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Gaining ground for future preparedness: Spatial Data Integration for the Maltese Islands

Global Environmental Change & Small Islands:
Economic & Labour Market Implication Symposium – 1-5 December 2014
Malta

Saviour Formosa
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Breaking the Ice

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FUTURE

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DISCOVER: Stunning infographics >

PRESENTED

FUTURE THINKING | 7 November 2013

Can games create an education fit f… the future?

Technology | Science & Environment | City | Education | Gaming

Share

Imagine a school where playing video games is encouraged during classes and may

Is there a need to convert the Real to Virtual?

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- **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? (economies of scale)
- **Why** should technology/gaming be brought in?
- **When** would it be best to introduce high end spatial analysis and serious gaming?
- **How** can we employ this technology for social change?
- **Why Not**?

W6H

The Situation and the Thematic Reality

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- 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' (EEA shift)
  - Geocoding is based on street centre points which does not allow for real locational analysis
  - System data is non-networked: streets/streams
  - 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).

Visualising the Real before acquiring the Virtual

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Identifying the Maltese Fundamentals

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Population: 420,000
(Demographic Review, 2010)

Households: 144,000
(Census, 2011)

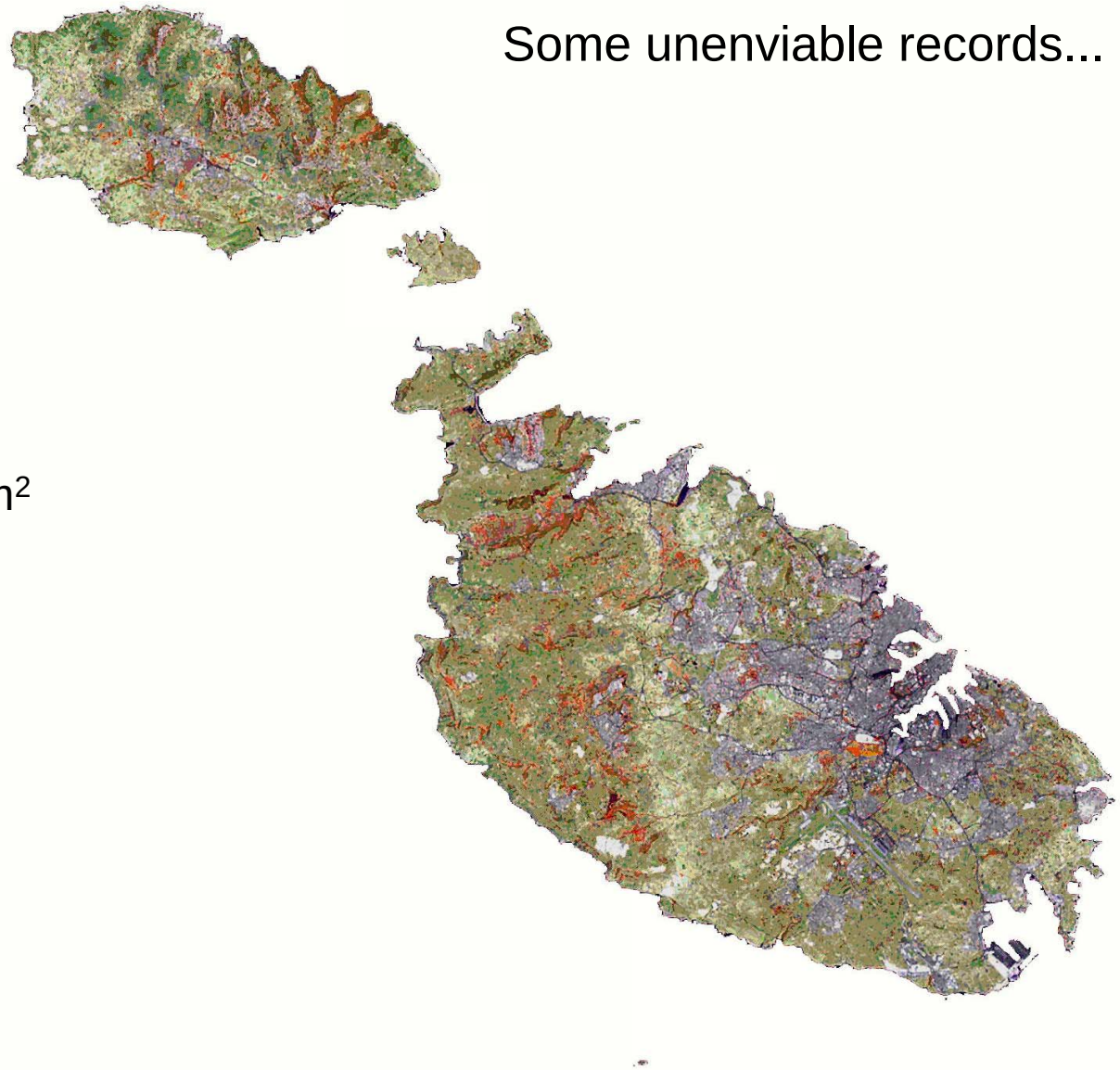
Land area: 315 Km^2
(MEPA, 2013)

Land cover: 32% - 101 Km^2
(MEPA, 2010)

Dwellings: 220,000
(Census, 2011)

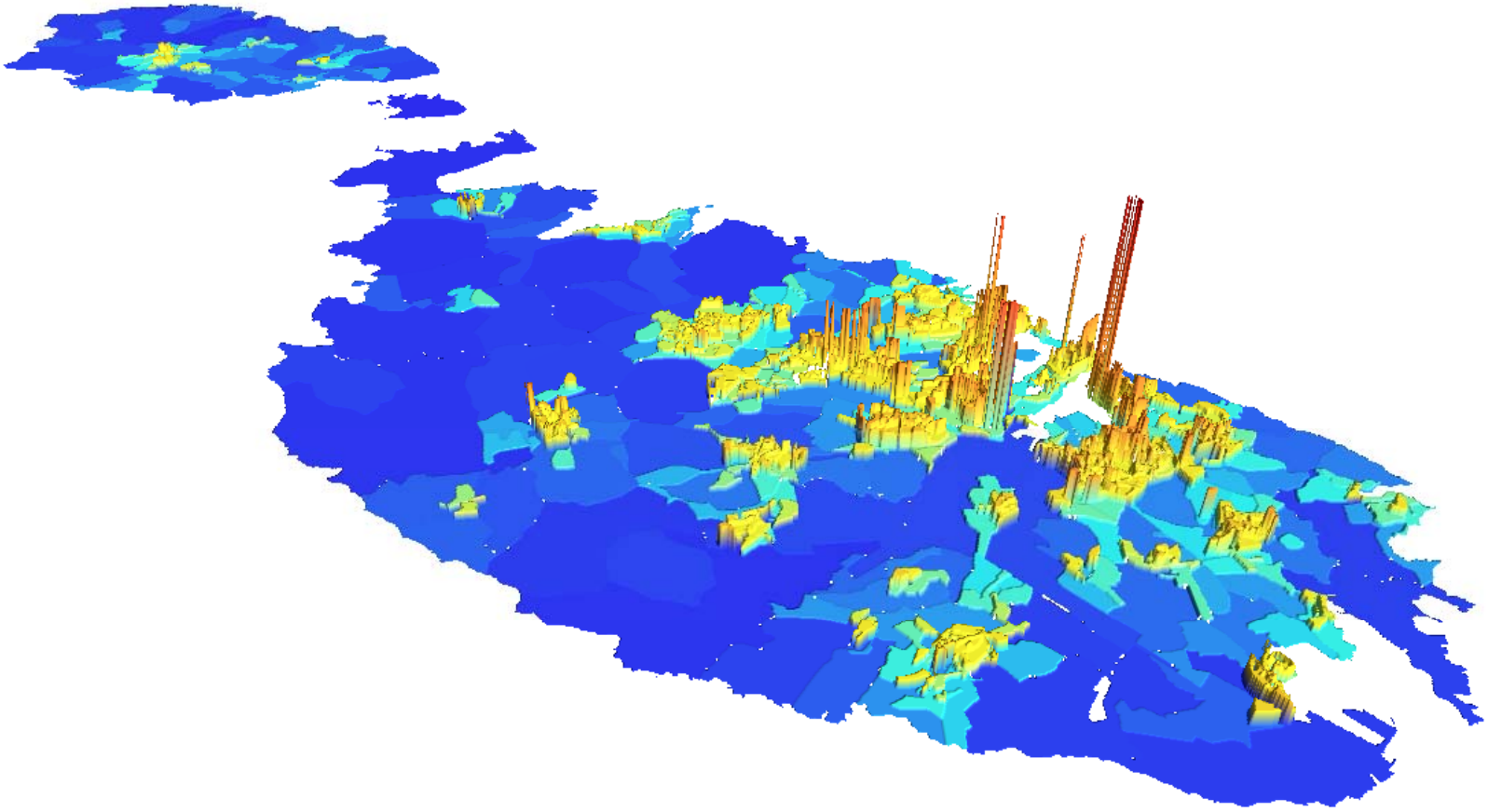
Vacant Dwellings: 72,000
(Census, 2011)

Enterprises: 50,000
(NSO, 2008)



Some unenviable records...

Demographic Landscapes: Population Density



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Physical landscapes: Zoning

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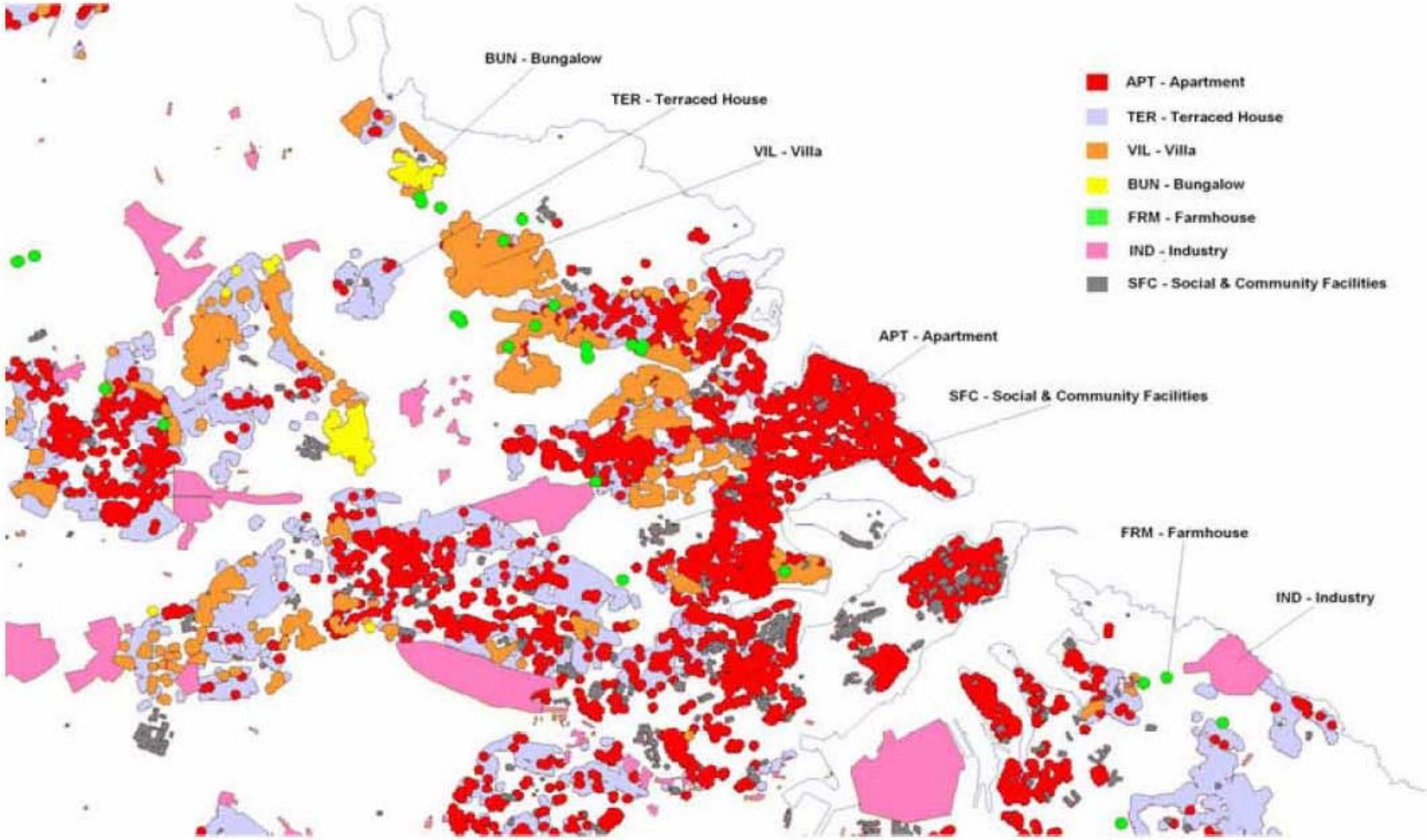
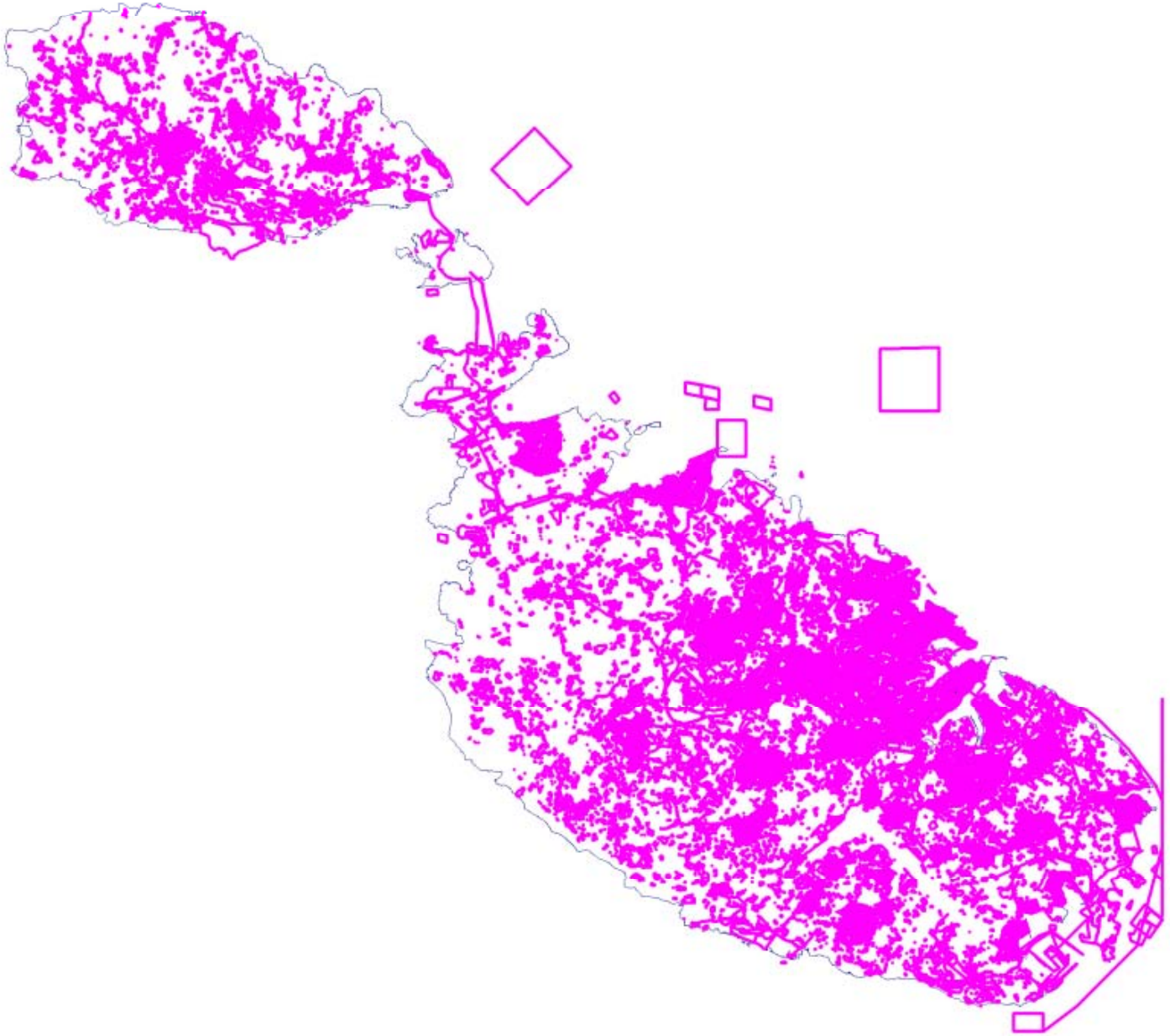


Applications for Development



Enforcement Cases

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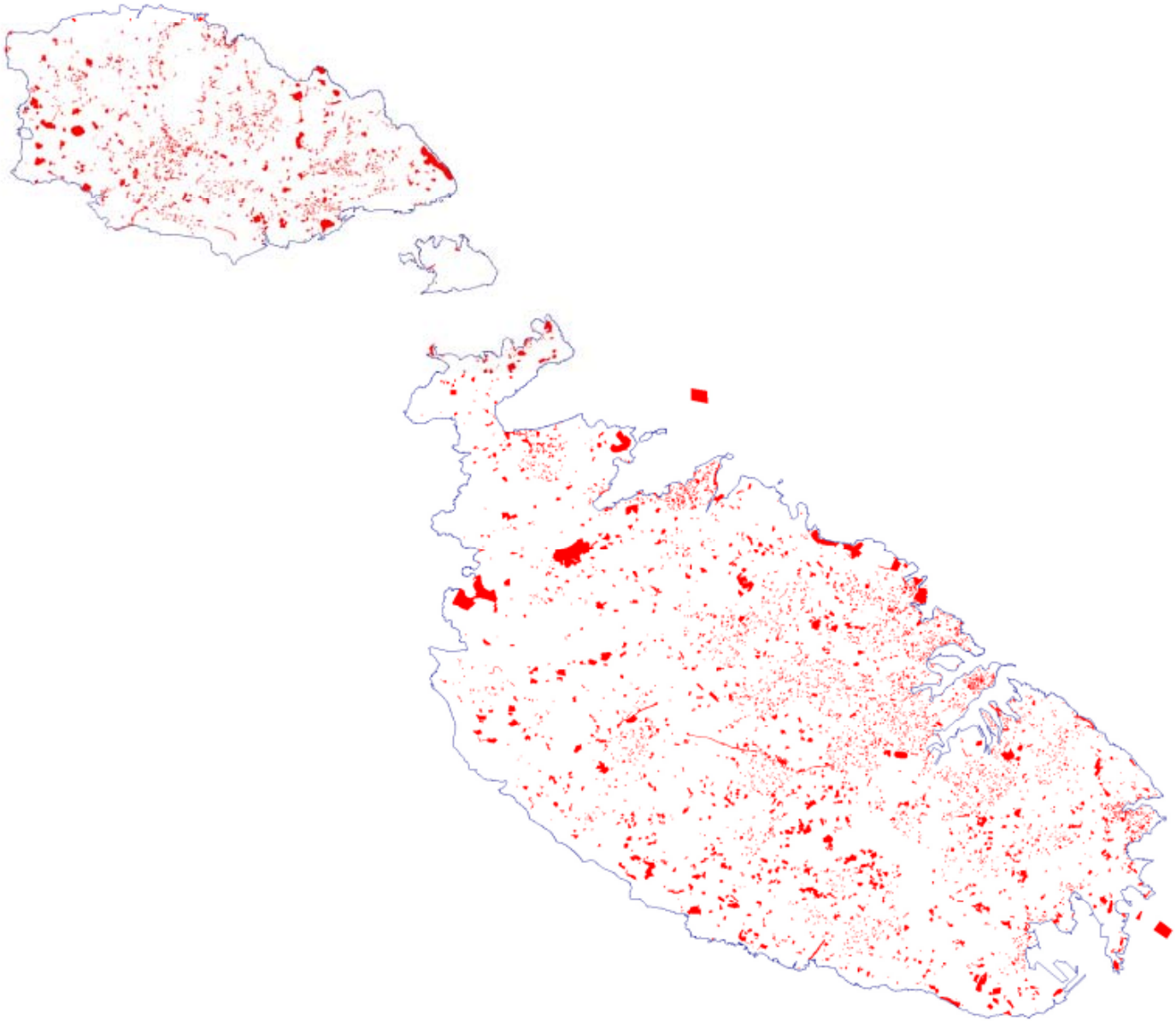

Historical

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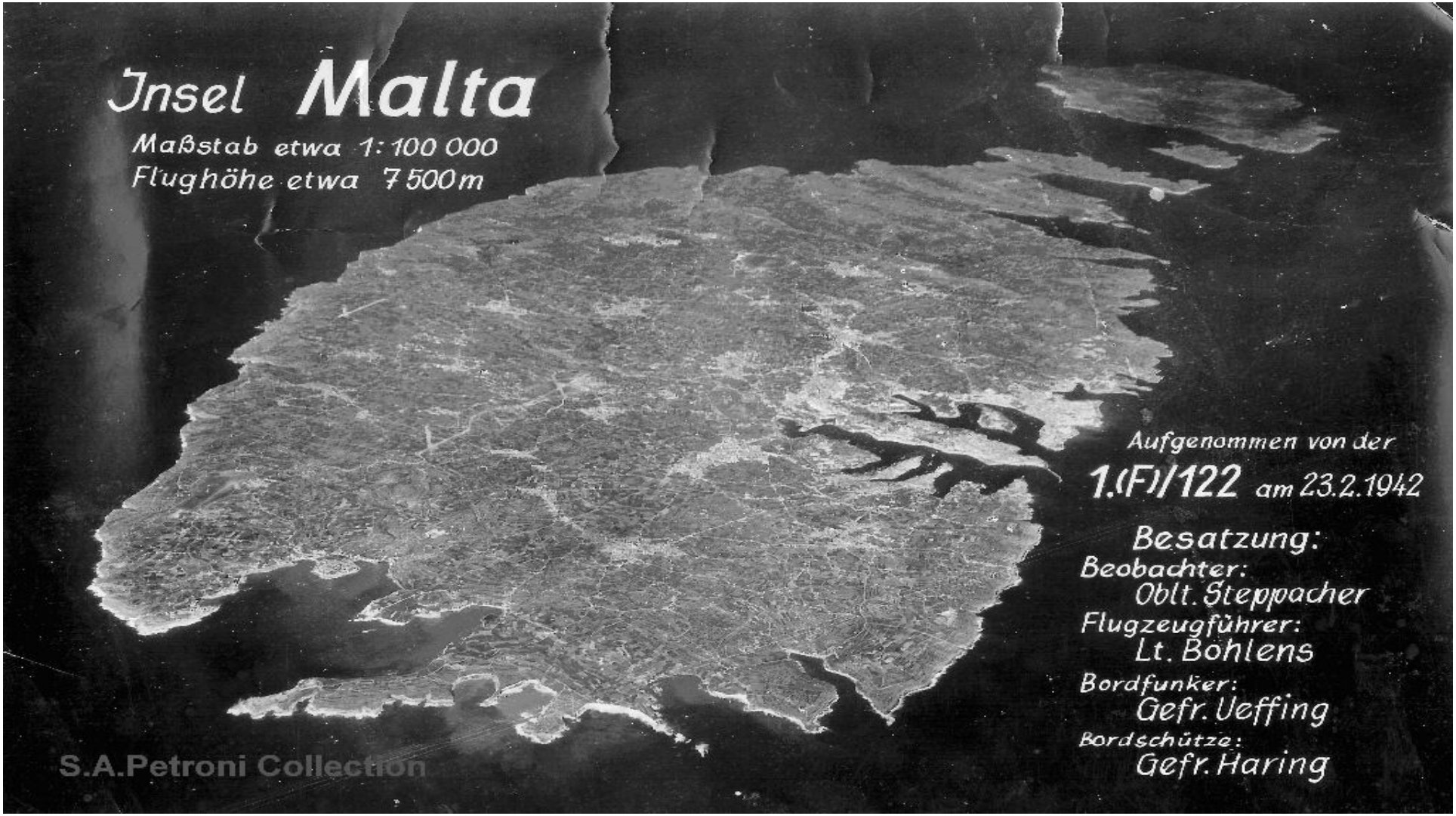

Contemporary

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Limitations

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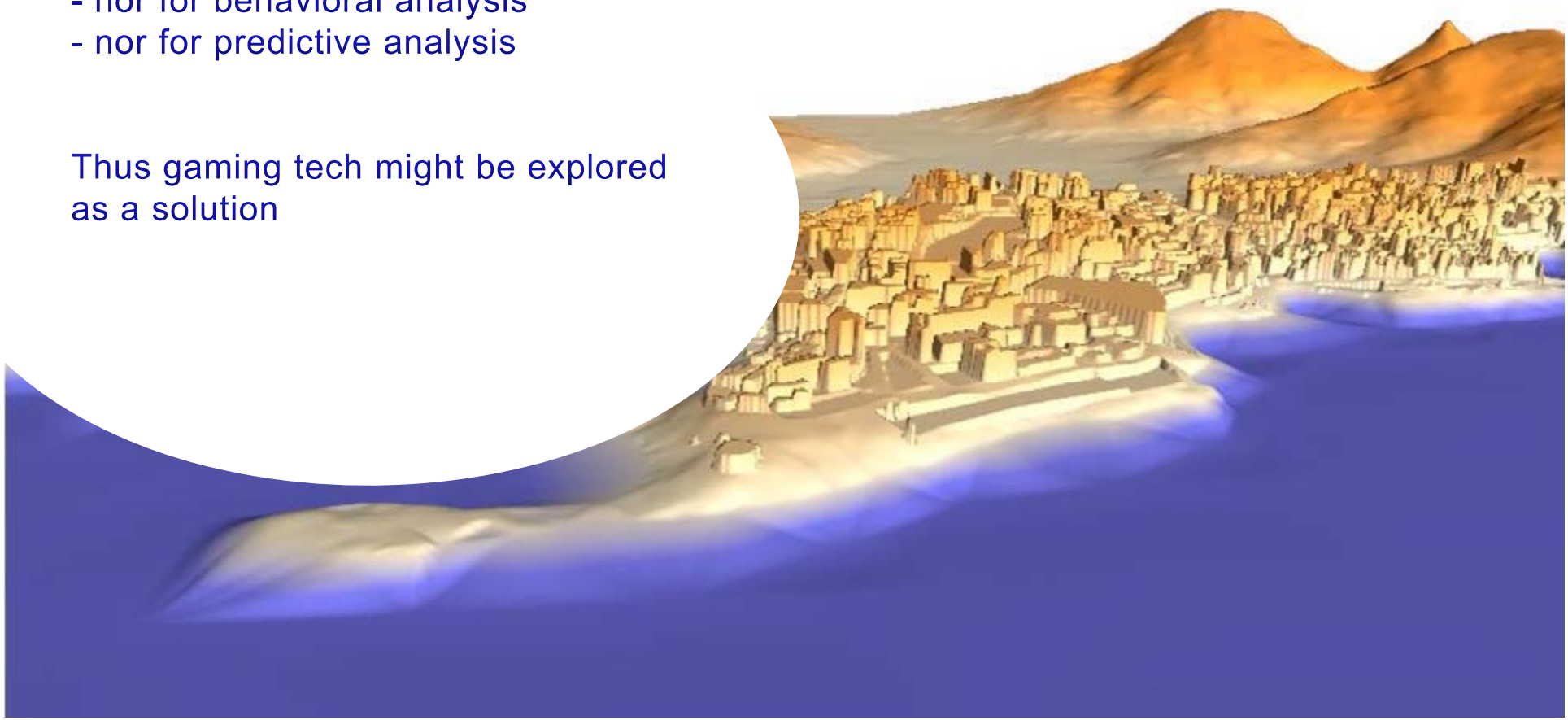
Understanding climate change requires multi-dimensional analysis.

