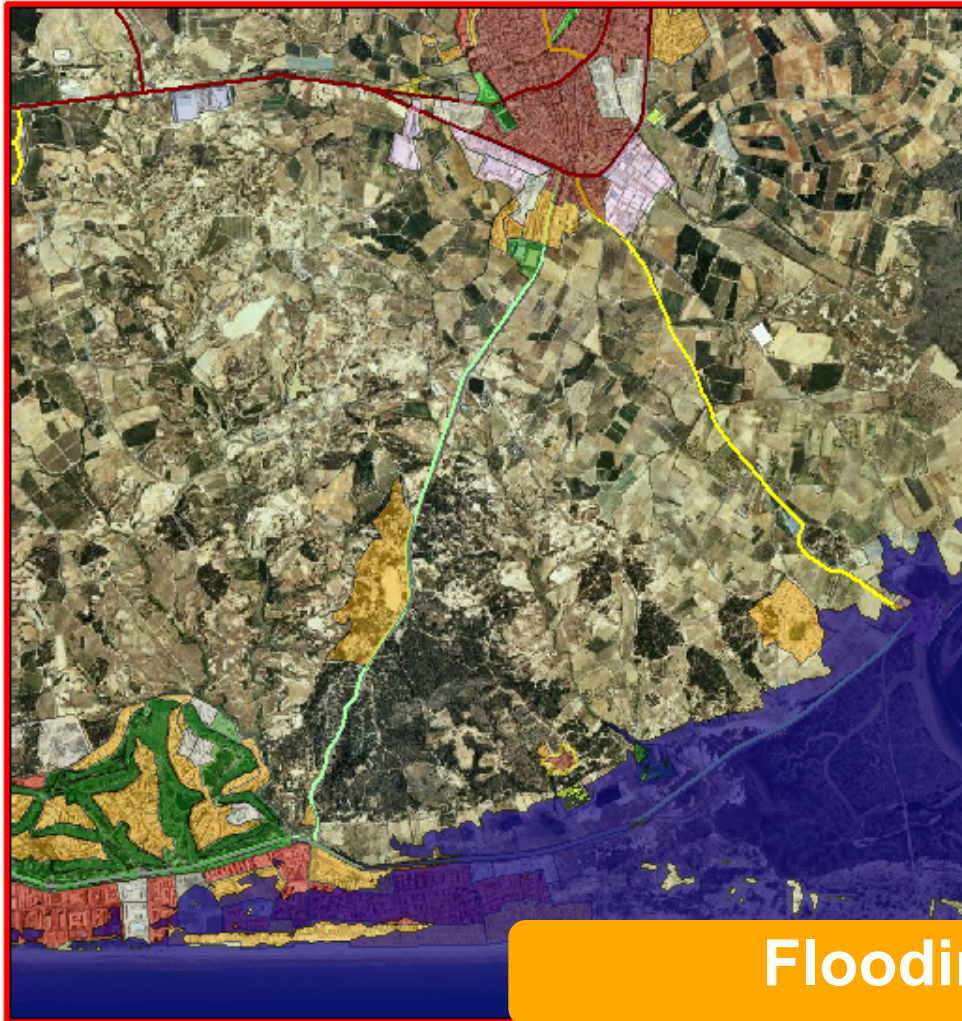


JUNTA DE ANDALUCIA

CONSEJERÍA DE OBRAS PÚBLICAS Y TRANSPORTES

Tipo de entidad: unidades fisiograficas

AREA	3150714.000
PERIMETER	24209.346
PROVINCIA	HUELVA
MUNICIPIO	LEPE
COD_INE	21044
NIVEL4	2800
TEXTO_N1	Formaciones arenosas litorales
TEXTO_N2	Formaciones complejas (isla barrera/flechas litorales)
TEXTO_N3	Formaciones complejas (isla barrera/flechas litorales)
TEXTO_N4	Formaciones complejas (isla barrera/flechas litorales)
MARISMA_AL	



Flooding Risk

1:37628
Km 0.96

Capas Entidades

- Multimedia
 - Fotos
 - Topónimos 2D/3D
 - Topónimos SIGLA
 - indun.shp
 - indun3.shp

Navigation icons: mouse, hand, zoom, globe, info, print, camera, 2D, 2.5D, 3D, back, forward.

