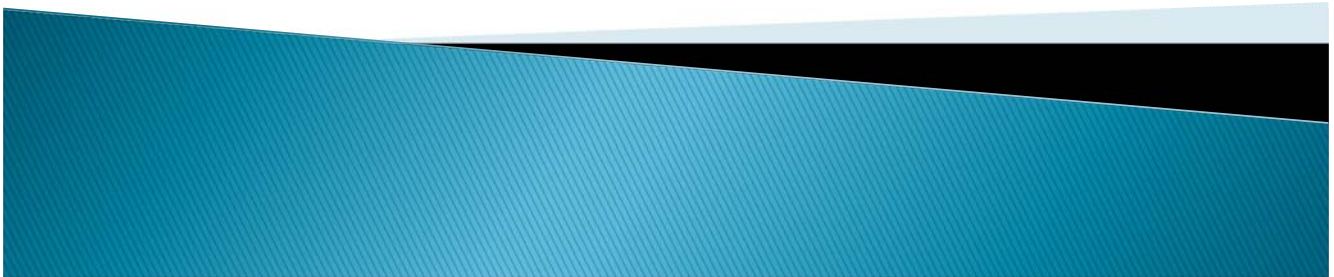


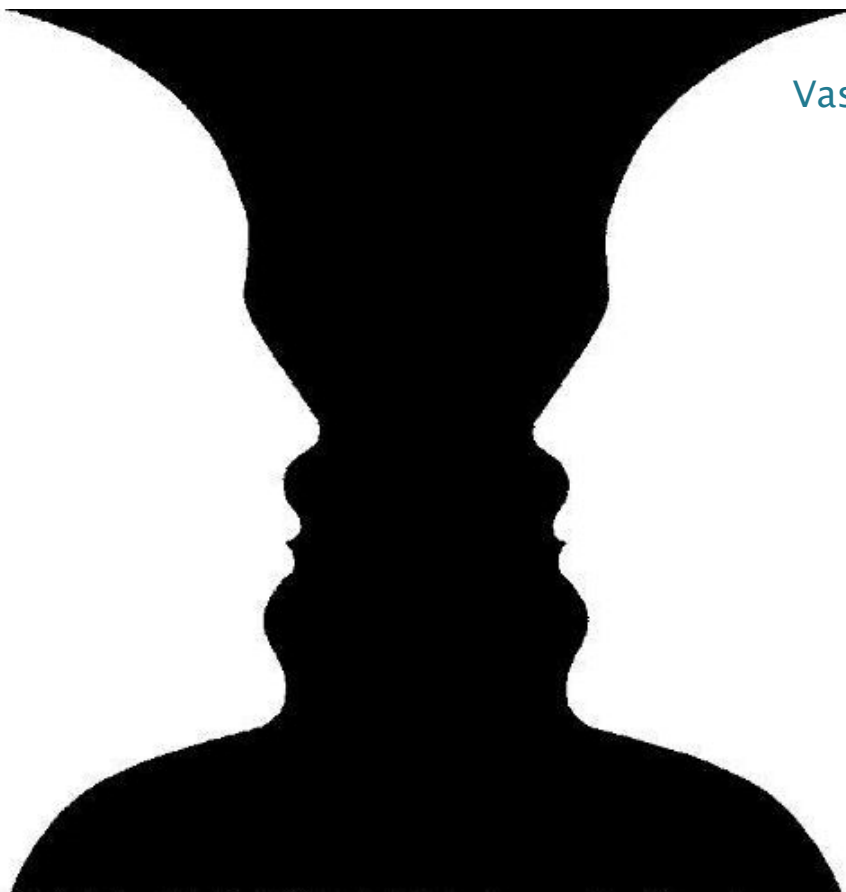
# The Role of Geospatial Techniques in Statistics – Visualisation Processes

Prof. Saviour Formosa

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



## Visualisation



Vase or Faces?

# Visualisation

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Young – Old



# Visualisation

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Maps – Easy No?

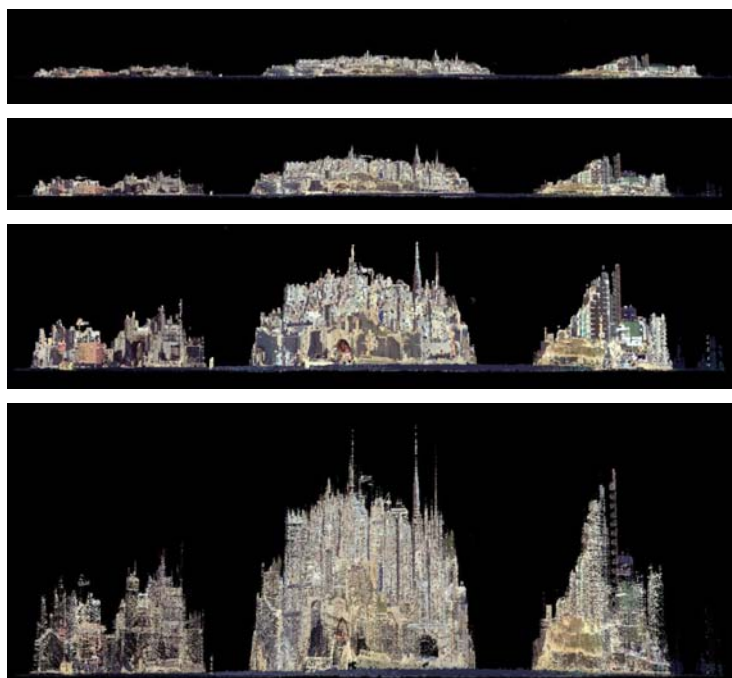
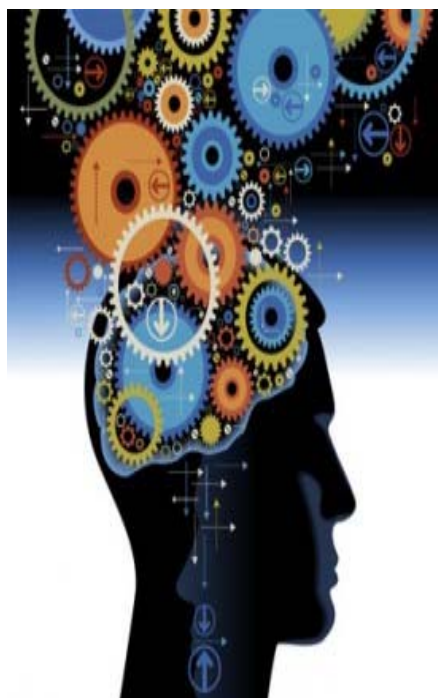


## Visualization – Visualisation

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Z  $\longrightarrow$  S

Imagine the Valletta Grand Harbour Vista



## 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

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- ▶ Lengler and Eppler (2007) – visualisation methods which they adventurously called the Periodic Table of Visualization Methods.
- ▶ Termed the Visual Literacy Project [\[1\]](http://www.visual-literacy.org/index.html).
- ▶ Lengler et al (2007) split the methods into six visualization categories based on what they called the Data, Information, Concept, Strategy, Metaphor and Compound approach (DICSMC).

[\[1\]](http://www.visual-literacy.org/index.html) <http://www.visual-literacy.org/index.html>

<b>Data Visualization</b>	Data in schematic form
<b>Information Visualization</b>	Data transformed to an image
<b>Concept Visualization</b>	Qualitative approach
<b>Strategy Visualization</b>	Systematic approach
<b>Metaphor Visualization</b>	Structuring information
<b>Compound Visualization</b>	Combining different methods

# Available Tools

## A PERIODIC TABLE OF VISUALIZATION METHODS

<b>C</b> continuum	<b>Tb</b> table	<b>Ga</b> cartesian coordinates	<b>Pi</b> pie chart	<b>L</b> line chart	<b>B</b> bar chart	<b>Ac</b> area chart	<b>R</b> radar chart	<b>Pa</b> parallel coordinates	<b>Hy</b> hyperbolic tree	<b>Cy</b> cycle diagram	<b>T</b> timeline	<b>Ve</b> venn diagram	<b>Mi</b> mindmap	<b>Sq</b> square of oppositions	<b>Cc</b> concentric circles	<b>Ar</b> argument slide	<b>Sw</b> swim lane diagram	<b>Gc</b> gantt chart	<b>Pm</b> perspectives diagram	<b>D</b> dilemma diagram	<b>Pr</b> parameter ruler	<b>Kn</b> knowledge map								
<b>Me</b> meeting trace	<b>Mm</b> metro map	<b>Tm</b> temple	<b>St</b> story template	<b>Tr</b> tree	<b>Co</b> communication diagram	<b>Fp</b> flight plan	<b>Cs</b> concept skeleton	<b>Br</b> bridge	<b>Fu</b> funnel	<b>Ri</b> rich picture	<b>Sa</b> sankey diagram	<b>In</b> information lense	<b>E</b> entity relationship diagram	<b>Pt</b> petri net	<b>Fl</b> flow chart	<b>Cl</b> clustering	<b>Lc</b> layer chart	<b>Py</b> pyramid technique	<b>Ce</b> cause-effect chains	<b>Tl</b> toulmin map	<b>Dt</b> decision tree	<b>Cp</b> cpm critical path method	<b>Cf</b> concept fan	<b>Co</b> concept map	<b>Ic</b> iceberg	<b>Lm</b> learning map				
<b>Da</b> data map	<b>Sp</b> spectrogram	<b>Tp</b> treemap	<b>Cn</b> cone tree	<b>Sy</b> system dyn./simulation	<b>Df</b> data flow diagram	<b>Se</b> semantic network	<b>So</b> soft system modeling	<b>Sn</b> synergy map	<b>Fo</b> force field diagram	<b>Ib</b> ibis argumentation map	<b>Pr</b> process event chains	<b>Pe</b> pert chart	<b>Ev</b> evocative knowledge map	<b>V</b> Vee diagram	<b>Hh</b> heaven's bell chart	<b>I</b> infomral	<b>Ed</b> edgeworth box	<b>Pf</b> portfolio diagram	<b>Sg</b> strategic game board	<b>Mz</b> mintzberg's organigraph	<b>Z</b> zwickly's morphological box	<b>Ad</b> affinity diagram	<b>De</b> decision discovery diagram	<b>Bm</b> bcg matrix	<b>Stc</b> strategy canvas	<b>Vc</b> value chain	<b>Hy</b> hype-cycle	<b>Sr</b> stakeholder rating map	<b>Ta</b> taps	<b>Sd</b> spray diagram

**Cy** Process Visualization

**Hy** Structure Visualization

- ☀ Overview
- Detail
- ☉ Detail AND Overview
- < > Divergent thinking
- > < Convergent thinking

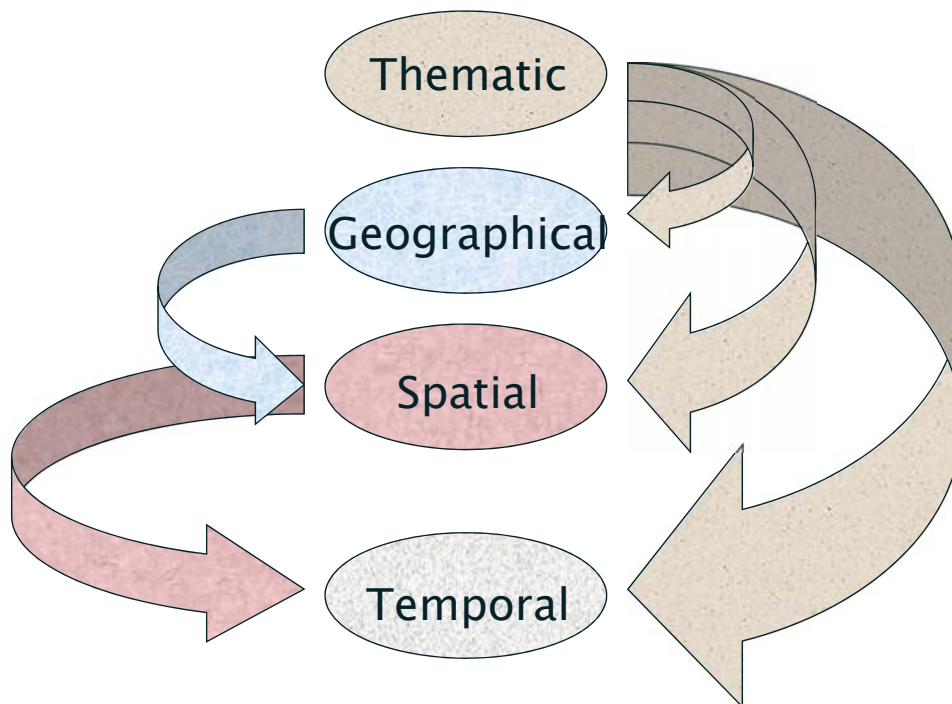
Note: Depending on your location and connection speed it can take some time to load a pop-up picture.  
© Ralph Lengler & Martin J. Eppler, www.visual-literacy.org

version 1.5

<b>Su</b> supply demand curve	<b>Pe</b> performance charting	<b>St</b> strategy map	<b>Oc</b> organization chart	<b>Ho</b> house of quality	<b>Fd</b> feedback diagram	<b>Ft</b> failure tree	<b>Mq</b> magic quadrant	<b>Ld</b> life-cycle diagram	<b>Po</b> porter's five forces	<b>S</b> s-cycle	<b>Sm</b> stakeholder map	<b>Is</b> ishikawa diagram	<b>Tc</b> technology roadmap
<b>Ed</b> edgeworth box	<b>Pf</b> portfolio diagram	<b>Sg</b> strategic game board	<b>Mz</b> mintzberg's organigraph	<b>Z</b> zwickly's morphological box	<b>Ad</b> affinity diagram	<b>De</b> decision discovery diagram	<b>Bm</b> bcg matrix	<b>Stc</b> strategy canvas	<b>Vc</b> value chain	<b>Hy</b> hype-cycle	<b>Sr</b> stakeholder rating map	<b>Ta</b> taps	<b>Sd</b> spray diagram

