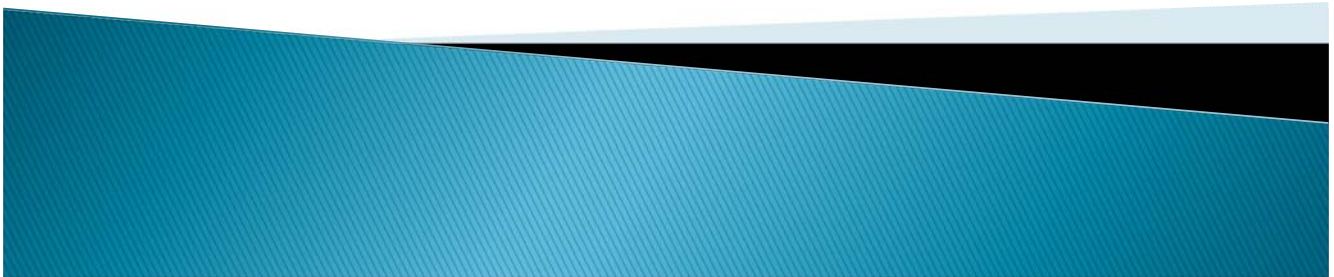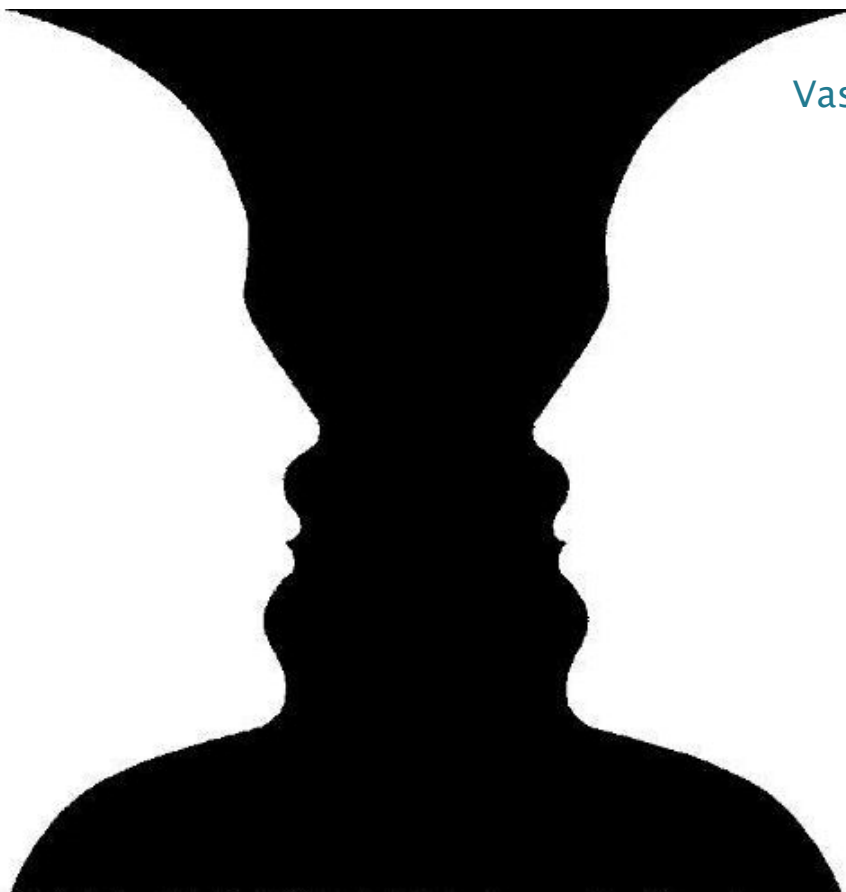# The Role of Geospatial Techniques in Statistics – Visualisation Processes

## Prof. Saviour Formosa

Celebrating World Statistics Day: Better Data, Better Lives
National Statistics Office Seminar
Tuesday 20 October 2015

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## Visualisation

Vase or Faces?

## Visualisation
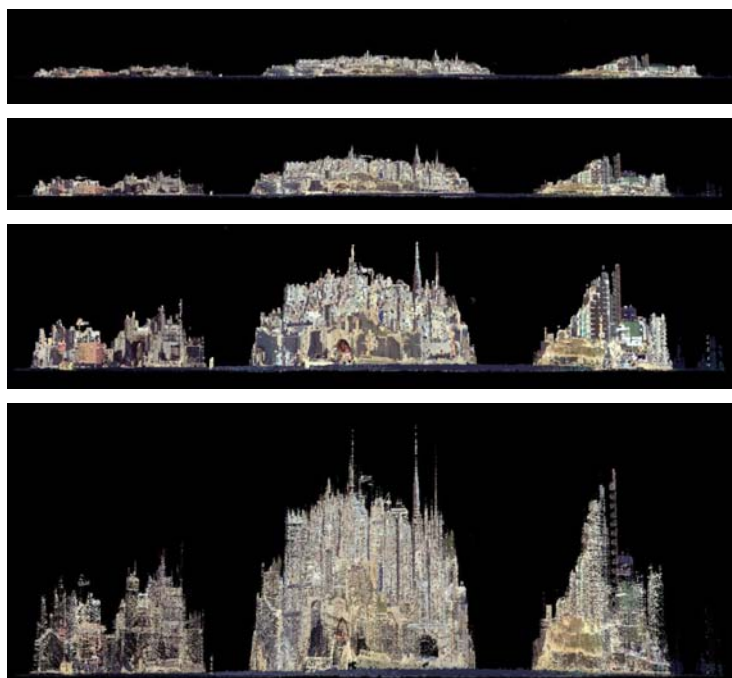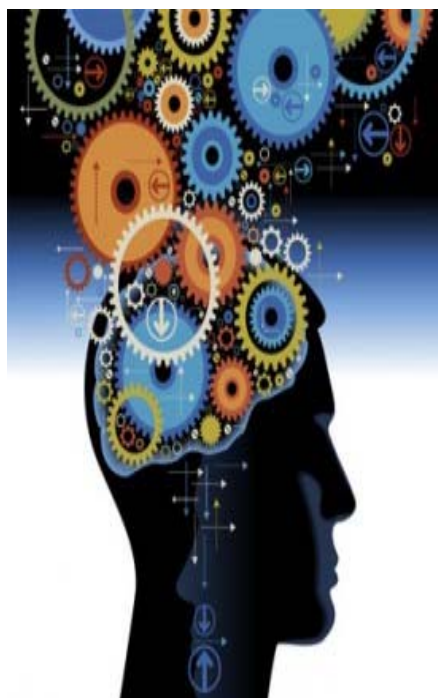
Young – Old



## Visualisation

Maps – Easy No?

## Visualization – Visualisation

Z ⟹ S

### Imagine the Valletta Grand Harbour Vista





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## The W6H Model to DIKA

- **Who** might use this information? Who are the players – end-users?

- **What** does the process entail? What 'outside of the box' options are there?

- **Where** can it be deployed?

- **Why** should visualization be brought in?

- **When** would it be best to introduce spatial information?

- **How** can we employ visualisation for social change

- **Why Not**?

W6H

## The Situation and the Thematic Reality

- A data dearth: most data is in analogue format

- Access and limitations/moratoria spread across the different entities

- Cleaning the data where available is done manually

- Spatial issues:
  - Projections and conversions of whole state has proven a 'nightmare'
  - Geocoding is based on street centre points which does not allow for real locational analysis
  - Streets are non-networked
  - Address point database does not exist...

- However, major steps have been made to create an NSDI based on the requirements from the **INSPIRE Directive**, together with a pivot from the CLC activities, the **Aarhus Convention** and other data-related legislation such as that required for reporting to the EEA (European Environment Agency).

## Periodic Table of Visualisation

- Lengler and Eppler (2007) – visualisation methods which they adventurously called the Periodic Table of Visualization Methods.

- Termed the Visual Literacy Project[1].

- Lengler et al (2007) split the methods into six visualization categories based on whjat they called the Data, Information, Concept, Strategy, Metaphor and Compound approach (DICSMC).

  [1] http://www.visual-literacy.org/index.html

| | |
|---|---|
| **Data Visualization** | Data in schematic form |
| **Information Visualization** | Data transformed to an image |
| **Concept Visualization** | Qualitative approach |
| **Strategy Visualization** | Systematic approach |
| **Metaphor Visualization** | Structuring information |
| **Compound Visualization** | Combining different methods |

## Available Tools



A PERIODIC TABLE OF VISUALIZATION METHODS

http://www.visual-literacy.org/index.html

## Analytical Constructs



Thematic

Geographical

Spatial

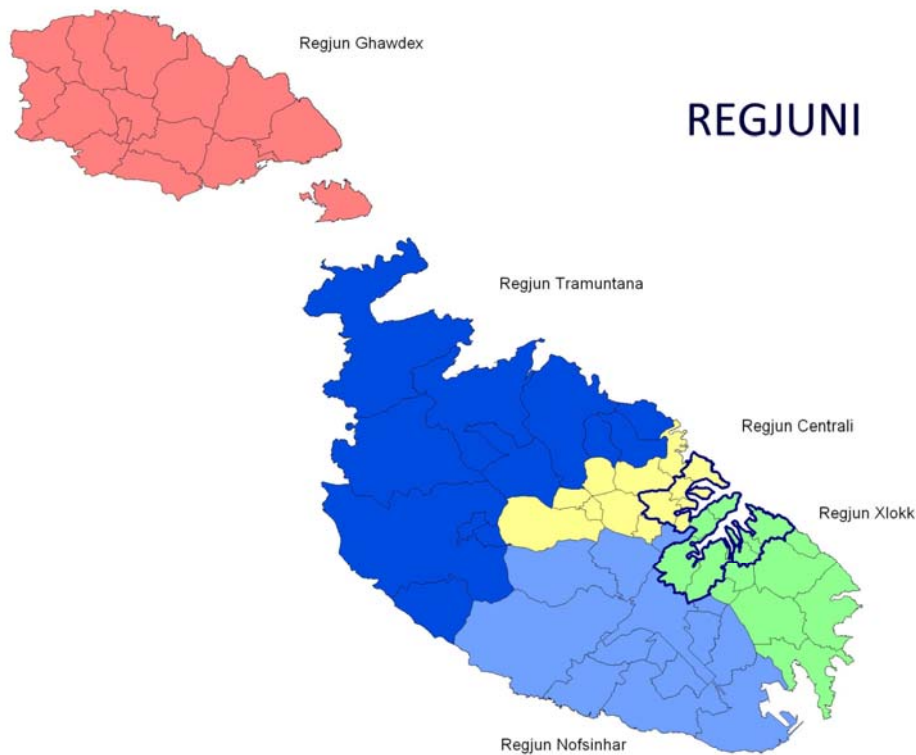Temporal

# The Concept Of Scale

- Global
- EUMedit/Regional
- NUTS 1 –
- NUTS 2 –
- NUTS 3 –
- NUTS 4 –
- NUTS 5 –
- Village Cores
- EAS
- Street Level
- Building
- Point
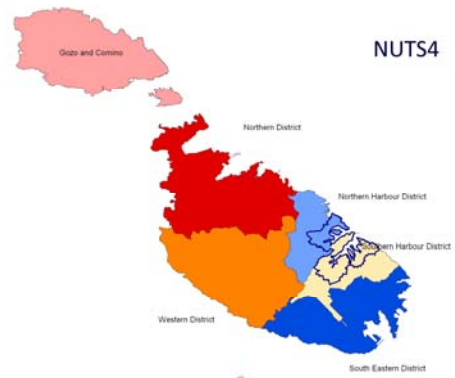
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## Overlaying Nightmare?    The Data Dilemma…