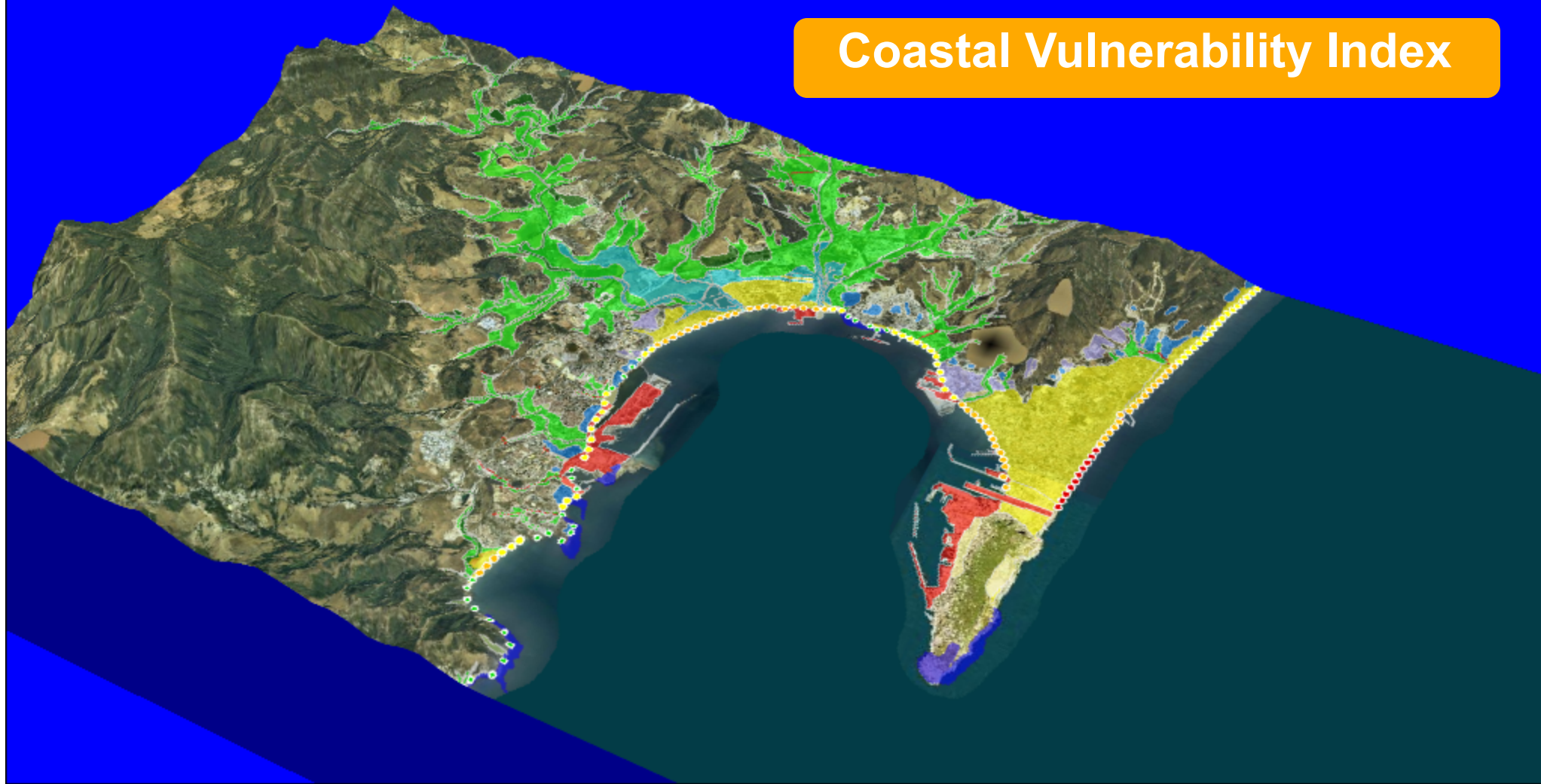


Mapa indice Detalle

UTM x: 657645.63, UTM y: 4118813.17
Huso: 29, Altitud: 0.00 m.