However we cannot visualise the effects of change through the employment of 2D and 3D data solely using professional tools:

- whether in interactive mode
- nor for behavioral analysis
- nor for predictive analysis

Thus gaming tech might be explored as a solution



Setting the baselines for a virtual world

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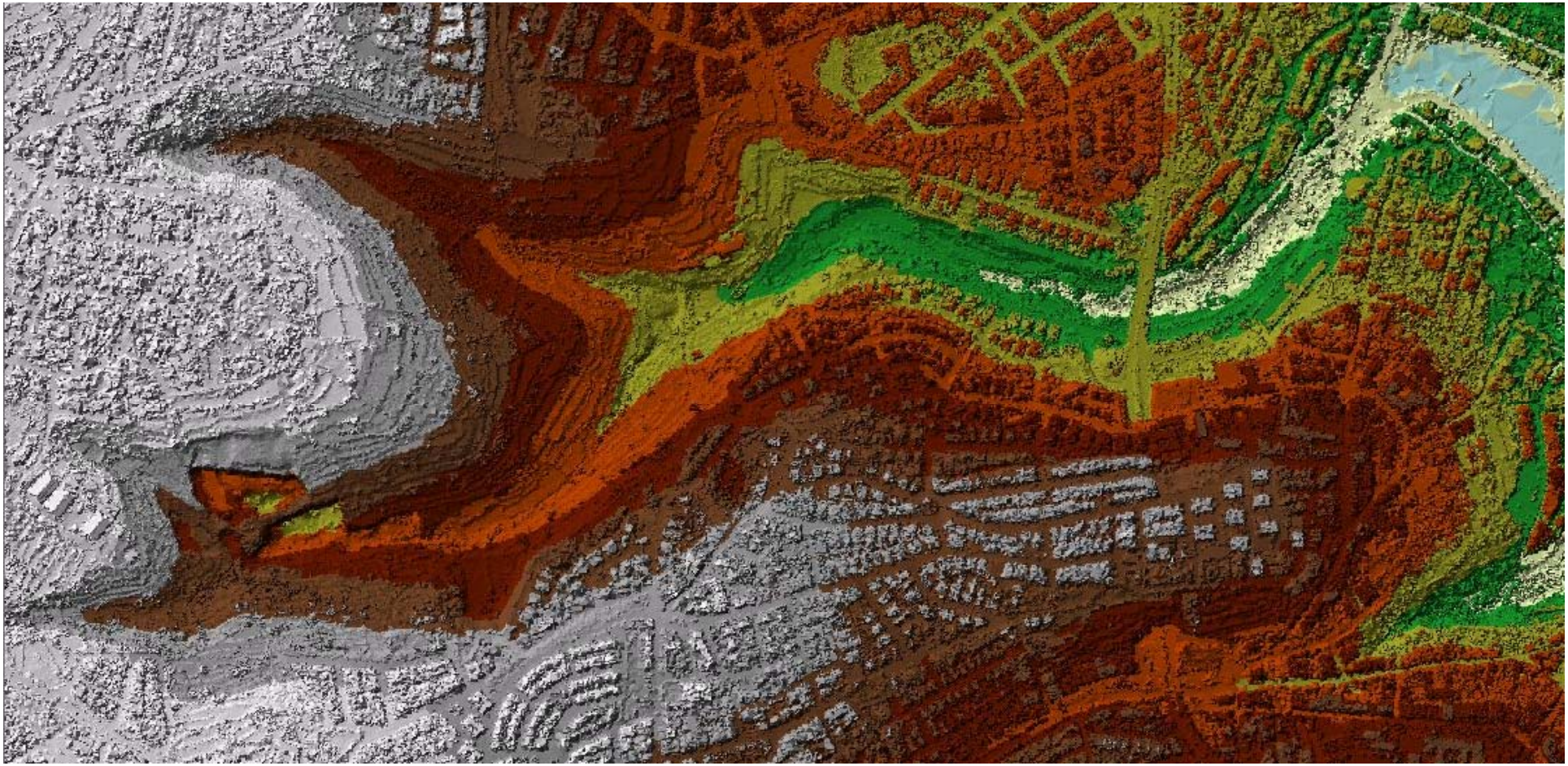

Overlaying Nightmare? The Data Dilemma…

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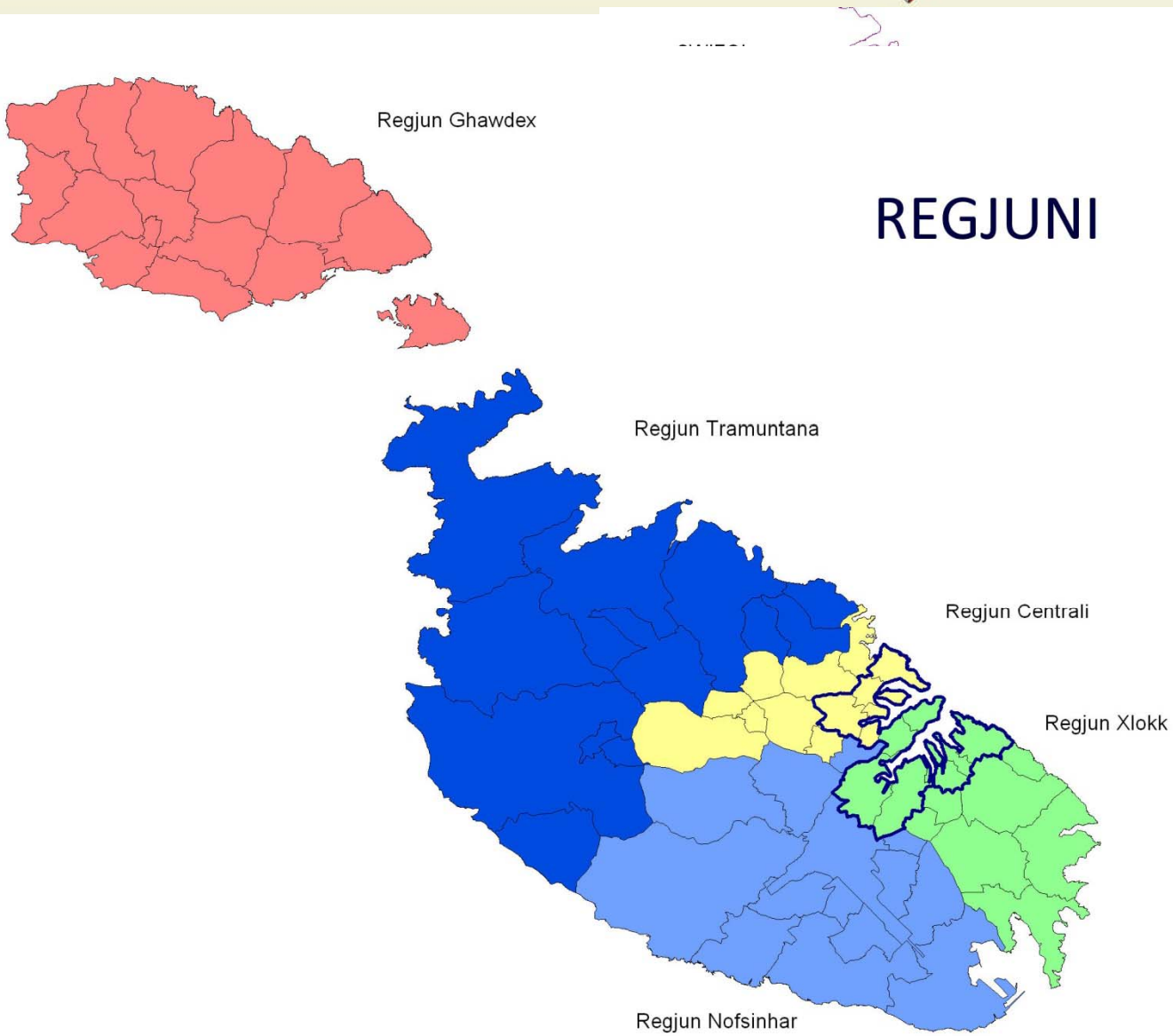
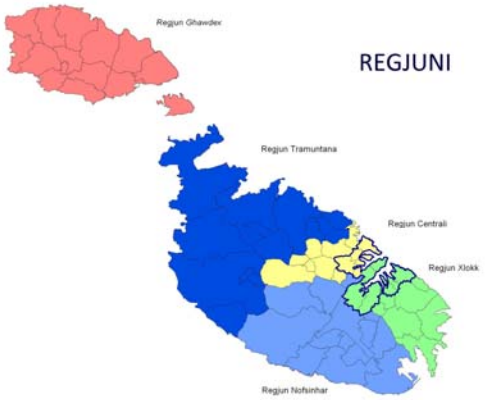
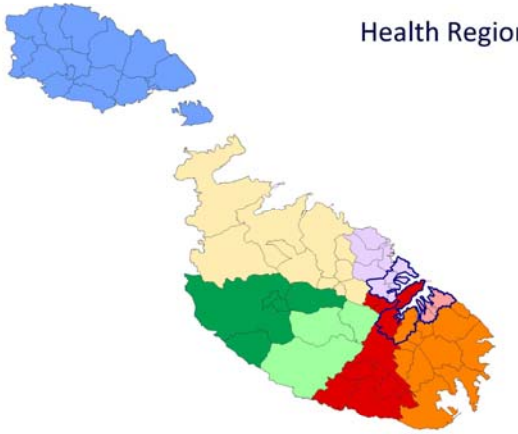


REGJUNI



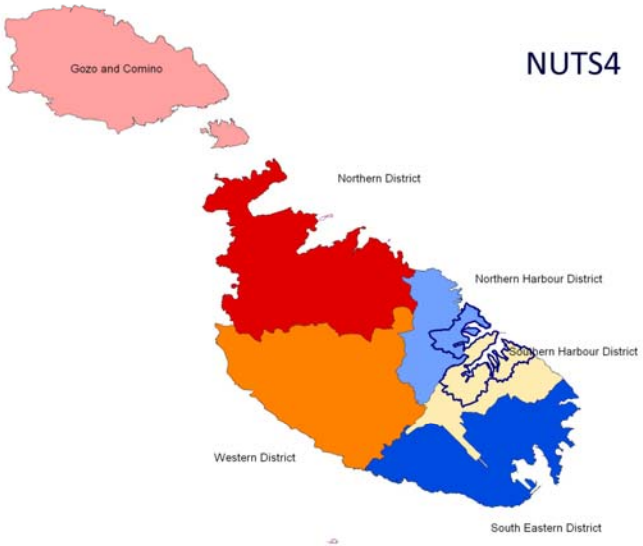
Police Districts

Health Regions



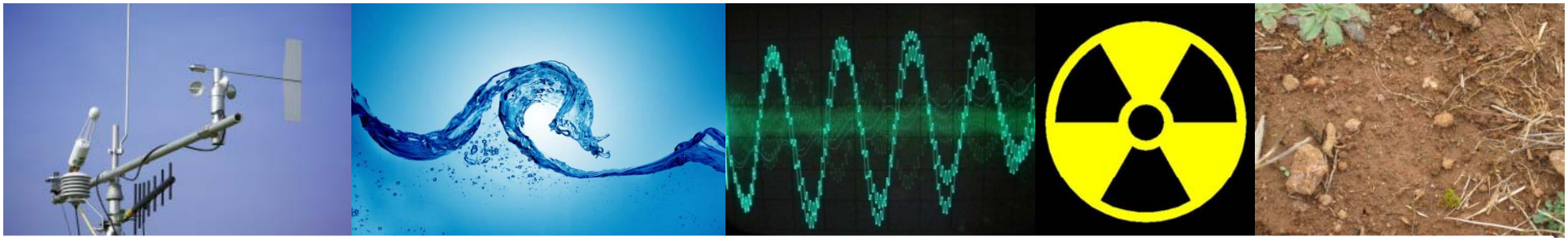
Local Plan Areas

NUTS4



EUROPEAN REGIONAL DEVELOPMENT FUND
MALTA2007-2013

ERDF 156:
Developing National Environmental Monitoring Infrastructure and Capacity



Operational Programme I – Cohesion Policy 2007-2013
Investing in Competitiveness for a Better Quality of Life
Project part-financed by the European Union
European Regional Development Fund (ERDF)
Co-financing rate: 85% EU funds; 15% National Funds

Investing in your future

The Conveyor

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Project Title	Developing National Environmental Monitoring Infrastructure and Capacity
Beneficiaries	Malta Environment and Planning Authority
Partners	University of Malta, Environmental Health Directorate National Statistics Office, Malta Resources Authority
Budget	€ 4.4 M

co-funded by ERDF (85%)
national Government (15%)
€ 0.2 m MEPA co-financed

Duration	Q3 2010 – Q1 2014

MEPA

NATIONAL STATISTICS OFFICE • MALTA

MRA
MALTA RESOURCES AUTHORITY

Environmental Health Directorate

The Scope

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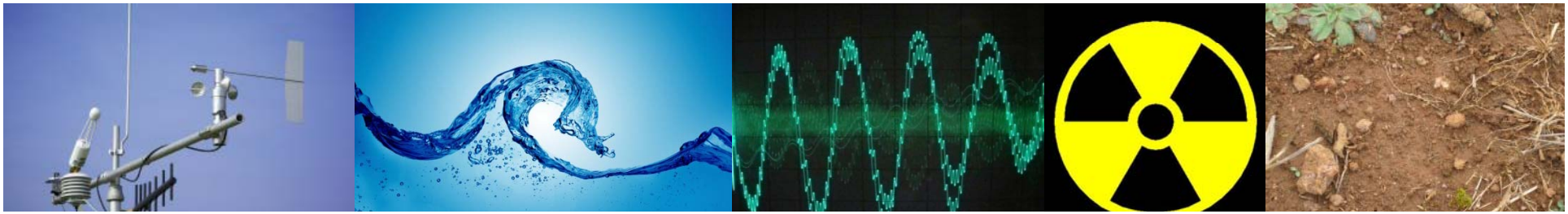
To develop the national environmental monitoring infrastructure and capacity for Malta, with the focus on monitoring 5 environmental themes:

1. Air
2. Water
3. Noise
4. Radiation
5. Soil

IR Factor: Themes are integrated with Information Resources systems



The Outcomes

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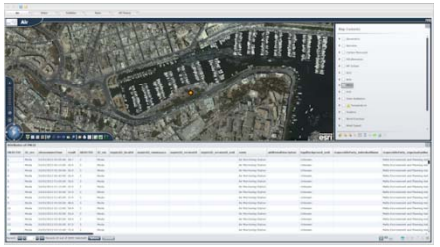
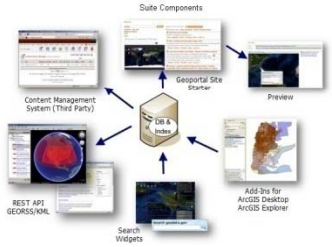
(1) **Strategy for Environmental Reporting** in the areas of air, water, noise, radiation, and soil.

(2) **Baseline Studies** conducted in the areas of water, noise, radiation and soil, together with 3D terrestrial spatial surveys and bathymetric surveys of coastal waters within 1 nautical mile.

(3) **Acquisition of Equipment** for the collection of real-time and ad hoc data.

(4) **Dissemination Tools** for the distribution and reporting of data to the Public, Scientific Domains and EU/International Reporting.





Information Resources

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- Deliveries included a terrestrial LIDAR Scan (Topographic Light Detection and Ranging (LiDAR)) which resulted in a baseline map for the Maltese Islands infrastructure and landcover/landuse analysis which is required for the monitoring of structures that impact on noise levels, enforcement issues, resource monitoring and risk prediction, amongst others.

- Bathymetric LIDAR aerial survey for depths of 0 m to 15m within 1 nautical mile from the Maltese coastline and a ship-based bathymetric scan employing acoustic side scan sonar which will enable the creation of new nautical charts as well as bathymetric outputs that will help in marine spatial planning.

Four Square Activities

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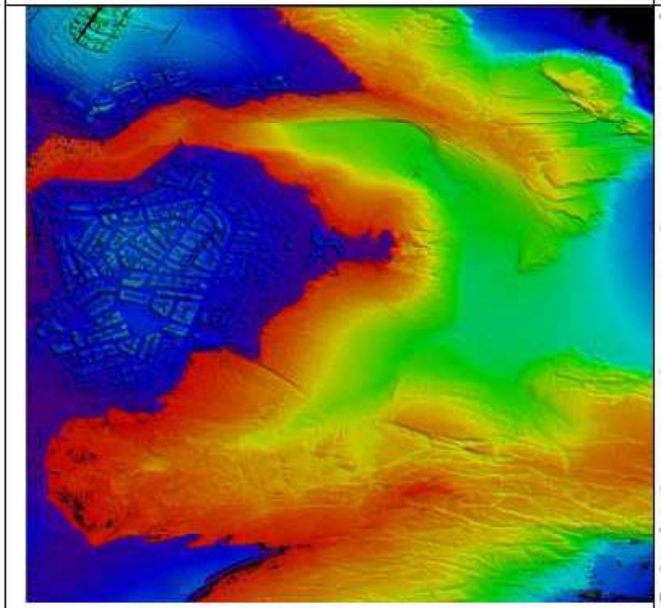
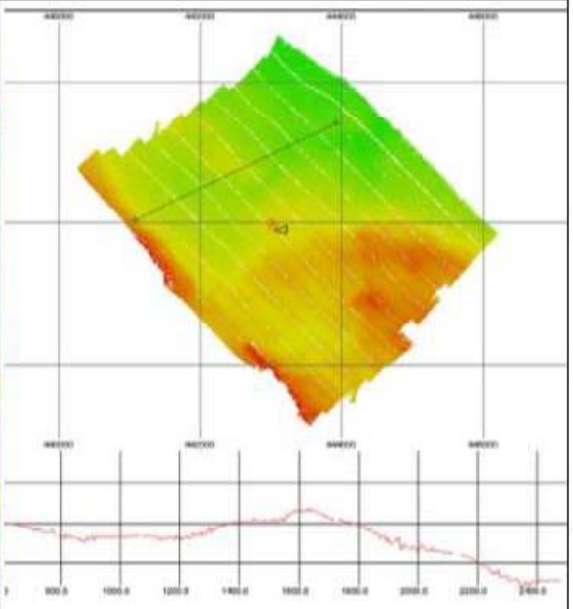
Activity 1- Lidar Survey and imagery

Activity 2- Oblique aerial imagery



Activity 3- Bathymetric Lidar survey



Activity 4 - Acoustic and bathymetric scans

Activities

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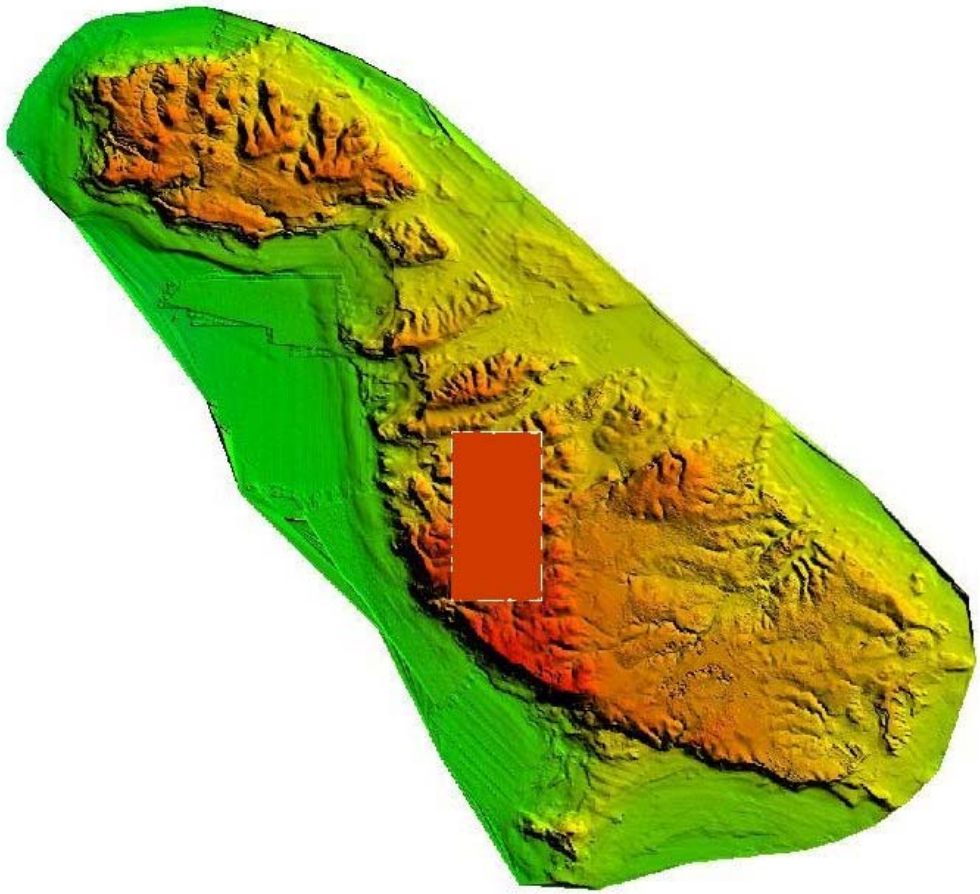

Activity 1

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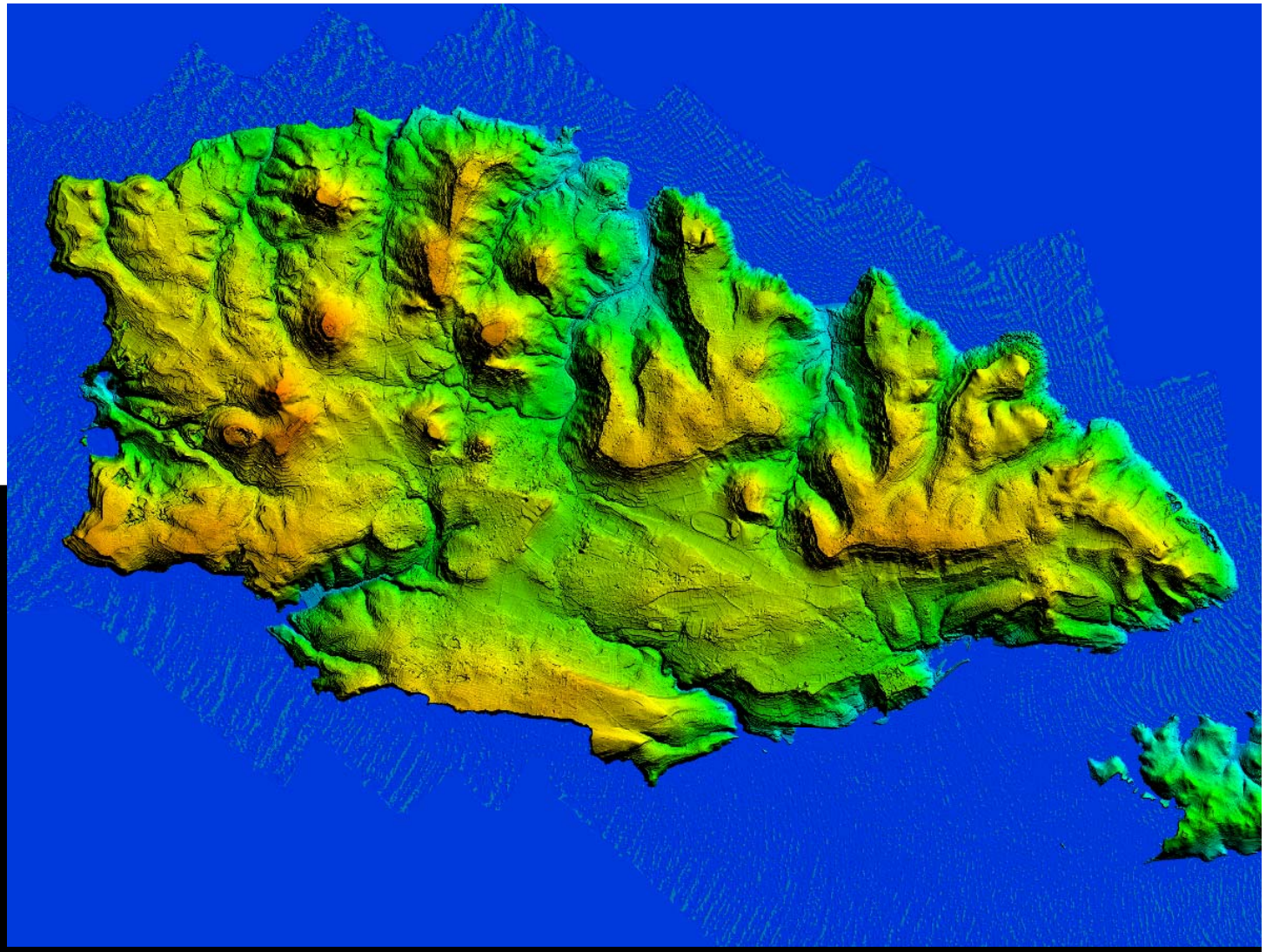

DTM - Gozo

Activity 1

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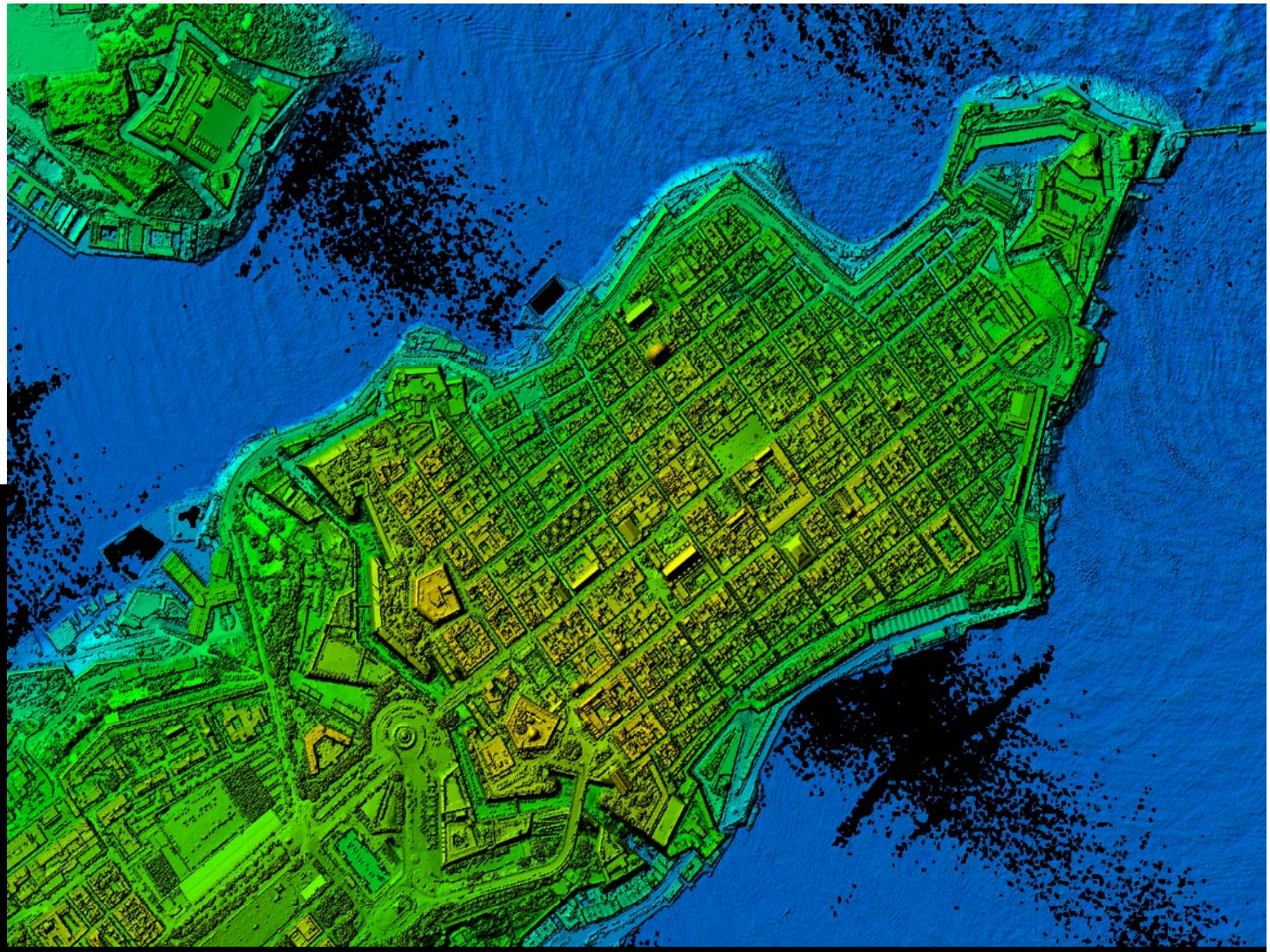