Regjun Ghawdex
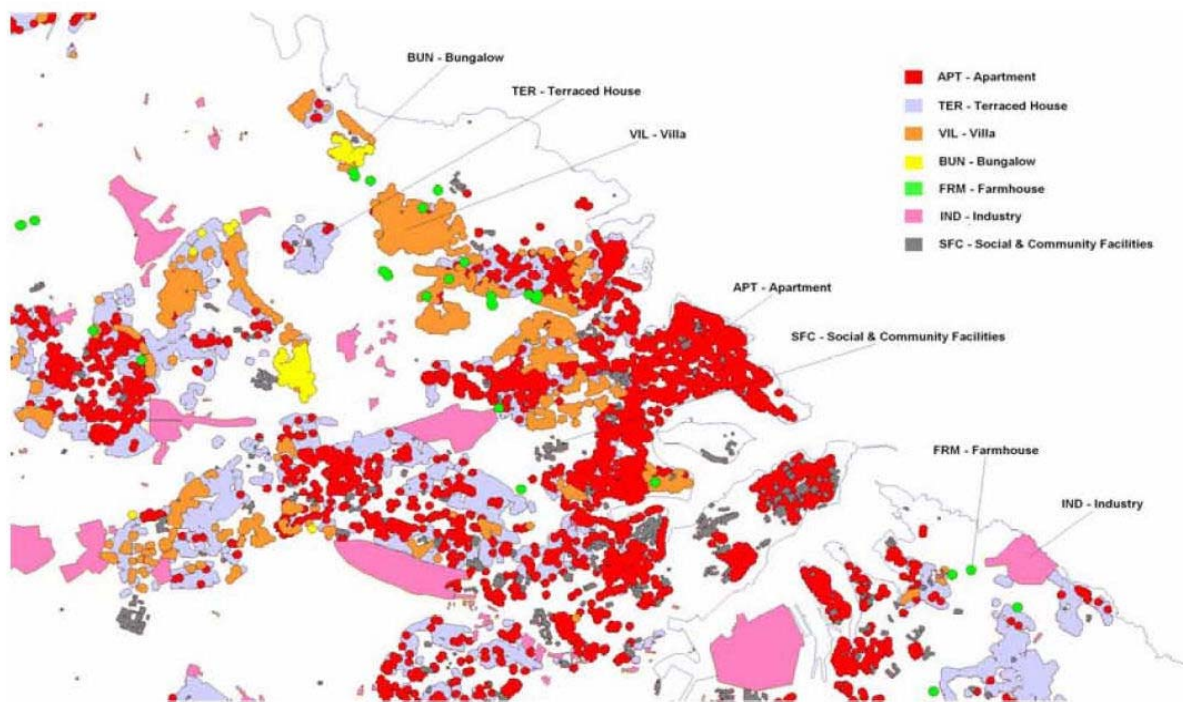
REGJUNI

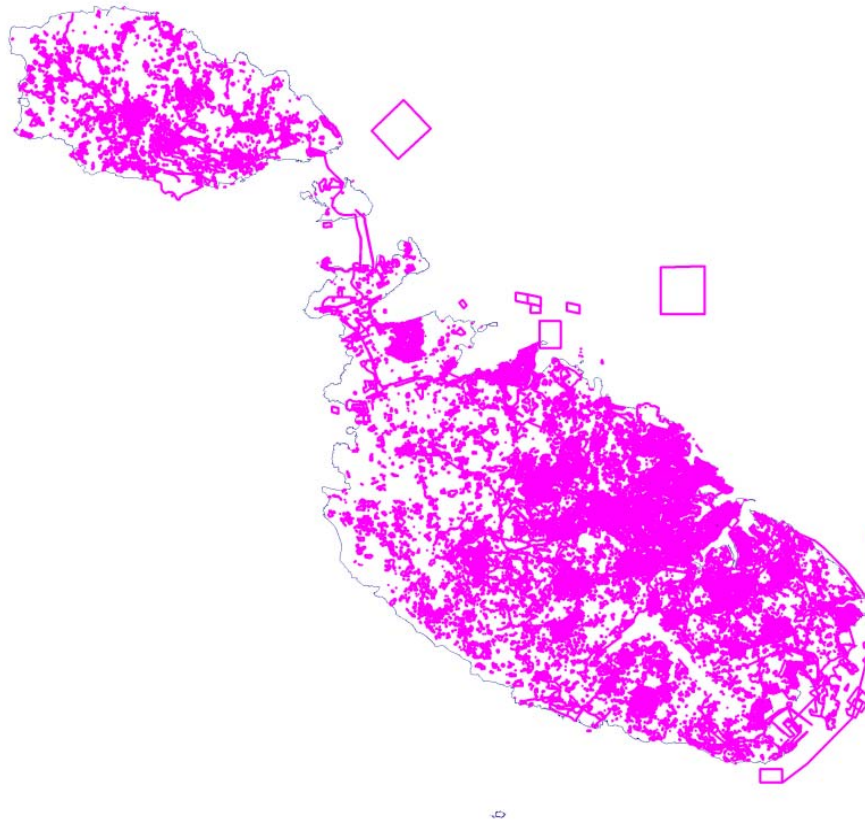Regjun Tramuntana

Regjun Centrali

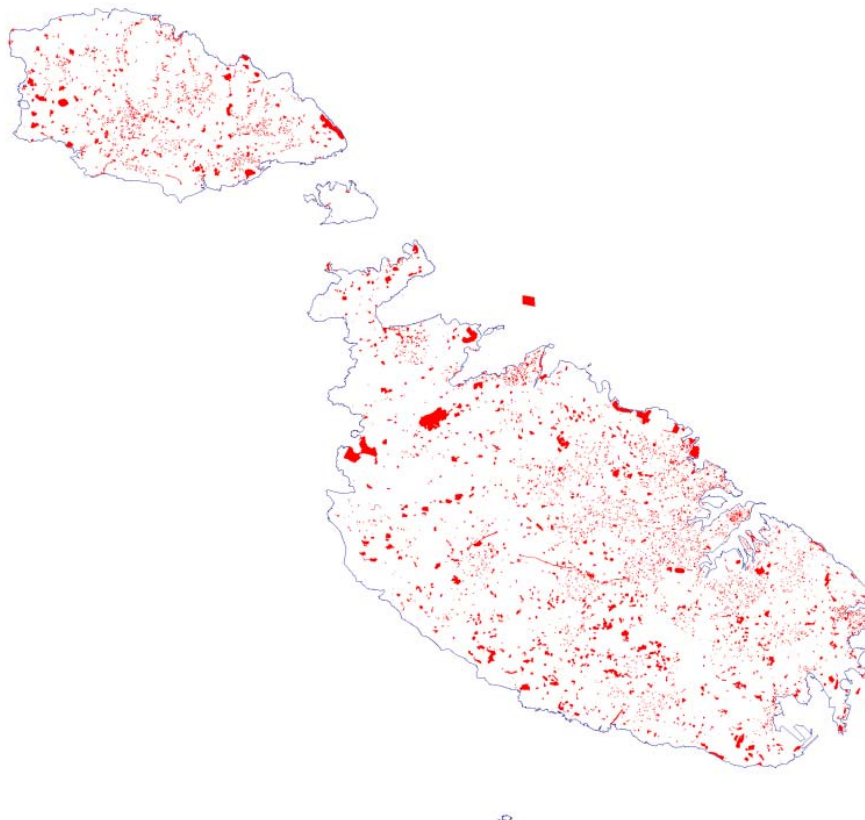Regjun Xlokk

Regjun Nofsinhar

# Physical landscapes: Zoning

# Development Planning: Applications for Development



# Development Planning: Enforcement Cases

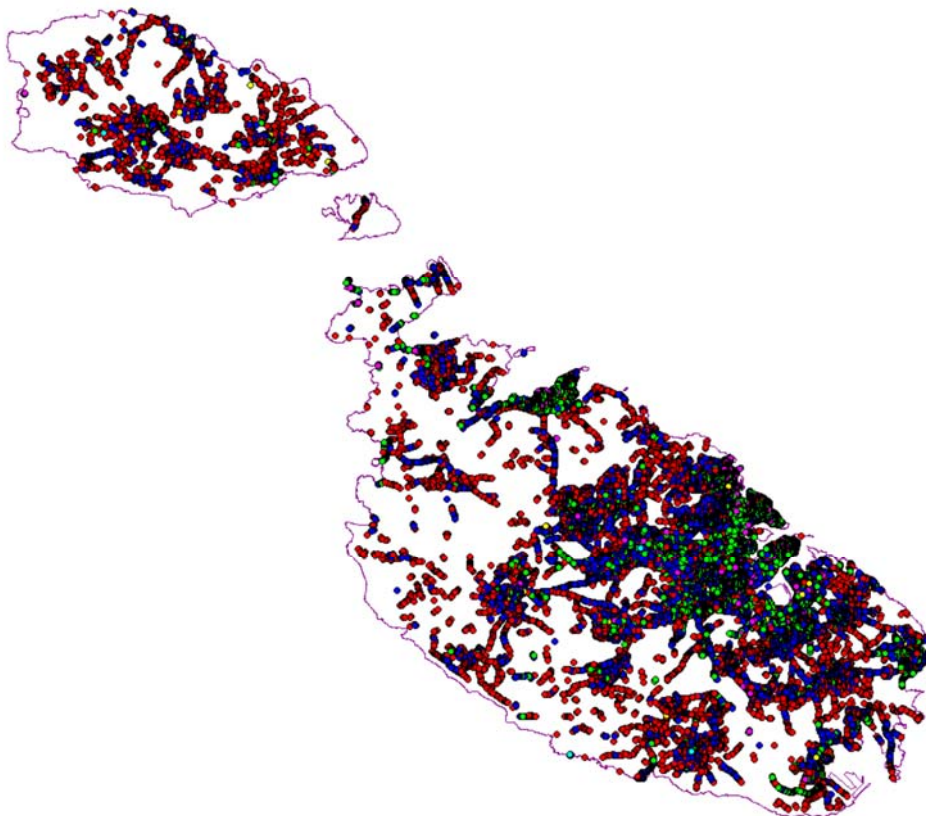State of the Environment Report 2005

**MEPA**

L-AWTORITA' TA' MALTA DWAR L-AMBJENT U L-IPPJANAR
MALTA ENVIRONMENT AND PLANNING AUTHORITY

Key

Area from which urban areas are visible

Area from which urban areas are NOT visible

Areas from which urban areas are visible

| Scale : | Date : | Figure : |
|---|---|---|
| as indicated | March 2005 | 6.1 |
| INDICATIVE ONLY | | |
| Not to be used for direct interpretation. | | |

Base Maps - 1988 Survey Sheets
Copyright Mapping Unit, Malta Environment and Planning Authority