Coastal Vulnerability Index



Capas / **Entidades**

- Topónimos SIGLA
- clasic
- clasic
- cvi6.shp
- cvi6_med.shp
- buf_cvim.shp

Icons for adding layers (disk and folder) and closing the panel (X).

Navigation and interaction tools:

- Mouse cursor, hand (pan), magnifying glass (zoom), globe (refresh), information (i), and camera (print) icons.
- Map style selection: 2D, 2.5D, 3D.
- Relieve enhancement slider: "Realce del relieve" with a value of x3.3.
- Navigation arrows (back and forward).

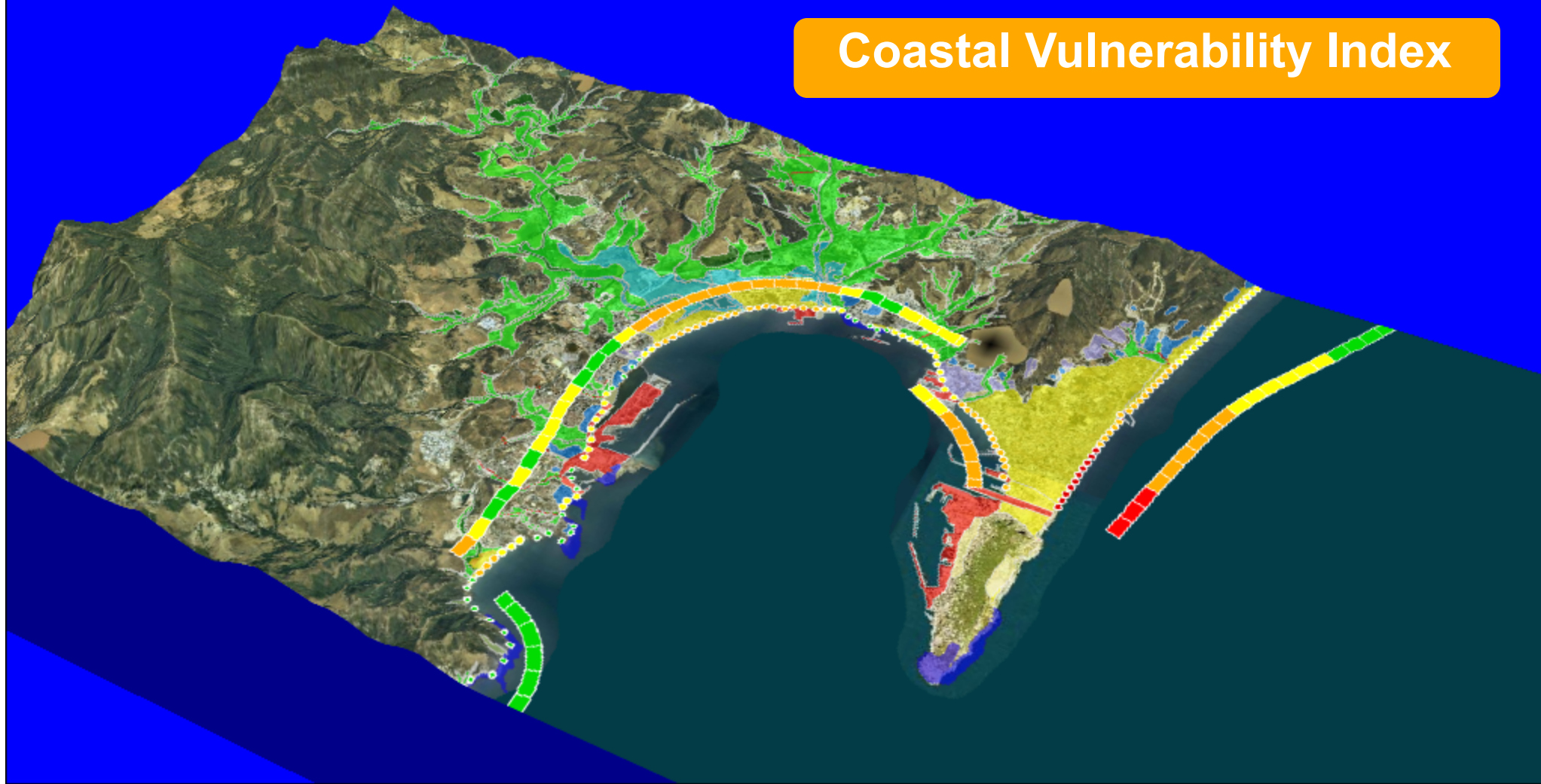


Mapa indice / **Detalle**

UTM x: 292872.96, UTM y: 4011880.33
Huso: 30, Altitud: 0.00 m.