DSM - Valletta

Activity 1

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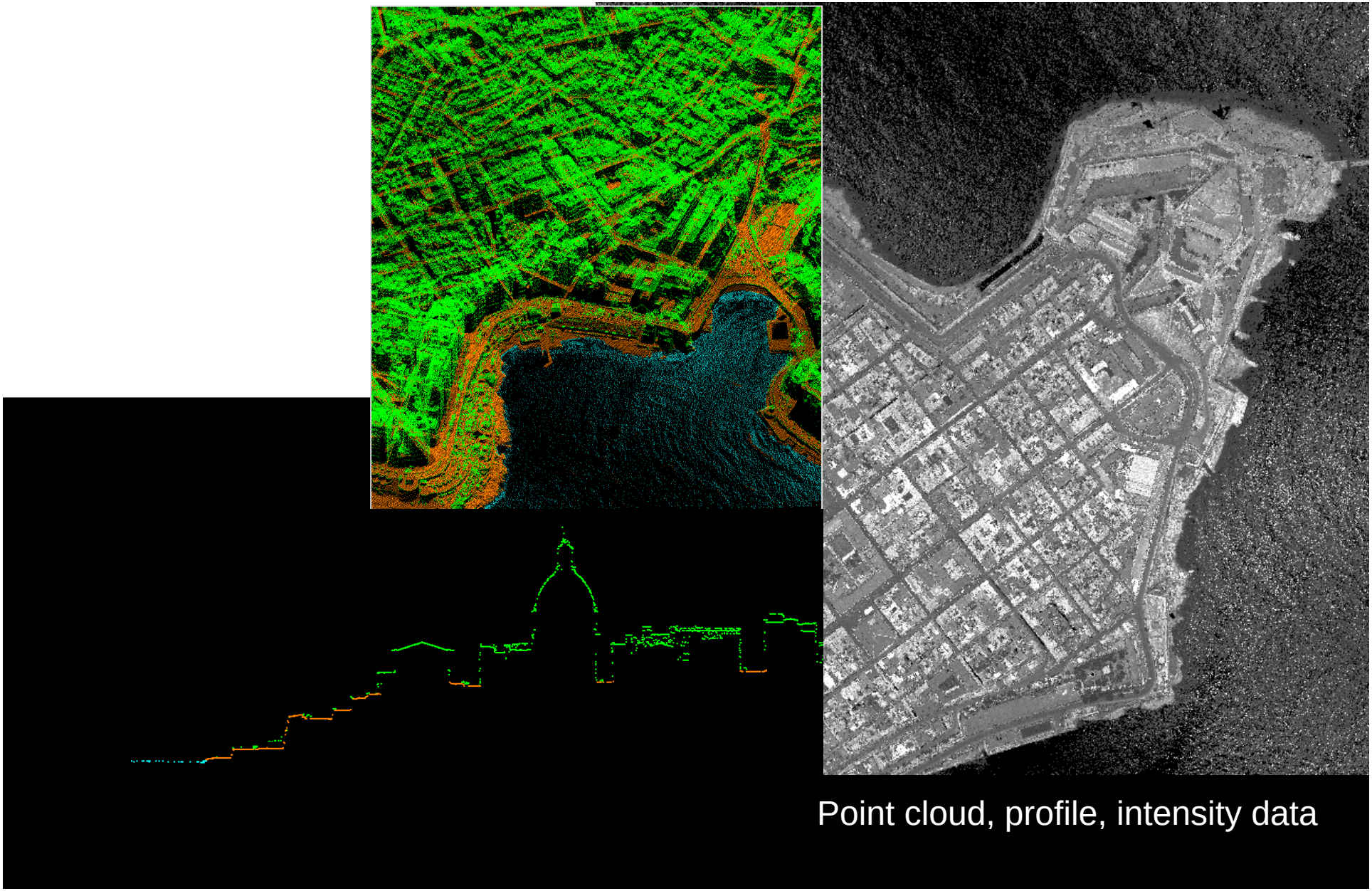

Point cloud, profile, intensity data

Activity 1

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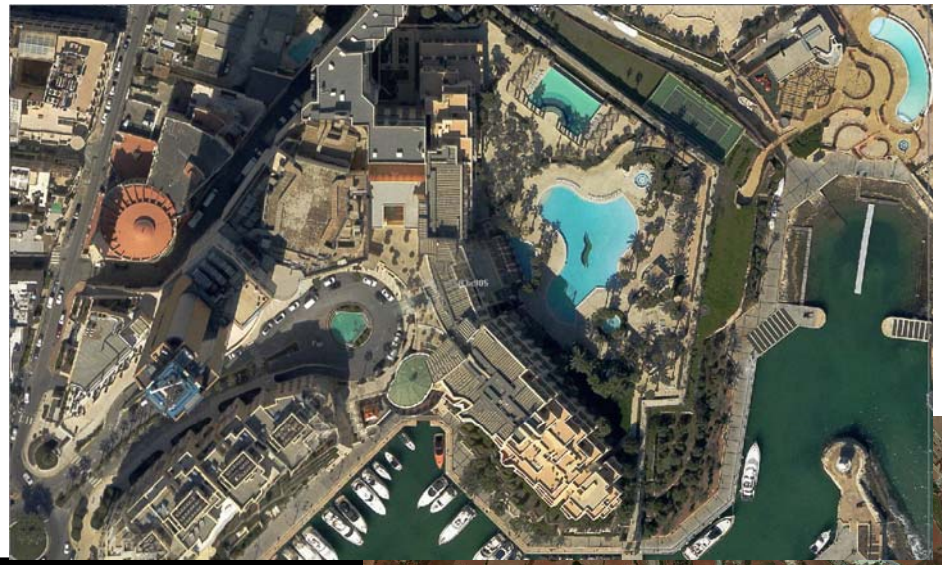

IGI DigiCam:
image mosaic
with GSD of 16 cm

Activity 1

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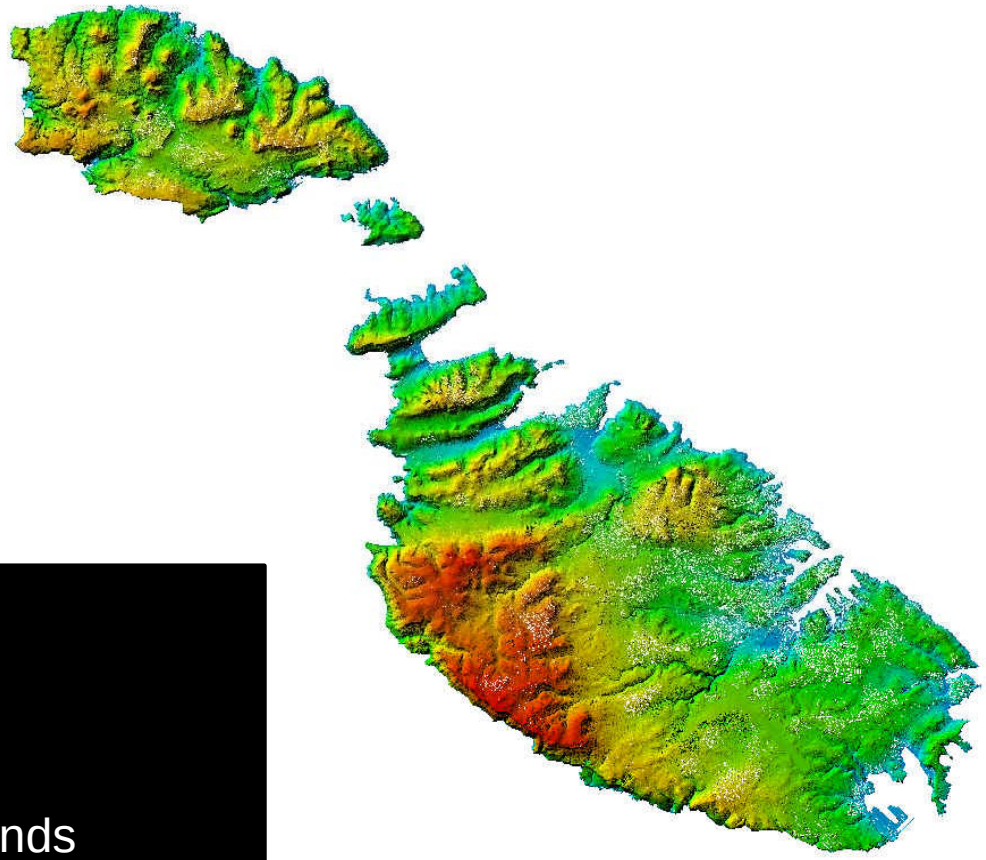

» Activity 1:

- 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
- absolute accuracy: ±11cm

Activity 2

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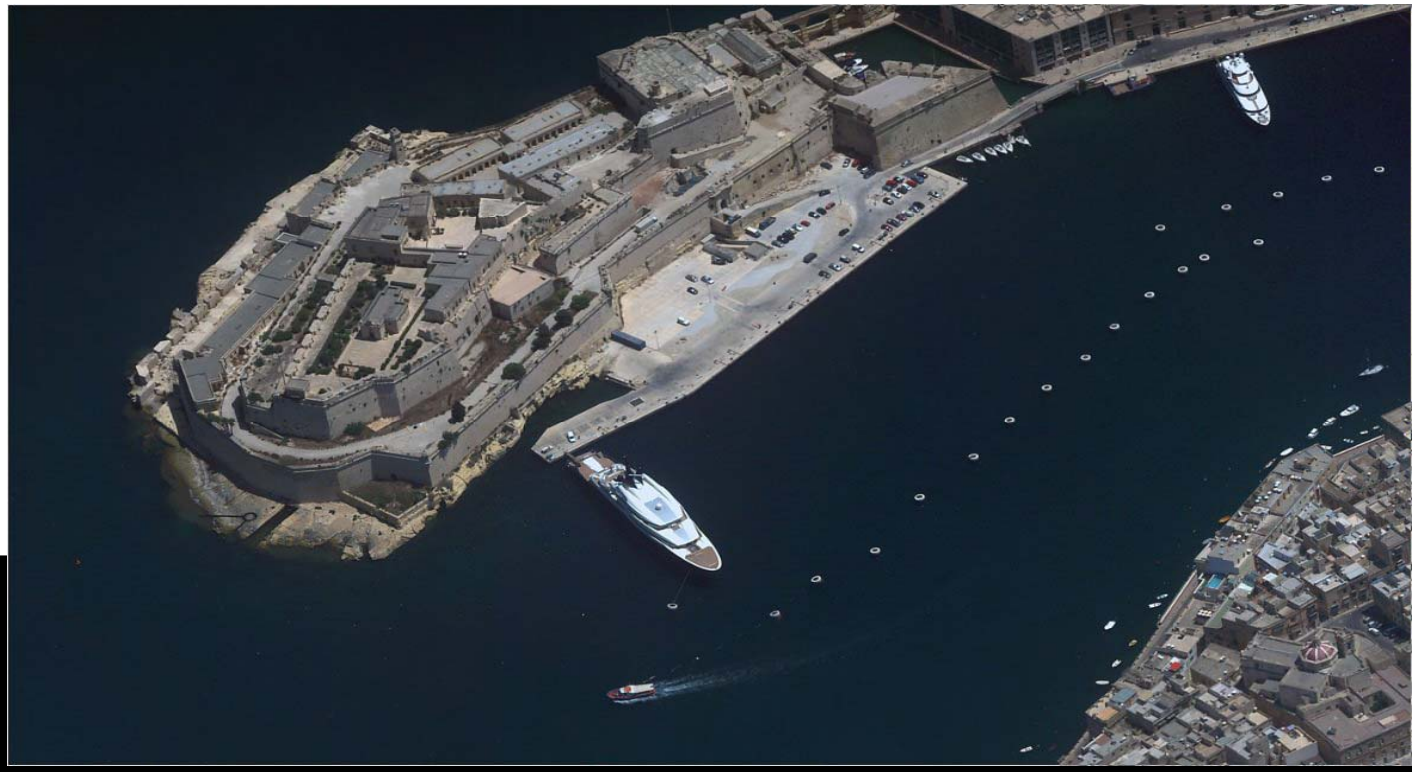

Activity 2:
Oblique aerial imagery

Tasks of Activity 2:

- Aerial imagery survey over the entire Maltese Islands terrain by capturing images obliquely
- Both orthogonal and oblique angles using four neighbouring image views taken from opposing directions
- Imagery should have a spatial resolution of 15cm

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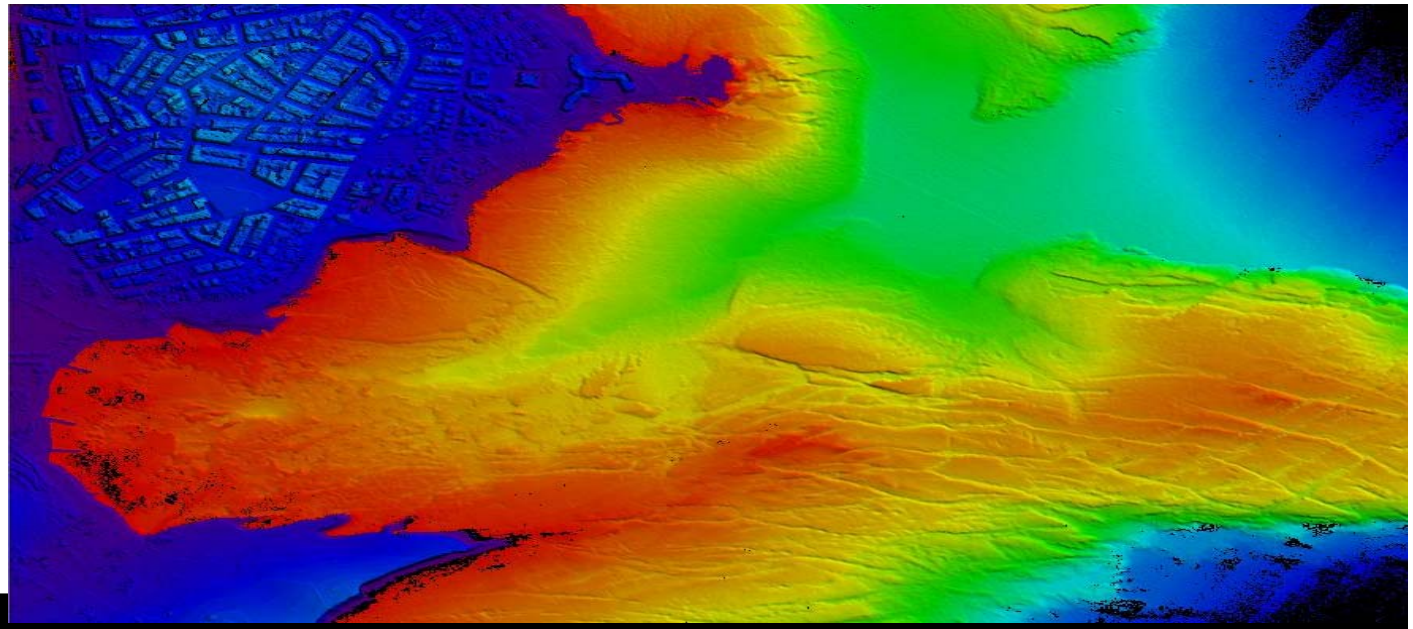

Activity 3: Bathymetric Lidar survey

Collection of bathymetric data of coastal waters
at depths between 0m to 15 m

- Bathymetric data must be collected with a sounding **post-spacing of at least 2 m by 2 m**
- **Simultaneous topography and bathymetric data capture**, so as to include the coastal land area
- Include a **minimum 5m overlap** between bathymetric airborne LIDAR and the swath bathymetric survey for quality assurance purposes.
- Post-processed data must fulfill the **IHO requirements**
- Deliverables to consist of an ASCII XYZ format file and a Digital Surface Model

Activity 3

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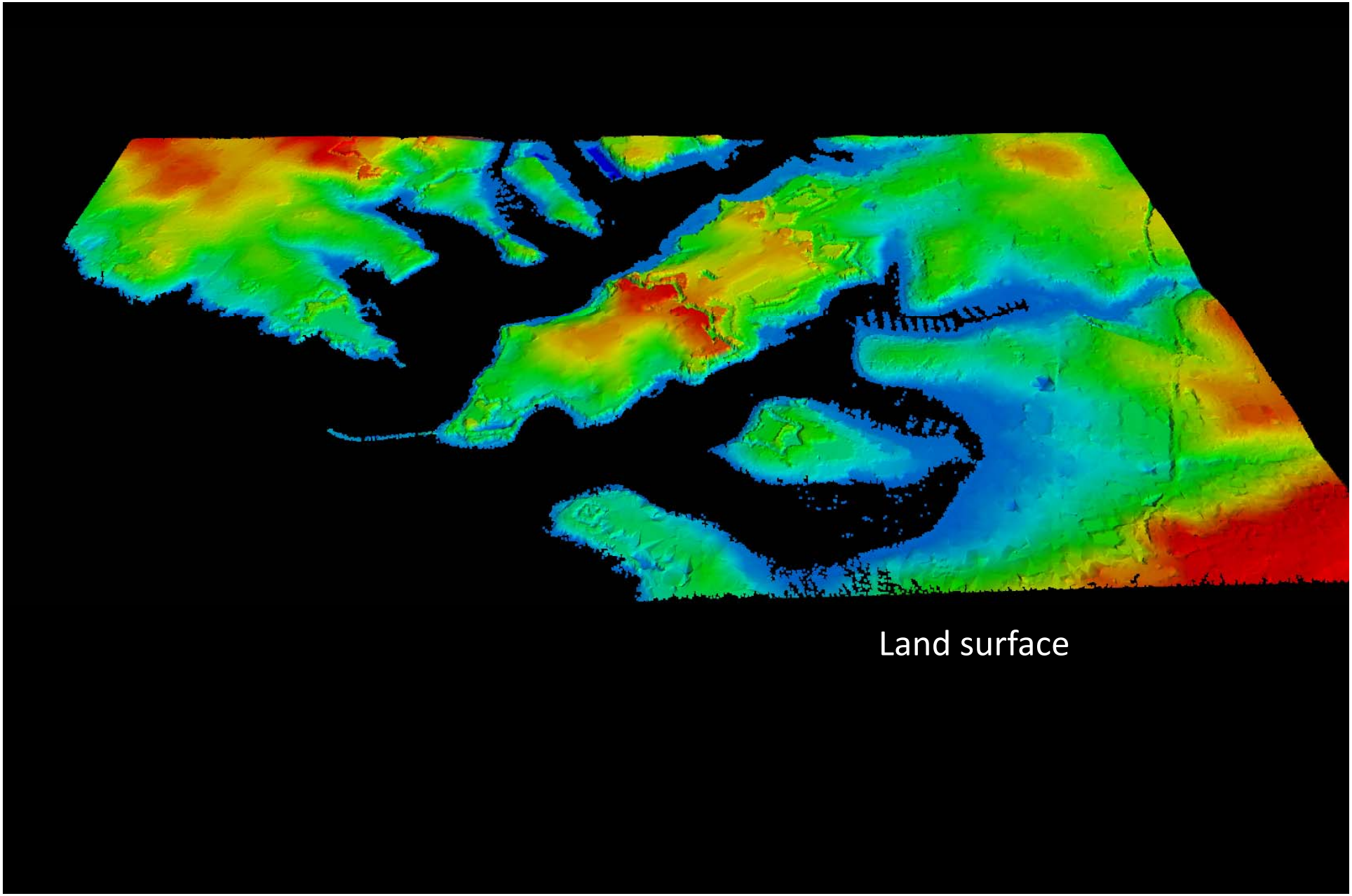

Activity 3

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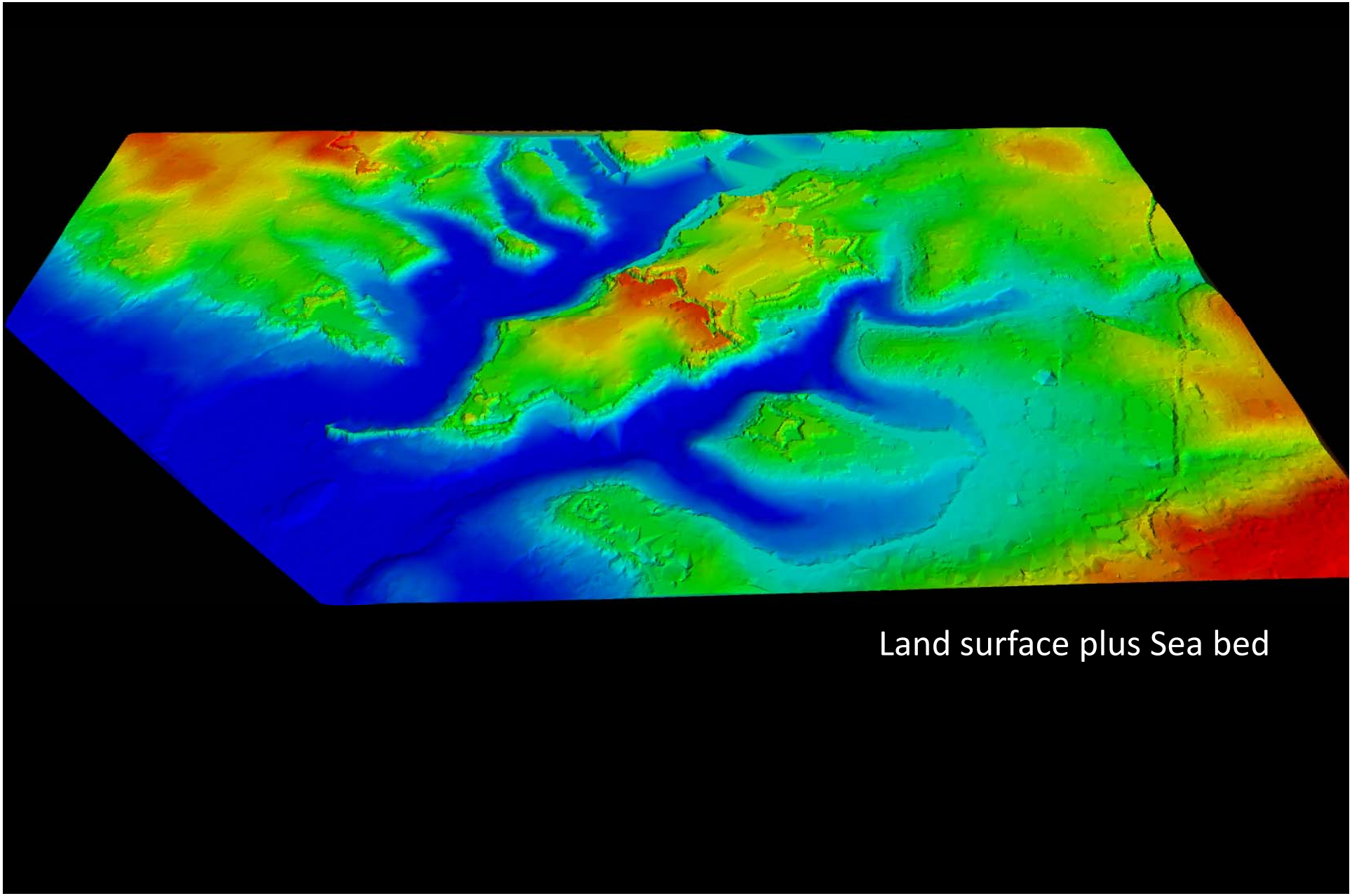

Land surface plus Sea bed

The Works

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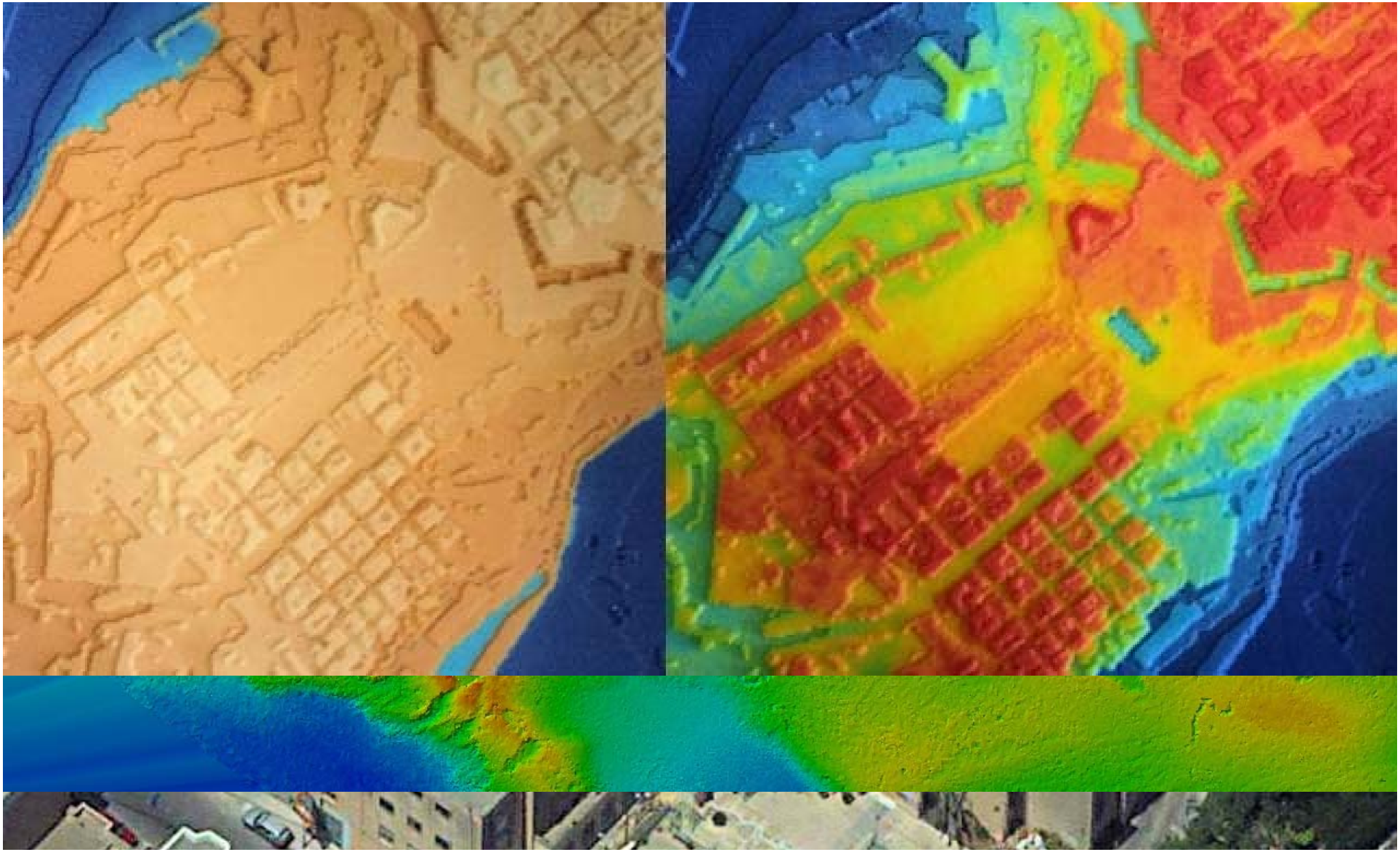