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

## Analytical Constructs



# The Concept Of Scale

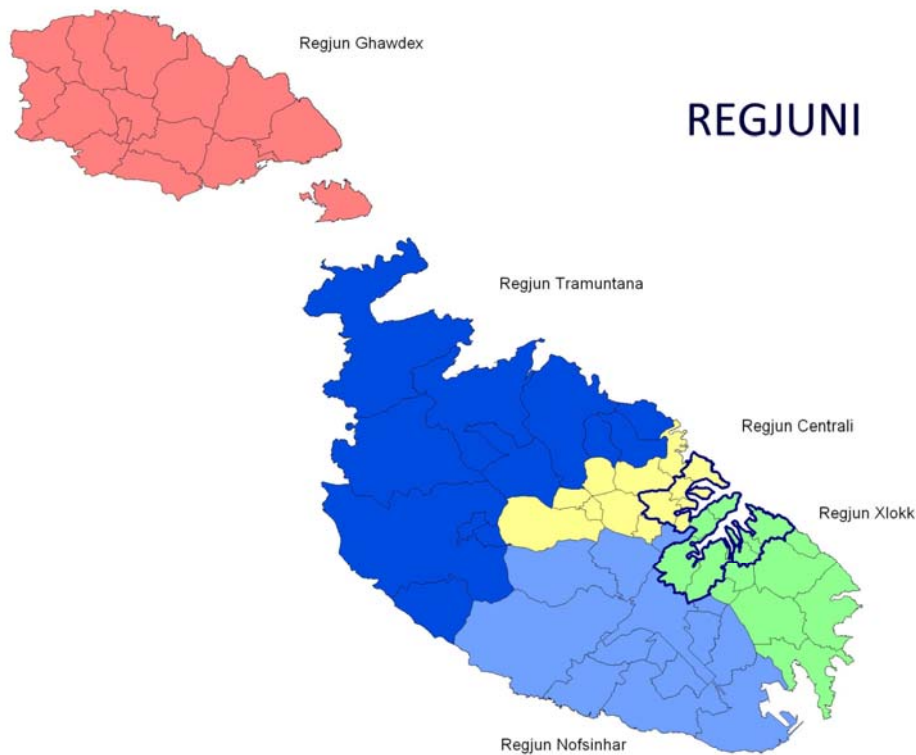
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- Global
- EUMedit/Regional
- NUTS 1 –
- NUTS 2 –
- NUTS 3 –
- NUTS 4 –
- NUTS 5 –
- Village Cores
- EAS
- Street Level
- Building
- Point



## Overlaying Nightmare? The Data Dilemma...

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REGJUNI



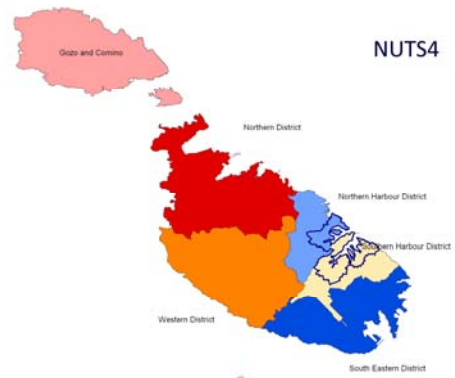
Police Districts



Health Regions

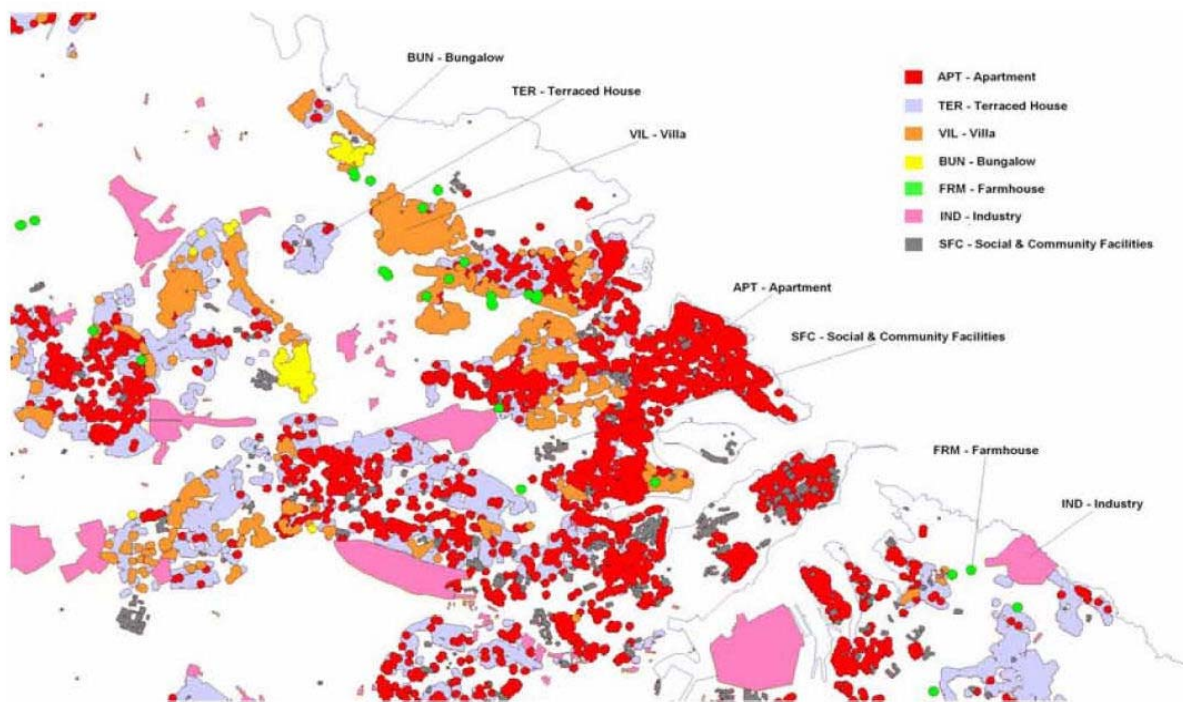


Local Plan Areas



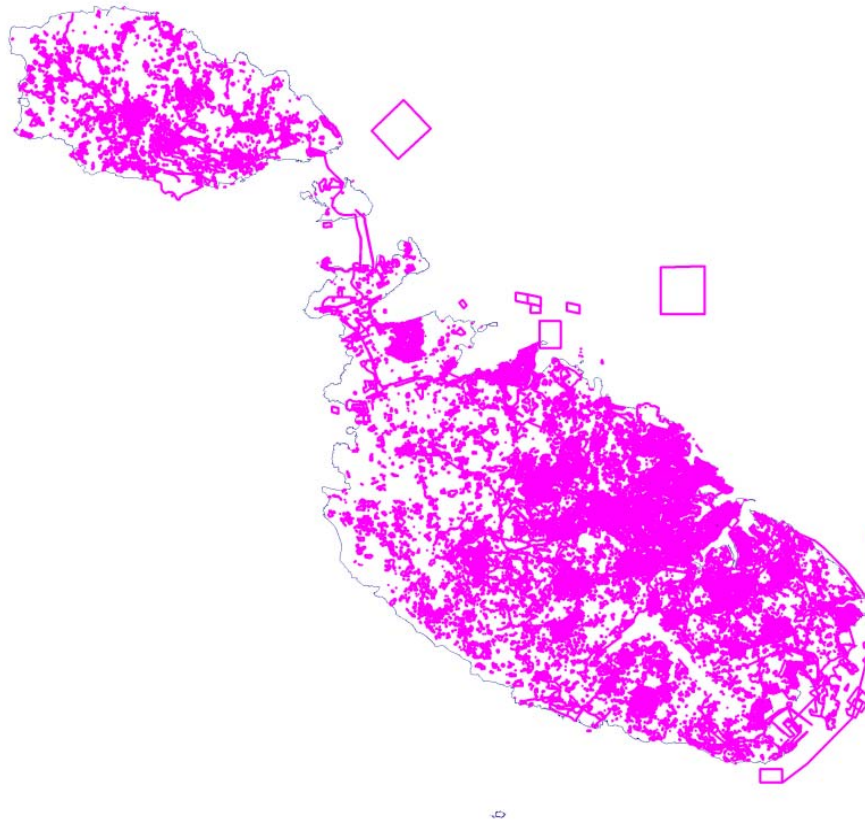
NUTS4

## Physical landscapes: Zoning



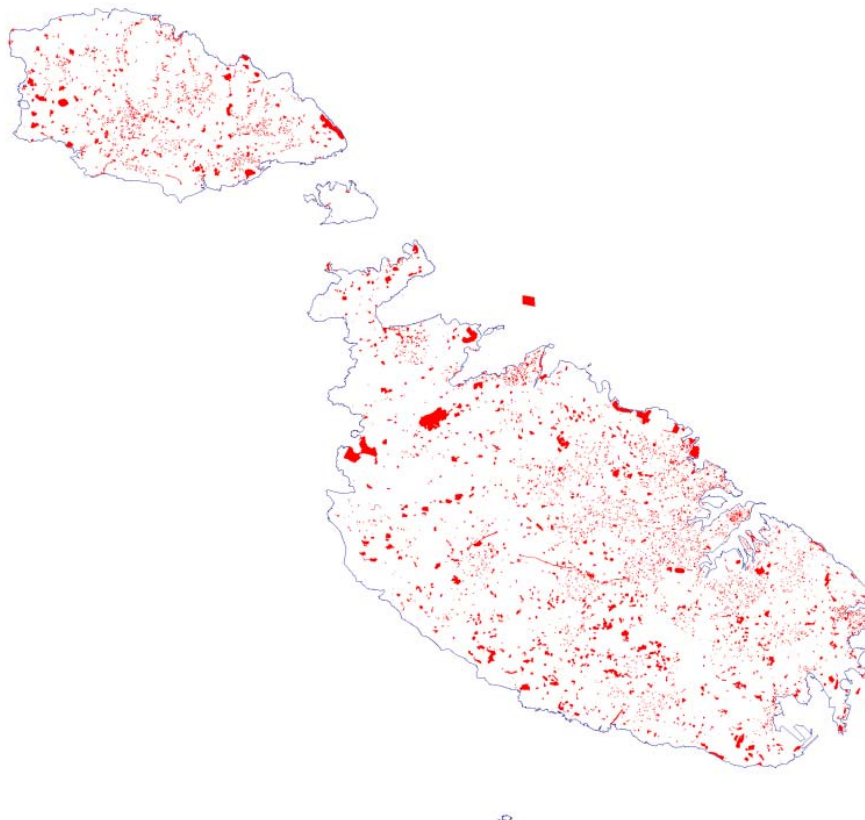
# Development Planning: Applications for Development