## Base Data for Statistical Analysis



WORLD STATISTICS DAY

# Offence NNA: spatial – Type by spread – Most effected



Leisure & Recreation Residential Parking

Leisure & Recreation Residential Retail

Health Residential Retail Parking

Reported Crimes

Recreation Residential Retail - Offices Parking
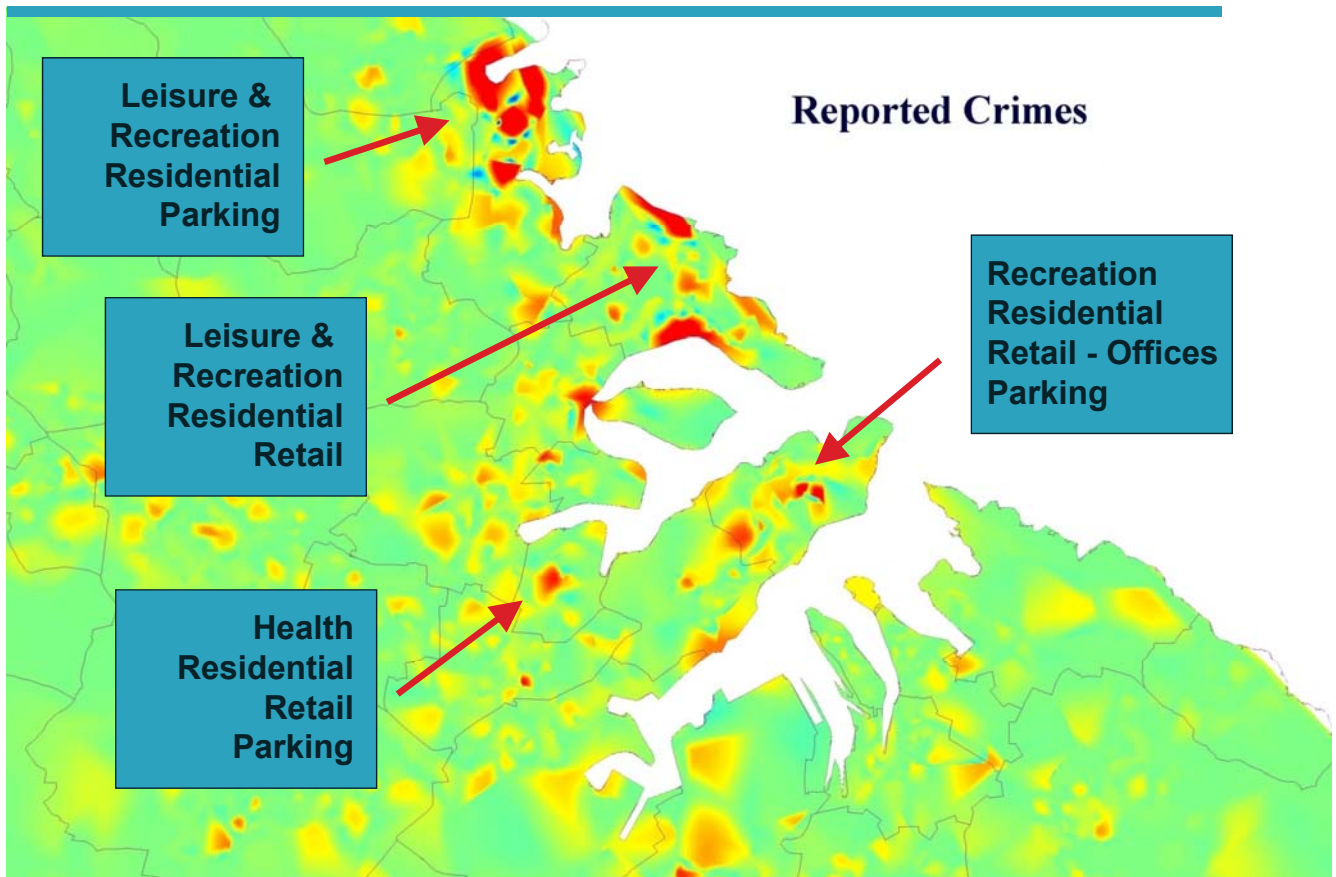
# Activity Hotspots: Spatial – Retail and Social Interactivity

## Cross-Thematic Spatial Overlays



Offender residence
Poverty hotspot
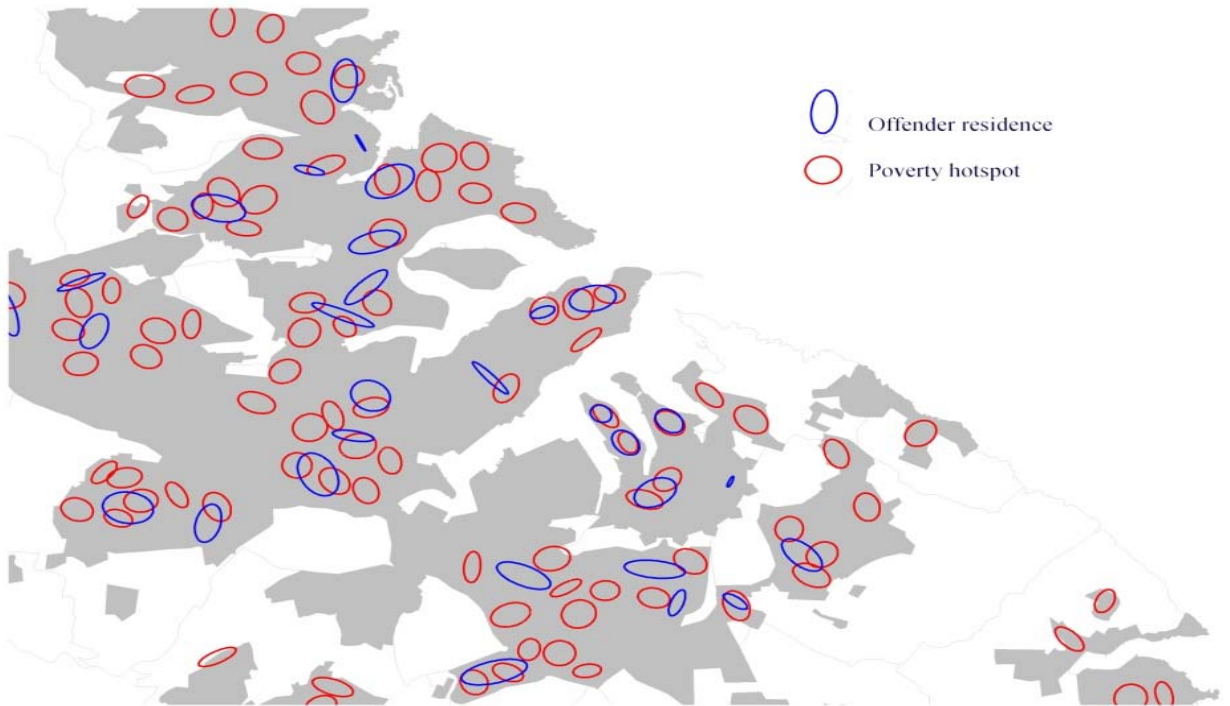
## Environmental: Benzene in Air Interpolation 2000–2003
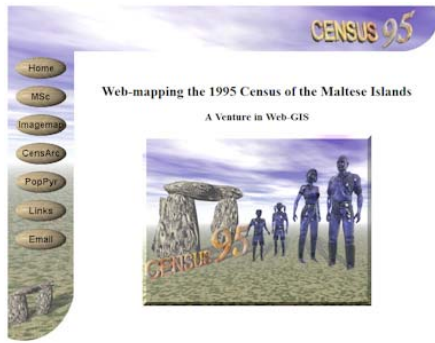


2000
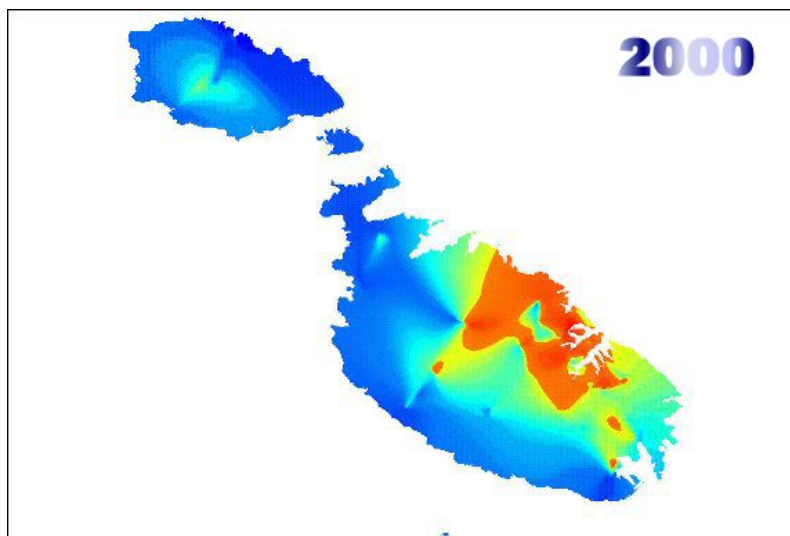
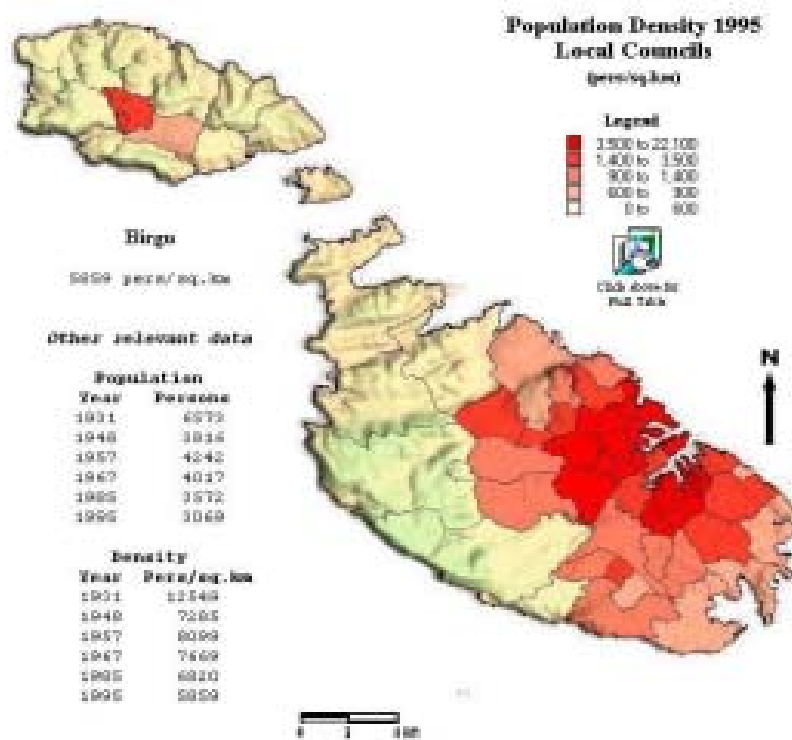# Demographic Landscapes: Population Density
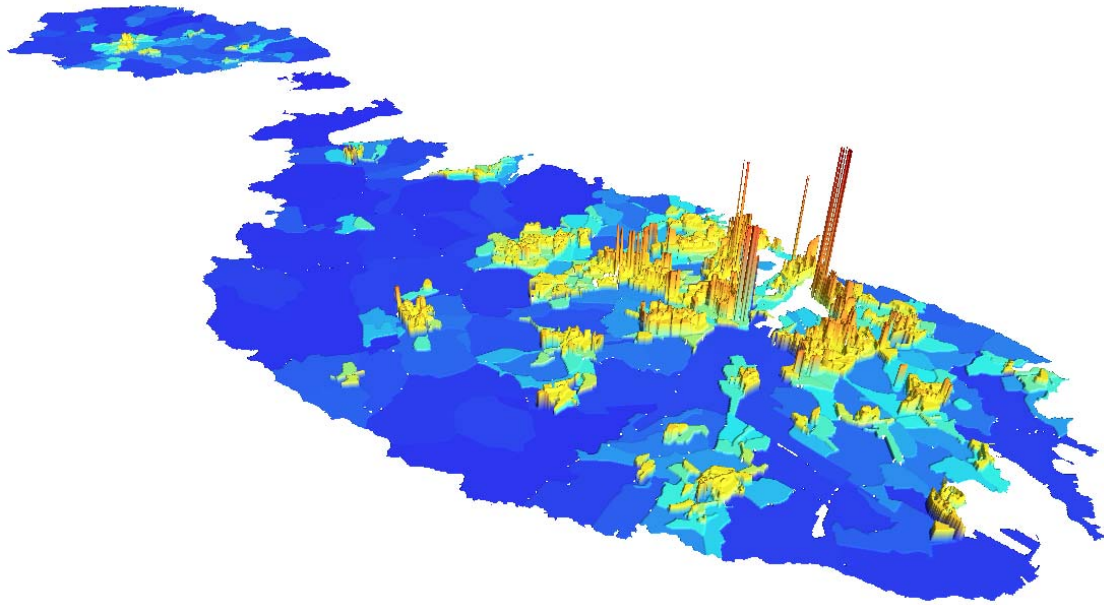