Visualisation

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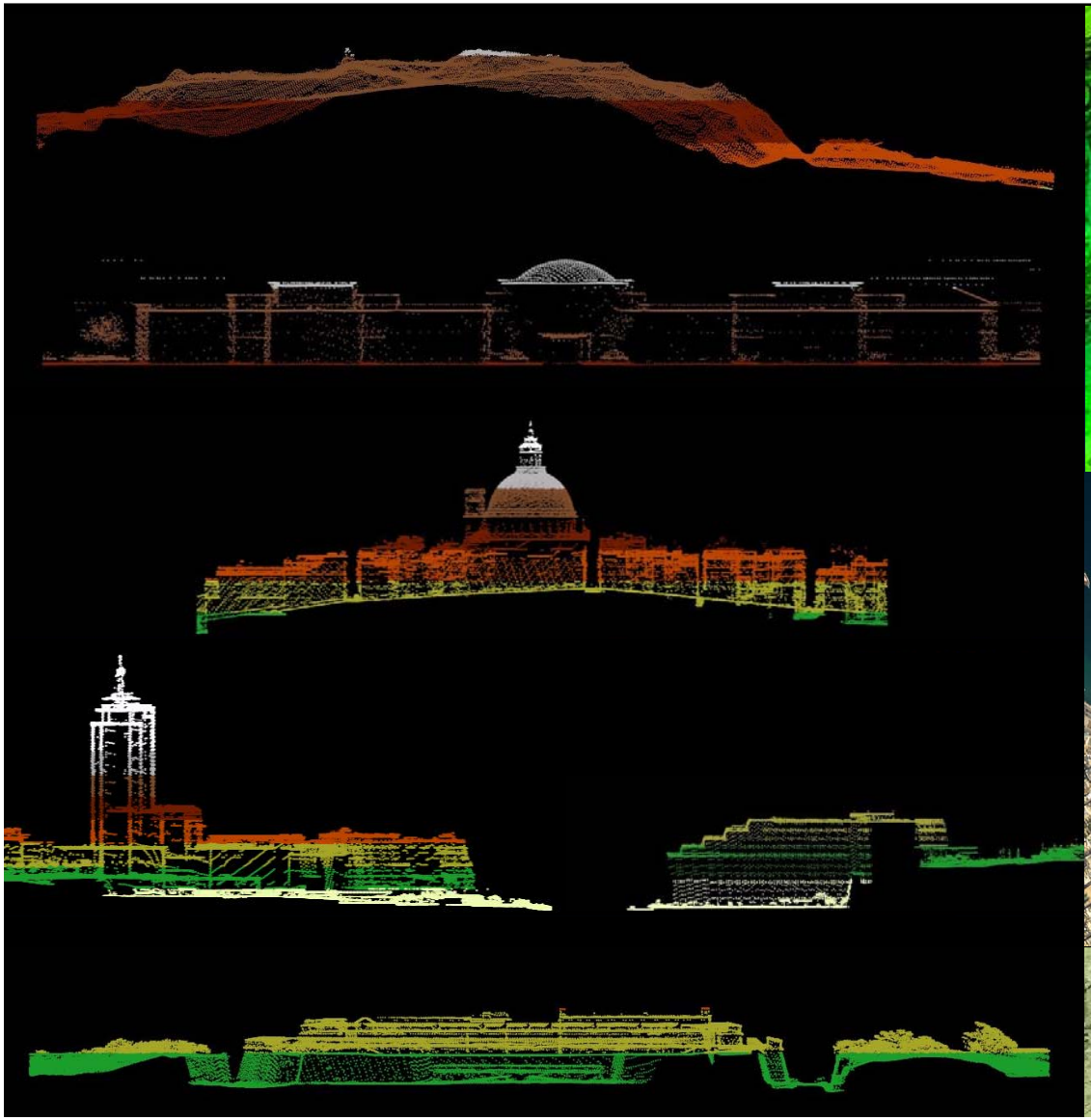

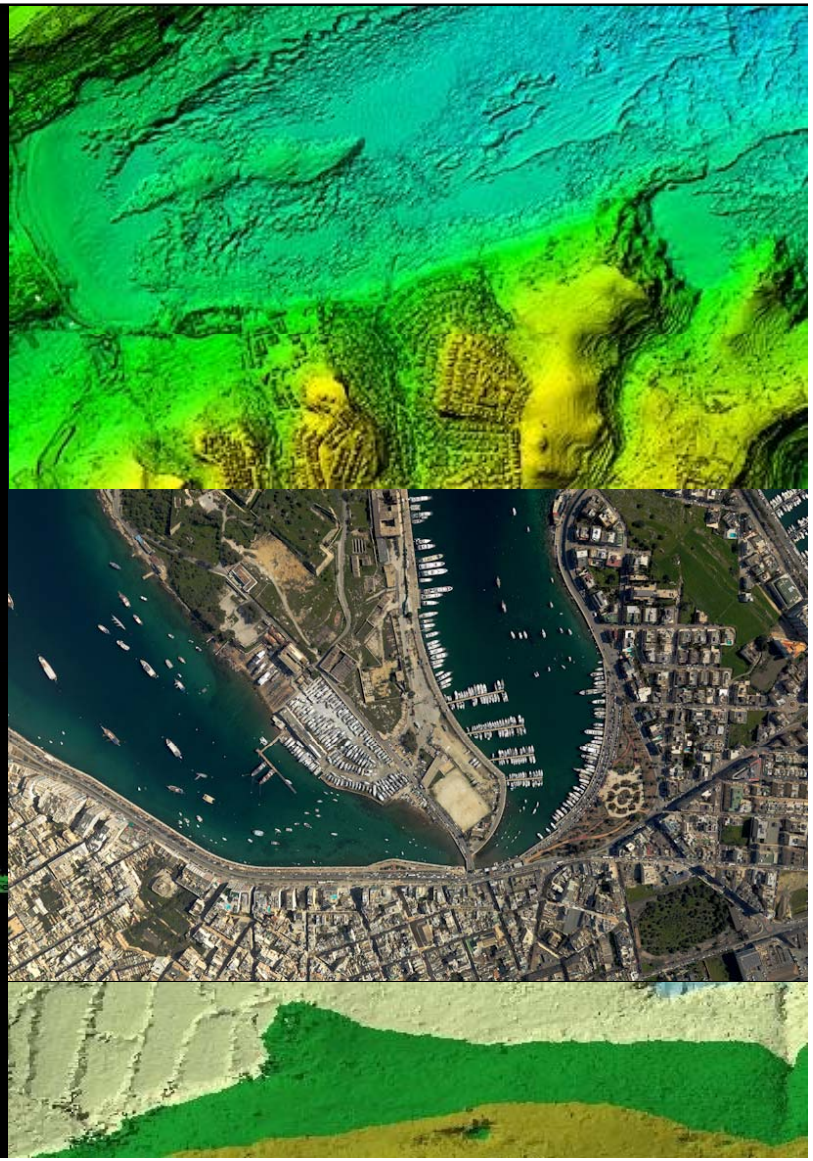

Dissemination: SEIS

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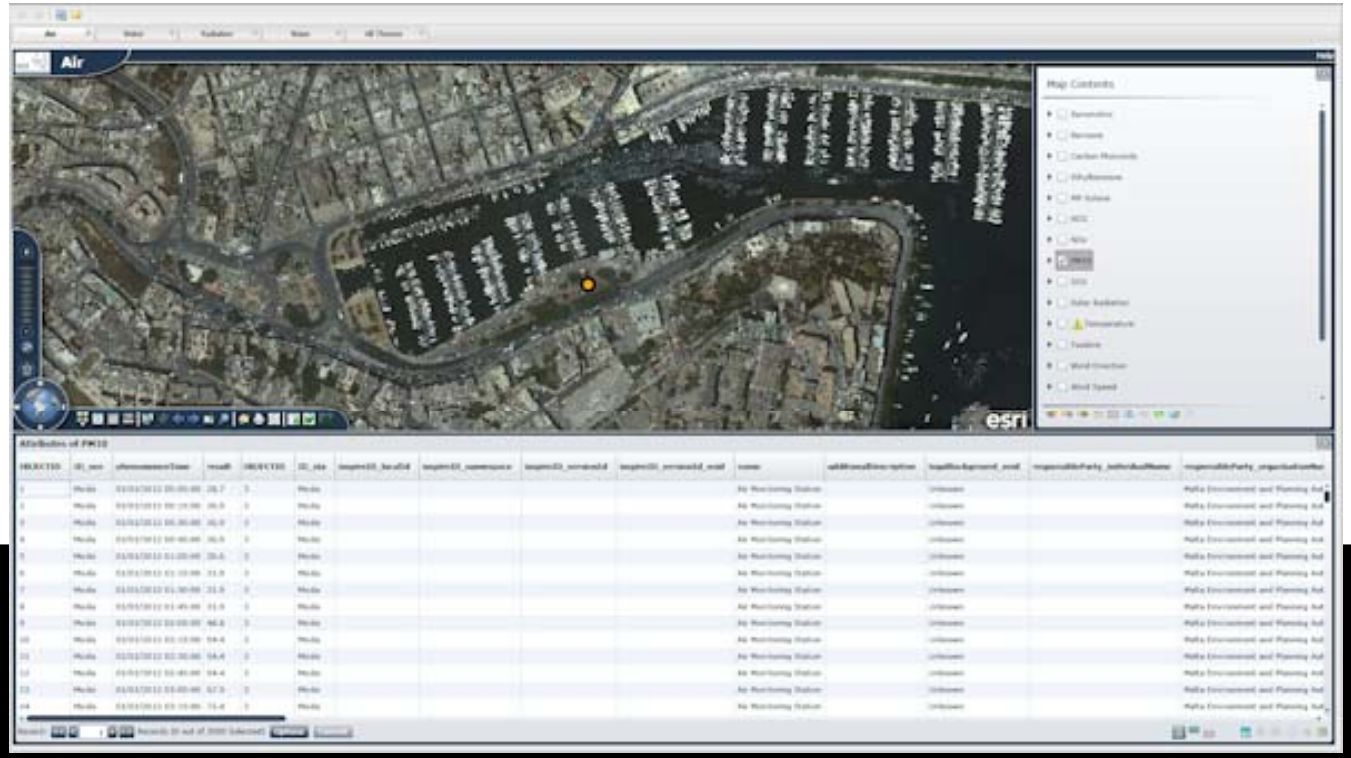
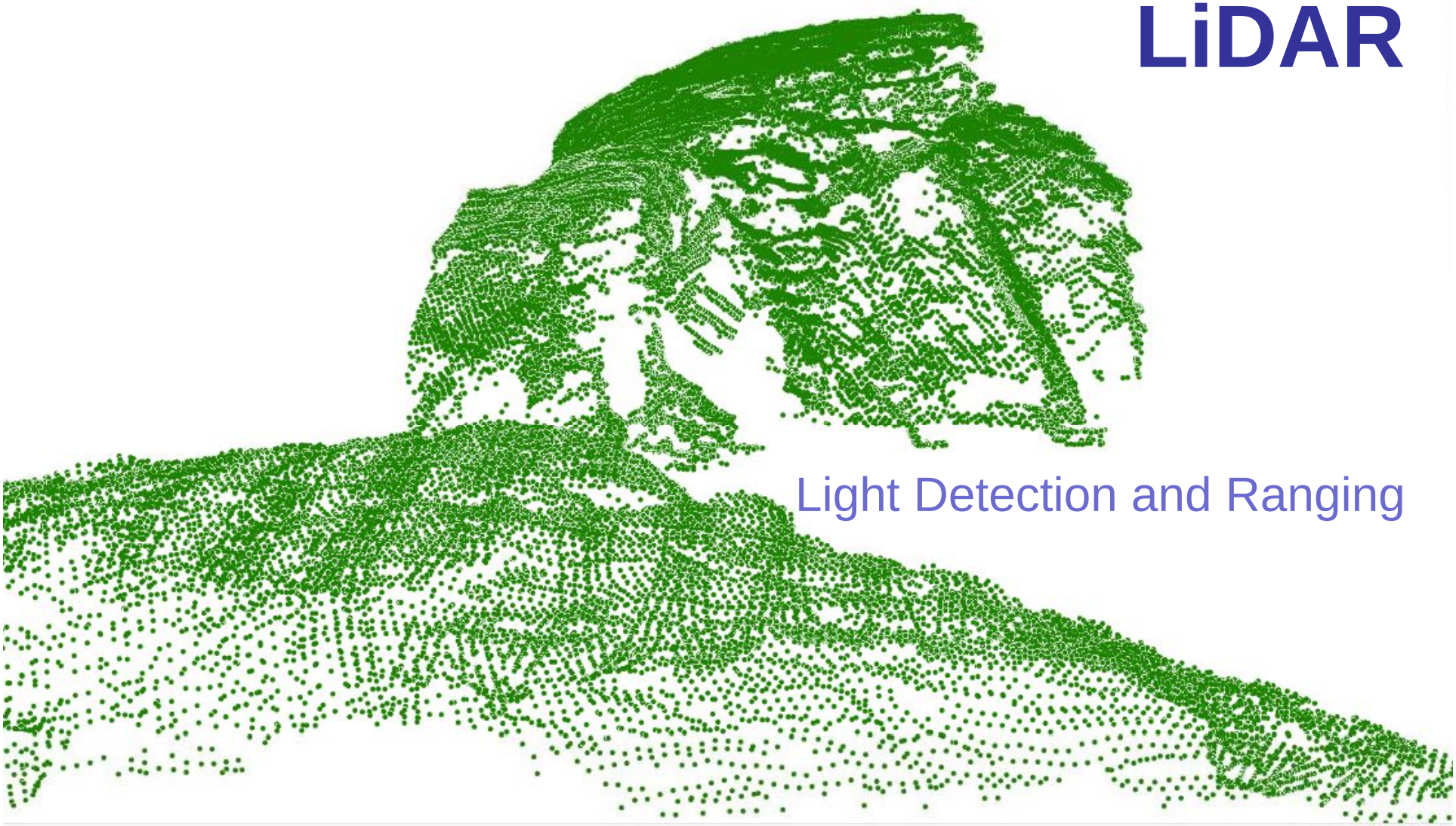


SEIS

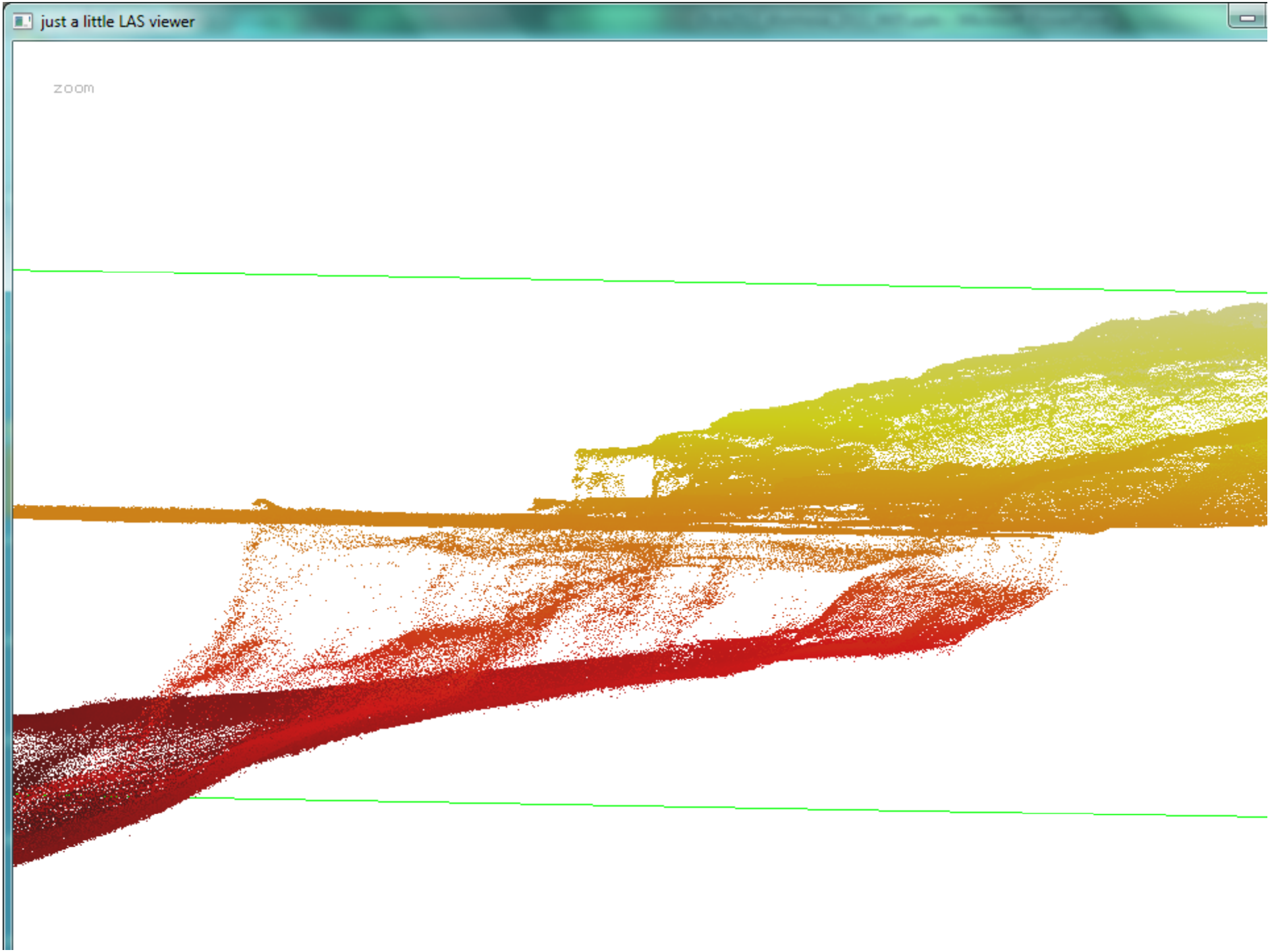
www.seismalta.org.mt

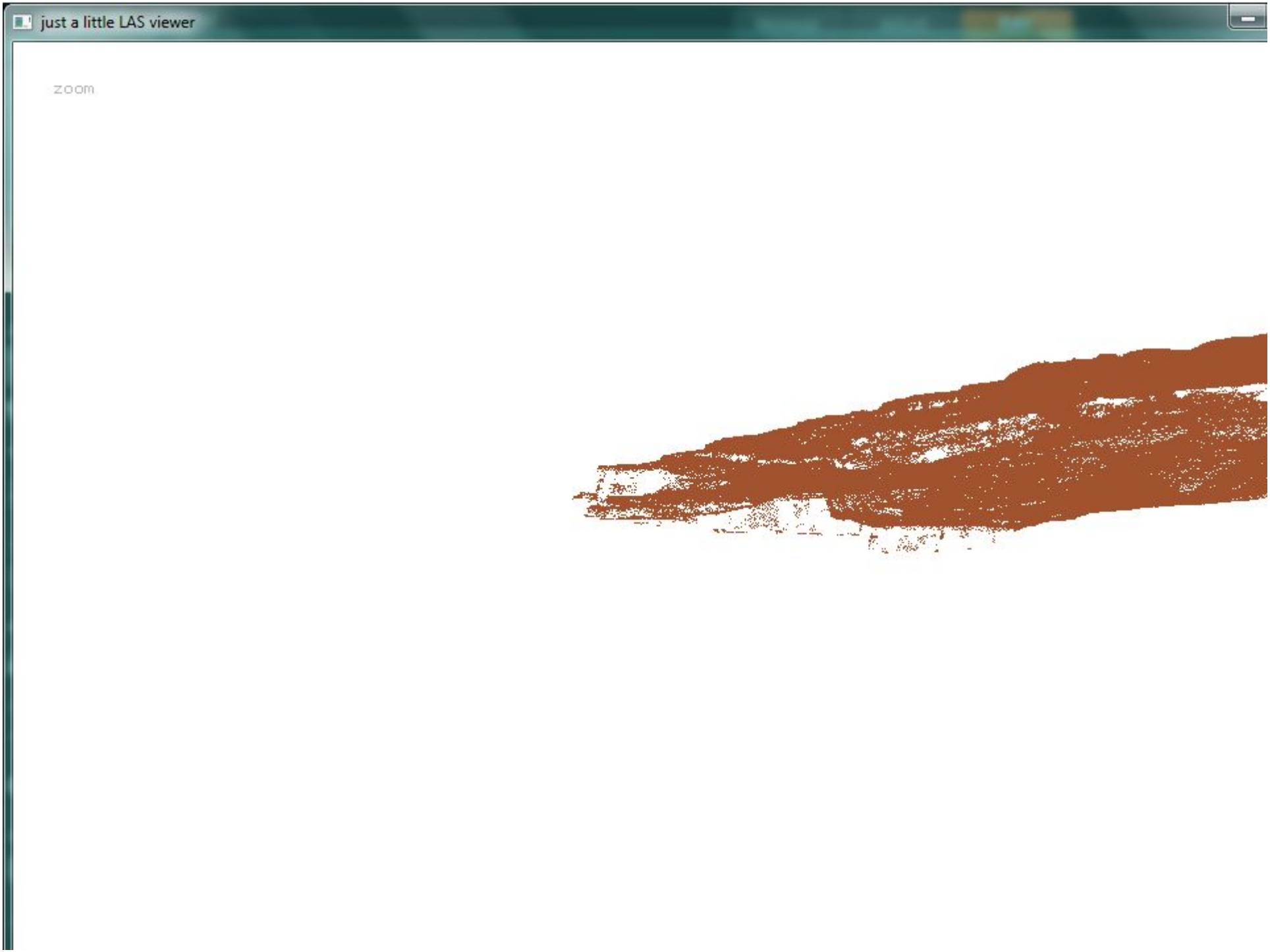
A Shared Environmental Information System will serve as the conveyor for such information and outputs from the project as based on INSPIRE, Aarhus and SEIS