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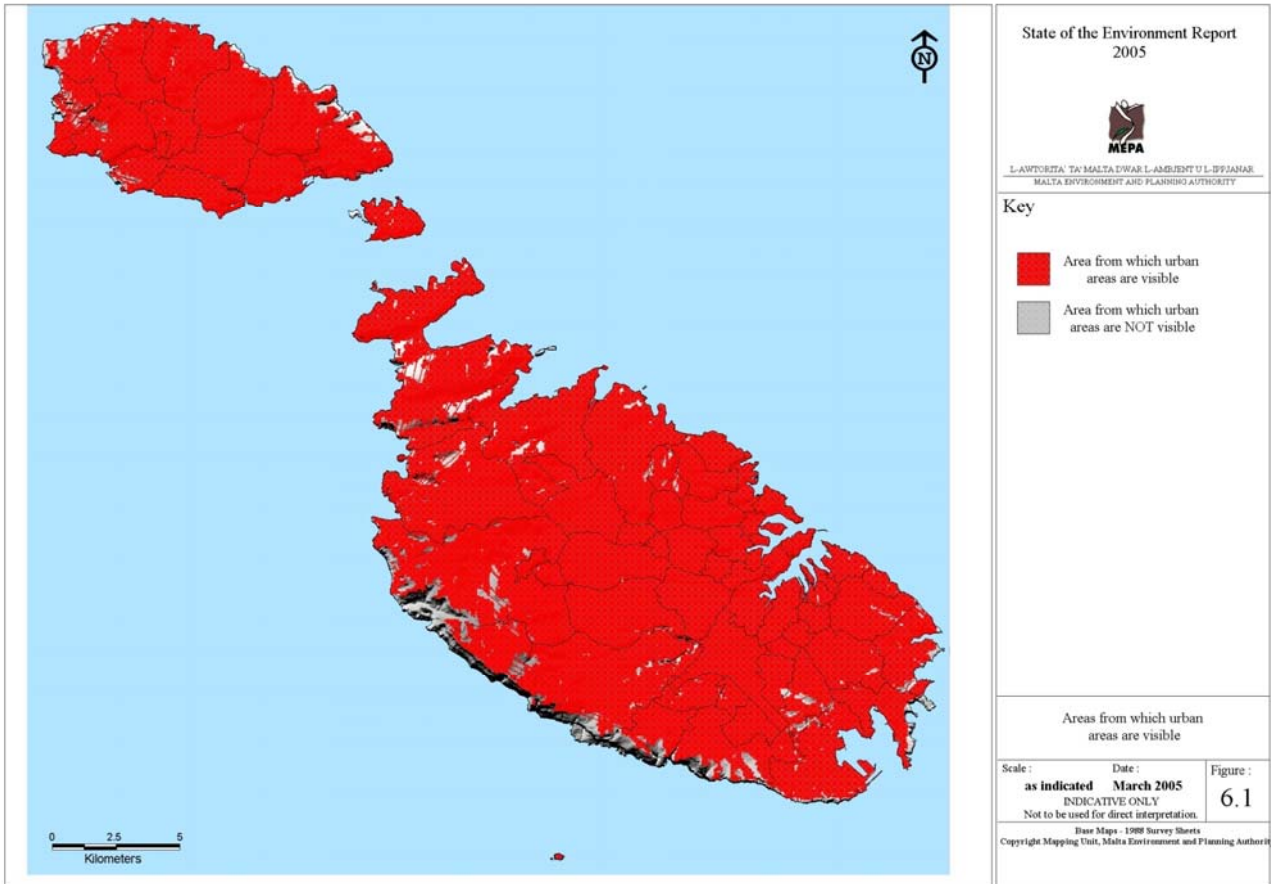


# Development Planning: Enforcement Cases

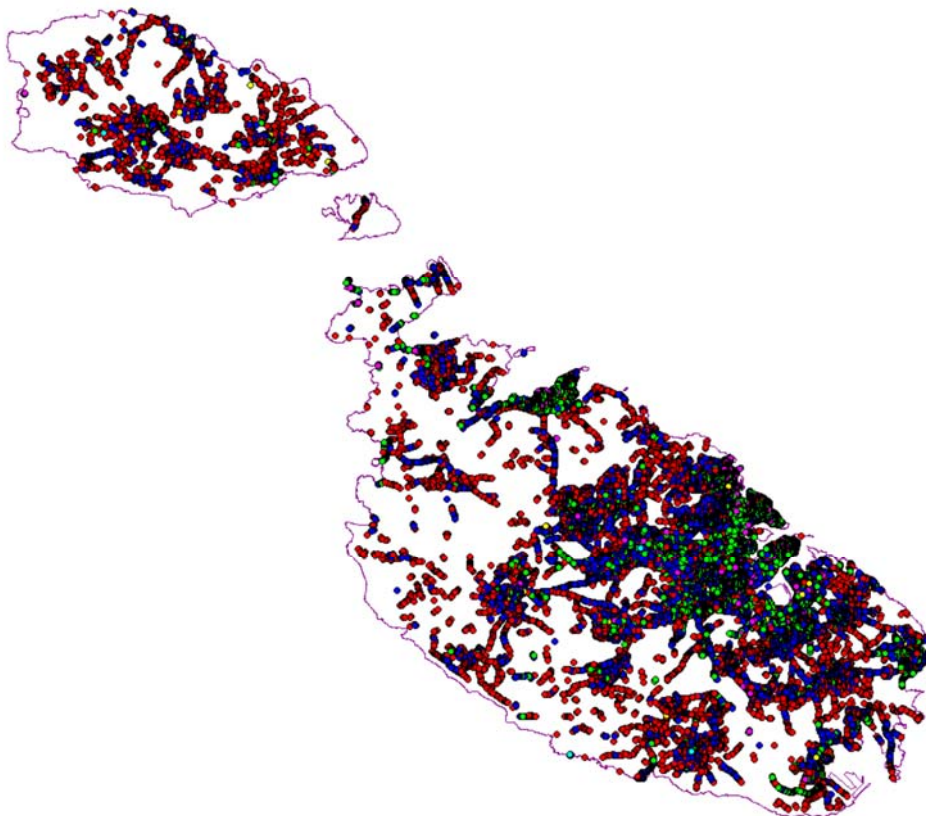
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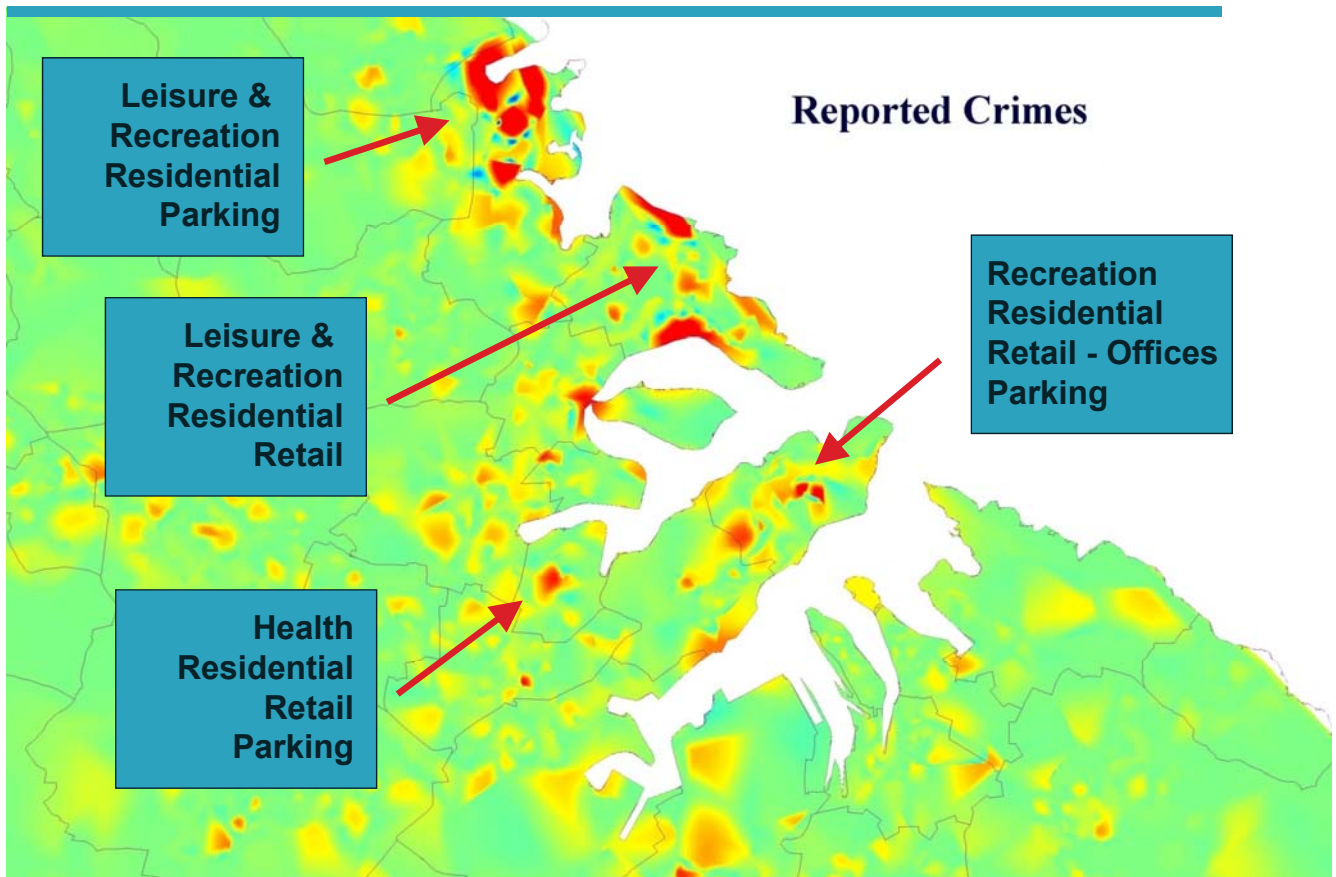