Coastal Vulnerability Index



Capas / **Entidades**

- tidal.shp
- topo.shp
- clasic
- cvi6.shp
- cvi6_med.shp
- buf_cvim.shp

Icons for file operations: disk, folder, and close (X).

Navigation and interaction tools:

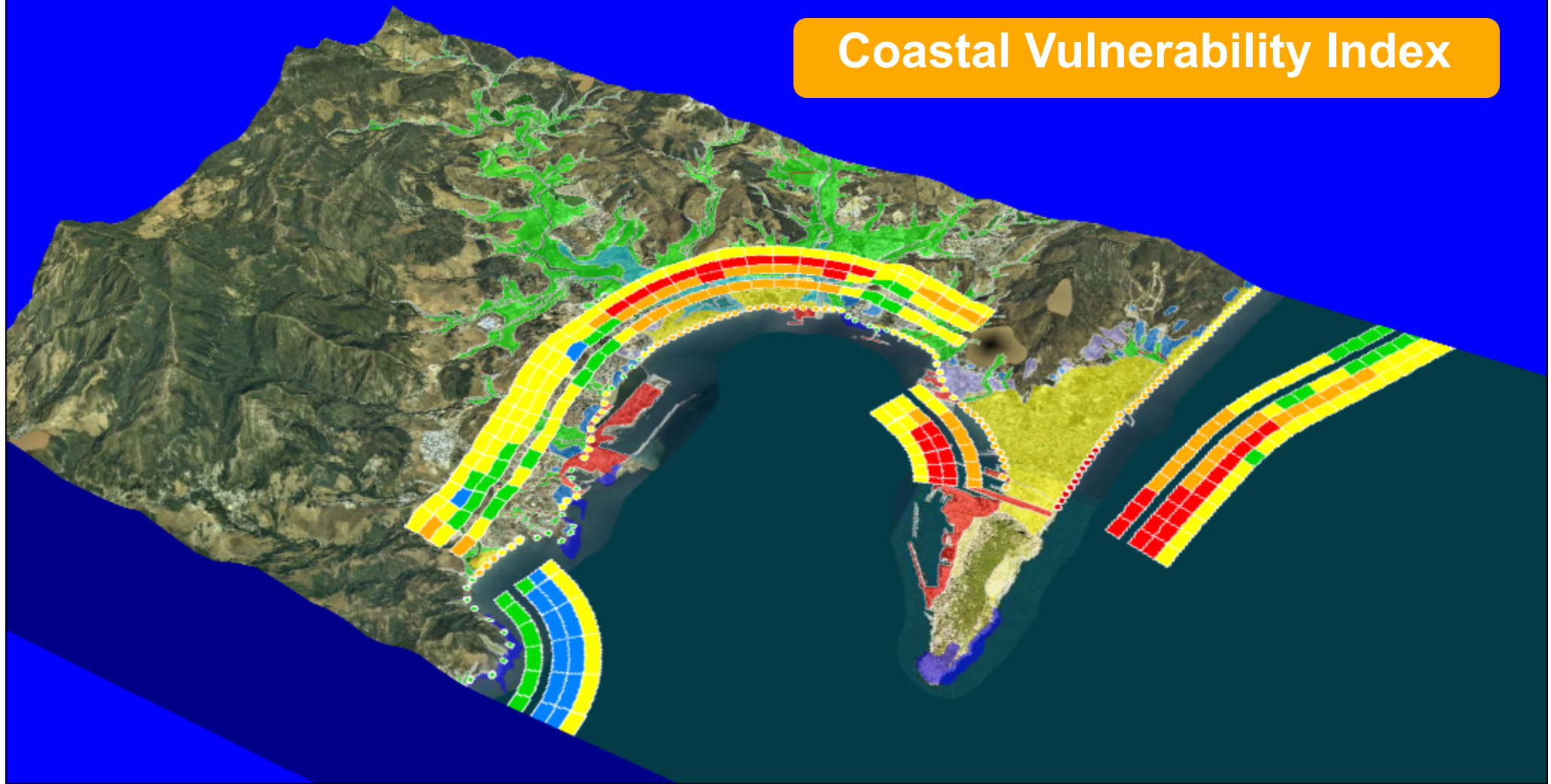
- Mouse cursor, hand, magnifying glass, globe, information (i), and camera icons.
- Map style selection: 2D, 2.5D, 3D.
- Relieve enhancement slider: "Realce del relieve" with a value of "x3.3".
- Navigation arrows: back (green) and forward (grey).