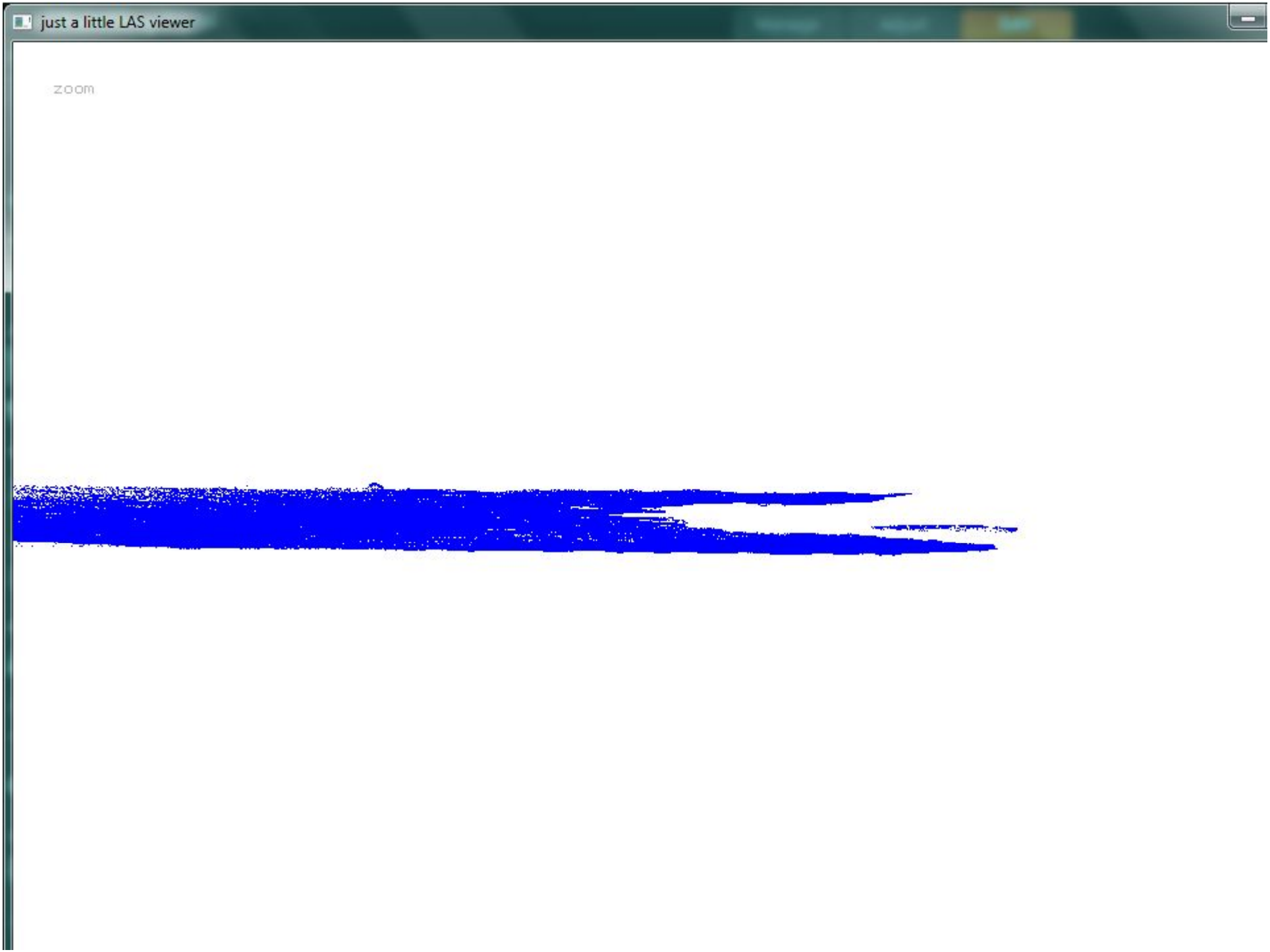
LiDAR



Light Detection and Ranging


just a little LAS viewer
zoom


just a little LAS viewer
zoom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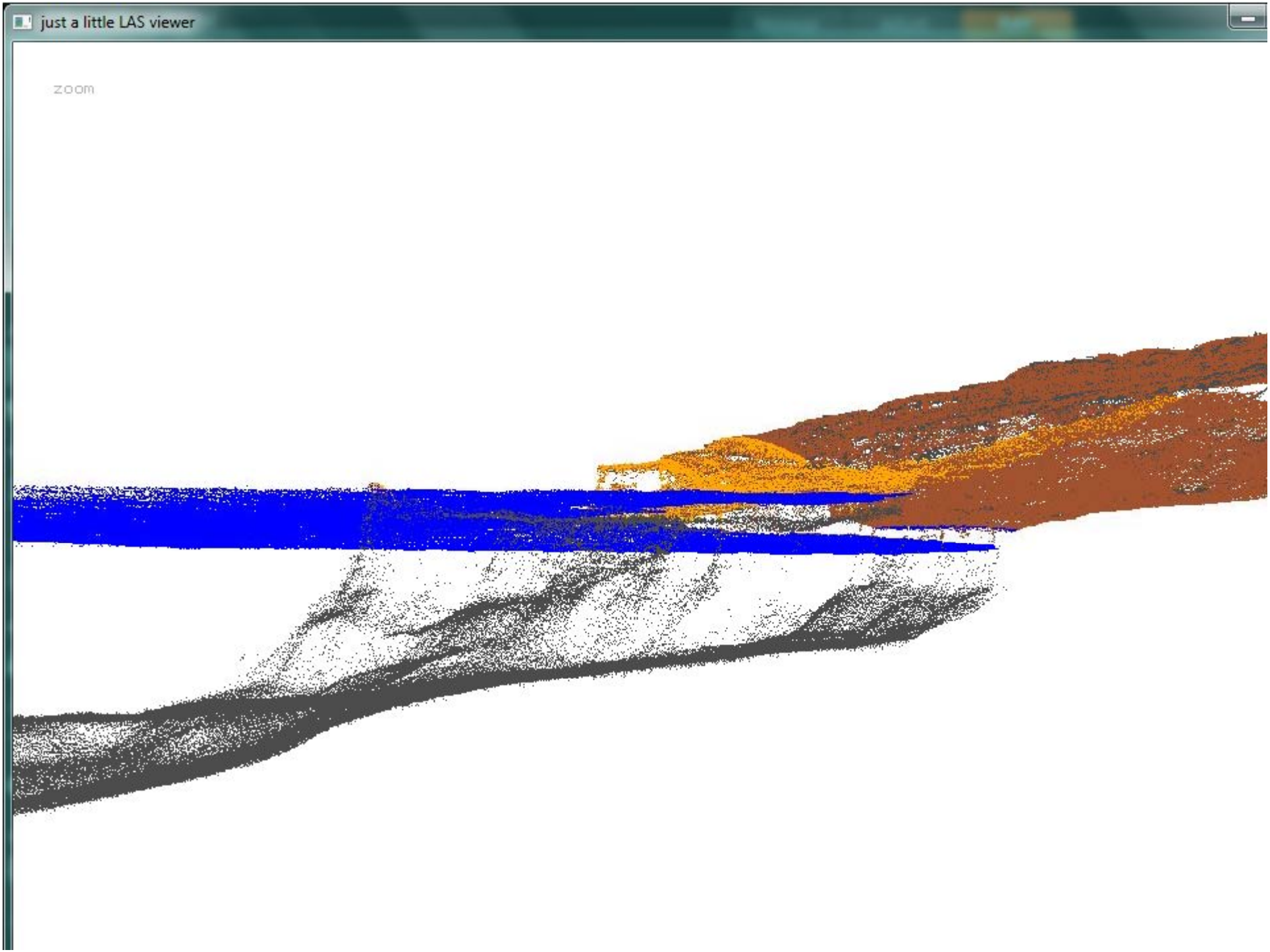
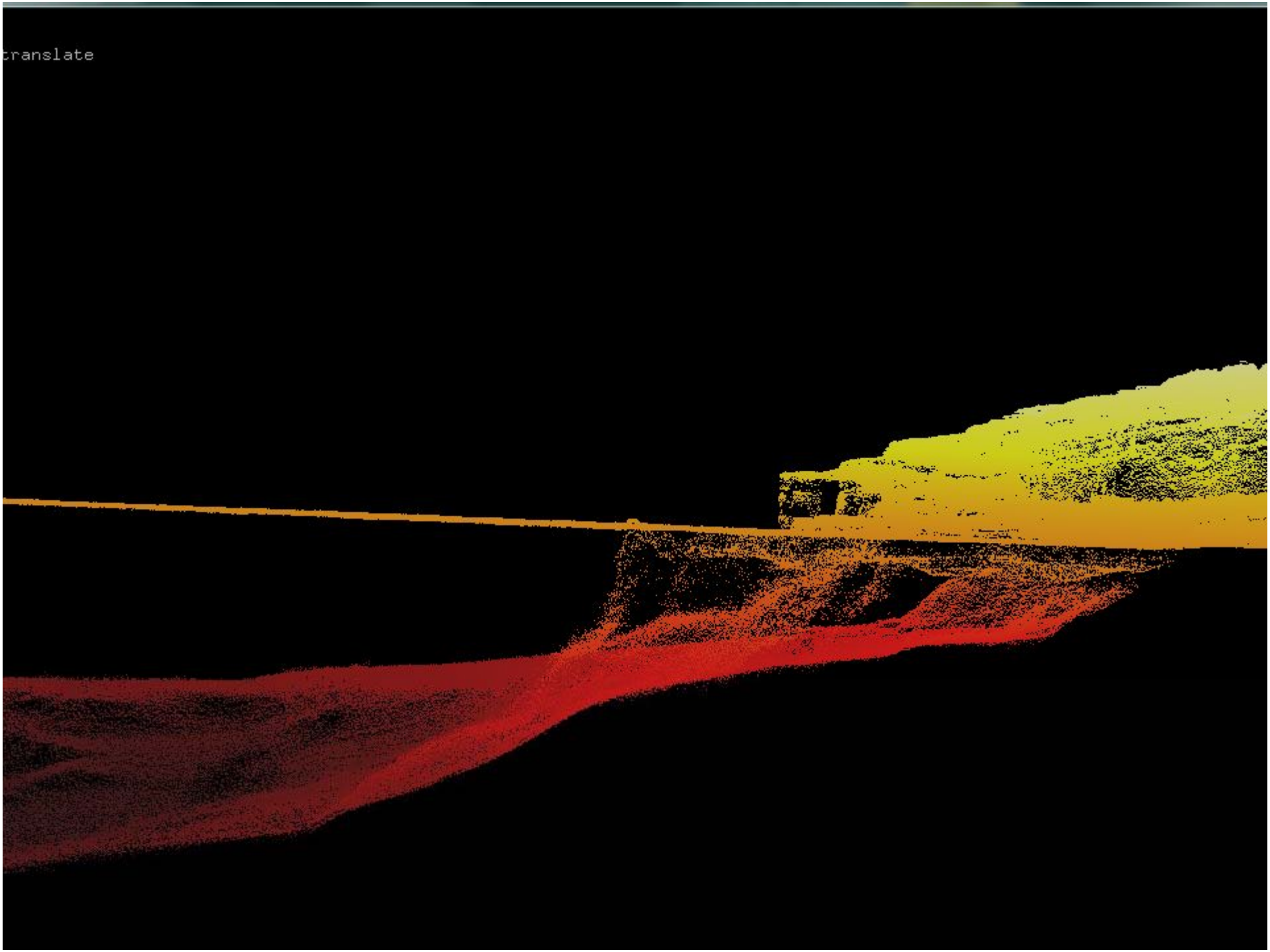
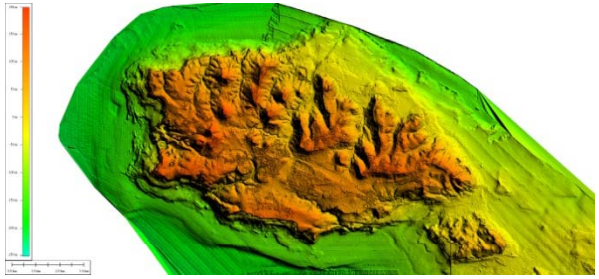

just a little LAS viewer
zoom


translate

Mediums to aid interaction

GIS



Virtualisation

Gaming

However, usage is very limited

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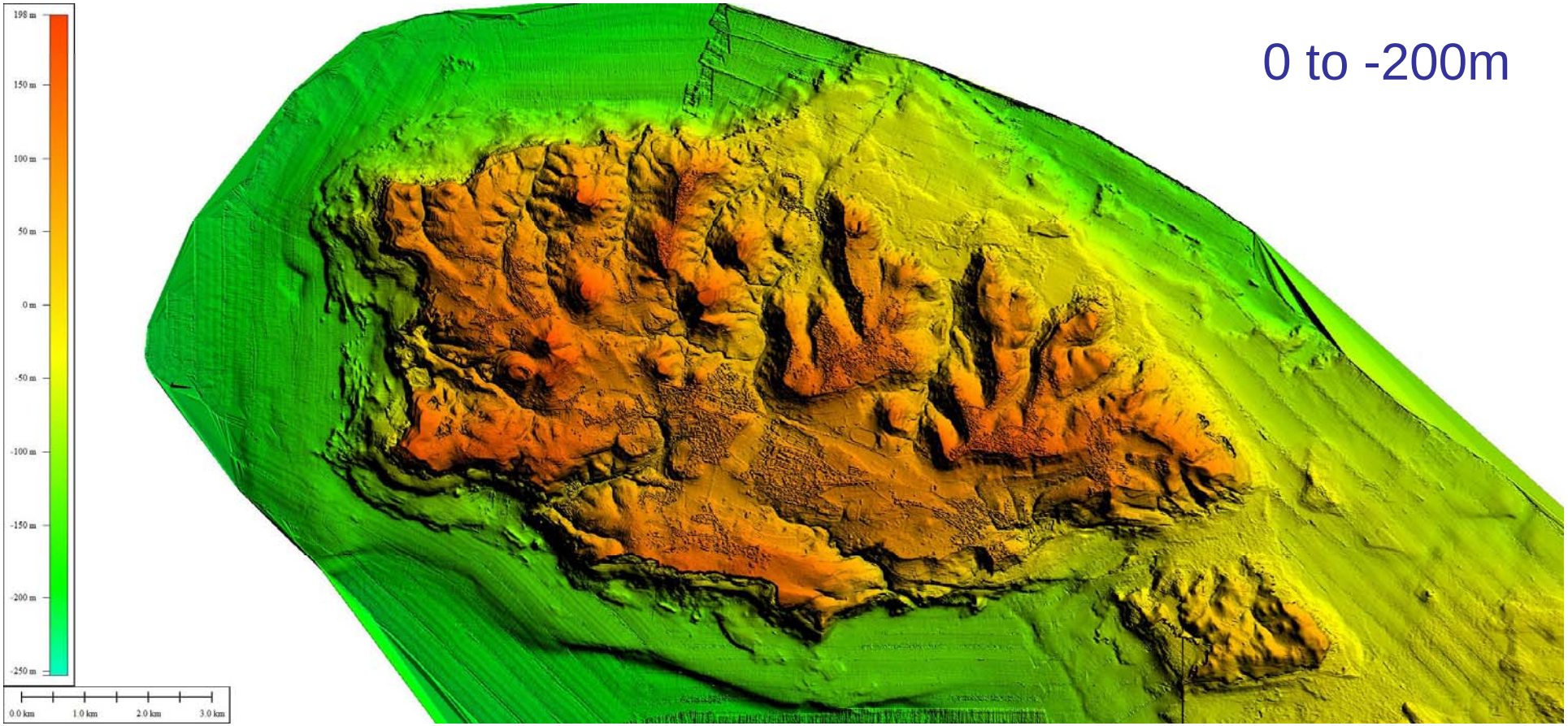
GIS



0 to -200m

However, usage is very limited

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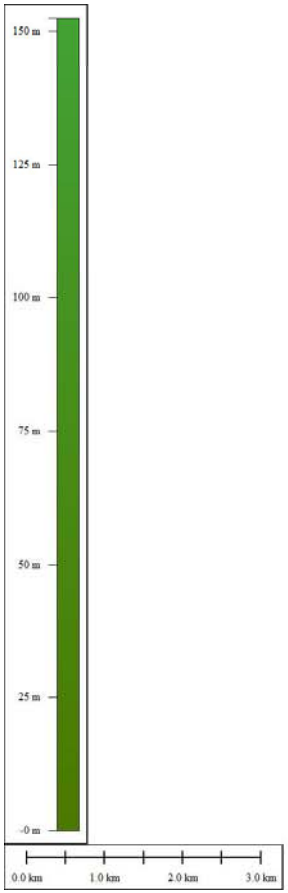
GIS



0m

However, usage is very limited

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GIS

-50m

However, usage is very limited

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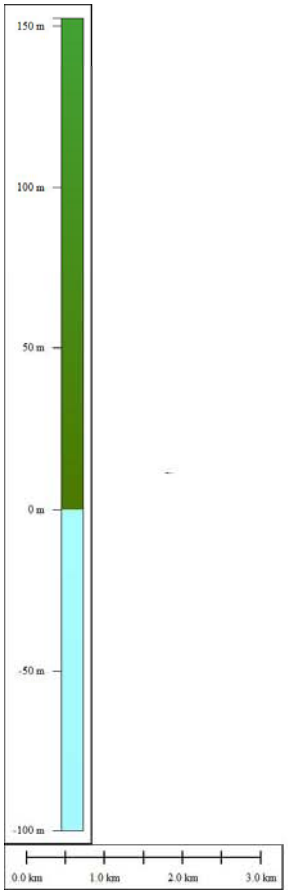
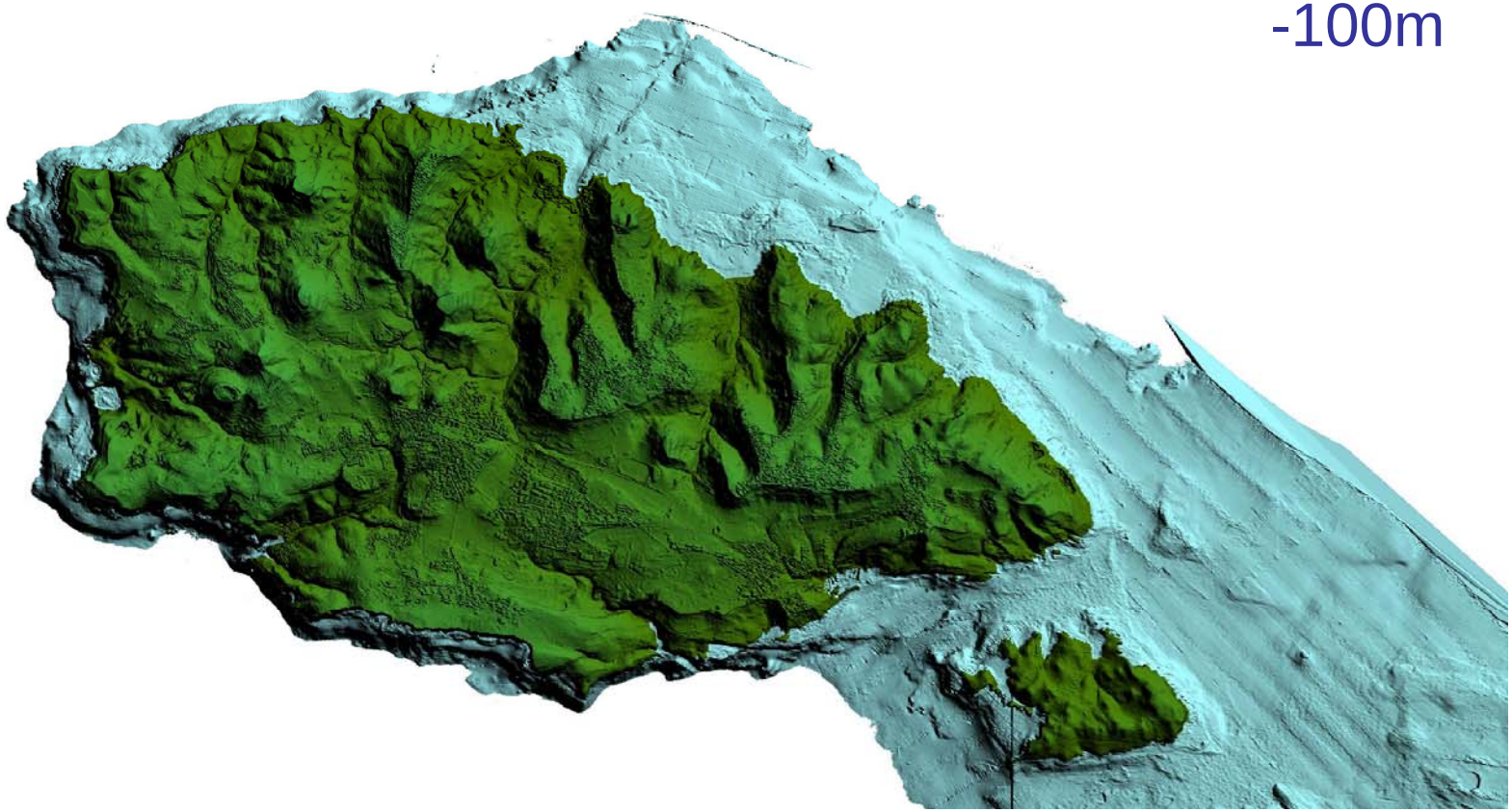
GIS





-100m

However, usage is very limited

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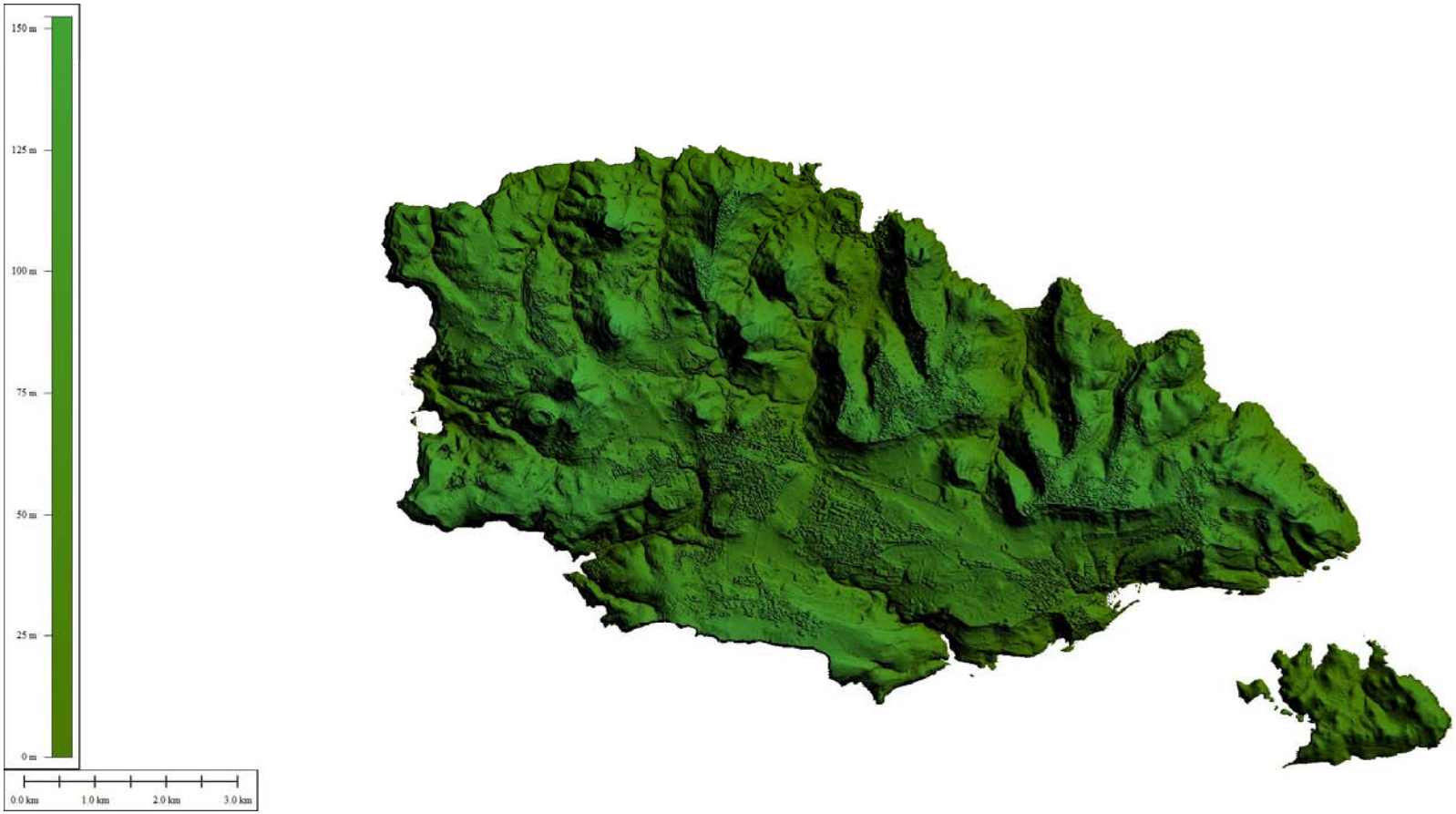
GIS



0m

However, usage is very limited

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GIS

+5m

However, usage is very limited

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GIS

+13m

However, usage is very limited

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GIS

+70m

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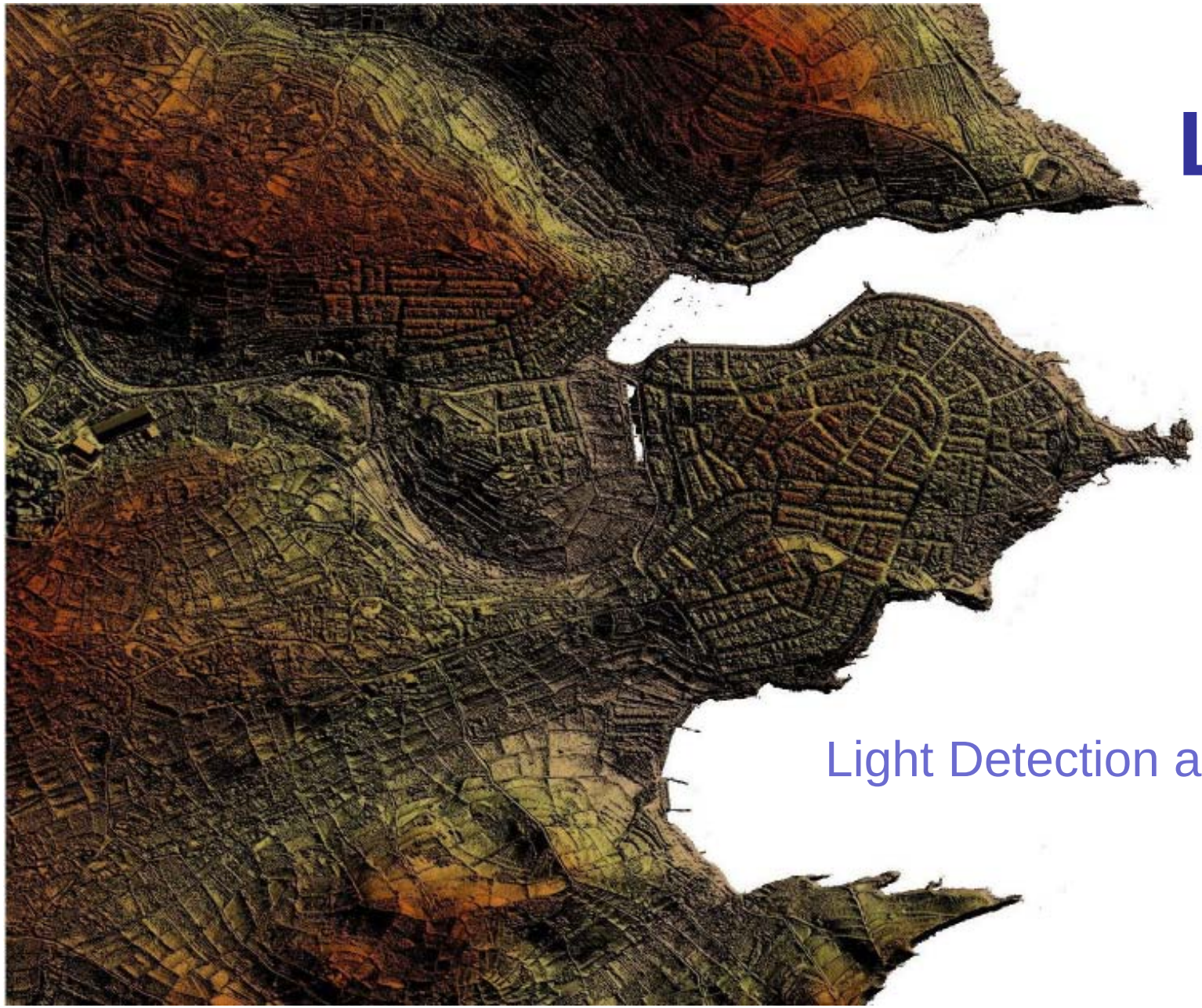

LiDAR

Light Detection and Ranging

Case Study – Marsascala

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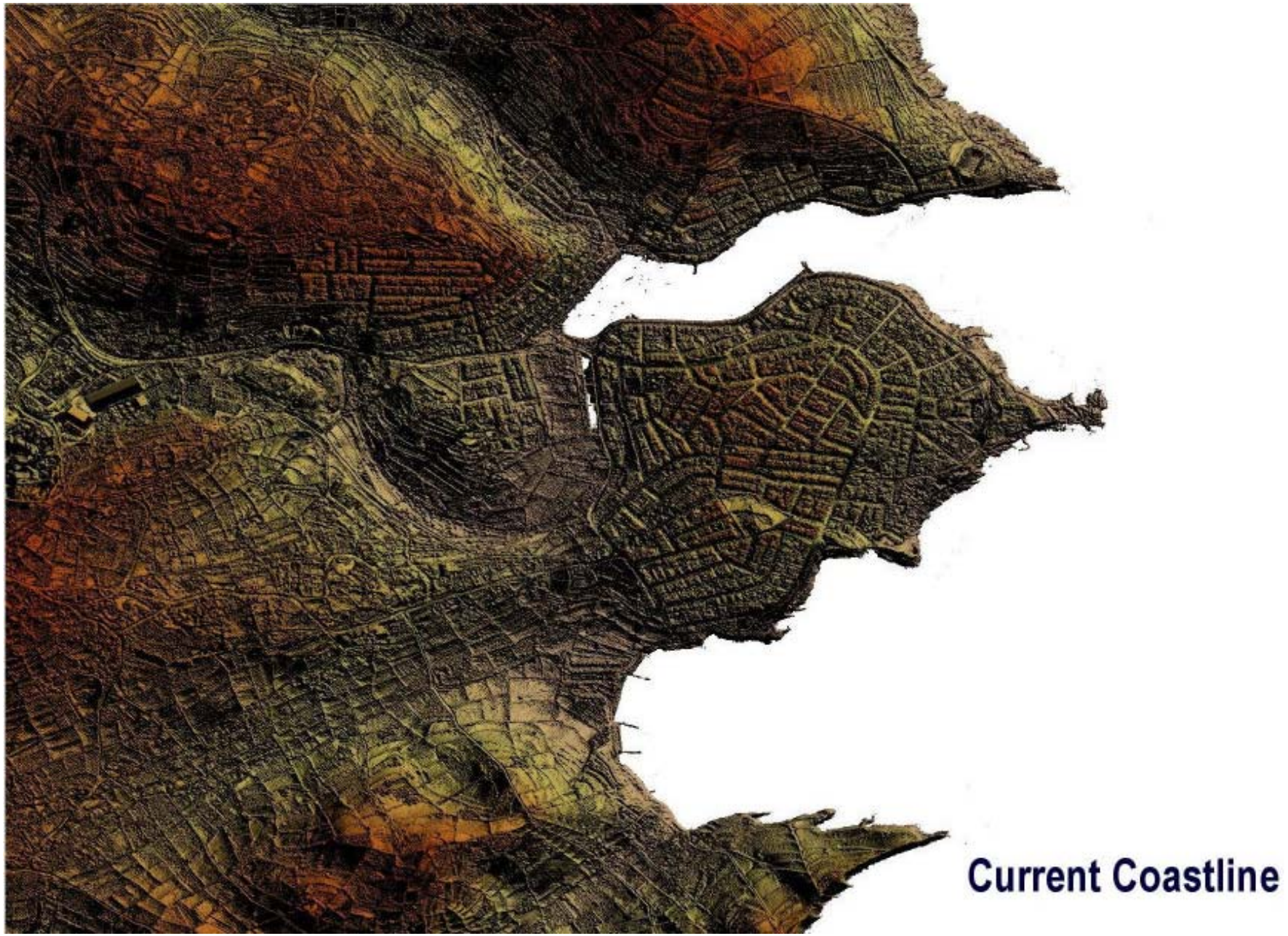