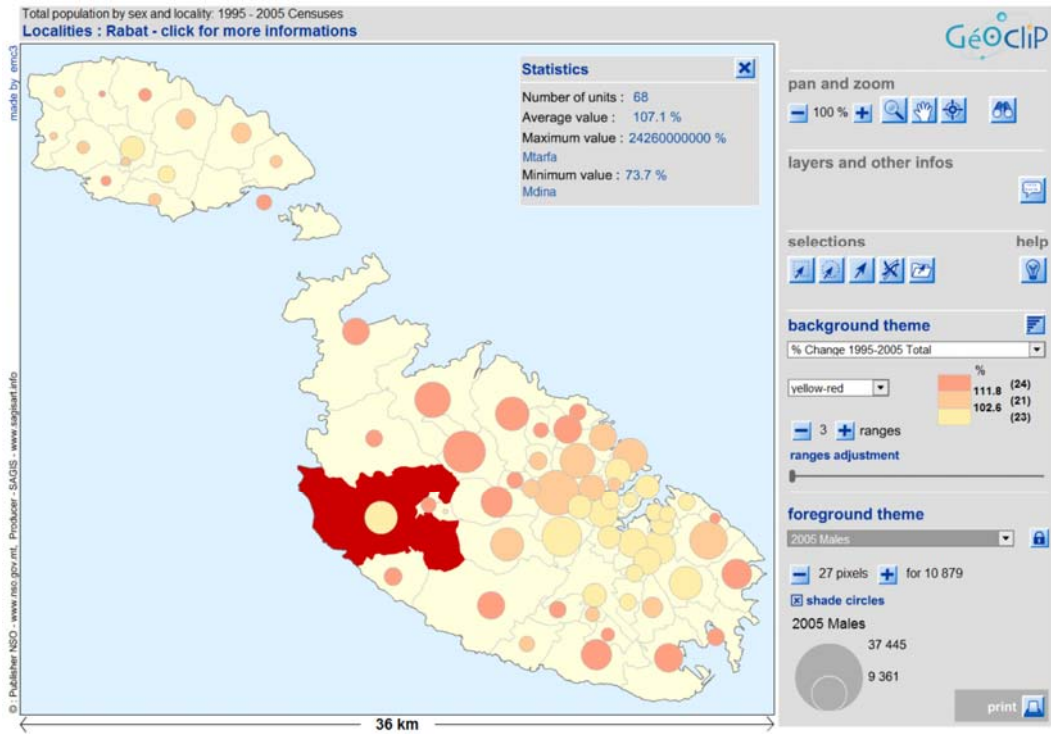# Social Landscapes: Unemployment Rates
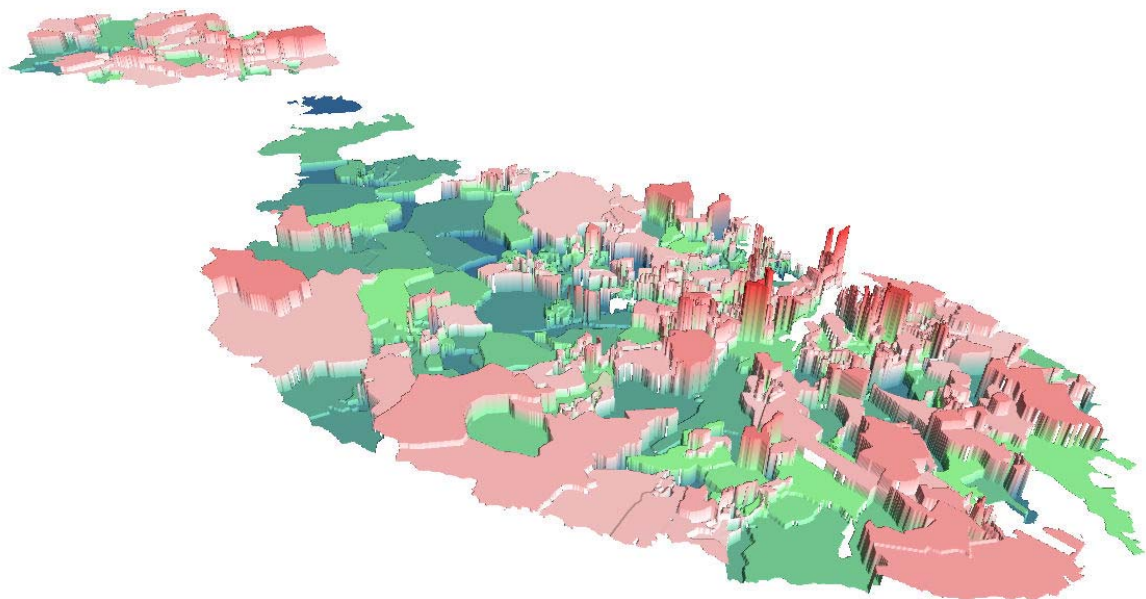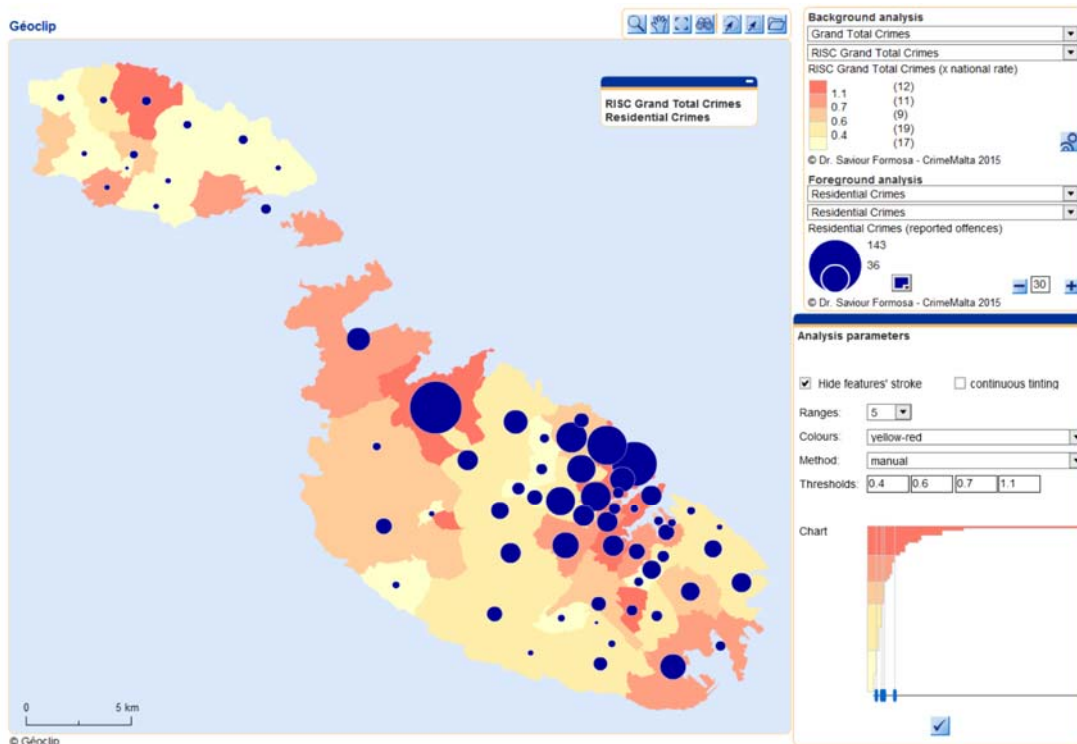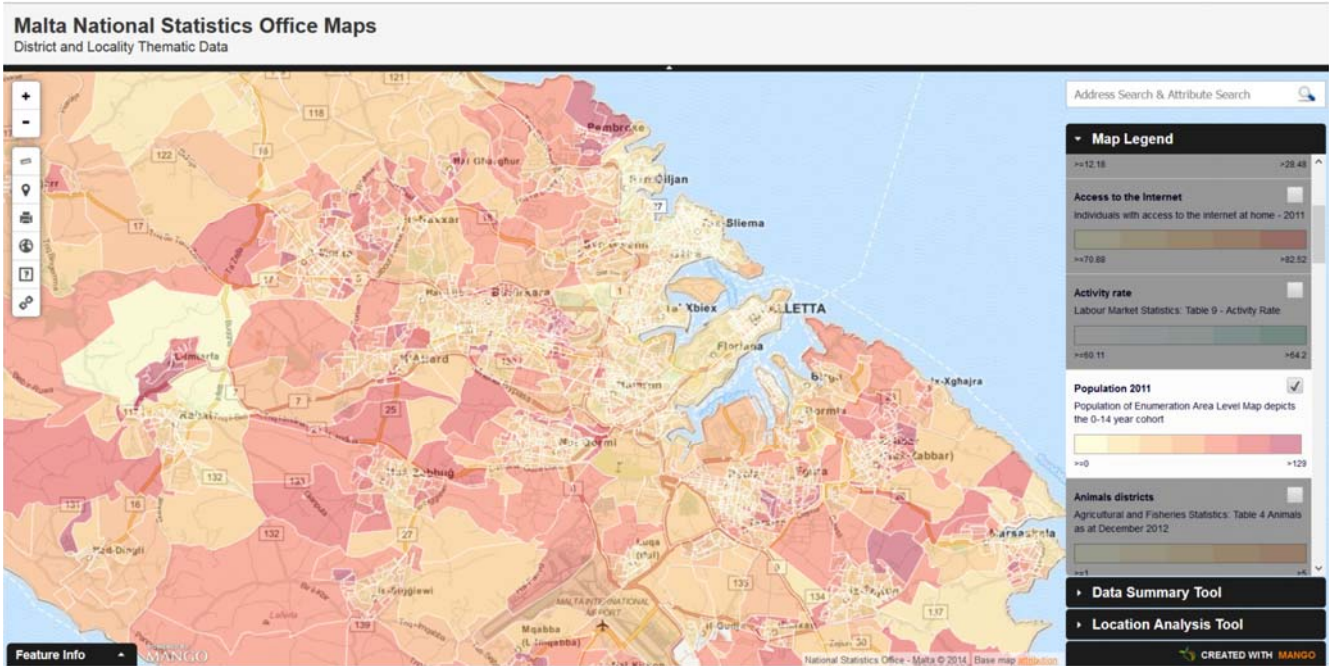
# The NSO Effort
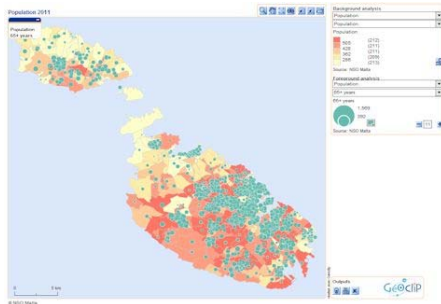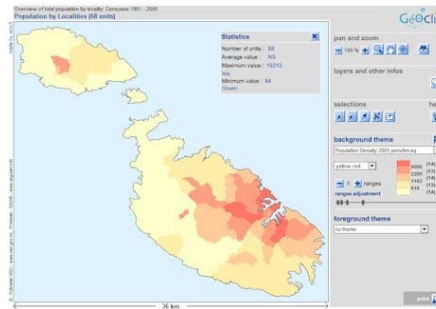