JUNTA DE ANDALUCIA

Mapa indice / **Detalle**

UTM x: 277943.03, UTM y: 4011288.12
Huso: 30, Altitud: 60.08 m.

Coastal Vulnerability Index



Capas / **Entidades**

- ero.shp
- hs.shp
- level.shp
- morfo.shp
- tidal.shp
- topo.shp

+

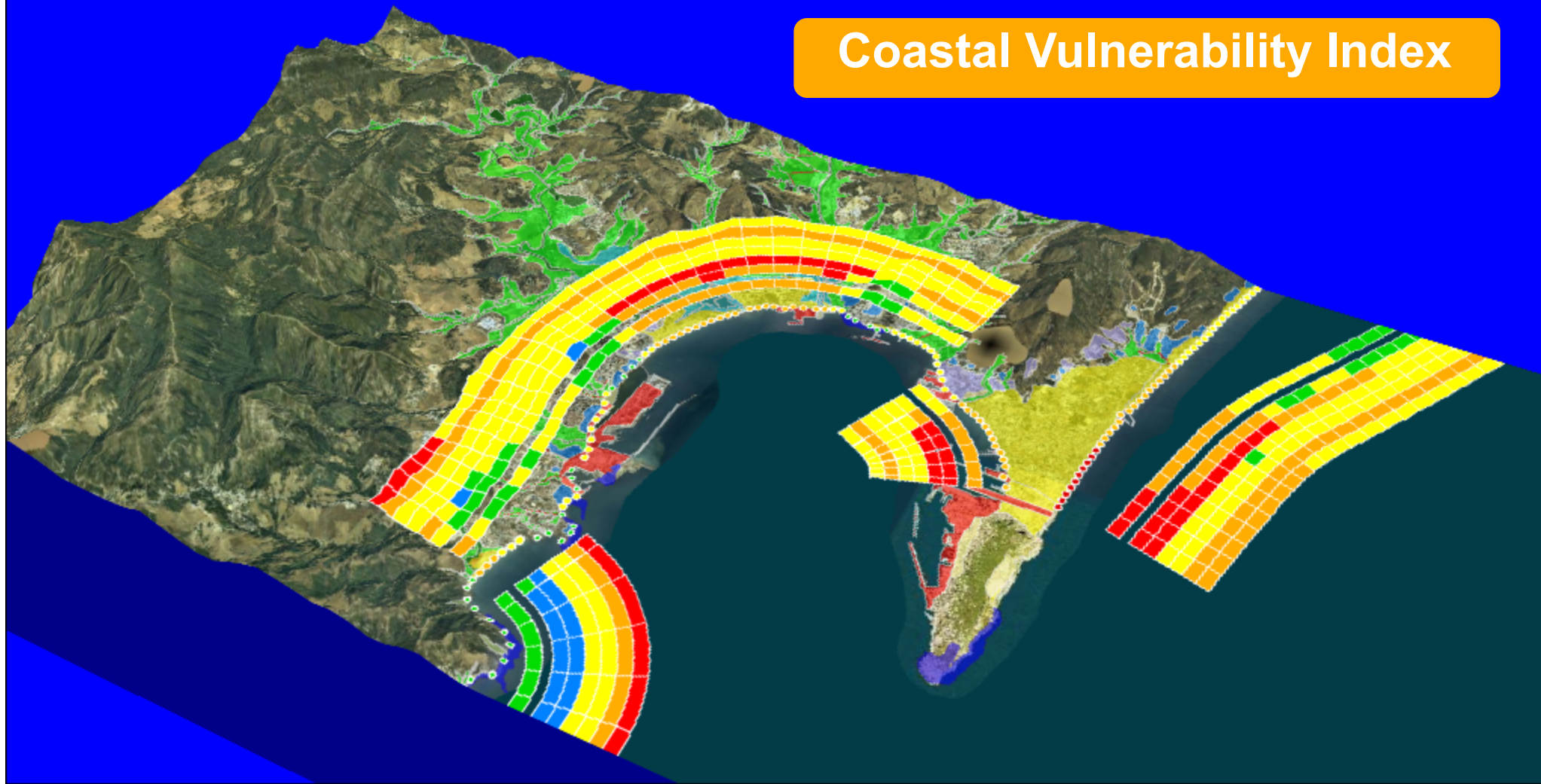
Realce del relieve
x3.3



Mapa indice / **Detalle**

UTM x: 283241.75, UTM y: 4010321.88
Huso: 30, Altitud: 35.81 m.

Coastal Vulnerability Index



Capas / **Entidades**

- ero.shp
- hs.shp
- level.shp
- morfo.shp
- tidal.shp
- topo.shp

Icons for file operations: Add, Remove, Refresh

Navigation and interaction tools:

- Mouse cursor, Hand, Magnifying glass, Globe, Information, Print, Camera
- Map style selection: 2D, 2.5D, 3D
- Relieve enhancement slider: Realce del relieve (x3.3)

Mapa indice / **Detalle**

UTM x: 278940.44, UTM y: 4011475.14