Case Study – Marsascala

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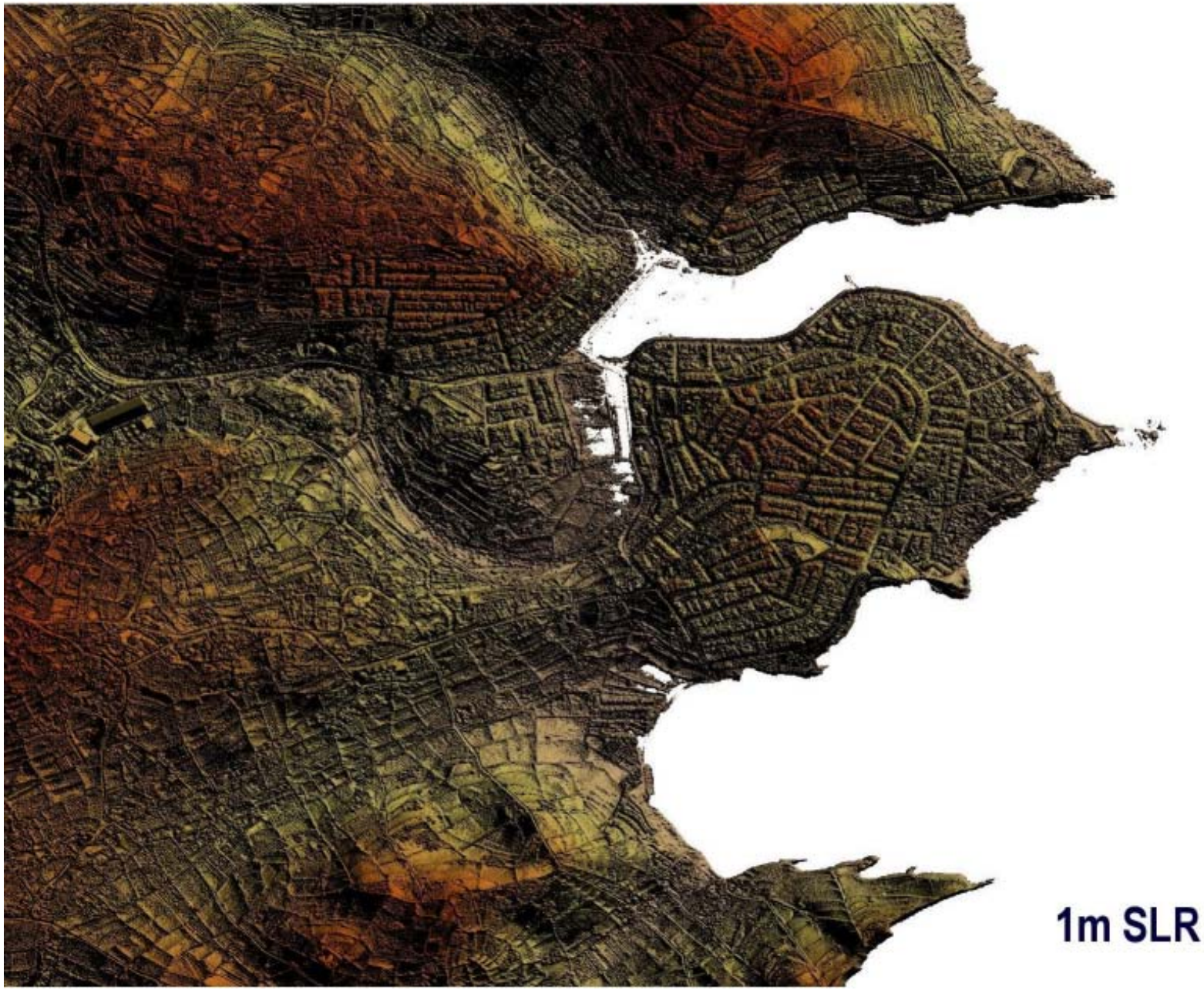

Case Study – Marsascala

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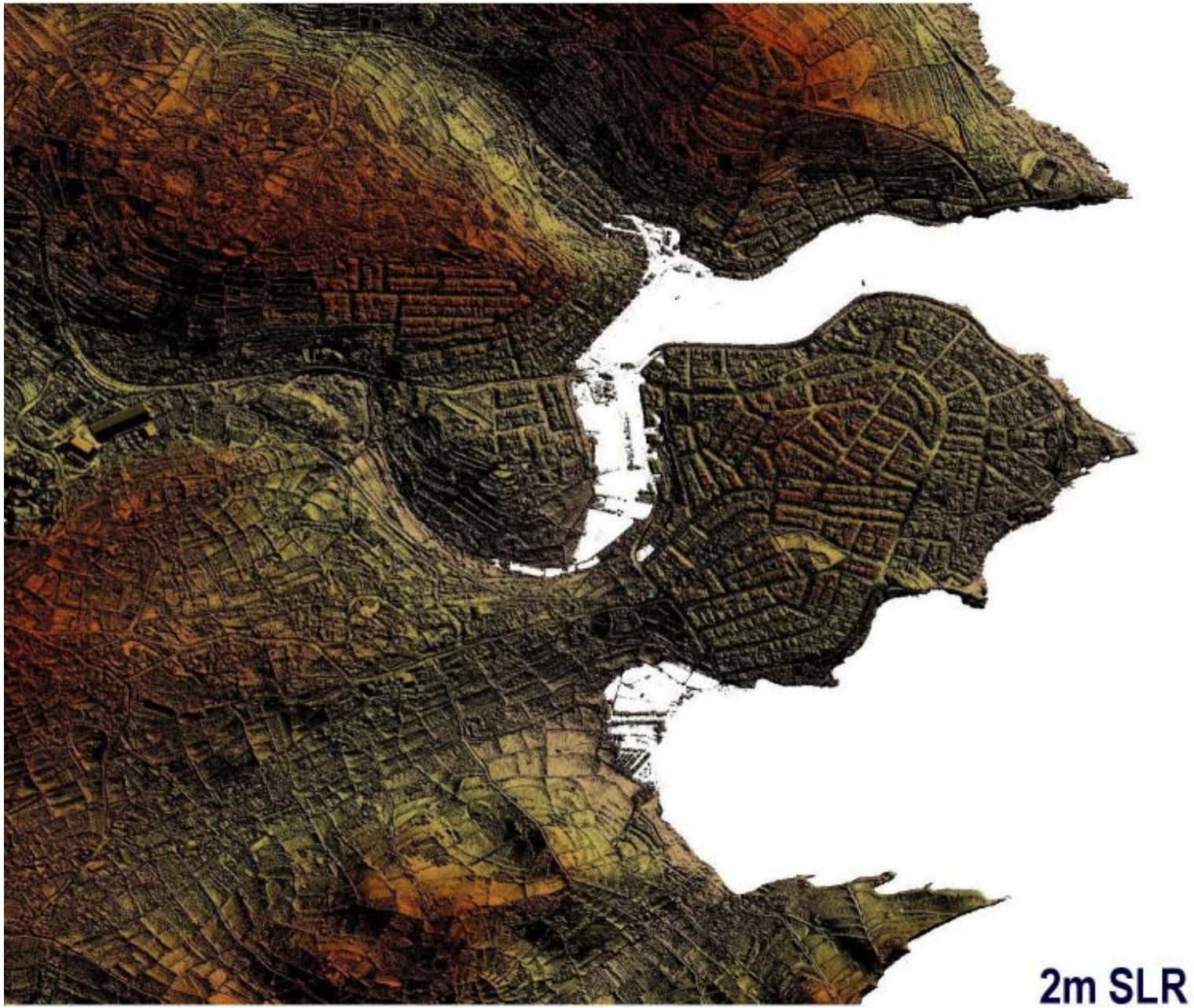

Case Study – Marsascala

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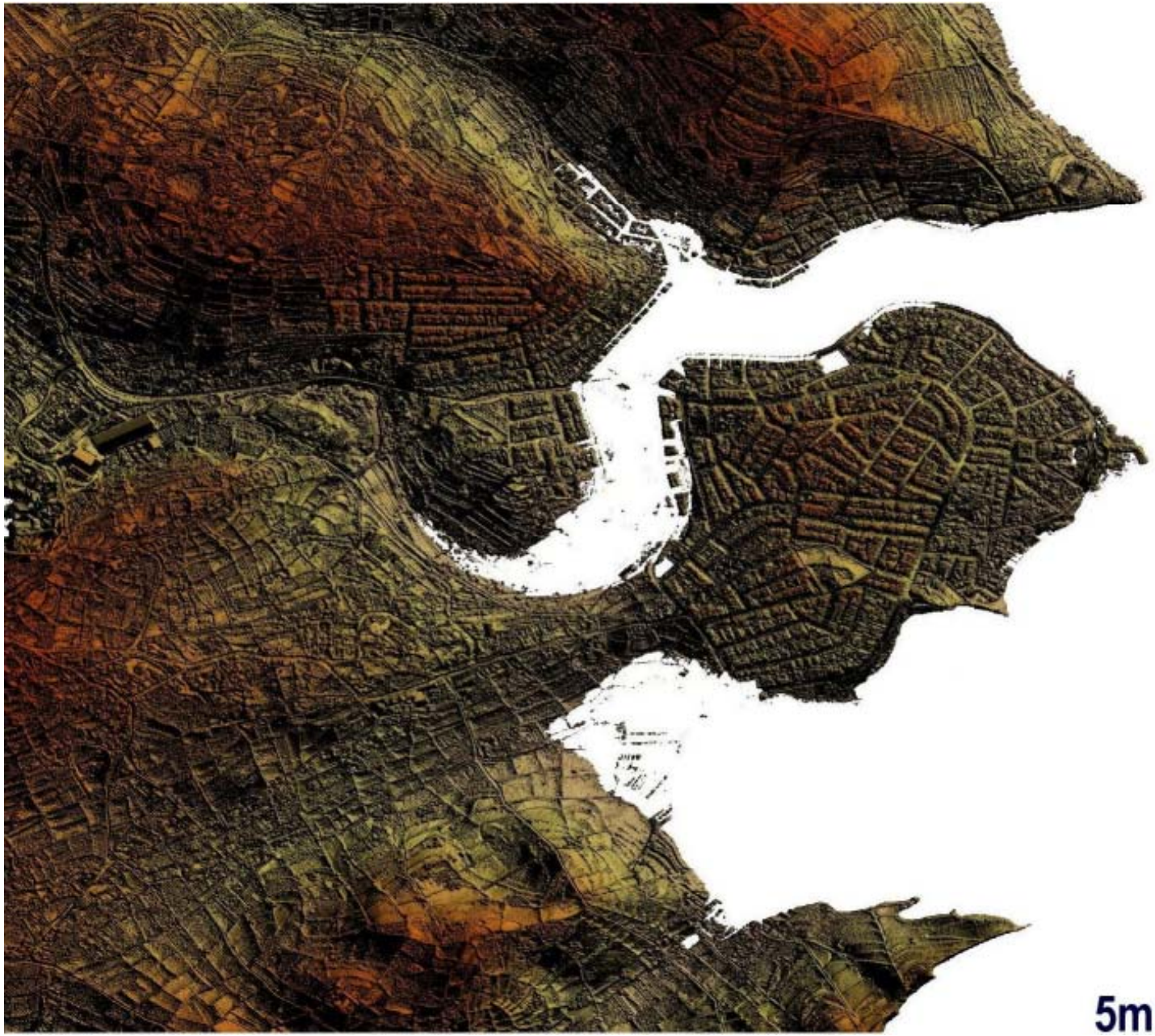

5m SLR

Case Study – Marsascala

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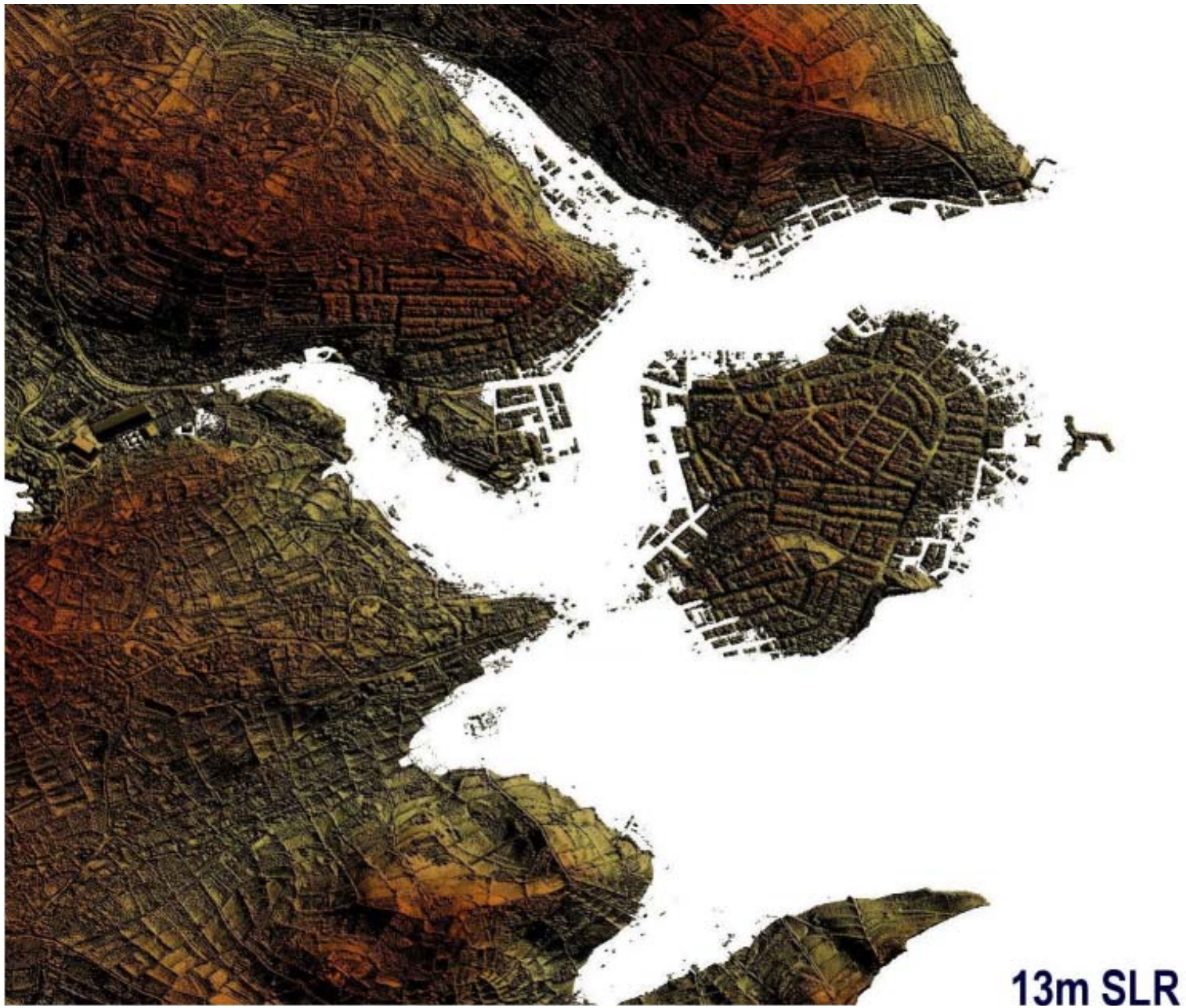

Case Study – Marsascala

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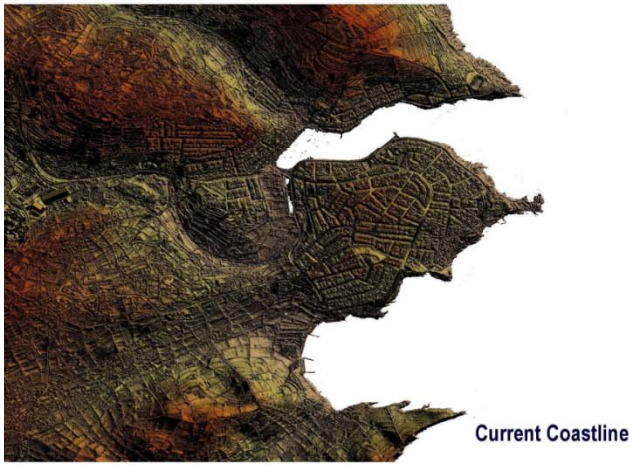

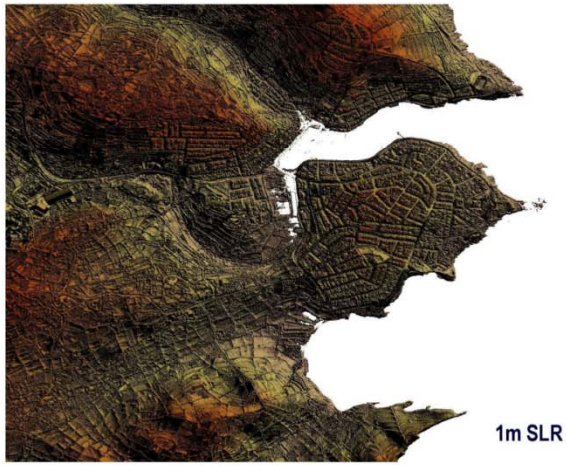

Marsascala Malta
Sea-Level Rise Scenarios
(current, 1m, 2m, 5m, 13m)

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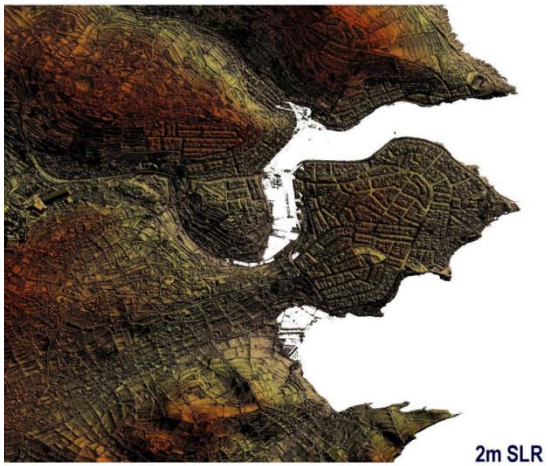
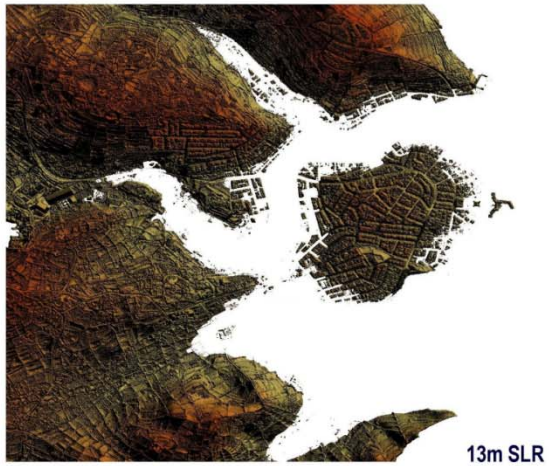
saviour.formosa@um.edu.mt





Case Study – Marsascala

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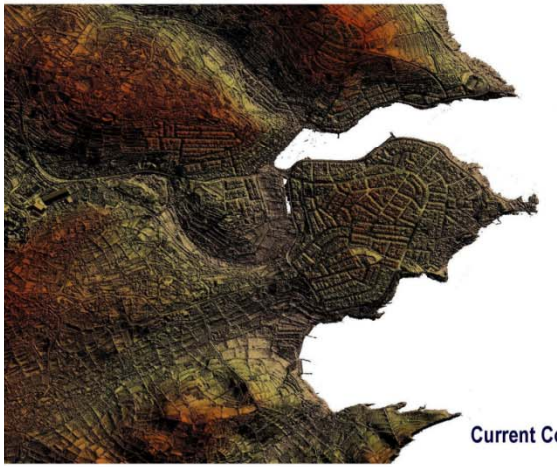
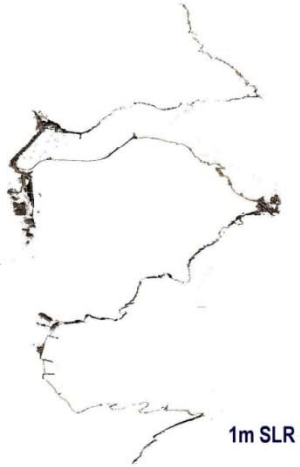

Current Coastline


1m SLR

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

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saviour.formosa@um.edu.mt


2m SLR


5m SLR


13m SLR

Case Study – Marsascala – SLR 3D

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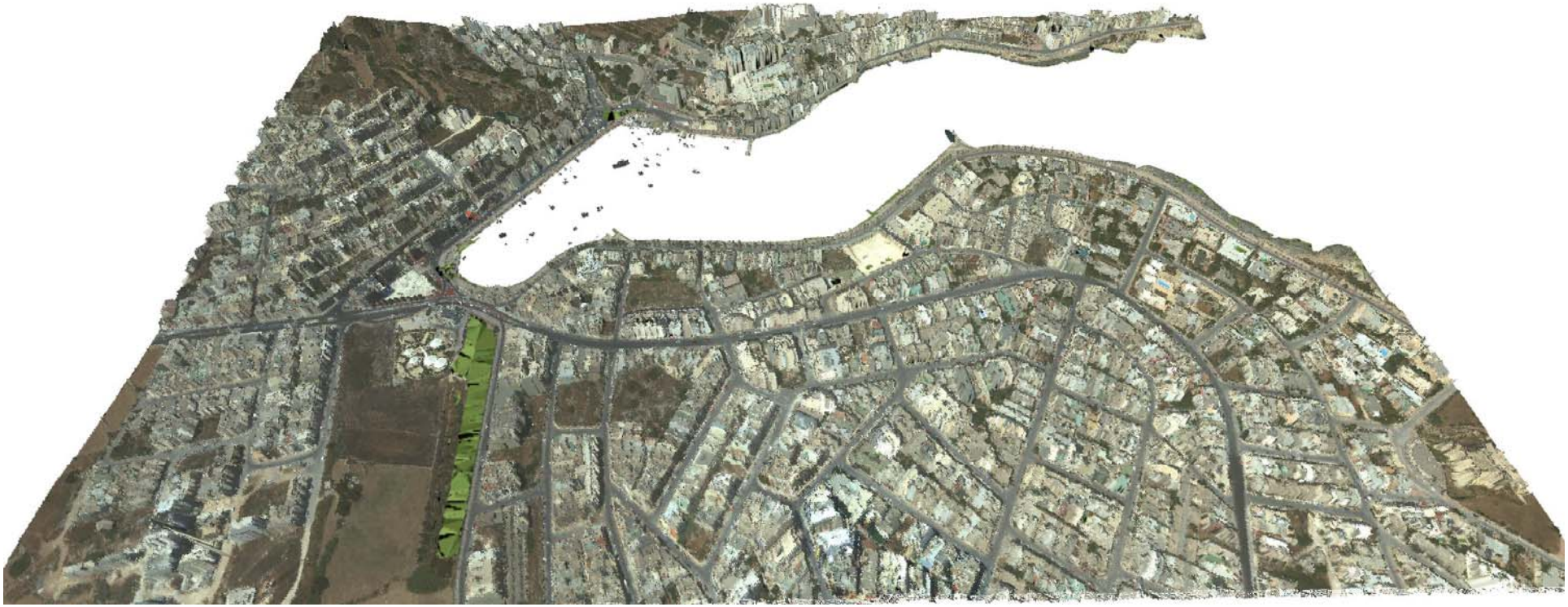
0m



Case Study – Marsascala – SLR 3D

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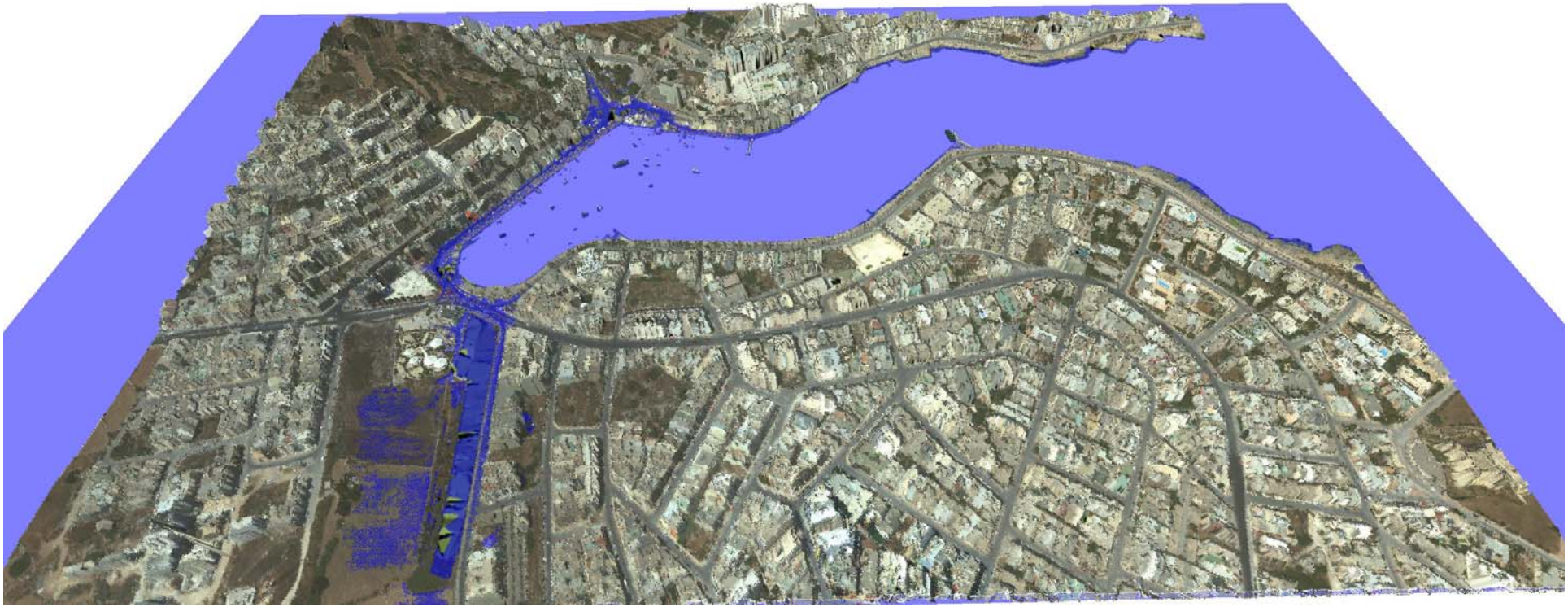
1m