## Base Data for Statistical Analysis



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

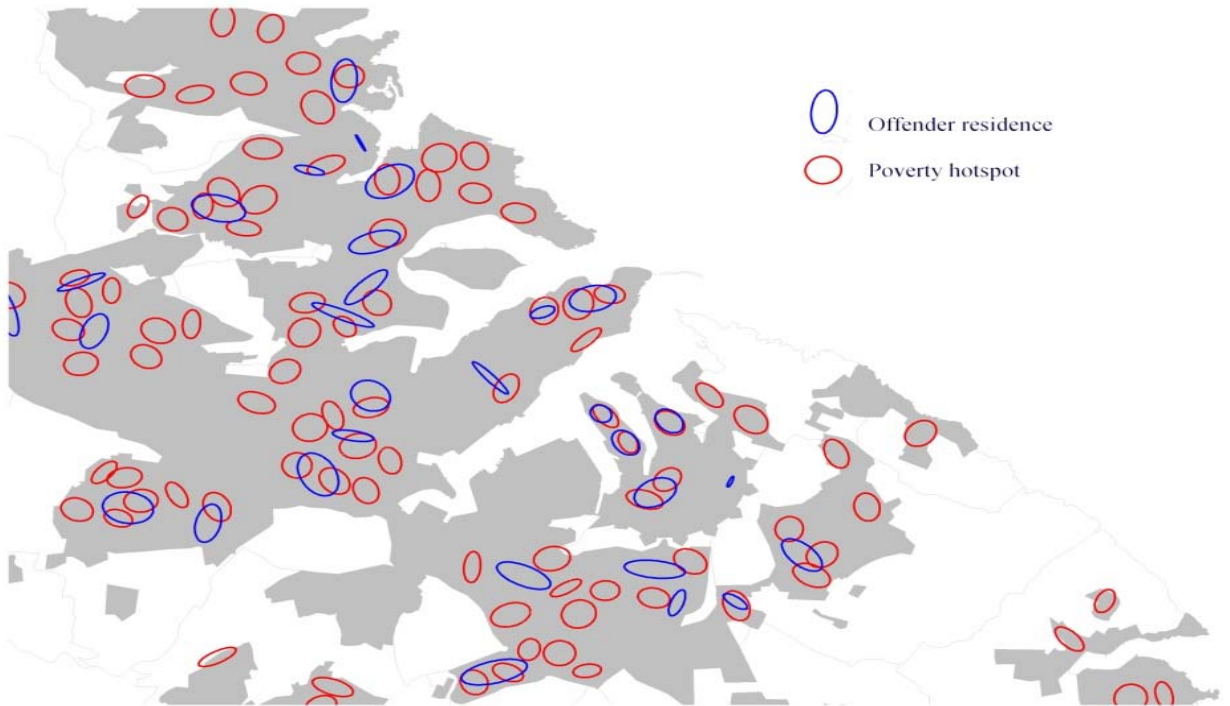


## Activity Hotspots: Spatial - Retail and Social Interactivity



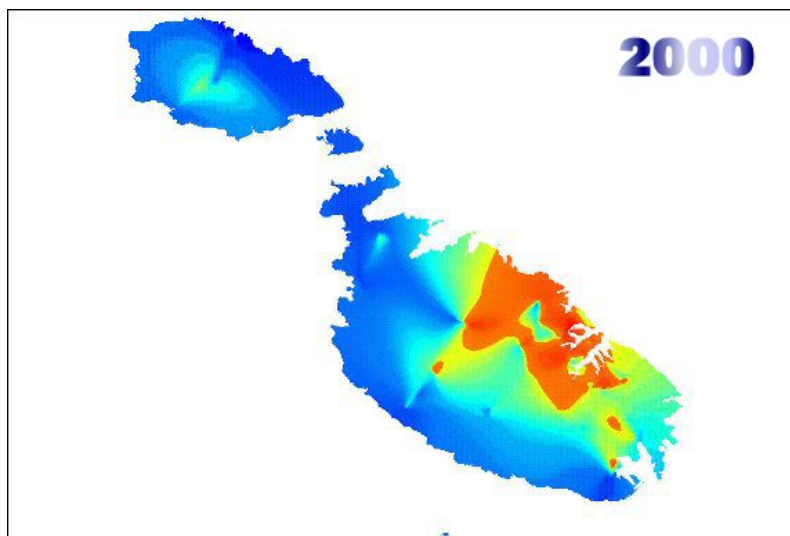
## Cross-Thematic Spatial Overlays

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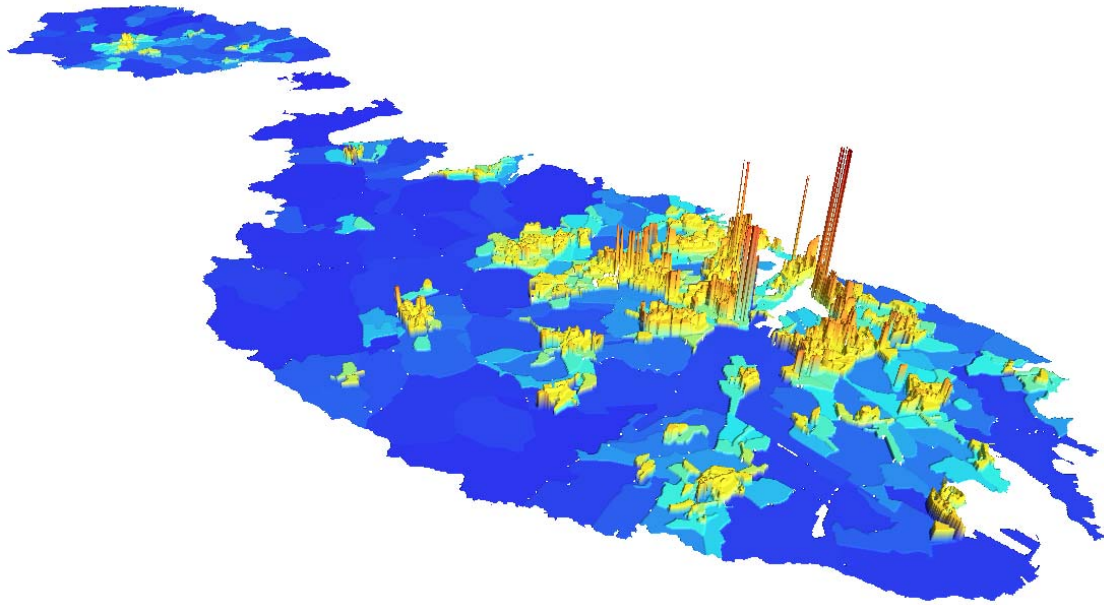
## Environmental: Benzene in Air Interpolation 2000–2003

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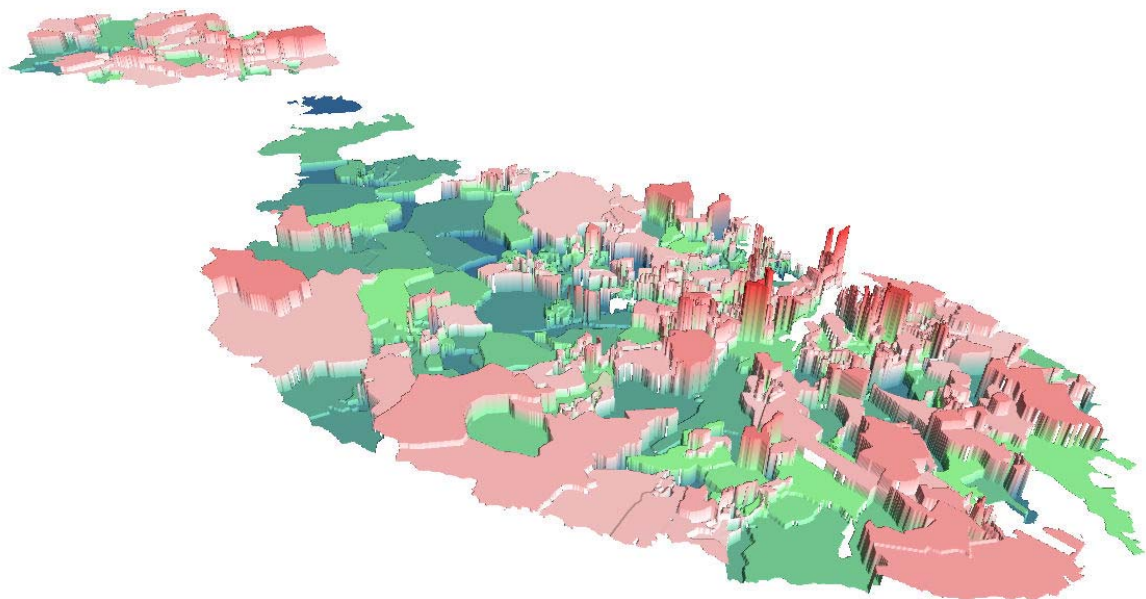
# Demographic Landscapes: Population Density

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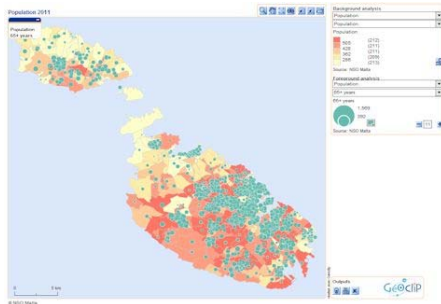
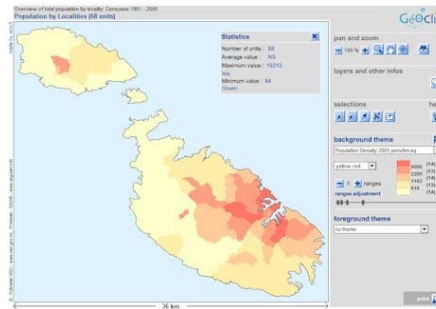
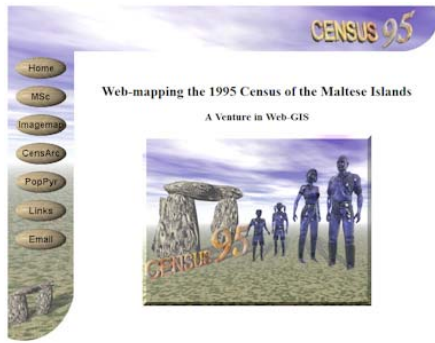


# Social Landscapes: Unemployment Rates

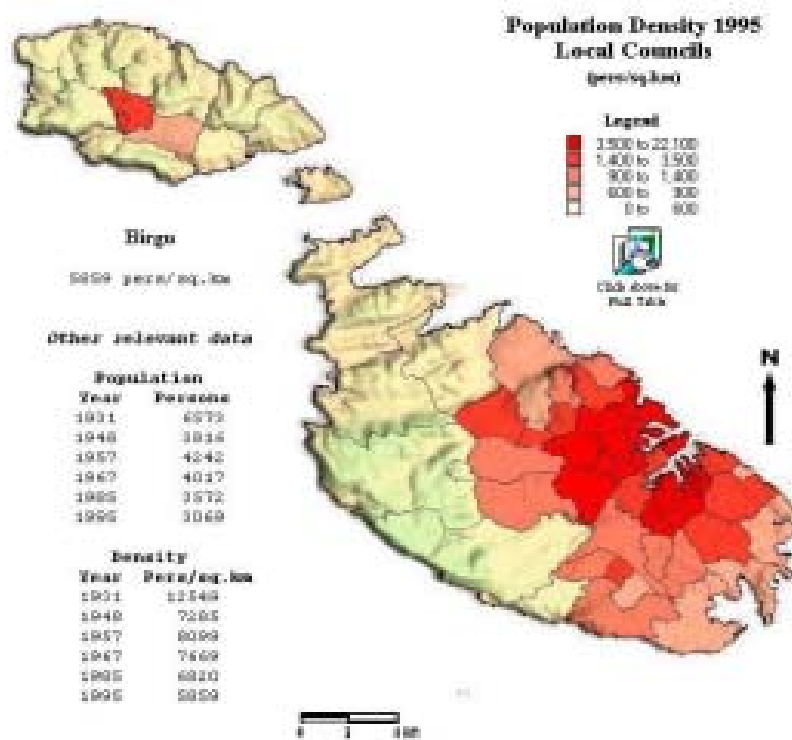
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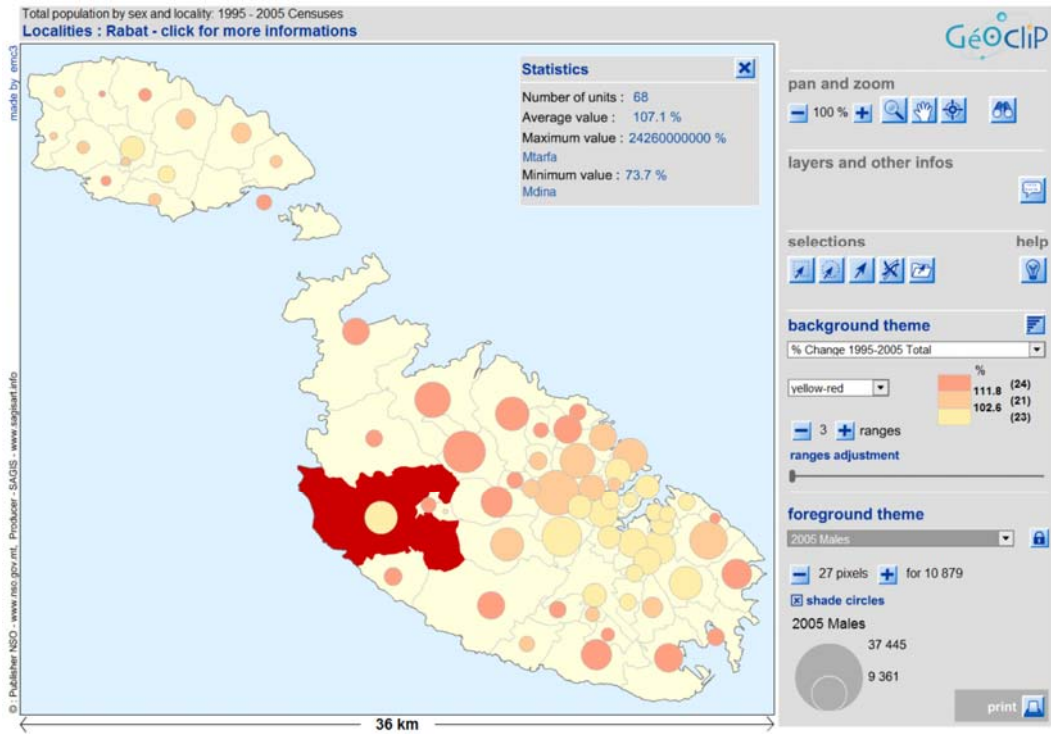
# The NSO Effort