# The Census: 1995

# The Census: 2005



# Thematic Integration: Demographic and Criminological Data

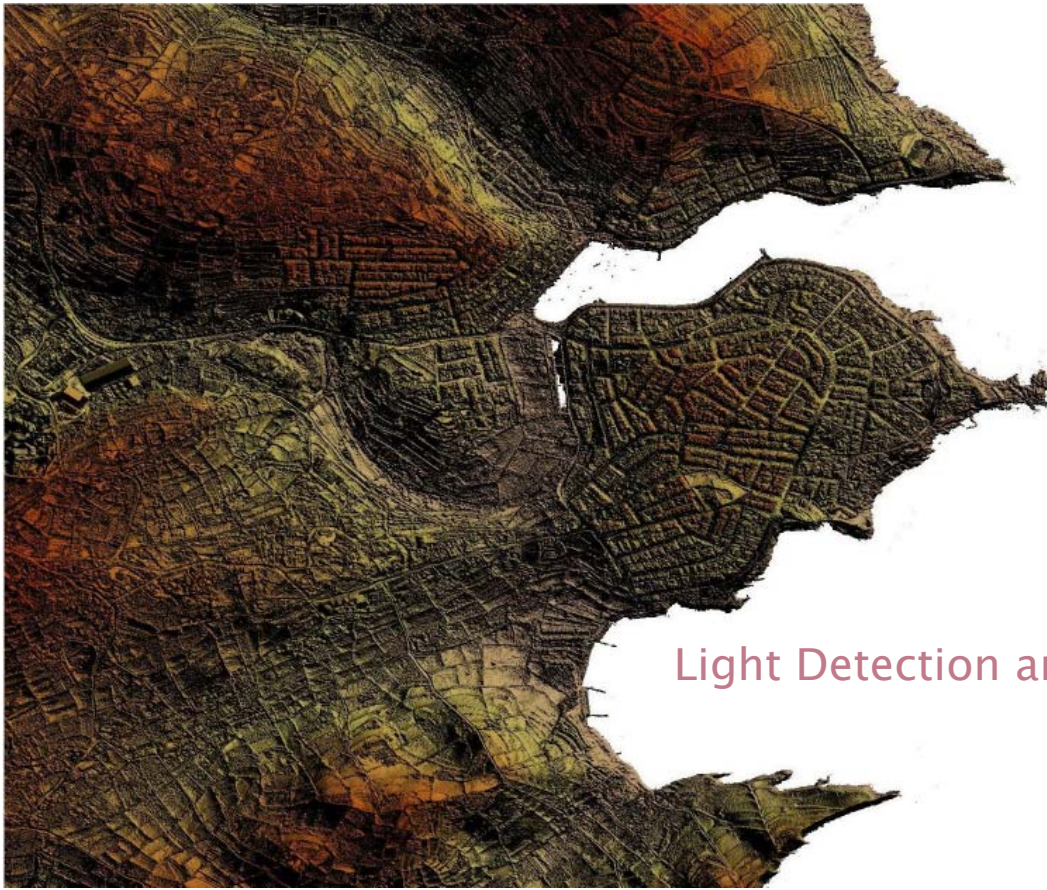## STATAMAP: Spatialisation and Dissemination of Statistics



http://mangomap.com/maps/23649/Malta-National-Statistics-Office-Maps#
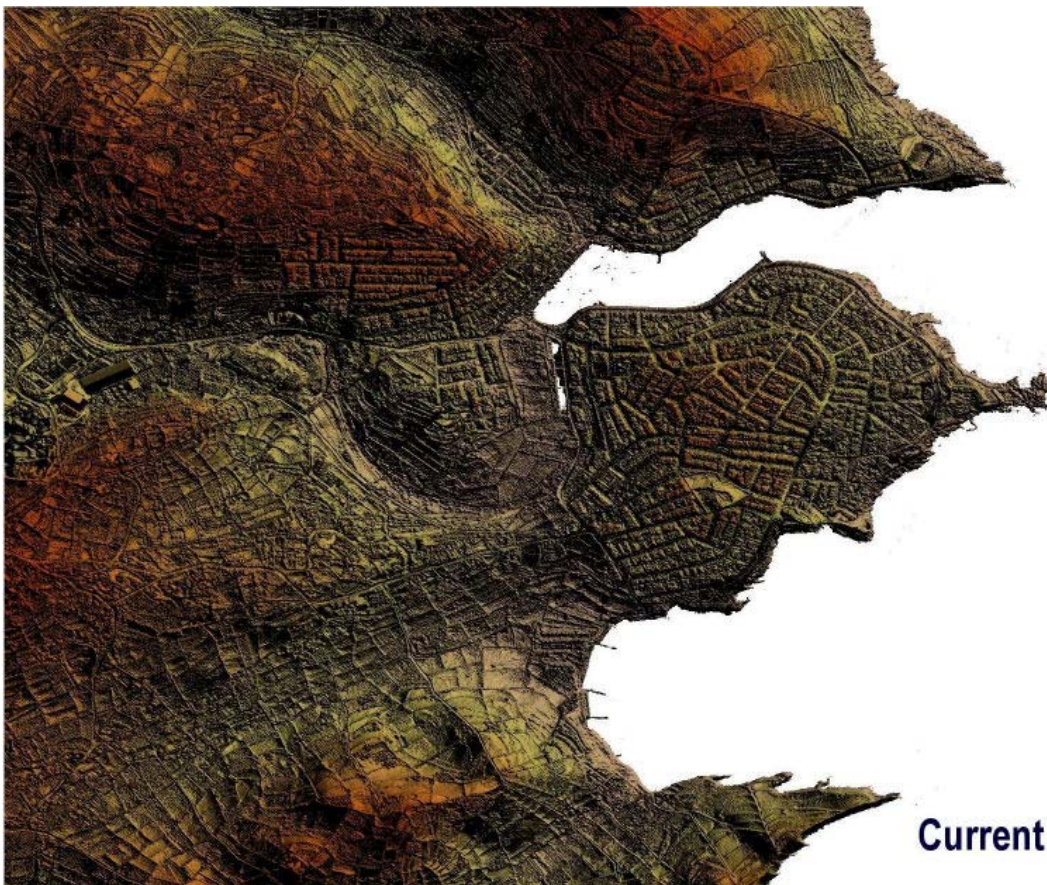
## Data Usage