Huso: 30, Altitud: 109.89 m.

Support Tools



Capas

Entidades

- 2005
- Mascara
- Multimedia
 - Fotos
 - Topónimos 2D/3D
 - Topónimos SIGLA

Icons for adding layers and folders.

Navigation and interaction tools:

- Mouse cursor, hand, zoom in, globe, information, print, camera.
- Map style selection: 2D, 2.5D, 3D.
- Navigation arrows: back, forward.



Mapa indice

Detalle

UTM x: 723762.44, UTM y: 4075258.75
Huso: 29, Altitud: 0.00 m.

Support Tools



Capas

Entidades

- Cartografía vectorial
- Mascara
- Multimedia
 - Fotos
 - Topónimos 2D/3D
 - Topónimos SIGLA

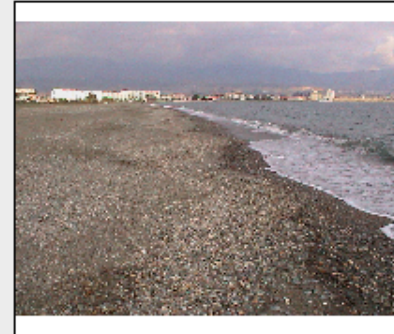
+

+

X

Navigation and interaction icons:

- Hand icon (pan)
- Zoom in icon
- Zoom out icon
- Home icon
- Info icon
- Layers icon
- Print icon
- 2D, 2.5D, 3D view toggles
- Relieve del relieve slider (x2.5)
- Left and right arrow icons