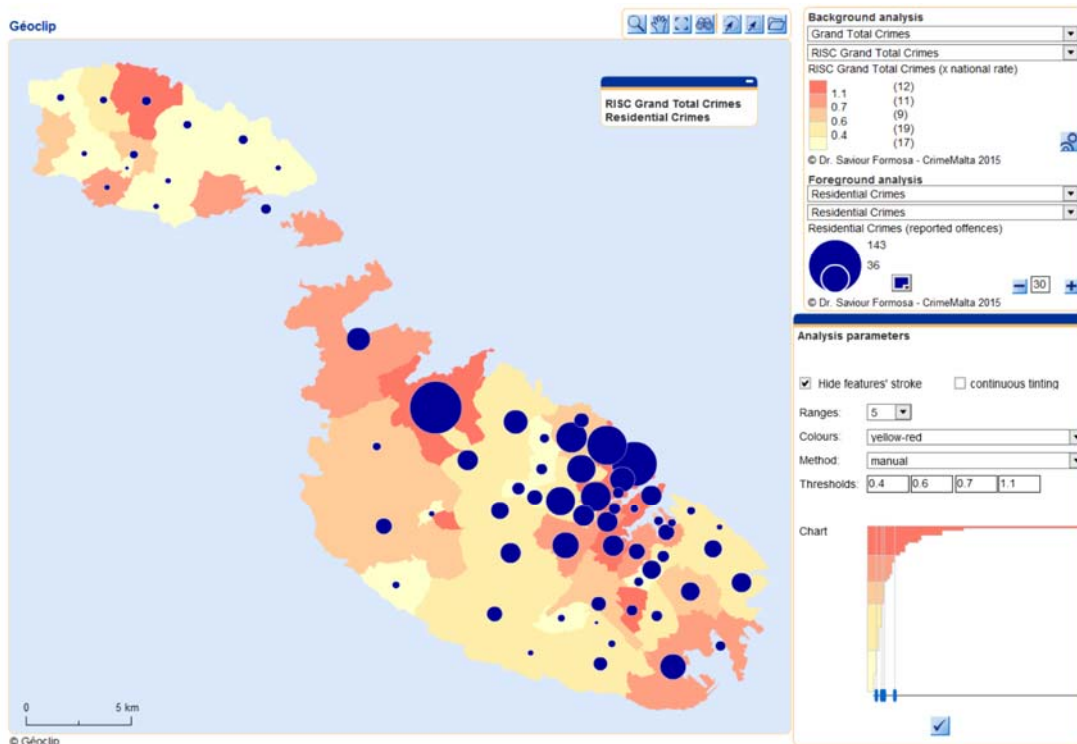
# The Census: 1995



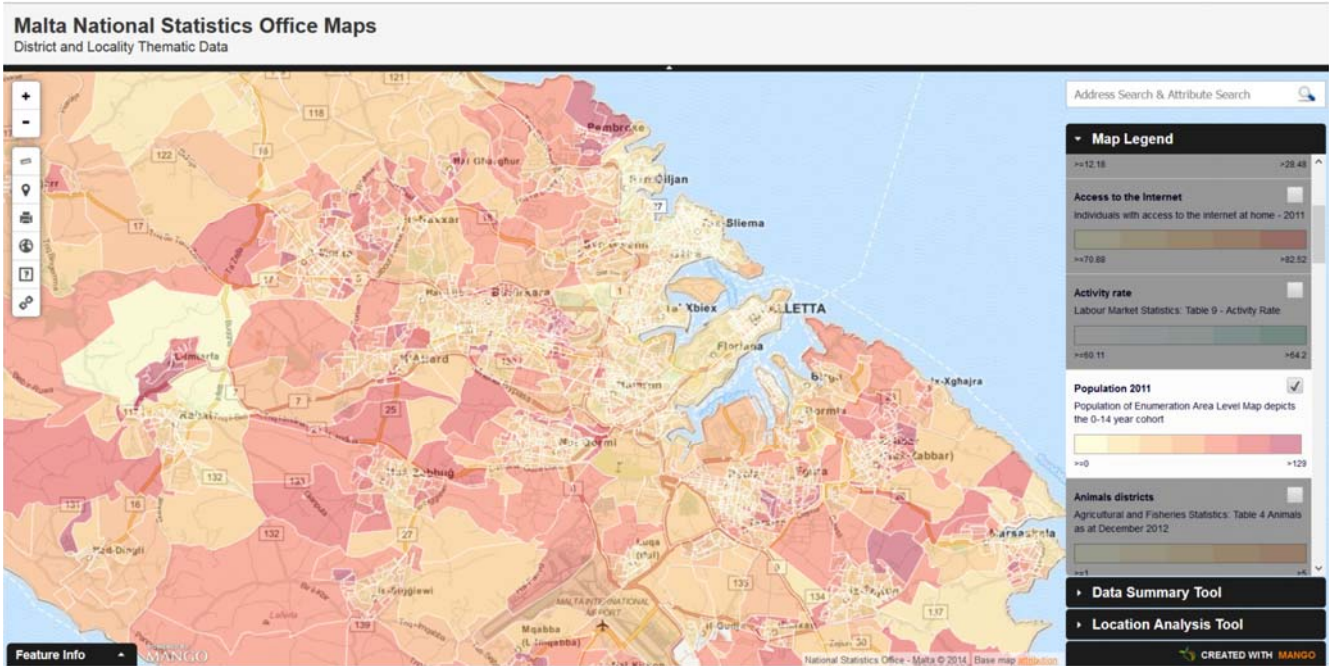
# The Census: 2005



# Thematic Integration: Demographic and Criminological Data



## STATAMAP: Spatialisation and Dissemination of Statistics



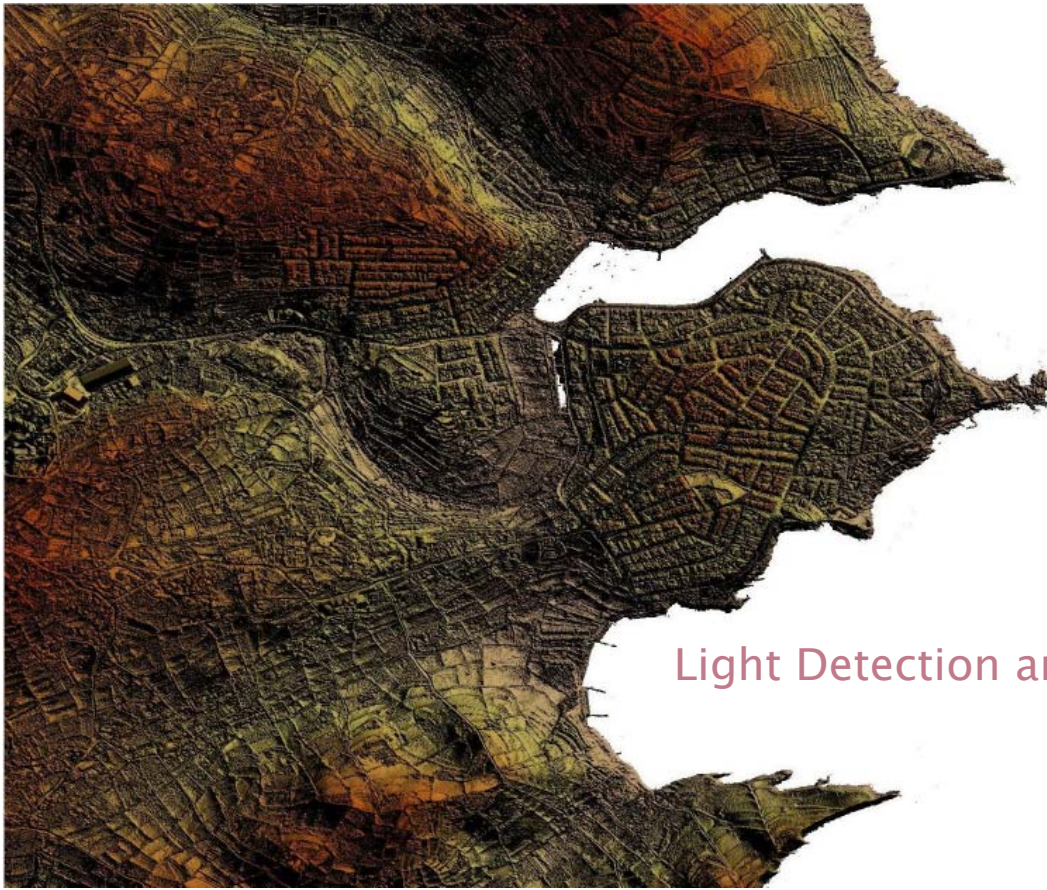
<http://mangomap.com/maps/23649/Malta-National-Statistics-Office-Maps#>