## Case Study – Marsascala



**LiDAR**
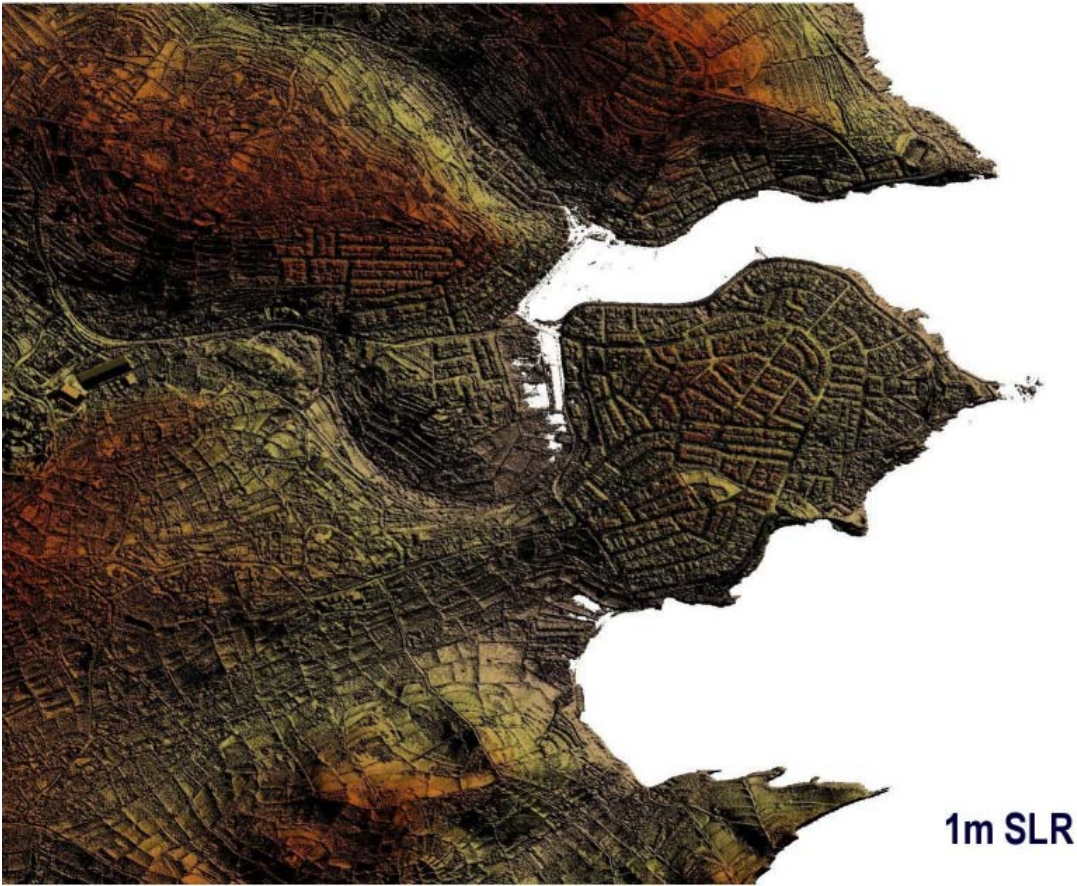
Light Detection and Ranging

## Case Study – Marsascala



**Current Coastline**

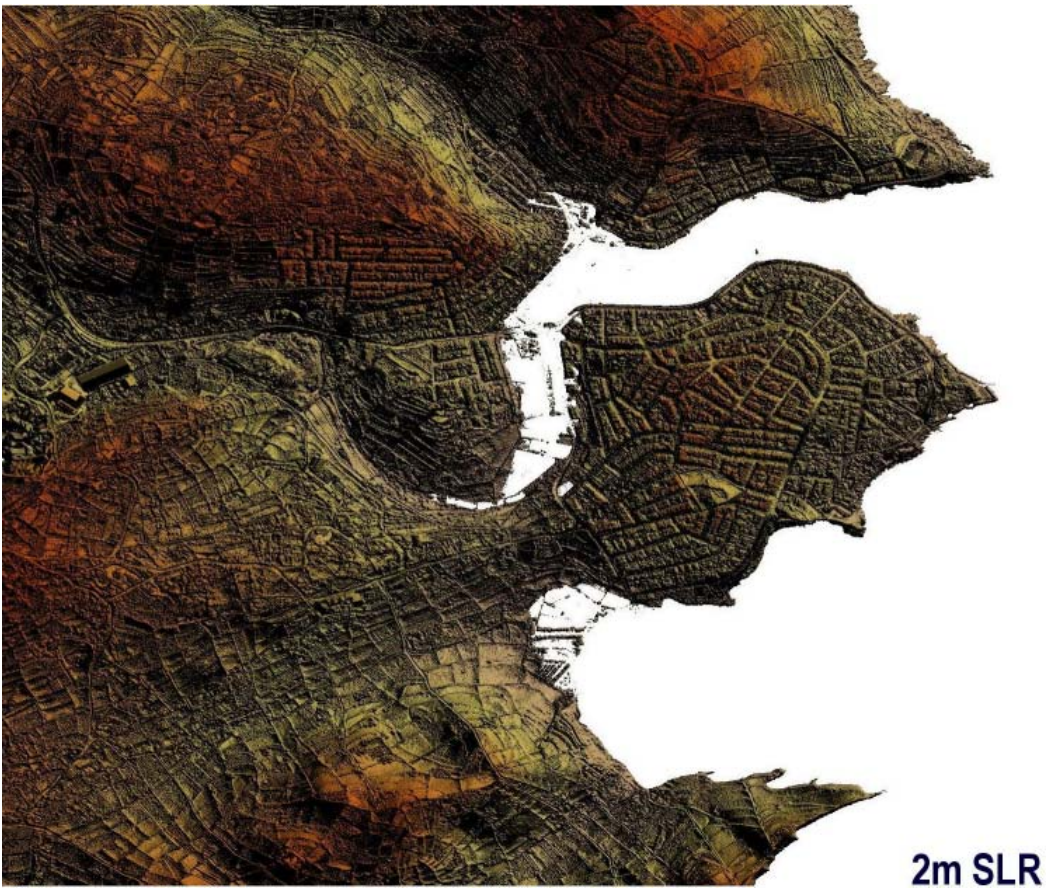## Case Study – Marsascala



1m SLR

## Case Study – Marsascala



2m SLR
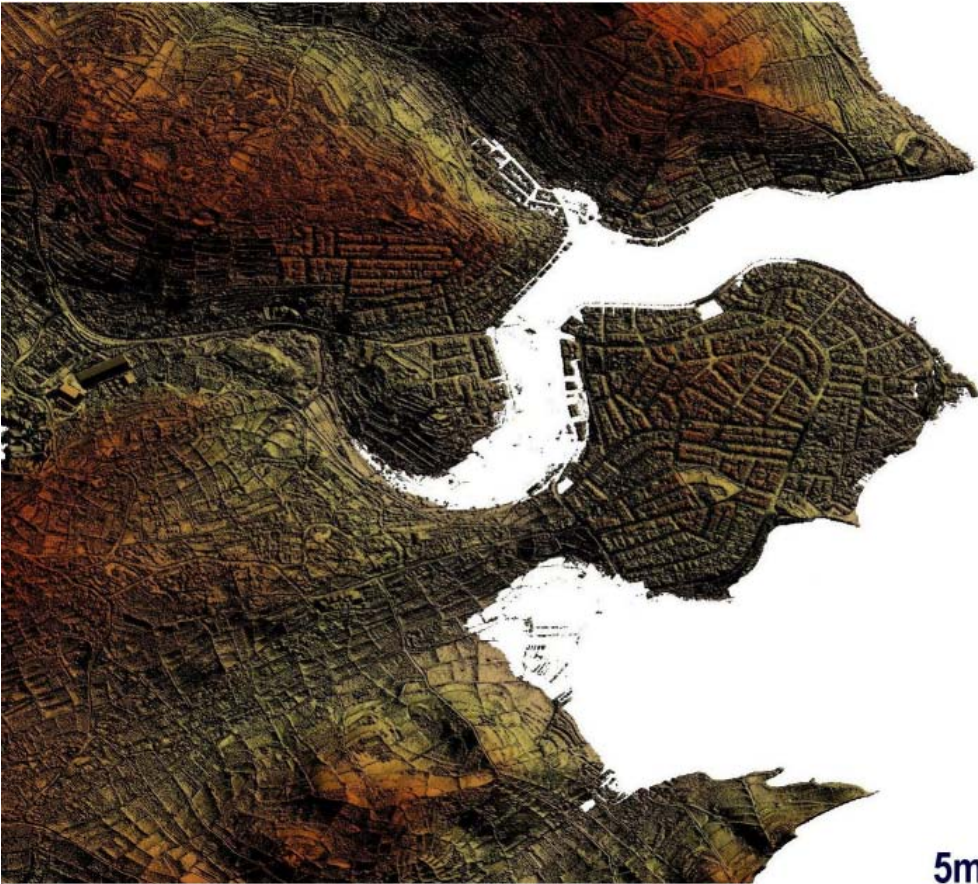
## Case Study – Marsascala



5m SLR
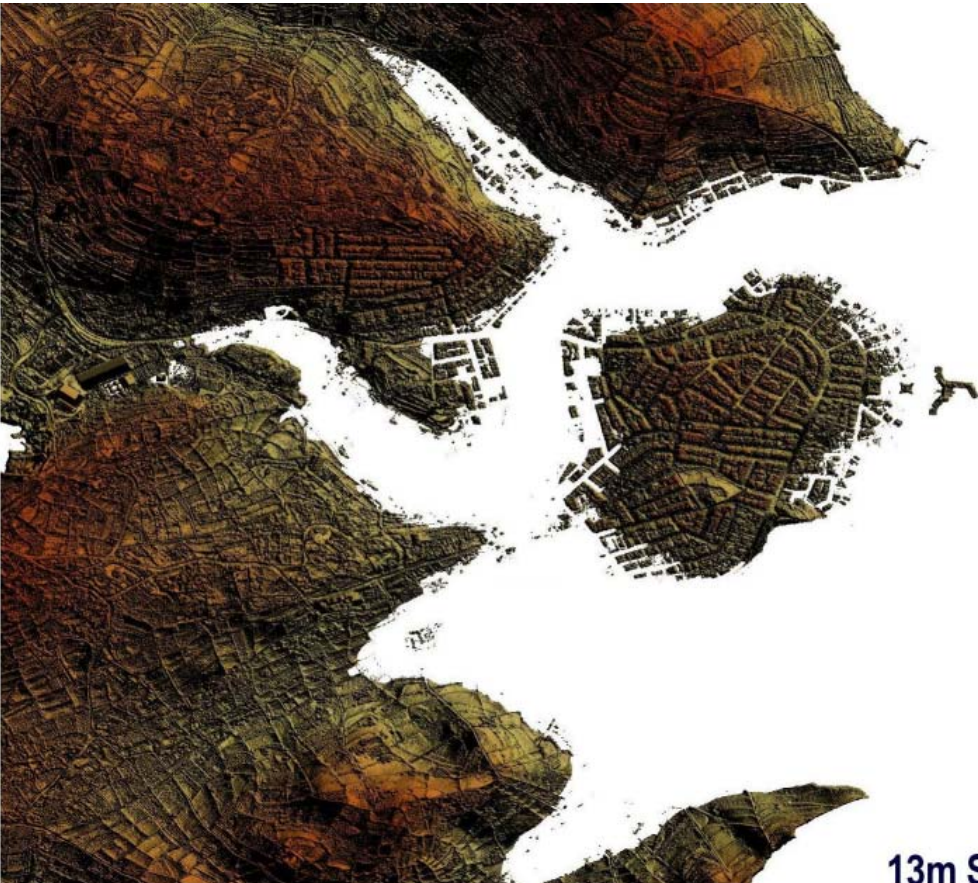
## Case Study – Marsascala



13m SLR

# Case Study – Marsascala
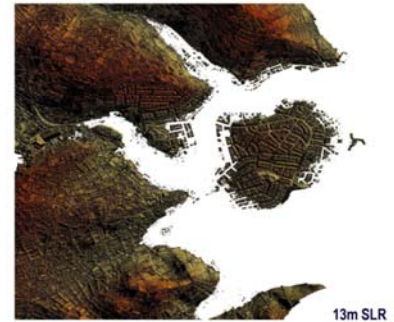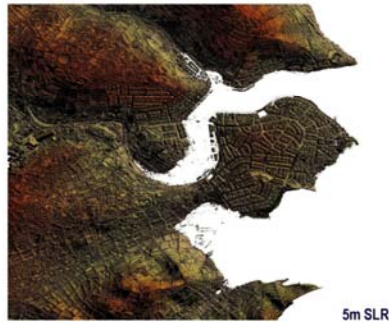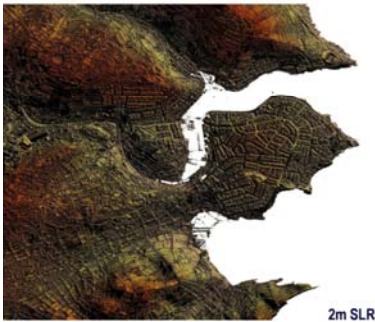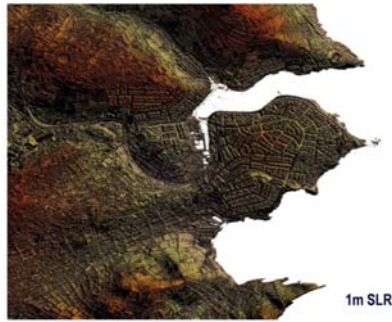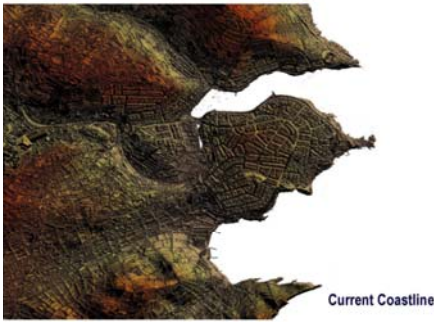


Marsascala Malta
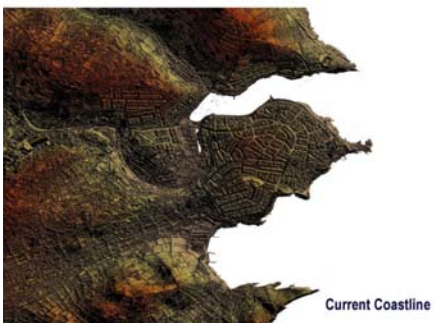Sea-Level Rise Scenarios
(current, 1m, 2m, 5m, 13m)