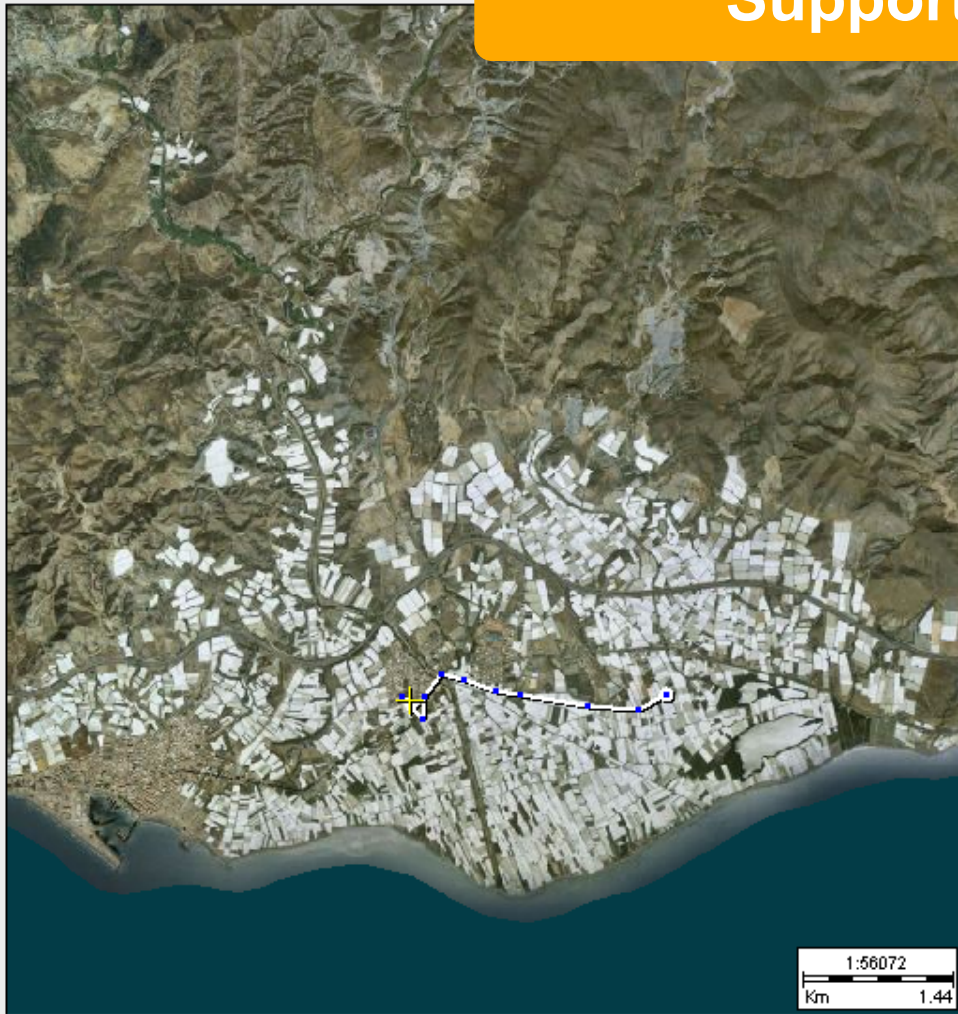


Mapa índice

Detalle

UTM x: 452828.06, UTM y: 4065892.48
Huso: 30, Altitud: 4.51 m.

Support Tools



Capas Entidades

✓ Entidad 0

SHP

PTH SHP

Mapa índice Detalle

UTM x: 501191.22, UTM y: 4067928.25
Huso: 30, Altitud: 21.47 m.

Realce del relieve x1.0

2D 2.5D 3D

Relevé del relieve

The interface includes a 'Capas' (Layers) panel with 'Entidades' (Entities) and 'Entidad 0' (Entity 0). It features a toolbar with navigation and editing tools, a 3D view of the terrain, and a 'Mapa índice' (Index Map) showing the current location within a larger regional context. The 'Detalle' (Detail) view shows a close-up of the terrain with a green box highlighting the area of interest. The interface also includes a scale bar and a 'Realce del relieve' (Relief enhancement) slider set to x1.0.

Ongoing!

- Coastal Scenarios (2025, 2050, 2100) for policy support and decision support tool.
- Inputs from other institutions and research centres at National (Spain), Regional (Andalusia), Provincial and Local level.
- Freely accessible tool through the REDIAM Web Channel
- SEIS (Shared Environmental Information System) by the EEA (INSPIRE, Access Directives)

For the nearest future...

- Integration of our Coastal and Marine Information System into the ICAN Network:
 - International network & exchanges
 - International collaboration (ENPI...)
 - International initiatives (FP7, ESPON, COST...)
 - International context for sharing management & Good practices:
 - Portugal
 - Morocco
 - British Colony of Gibraltar

¡Muchas gracias! Grazie!

Moltes gràcies Eskerrik Asko Muitas gracias

* * * * *

Dziękuję Merci beaucoup Много Благодаря Obrigado
Paldies Ευχαριστώ Tack Thank you very much Dank u
Hvala Köszönöm Dekuj Multumesc Dakujem Danke Takk
Aitäh Grazzi Kiitos Спасібо Tesekkur Ederim Dêkuji شُكْرًا

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