## Data Usage



## Case Study - Marsascala

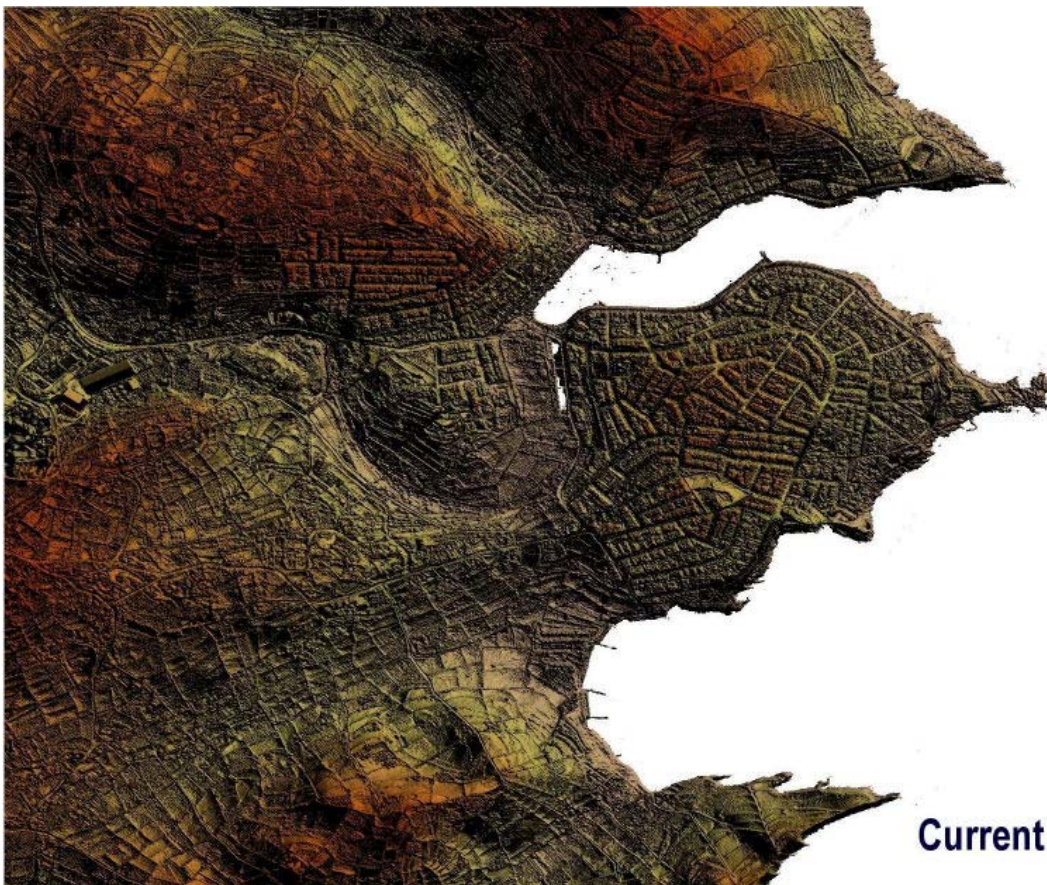


**LiDAR**

Light Detection and Ranging

TICS  
1  
16  
18

## Case Study - Marsascala

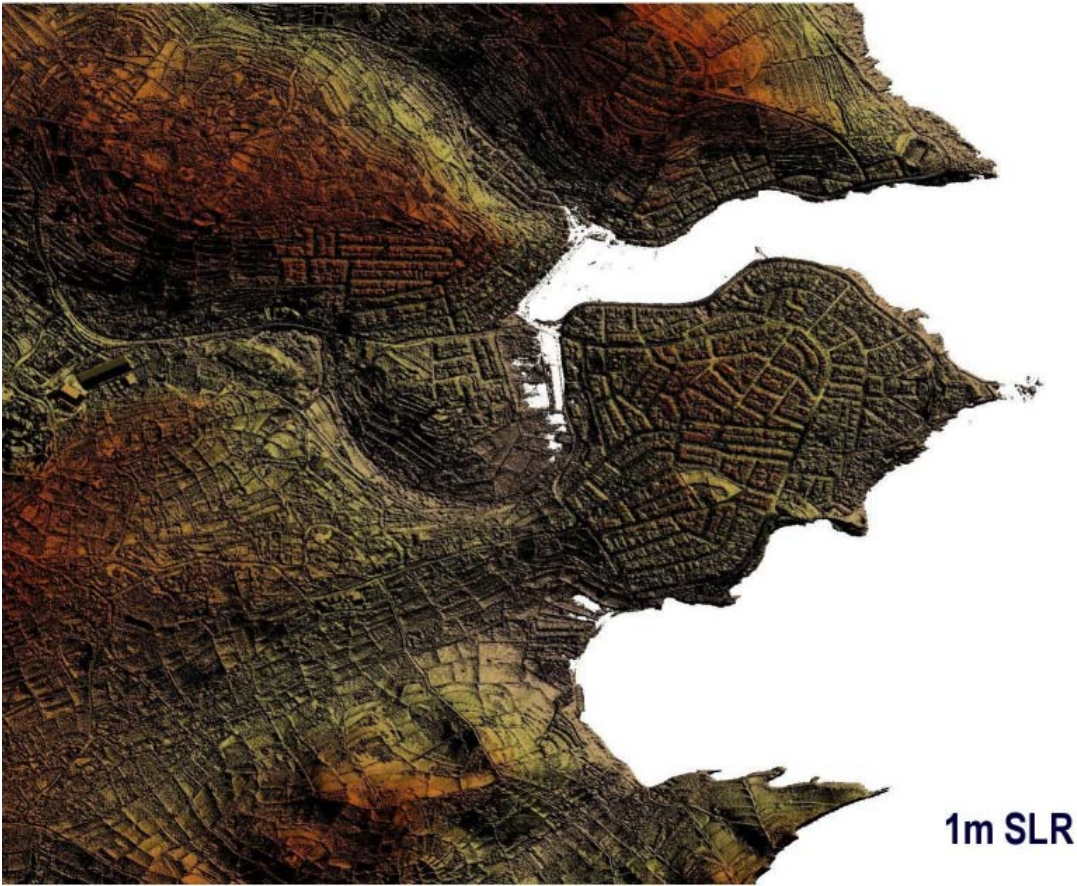


**Current Coastline**

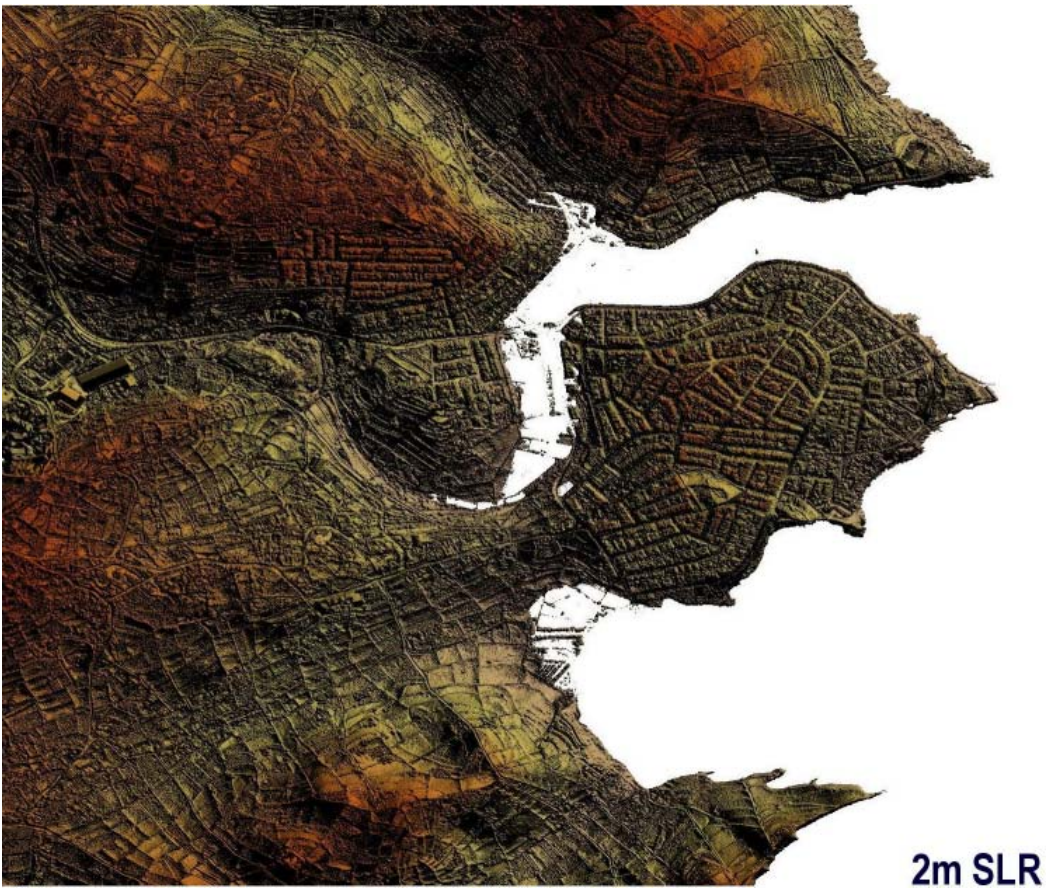
TICS  
1  
16  
18



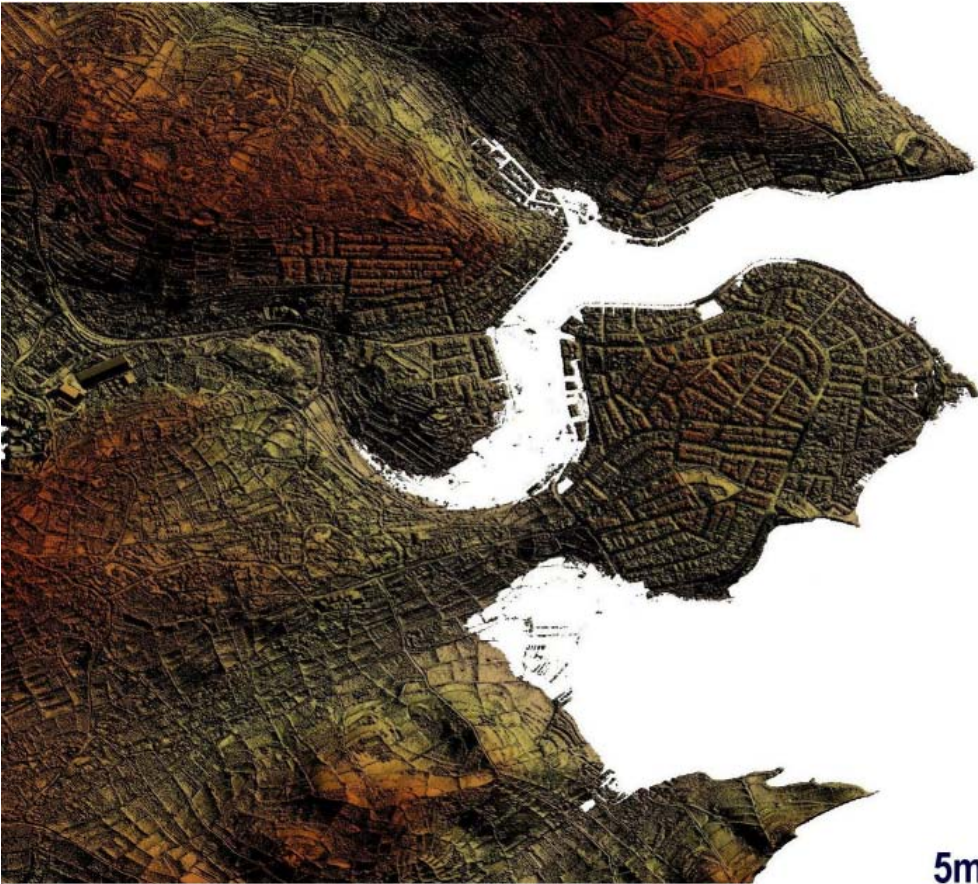
## Case Study - Marsascala



## Case Study - Marsascala



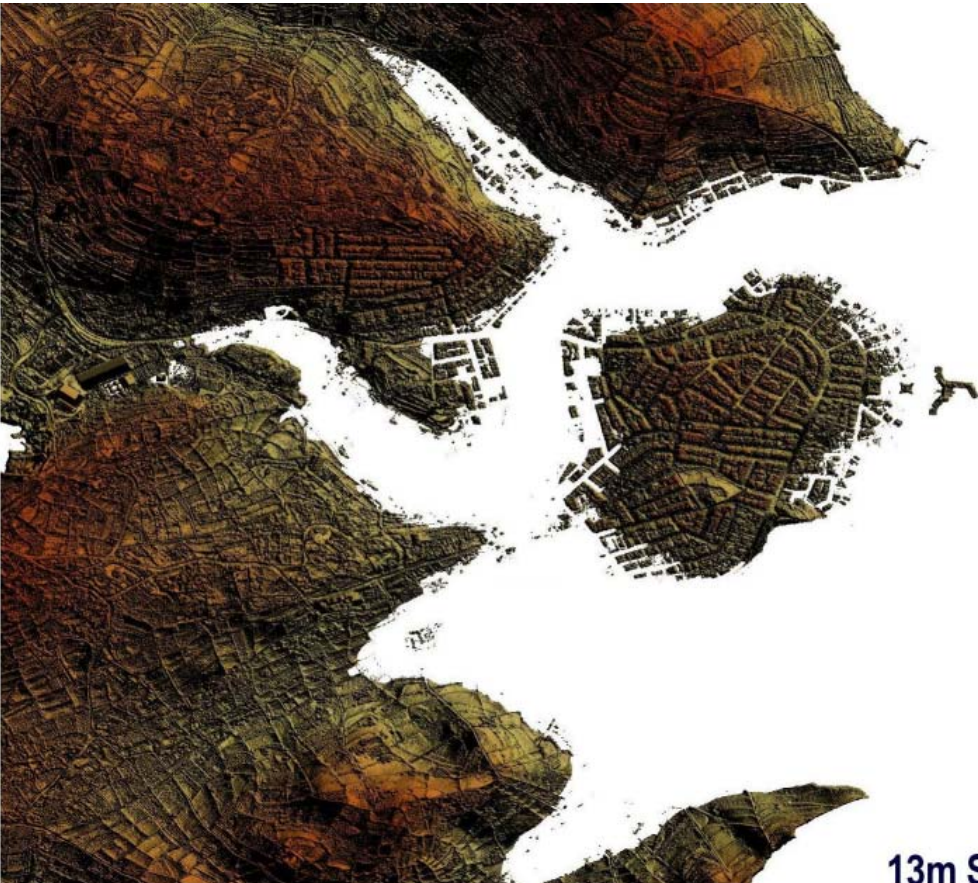
Case Study - Marsascala



5m SLR

WORLD  
STATISTICS  
DAY  
25.10.2019  
BETTER DATA.  
BETTER LIVES.

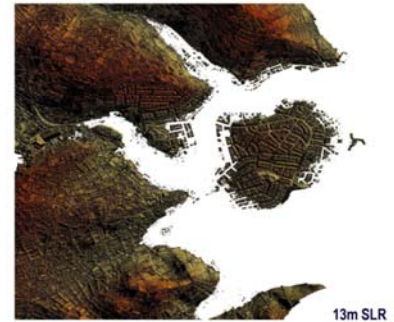
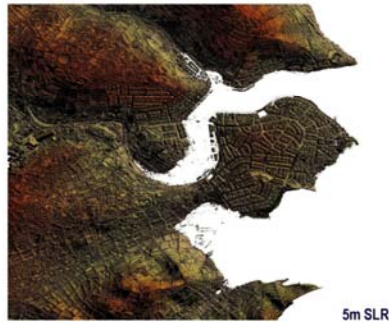
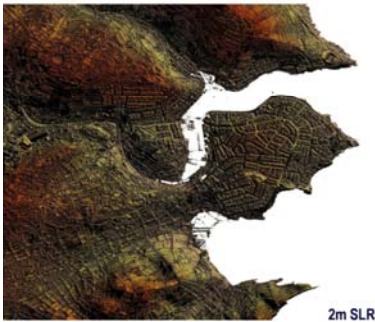
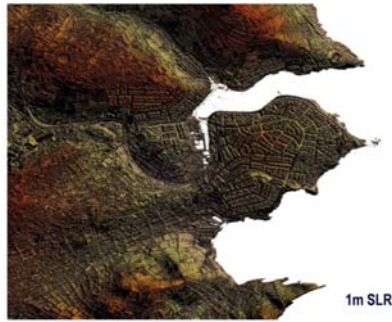
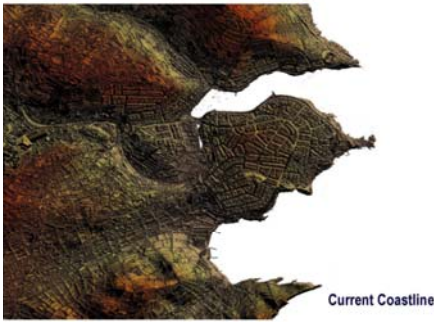
Case Study - Marsascala



13m SLR

WORLD  
STATISTICS  
DAY  
25.10.2019  
BETTER DATA.  
BETTER LIVES.