Case Study – Marsascala – SLR 3D

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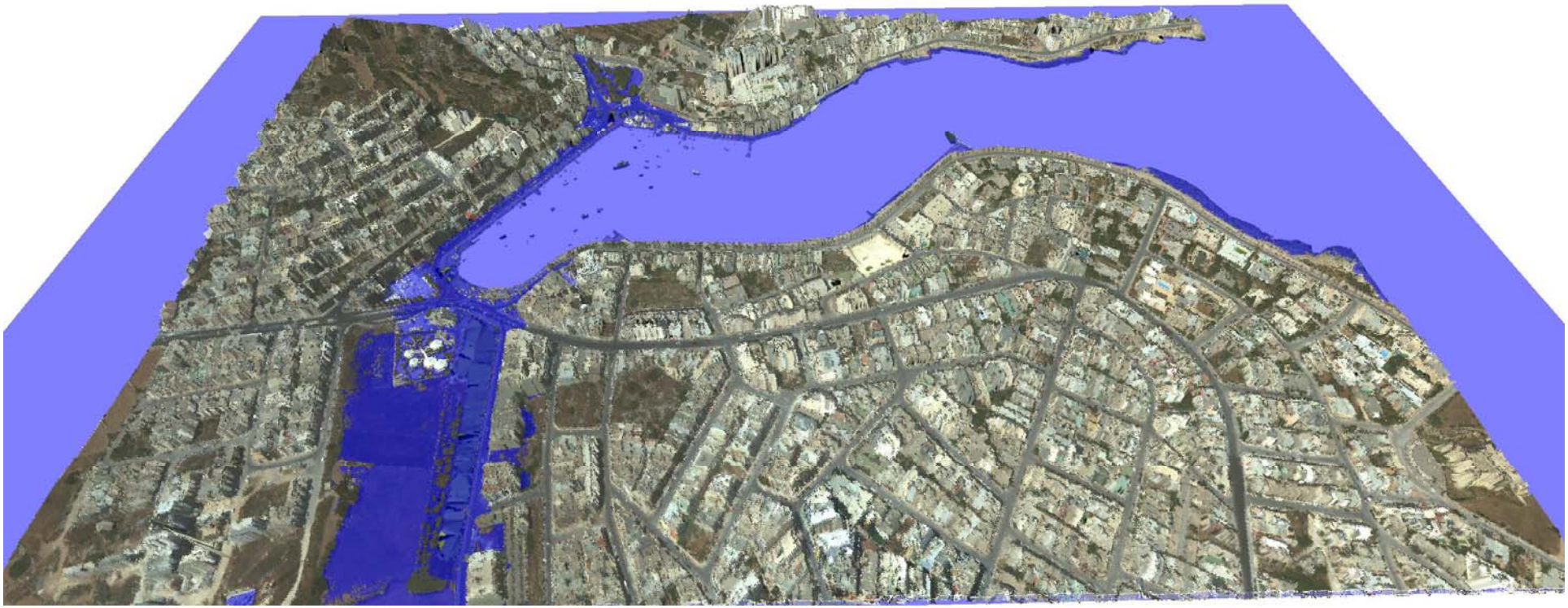
2m



Case Study – Marsascala – SLR 3D

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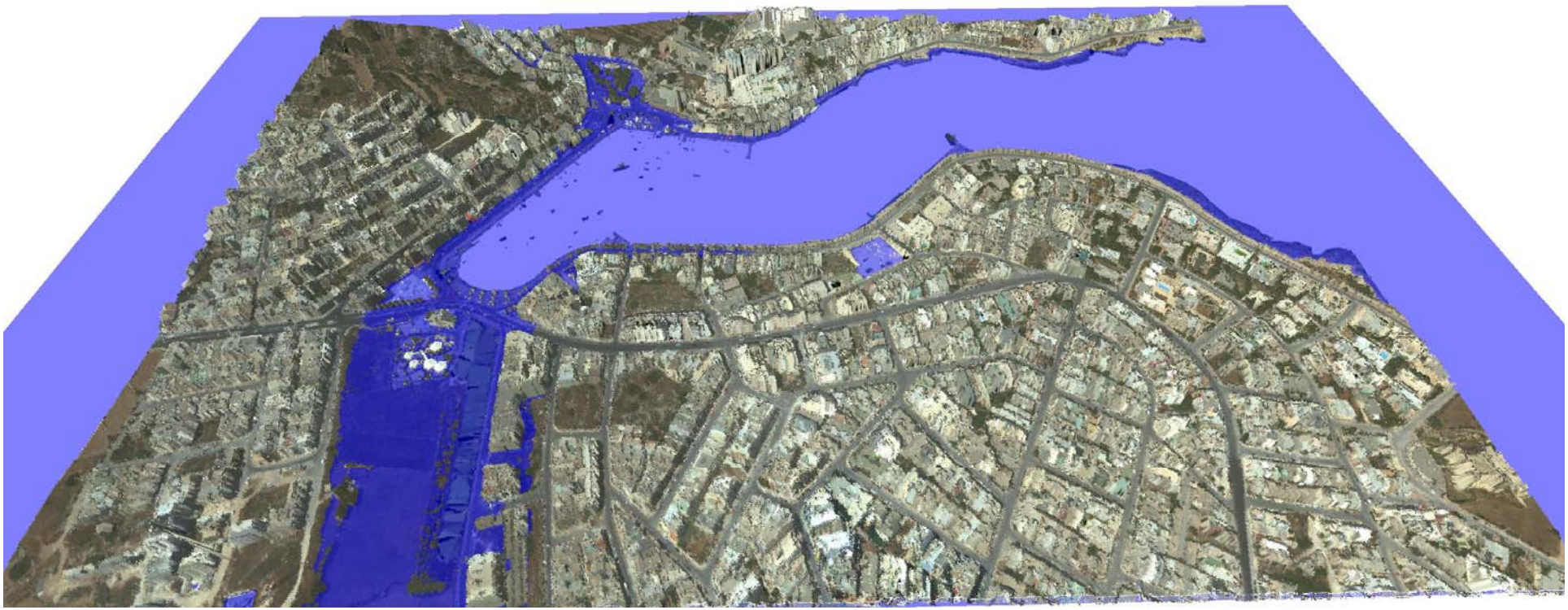
3m



Case Study – Gzira – SLR 3D

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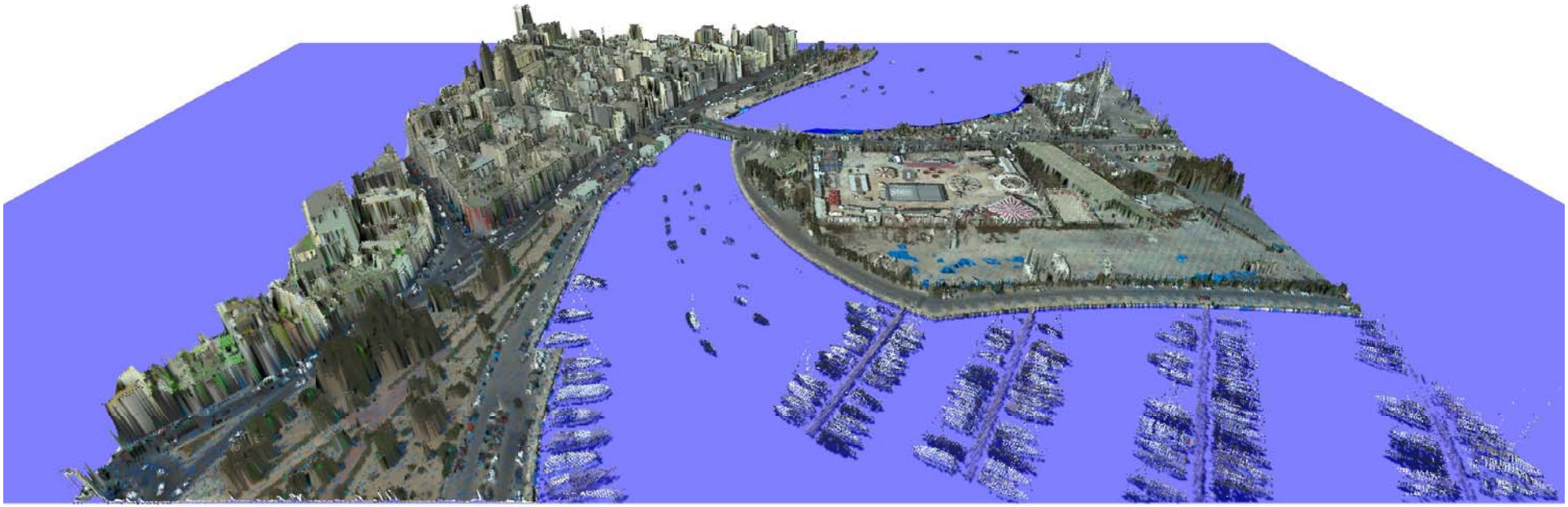
0m



Case Study – Gzira – SLR 3D

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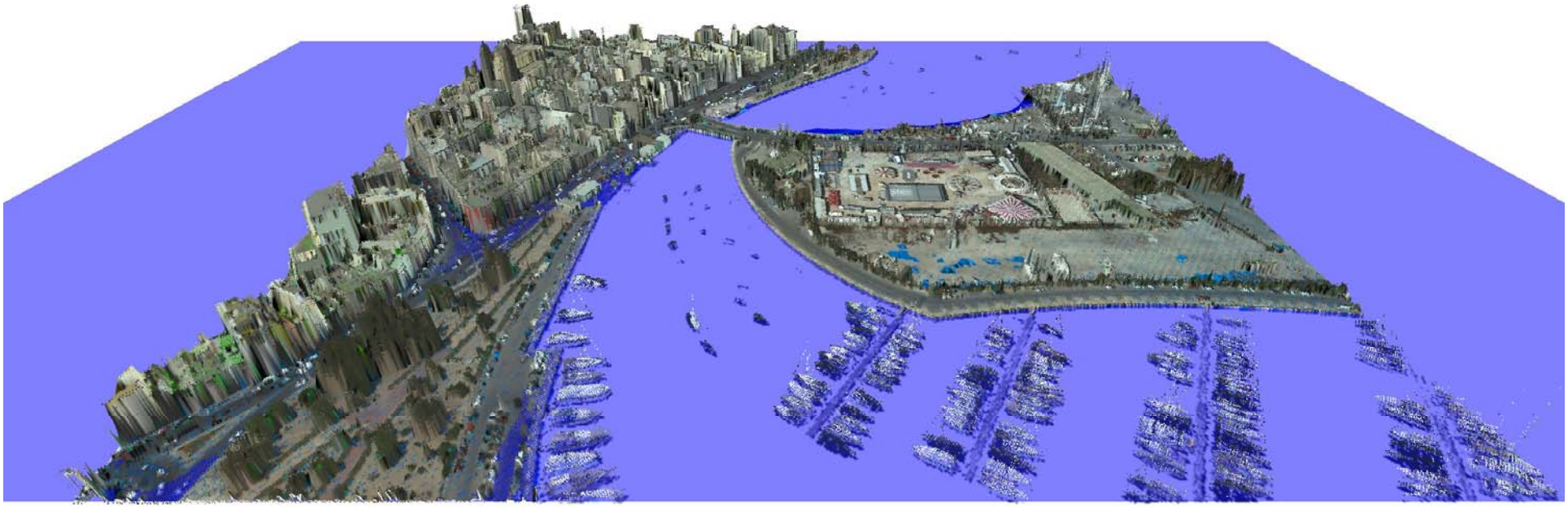
1m



Case Study – Gzira – SLR 3D

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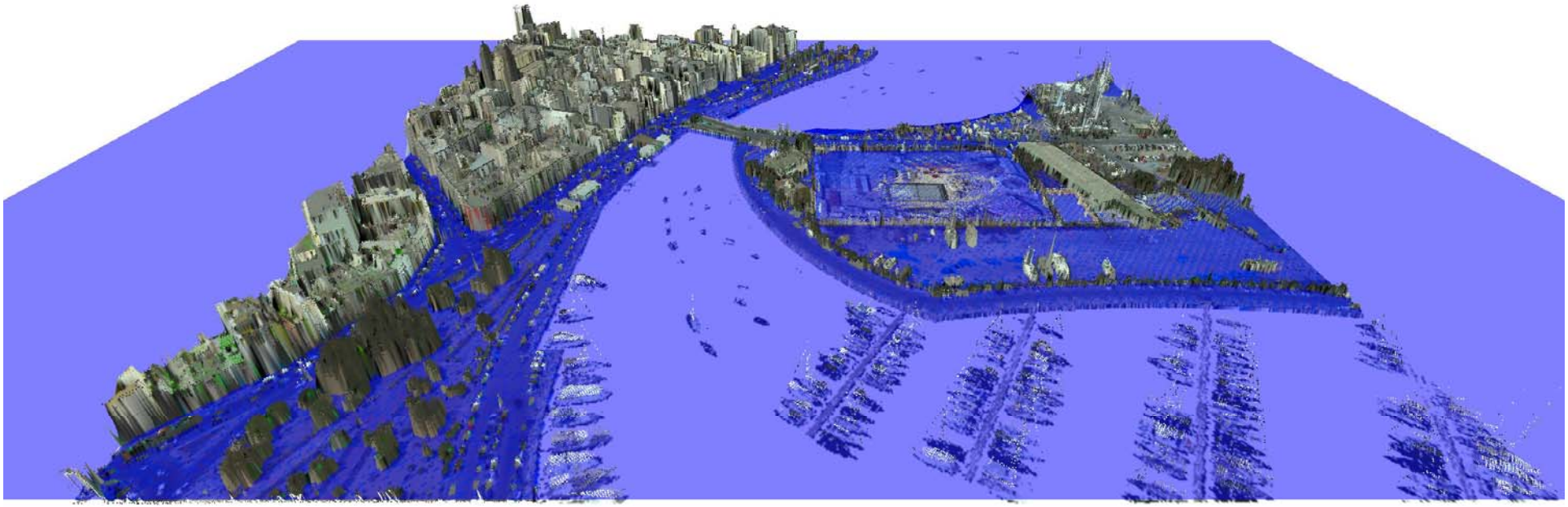
2m



Case Study – Gzira – SLR 3D

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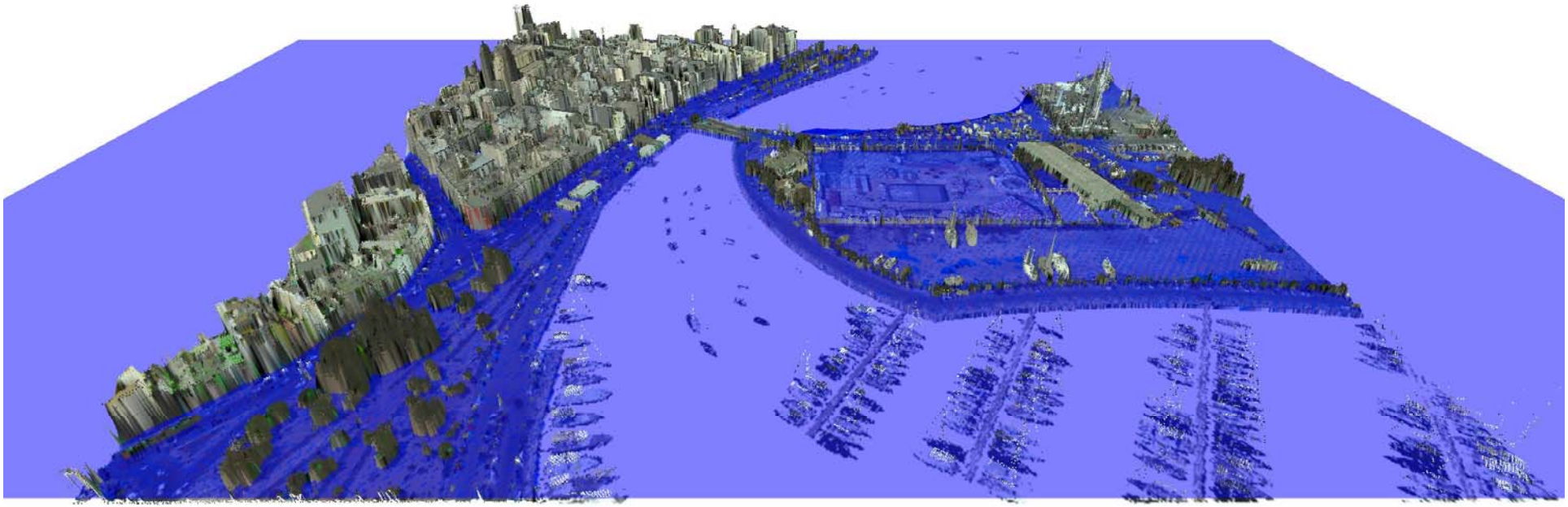
2.5m



Case Study – Sliema – SLR 3D

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0m

Case Study – Sliema – SLR 3D

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1m

Case Study – Sliema – SLR 3D

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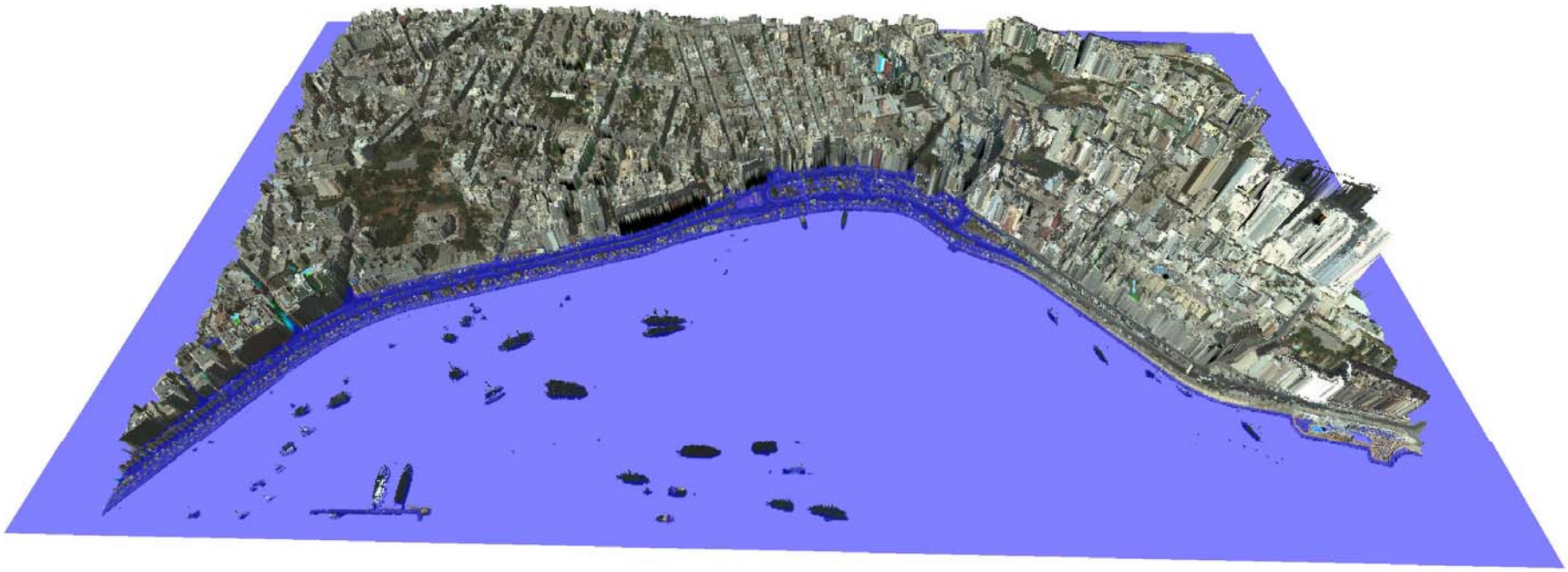
2m



Case Study – Sliema – SLR 3D

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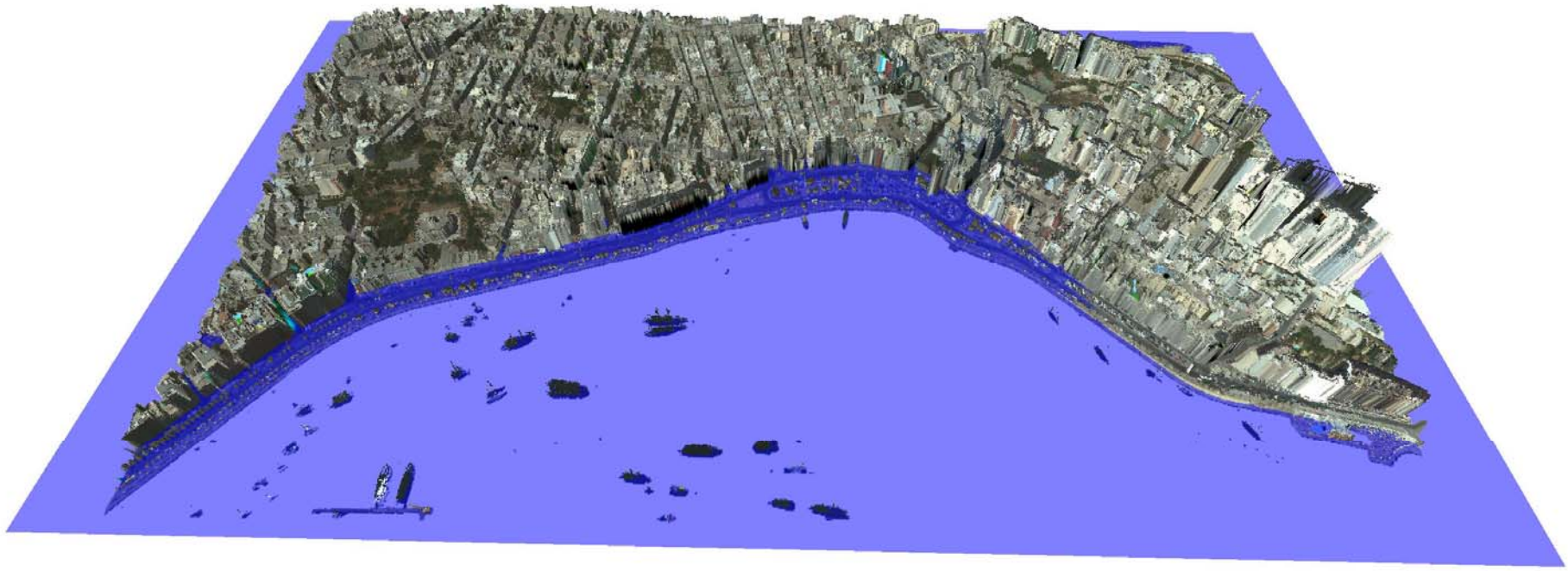
3m

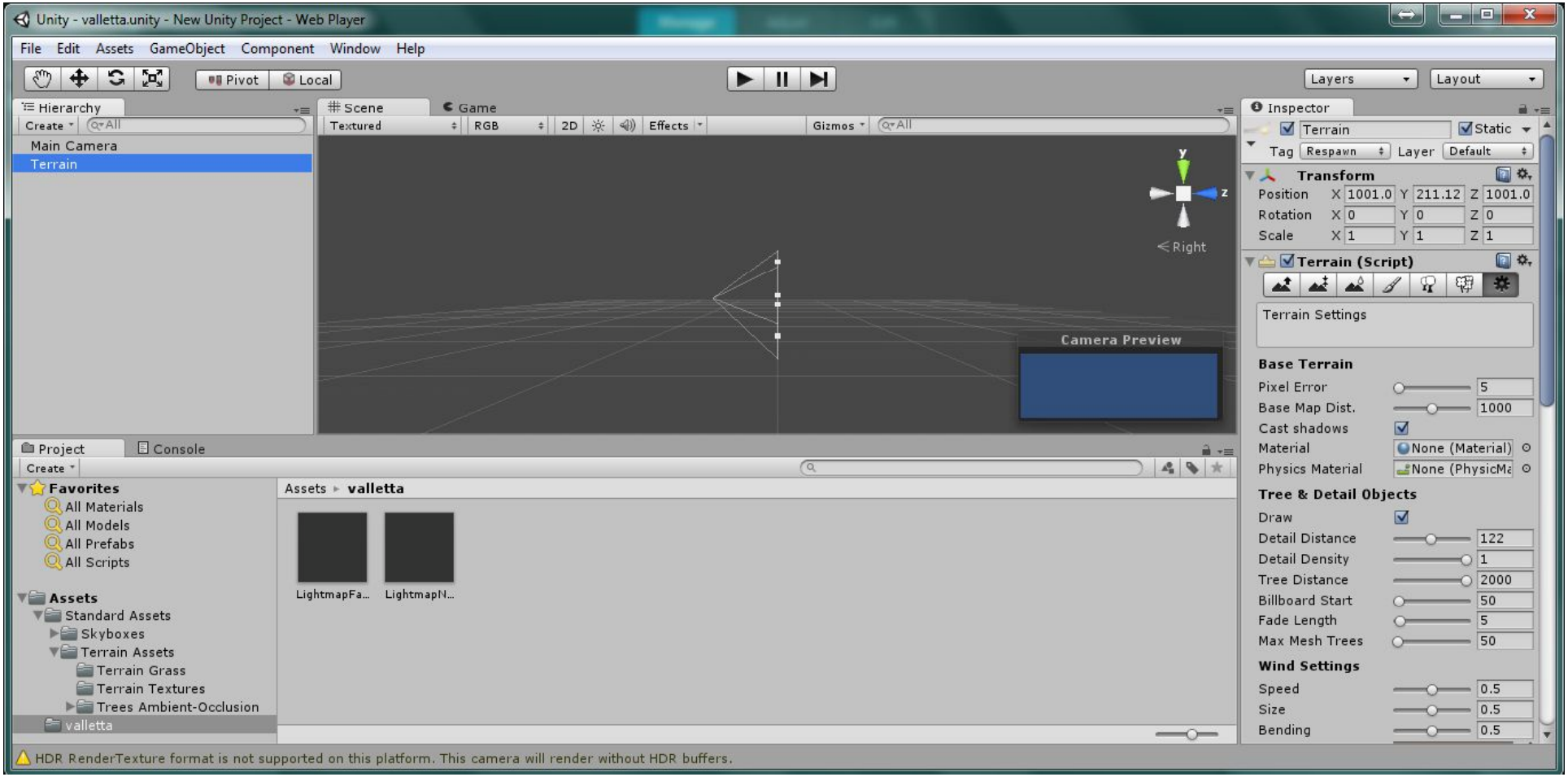


Sourcing Techs

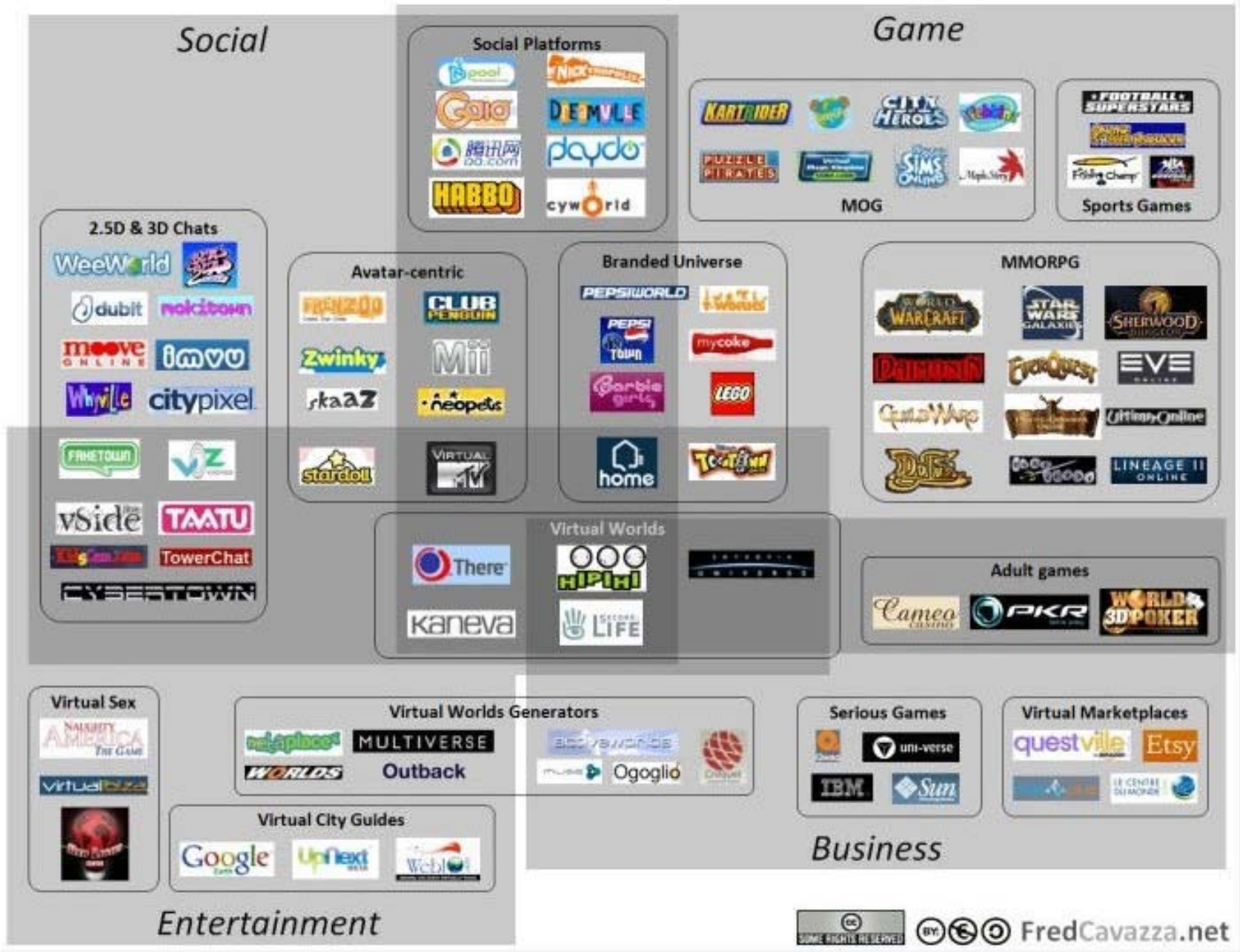
However, usage is very limited

SimCity

Unity3D


Unity - valletta.unity - New Unity Project - Web Player
File Edit Assets GameObject Component Window Help
Pivot Local
Layers Layout
Hierarchy
Create All
Main Camera
Terrain
Scene Game
Textured RGB 2D Effects Gizmos All
Right
Camera Preview
Inspector
Terrain Static
Tag Respawn Layer Default
Transform
Position X 1001.0 Y 211.12 Z 1001.0
Rotation X 0 Y 0 Z 0
Scale X 1 Y 1 Z 1
Terrain (Script)
Terrain Settings
Base Terrain
Pixel Error 5
Base Map Dist. 1000
Cast shadows
Material None (Material)
Physics Material None (PhysicMa
Tree & Detail Objects
Draw
Detail Distance 122
Detail Density 1
Tree Distance 2000
Billboard Start 50
Fade Length 5
Max Mesh Trees 50
Wind Settings
Speed 0.5
Size 0.5
Bending 0.5
Project Console
Create
Favorites
All Materials
All Models
All Prefabs
All Scripts
Assets
Standard Assets
Skyboxes
Terrain Assets
Terrain Grass
Terrain Textures
Trees Ambient-Occlusion
valletta
Assets ▸ valletta
LightmapFa...
LightmapN...
HDR RenderTexture format is not supported on this platform. This camera will render without HDR buffers.