Saviour Formosa 2014
saviour.formosa@um.edu.mt

Current Coastline

1m SLR

2m SLR

5m SLR

13m SLR

# Case Study – Marsascala



Marsascala Malta
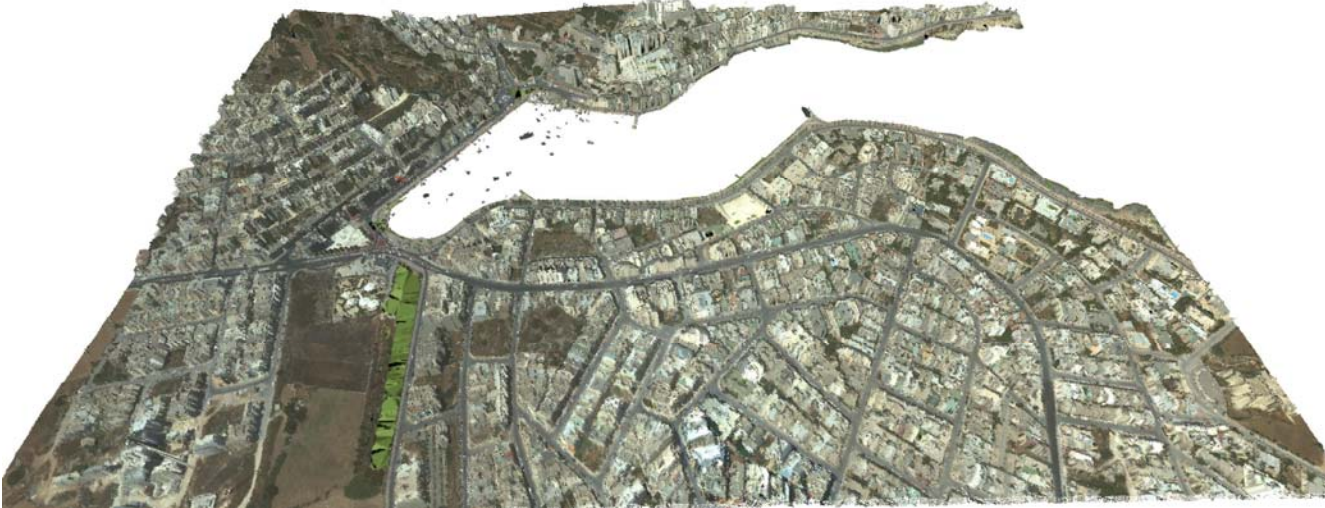Sea-Level Rise Scenarios - Land Area Loss
(current, 1m, 2m, 5m, 13m)
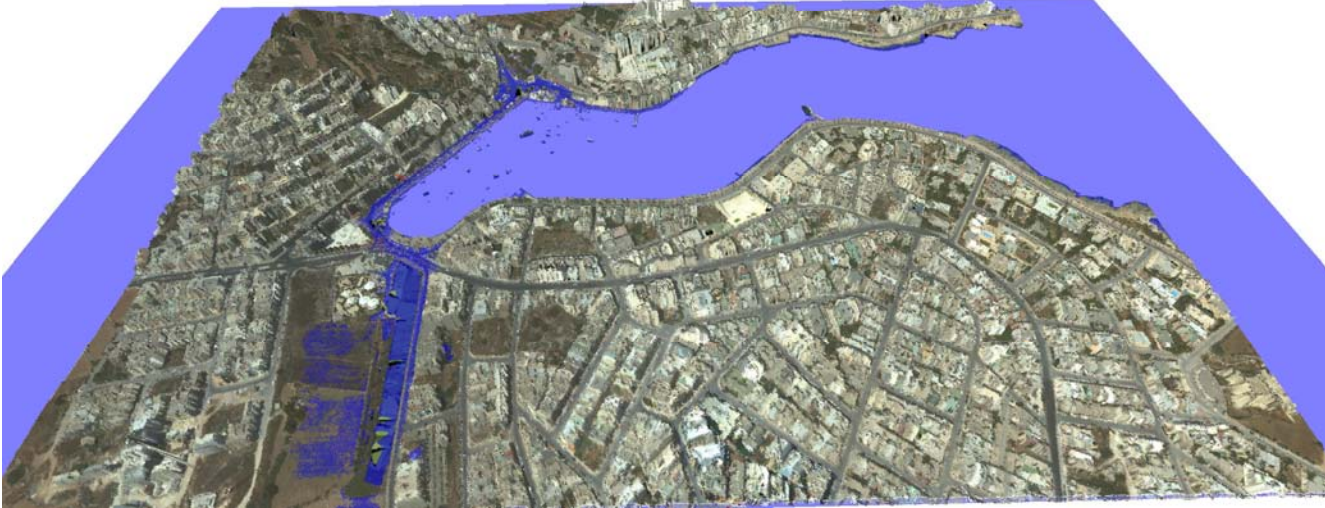
Saviour Formosa 2014
saviour.formosa@um.edu.mt

Current Coastline

1m SLR

2m SLR

5m SLR

13m SLR

## Case Study – Marsascala – SLR 3D

0m



## Case Study – Marsascala – SLR 3D

1m

## Case Study – Marsascala – SLR 3D

2m



## Case Study – Marsascala – SLR 3D
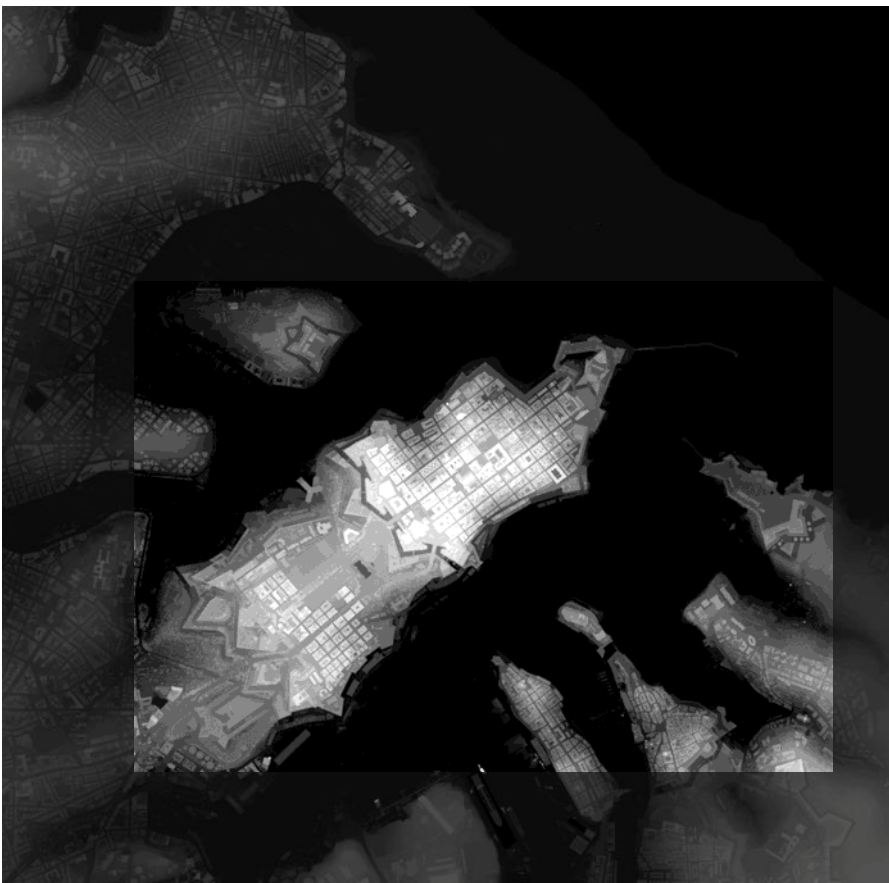
3m

# 3D: Structuring Data



# Case Study – Valletta



*Employing base data*
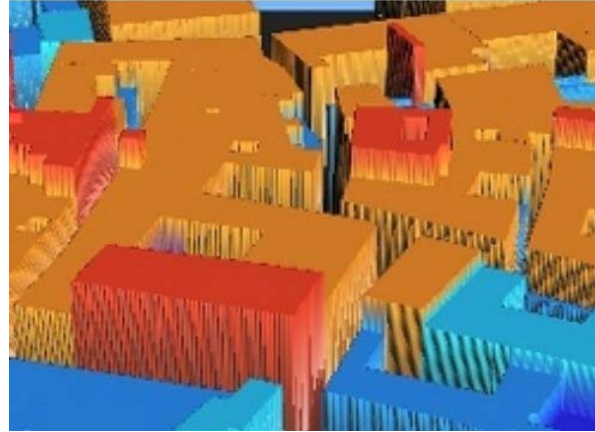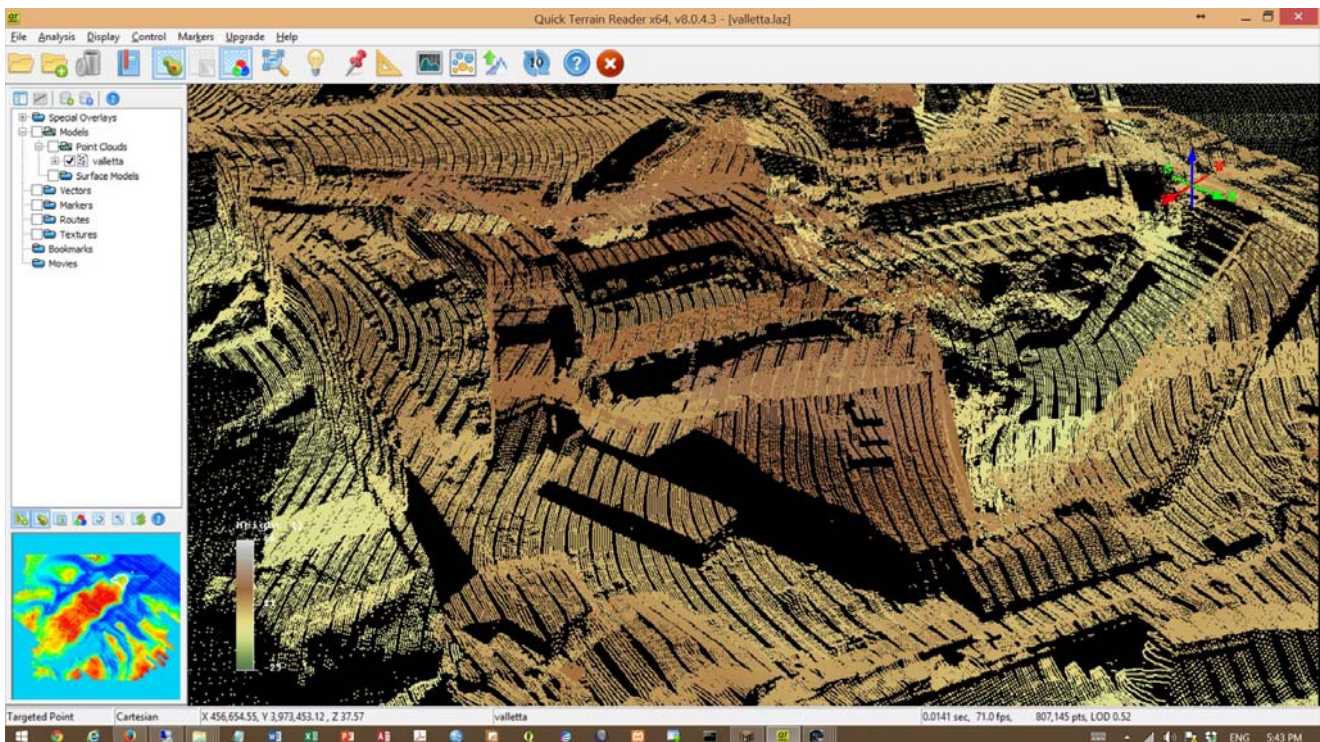
# LiDAR
Light Detection and Ranging