# Case Study - Marsascala

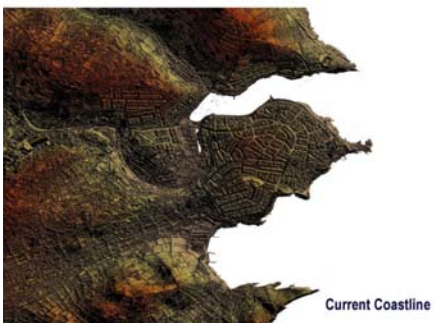


Marsascala Malta  
Sea-Level Rise Scenarios  
(current, 1m, 2m, 5m, 13m)

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



# Case Study - Marsascala



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

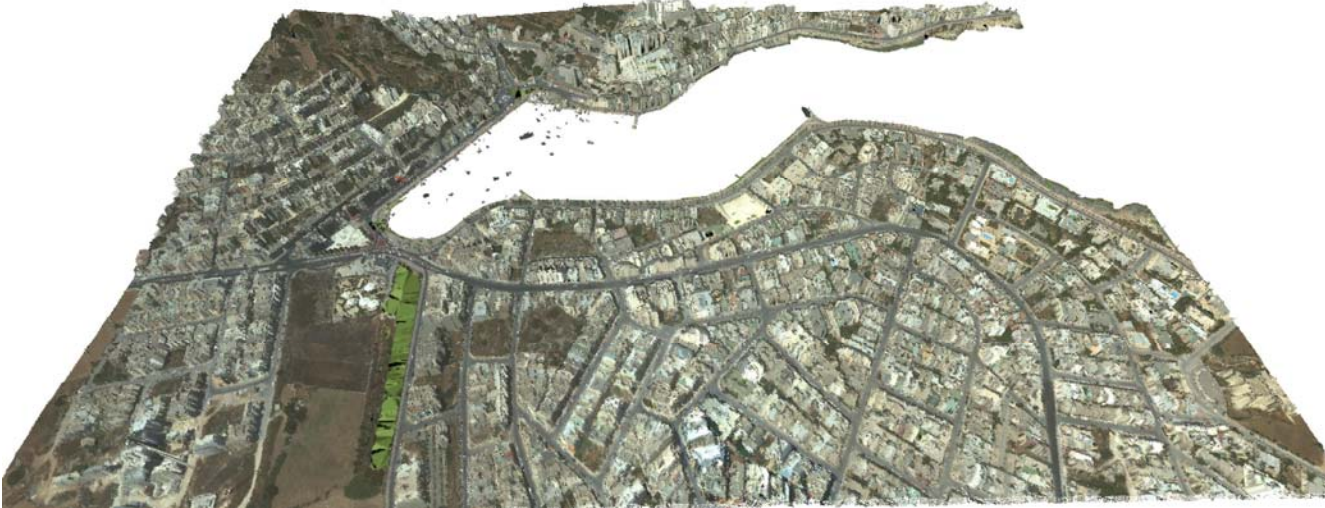
Saviour Formosa 2014  
saviour.formosa@um.edu.mt



Case Study - Marsascala - SLR 3D

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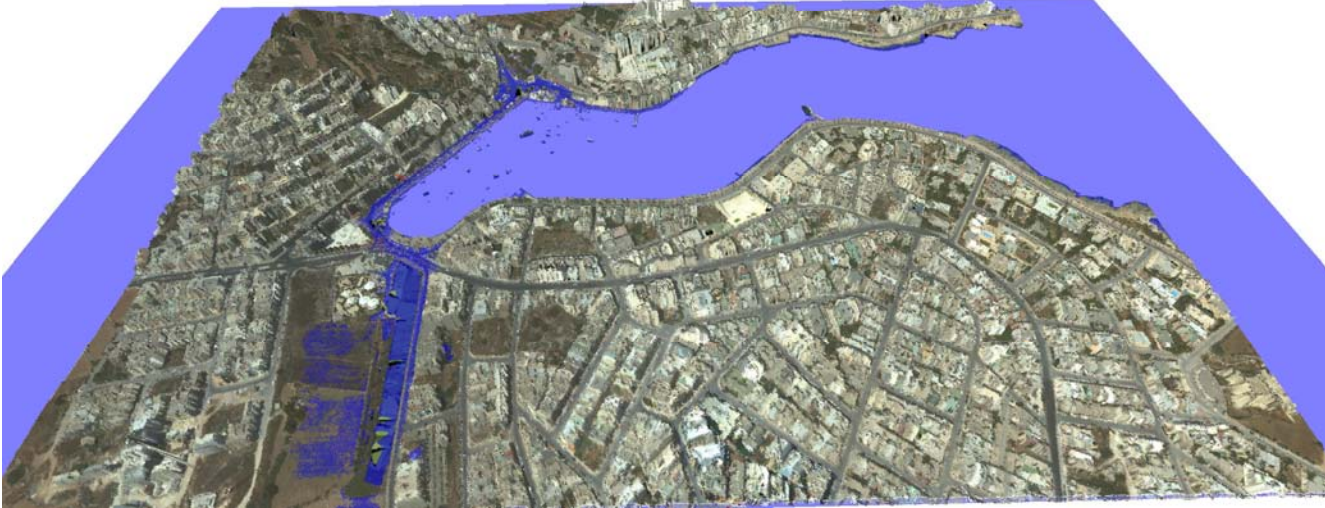
0m



Case Study - Marsascala - SLR 3D

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1m



Case Study - Marsascala - SLR 3D

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2m



Case Study - Marsascala - SLR 3D

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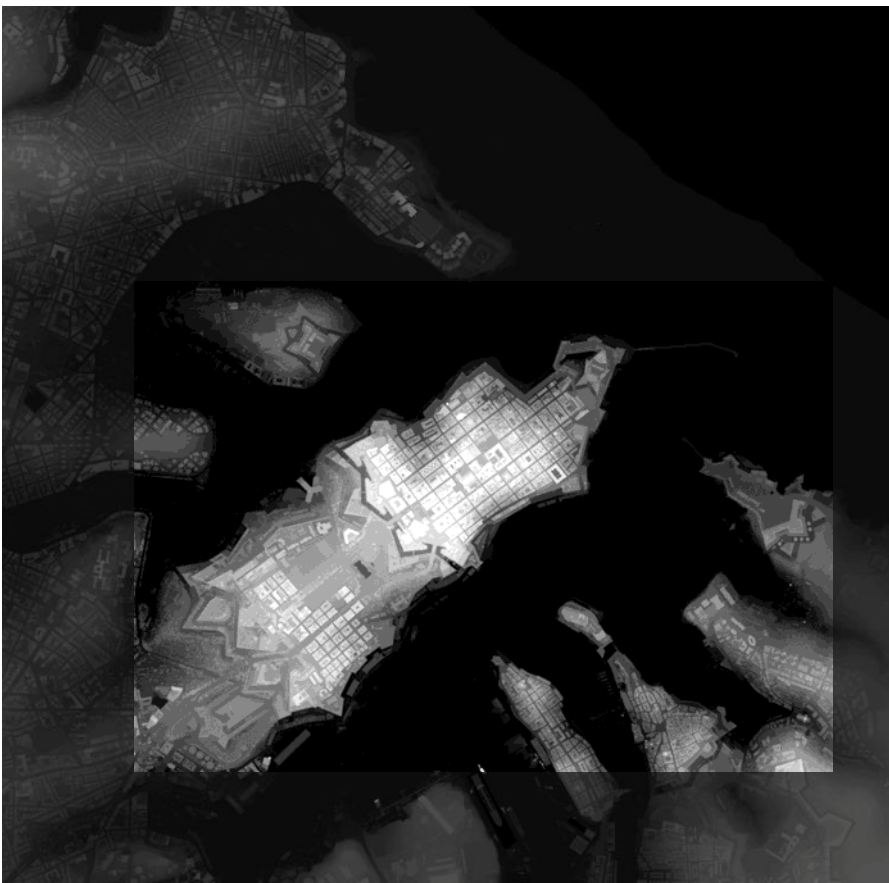
3m



## 3D: Structuring Data



### Case Study - Valletta



*Employing base data*

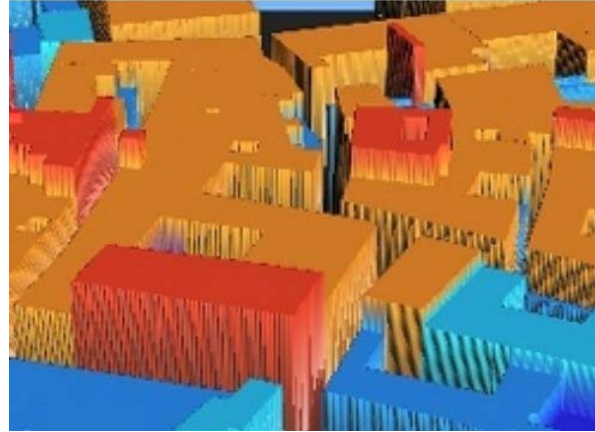
## **LiDAR**

Light Detection and Ranging

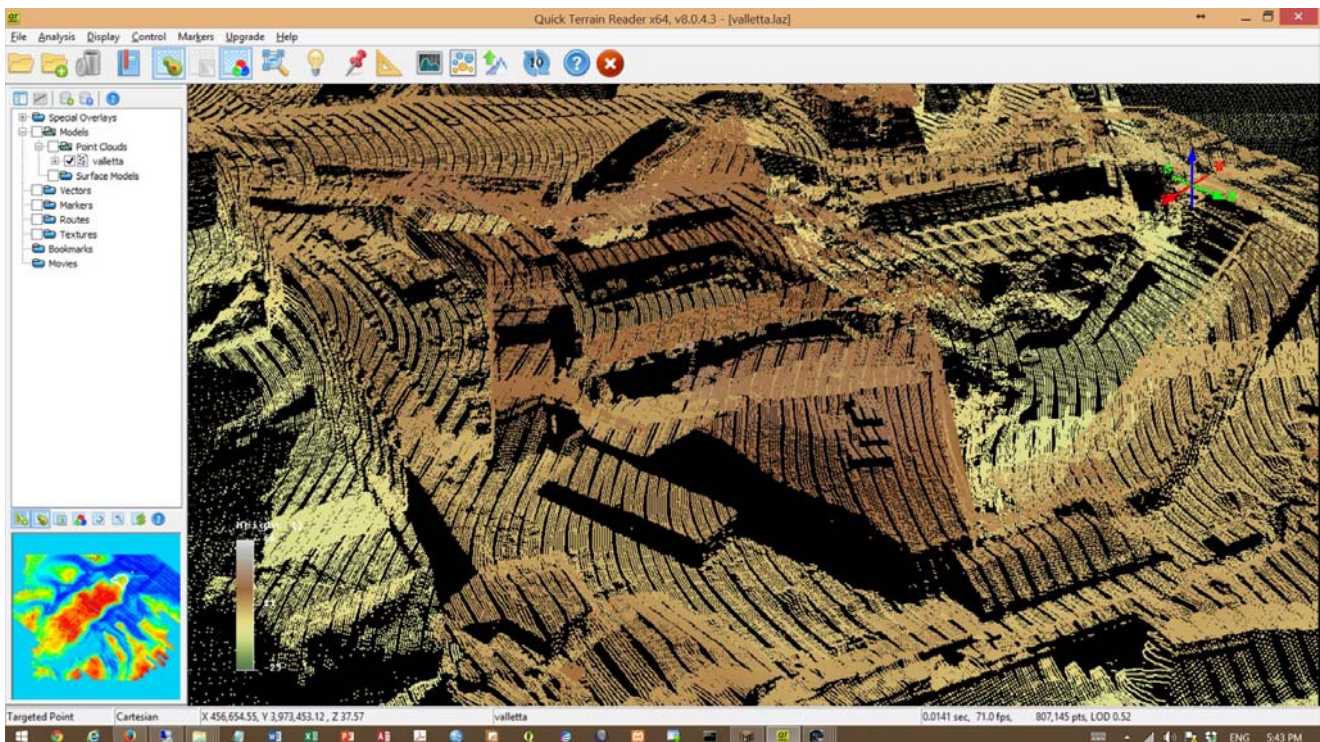
DSM and DTM of the Islands

- average point density  
4.3 Pts./m<sup>2</sup>
- height accuracy  
> 5 cm
- orthoimage mosaic with  
a resolution of 16 cm

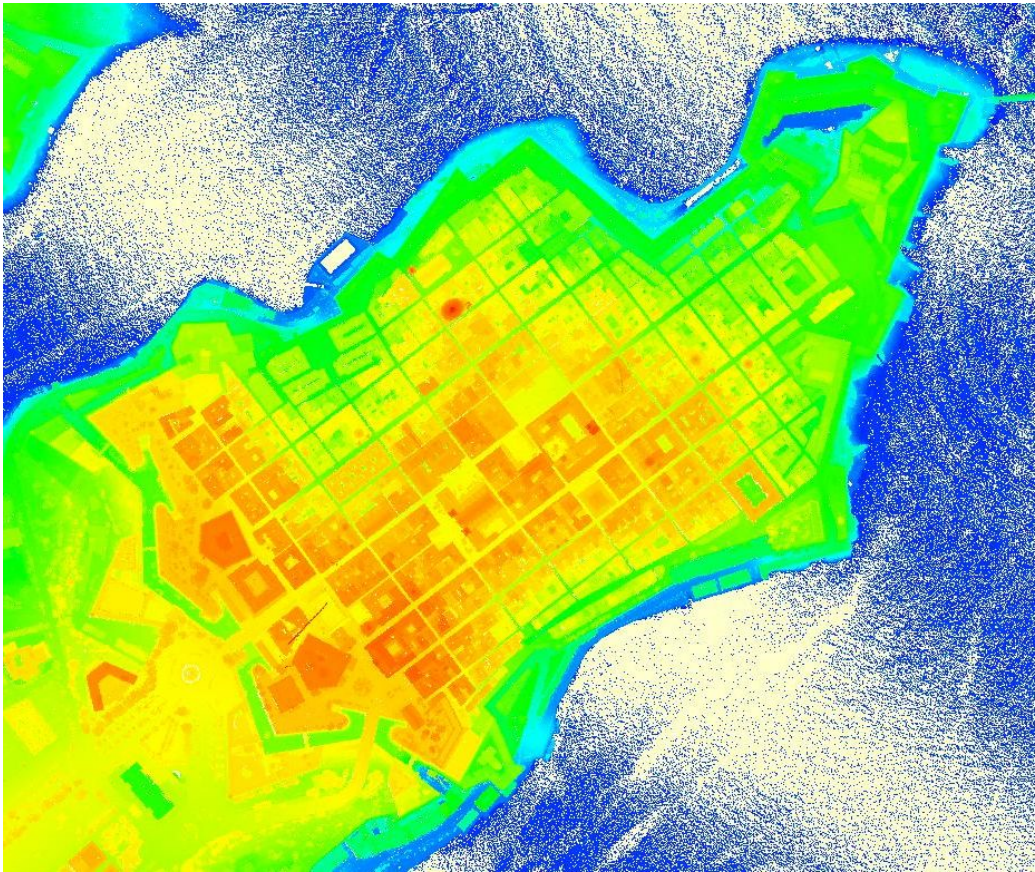
## Case Study - Valletta - precursors



## Case Study - Valletta - Captured Points



Case Study - Valletta - LiDAR

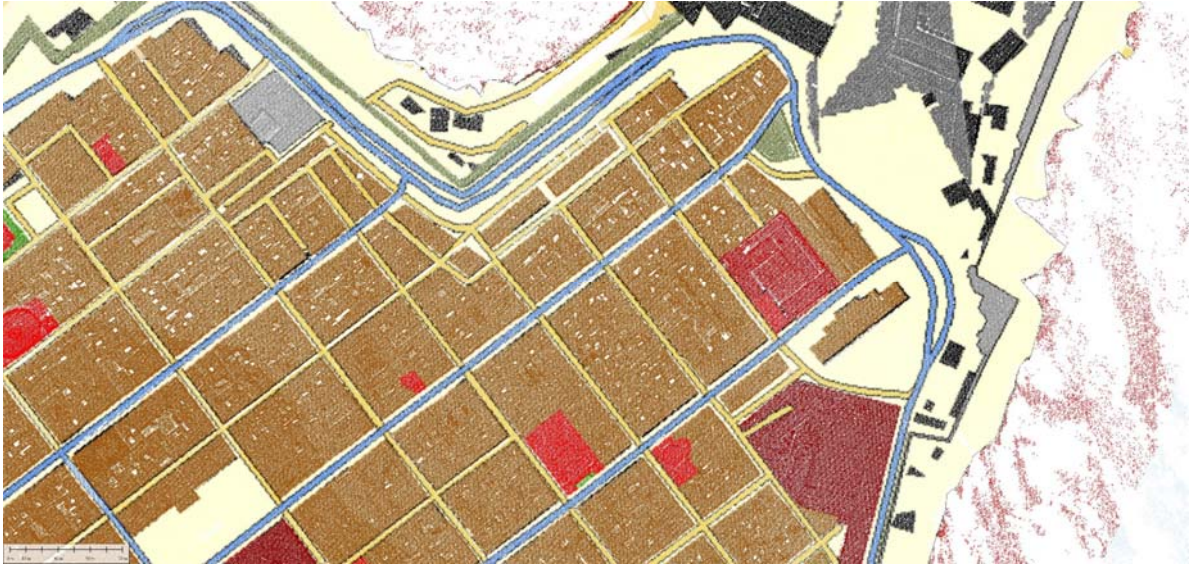


Case Study - Valletta - TIN

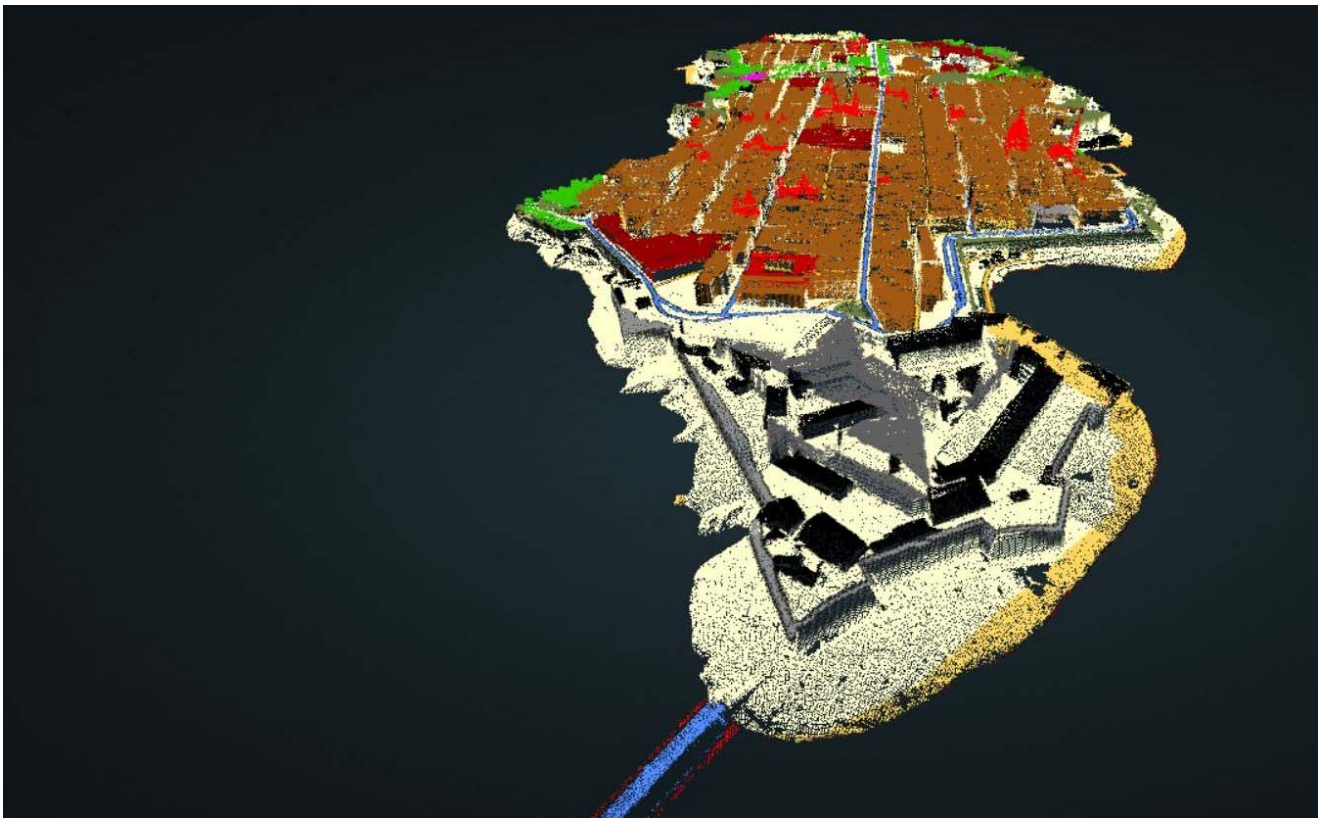




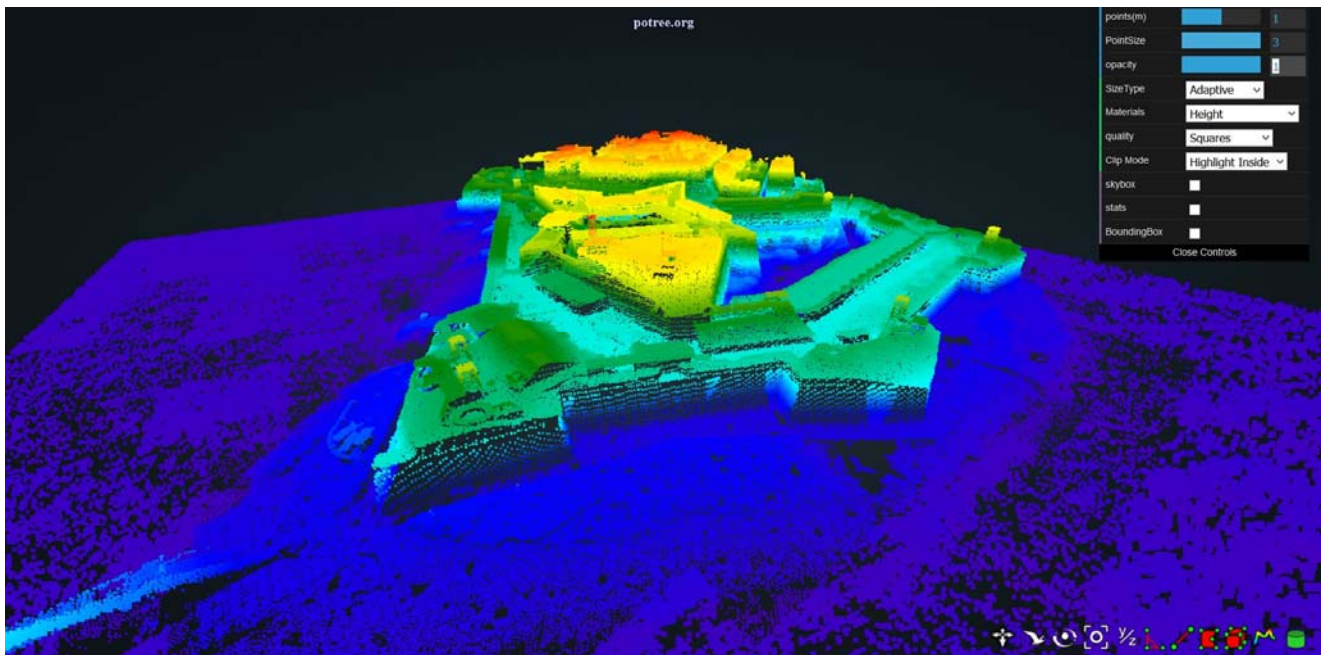
## Case Study - Valletta - Thematic



## Case Study - Valletta - RGB Height



## Case Study - Valletta - St Elmo Heights



## Case Study - Valletta - St Elmo RGB



# Case Study – Valletta – Minecrafted

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# Case Study – Immersion – Hypogeum

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# Thank You

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[saviour.formosa@um.edu.mt](mailto:saviour.formosa@um.edu.mt)



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