DSM and DTM of the Islands

- average point density 4.3 Pts./m²

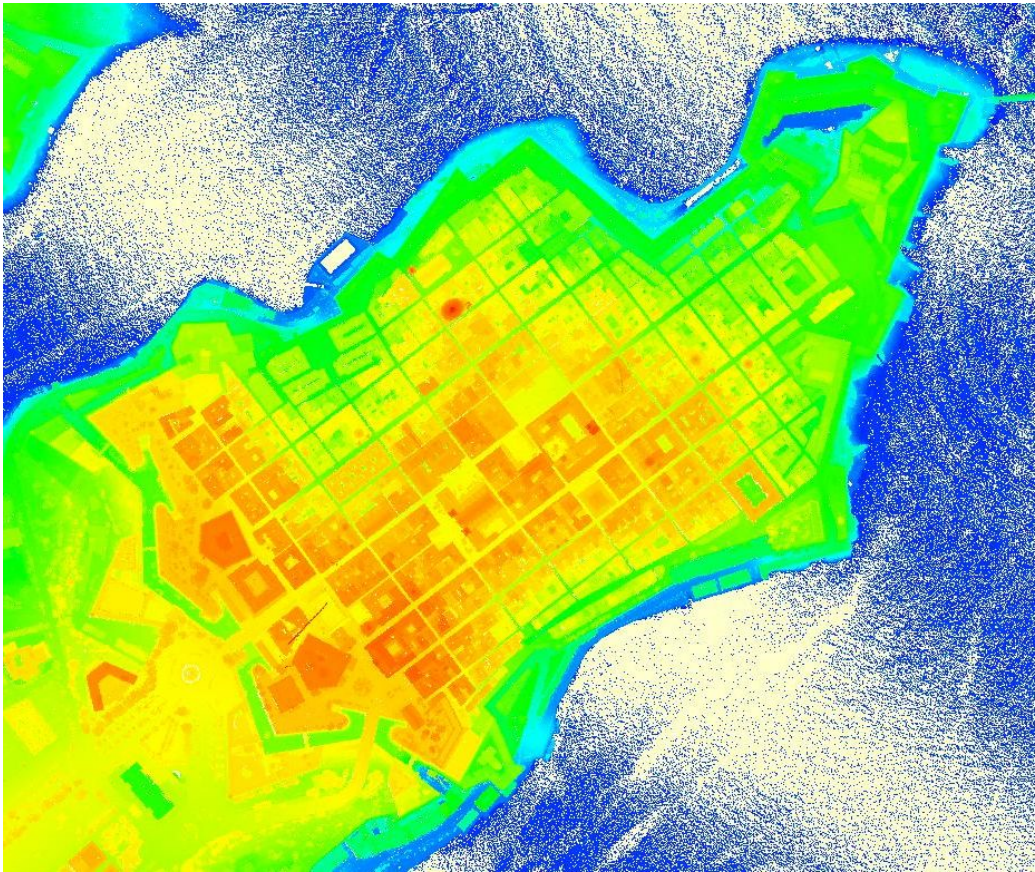- height accuracy > 5 cm
- orthoimage mosaic with a resolution of 16 cm

# Case Study – Valletta – precursors



# Case Study – Valletta – Captured Points

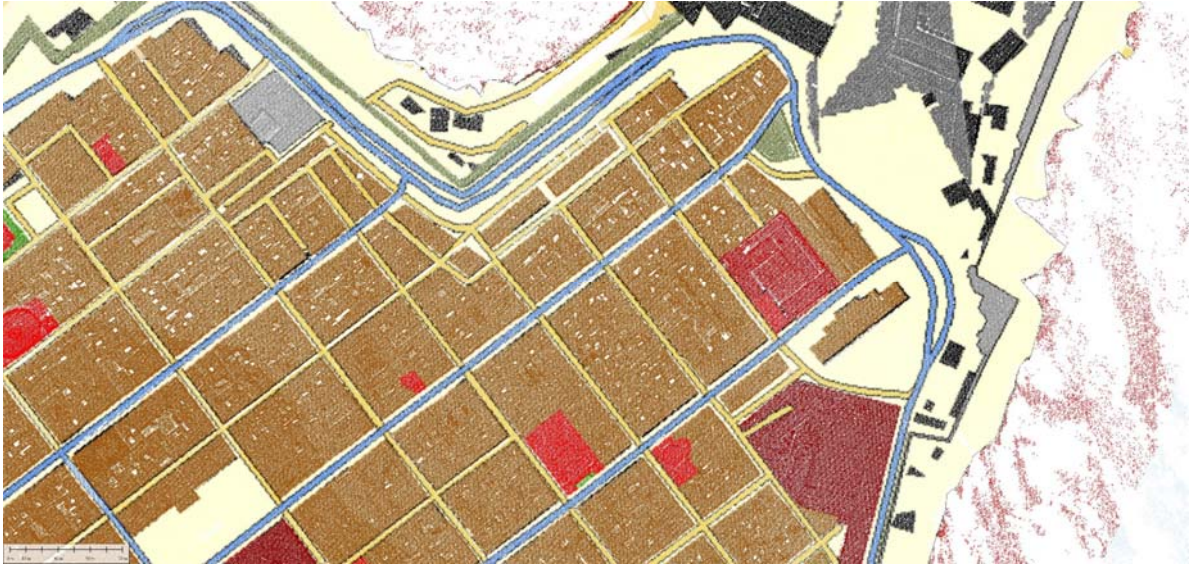# Case Study – Valletta – LiDAR



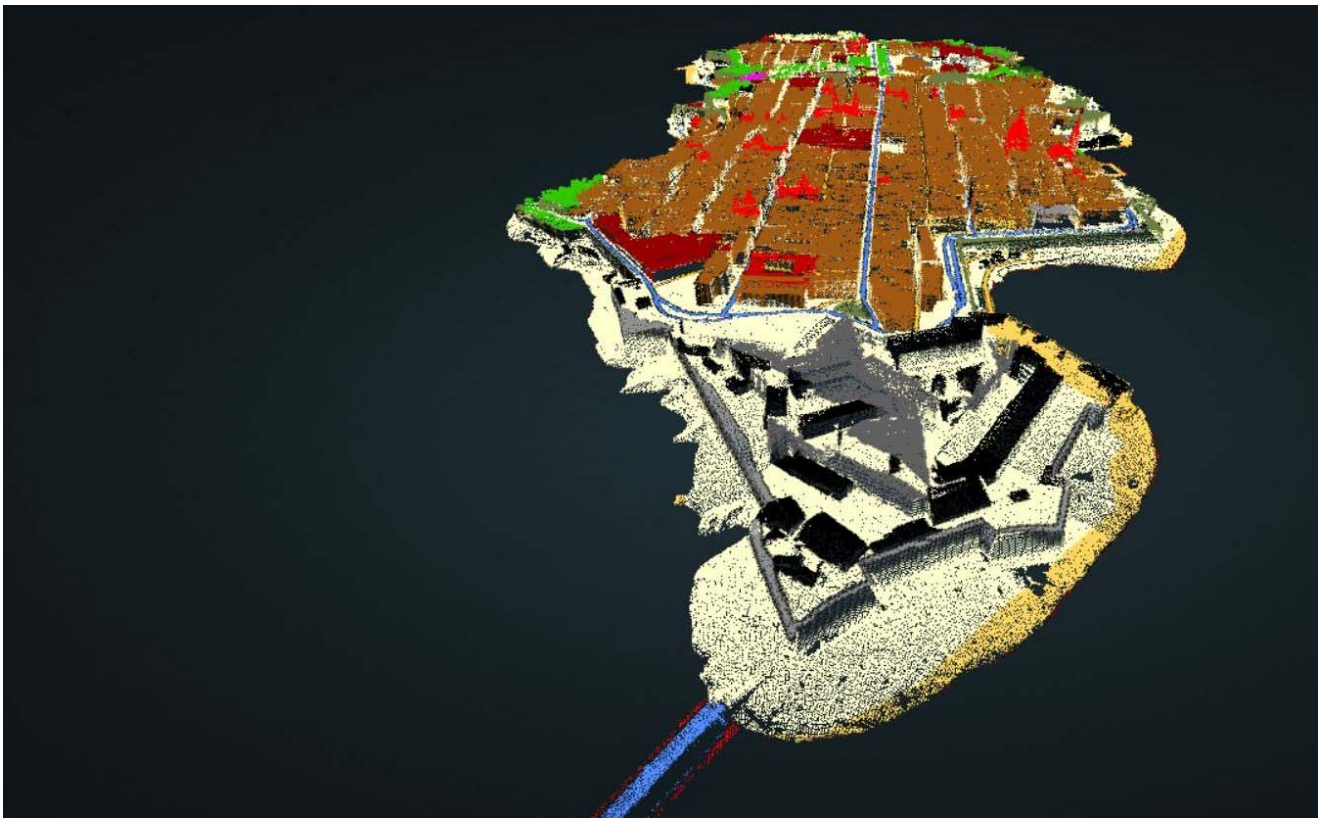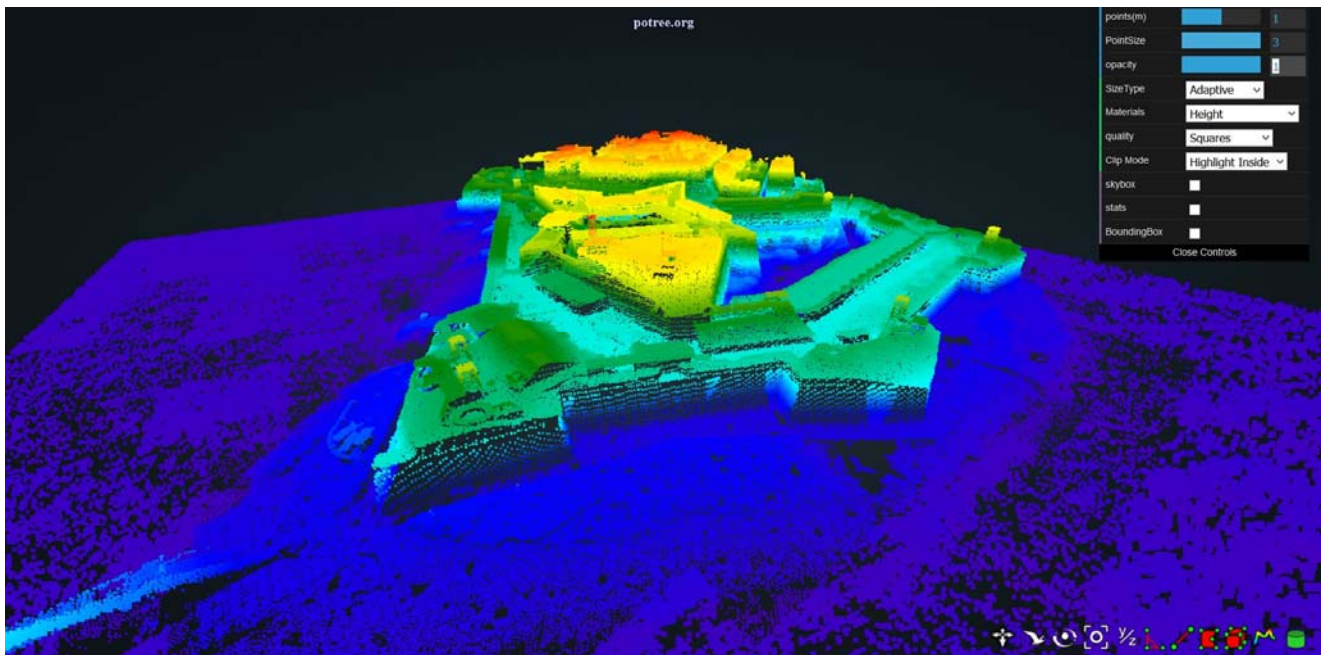# Case Study – Valletta – TIN

## Case Study – Valletta – Thematic



## Case Study – Valletta – RGB Height

## Case Study – Valletta – St Elmo Heights



## Case Study – Valletta – St Elmo RGB

## Case Study – Valletta – Minecrafted



## Case Study – Immersion – Hypogeum

# Thank You

**Prof. Saviour Formosa**

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20.10.2015
BETTER DATA.
BETTER LIVES.

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