Virtual Worlds


Social
Game
Social Platforms
2.5D & 3D Chats
Avatar-centric
Branded Universe
MMORPG
MOG
Sports Games
Virtual Worlds
Adult games
Virtual Sex
Virtual Worlds Generators
Serious Games
Virtual Marketplaces
Virtual City Guides
Business
Entertainment
FredCavazza.net

Then came MC

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Mdina

Pilot Study - Mdina

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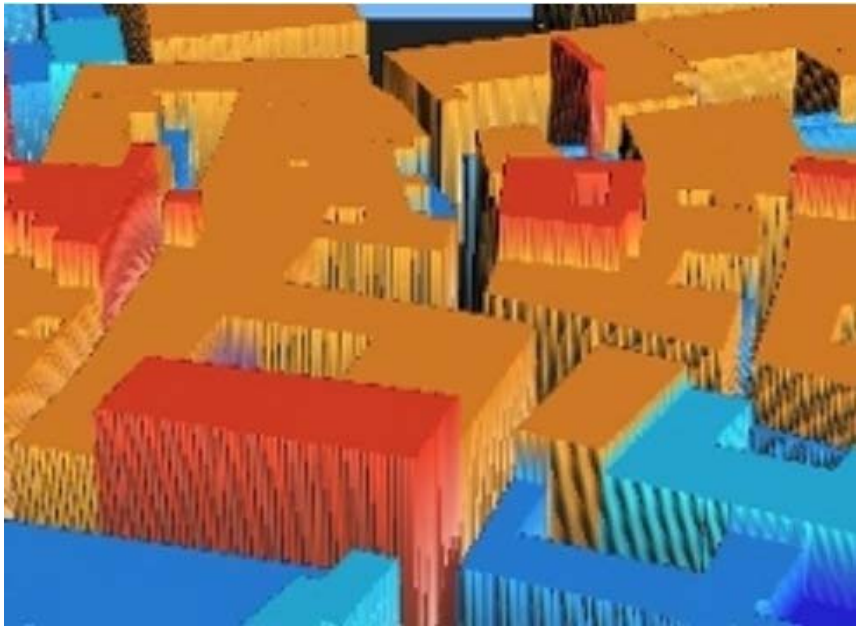

Pilot Study - Mdina

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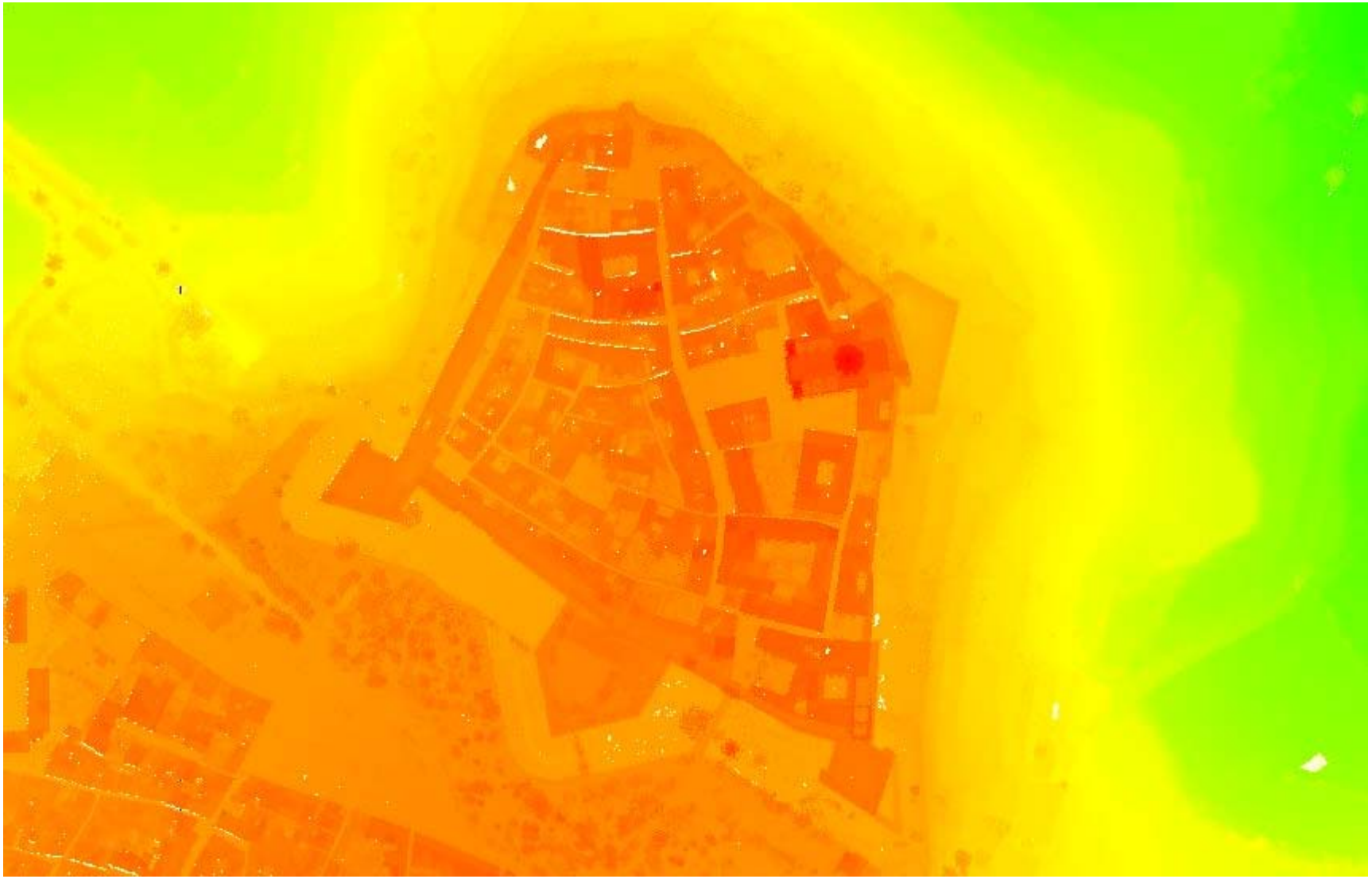

Pilot Study - Mdina

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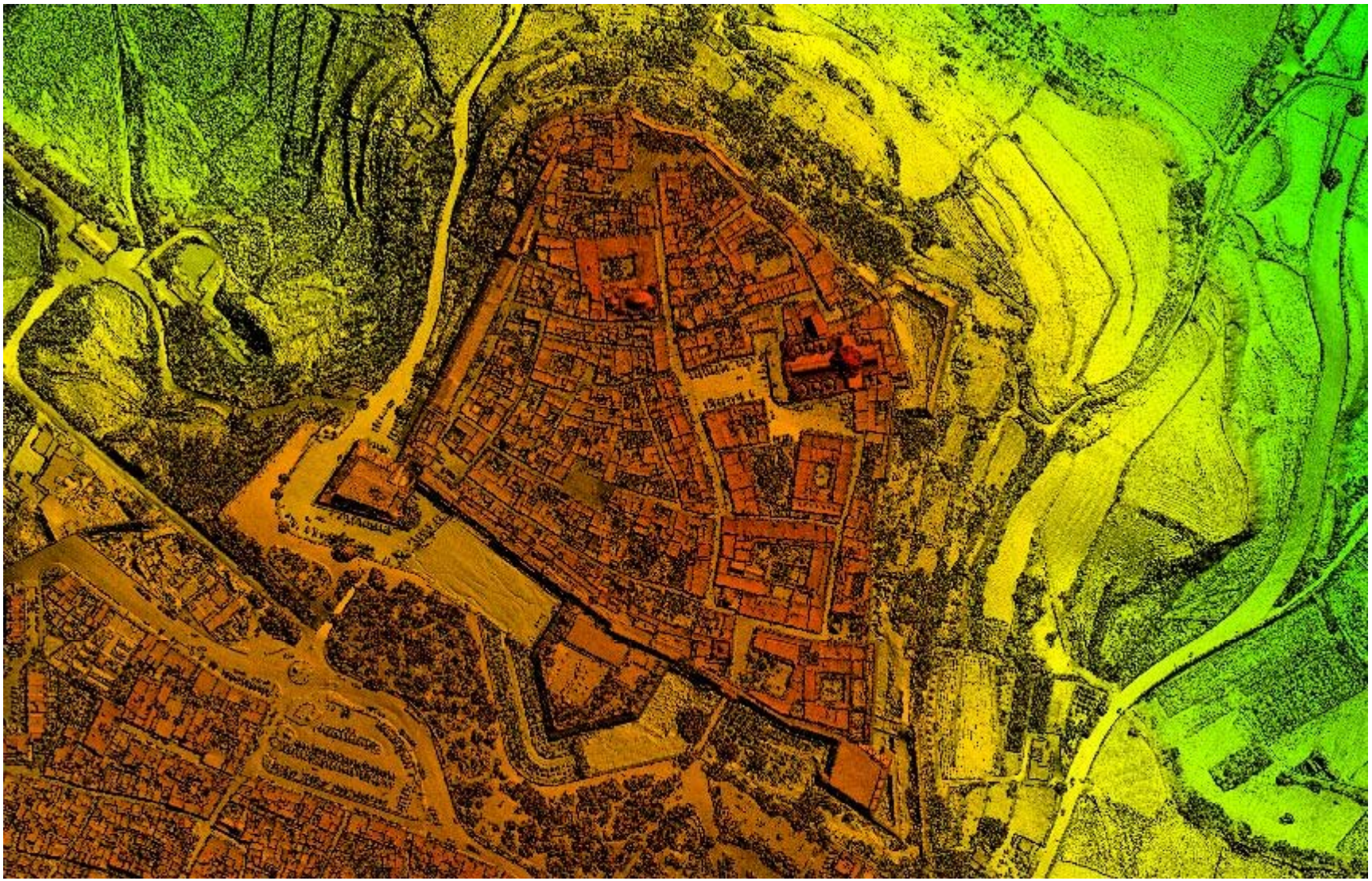

Pilot Study - Mdina

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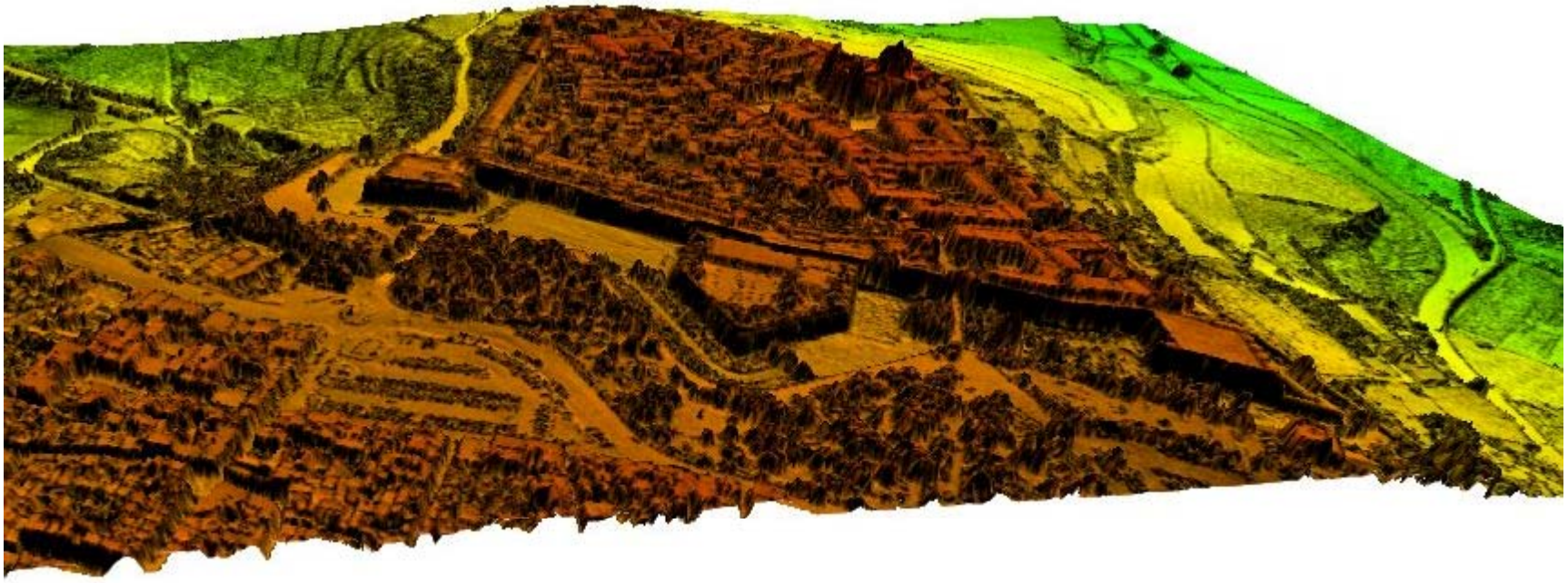

Pilot Study - Mdina

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Pilot Study - Mdina

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Pilot Study - Mdina

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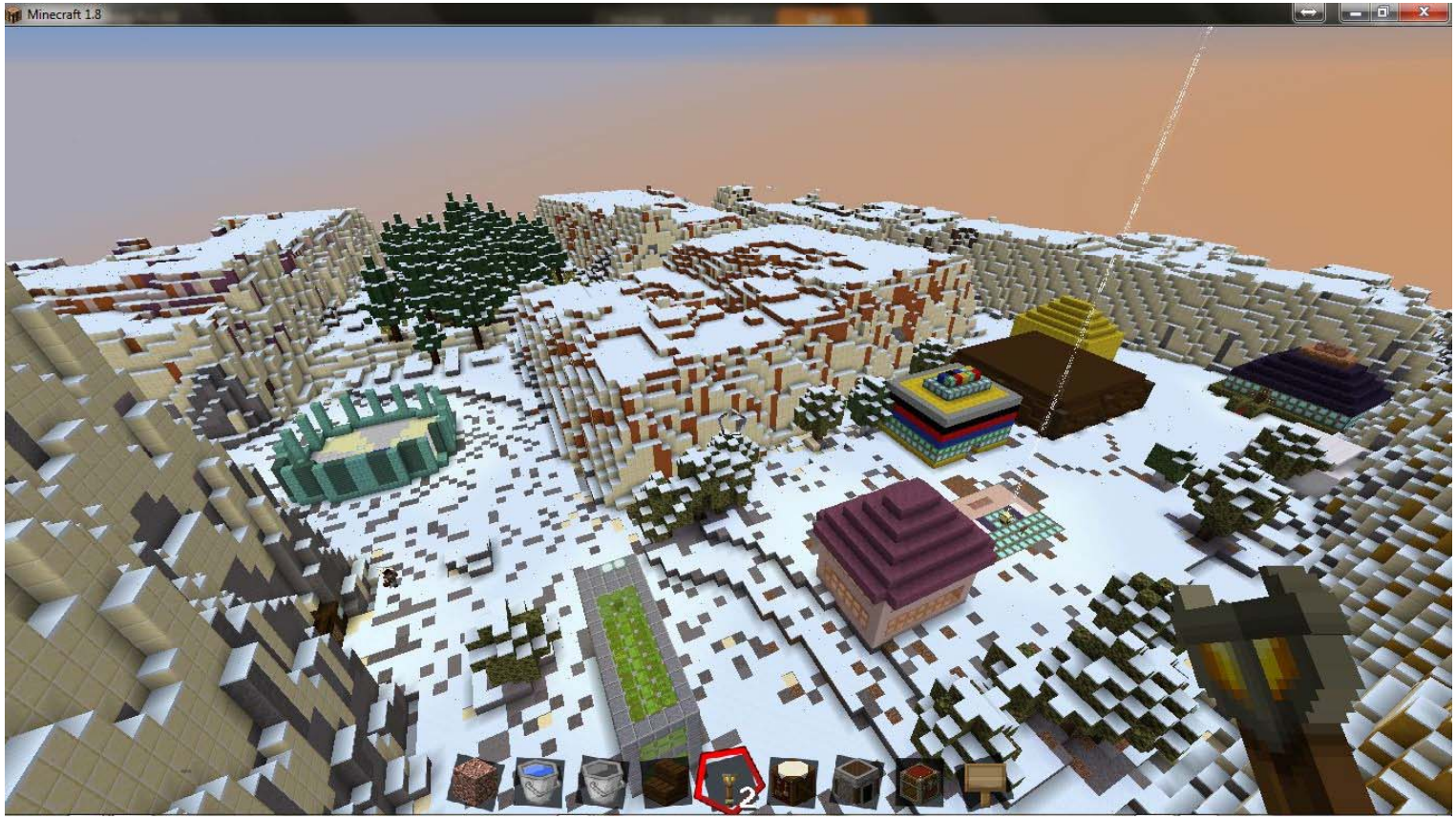
Pilot Study - Mdina



Pilot Study - Mdina

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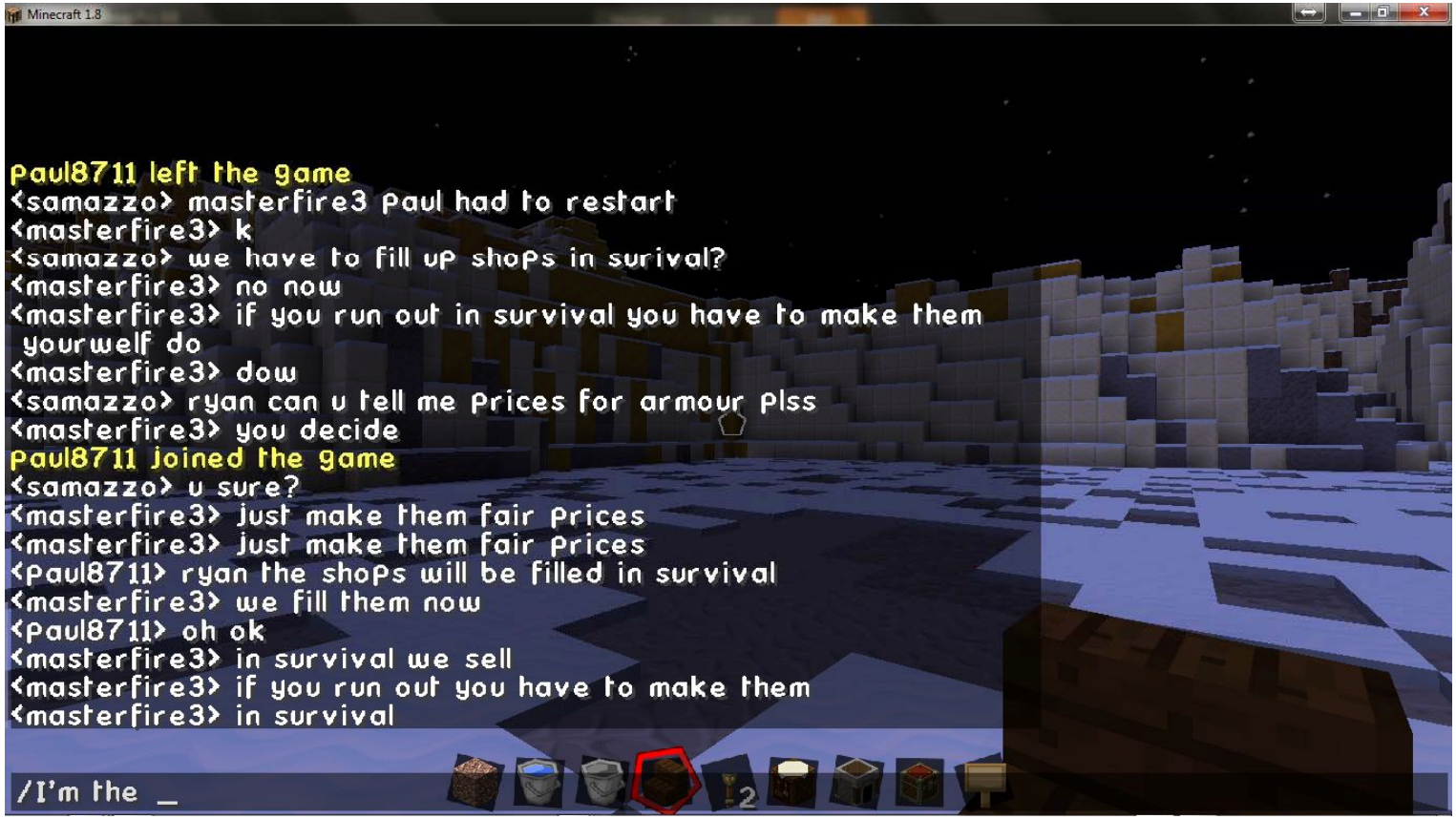
Pilot Study - Mdina



Pilot Study - Mdina

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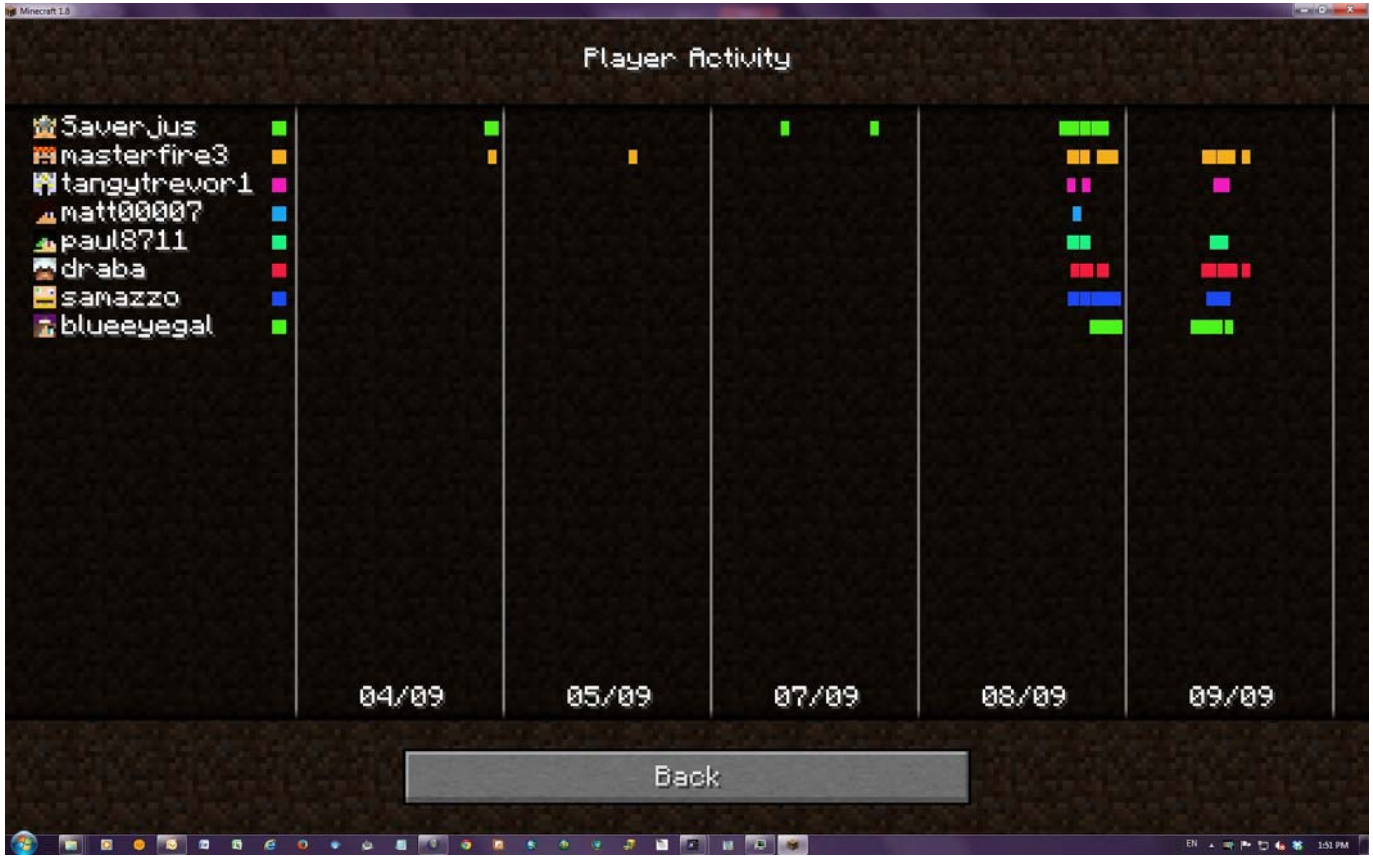
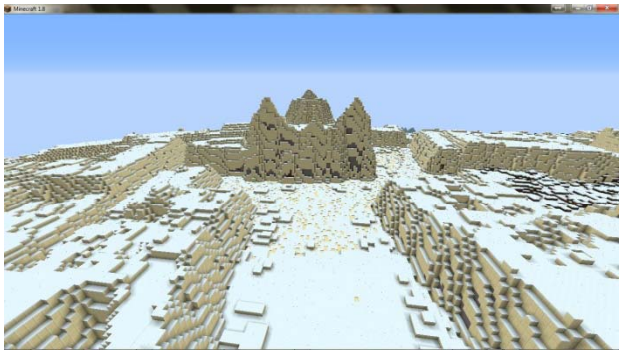


Pilot Study - Mdina



Peaceful Entry

Negotiated Outcome

Communication Breakdown

Future Social Interactionism

Post Project

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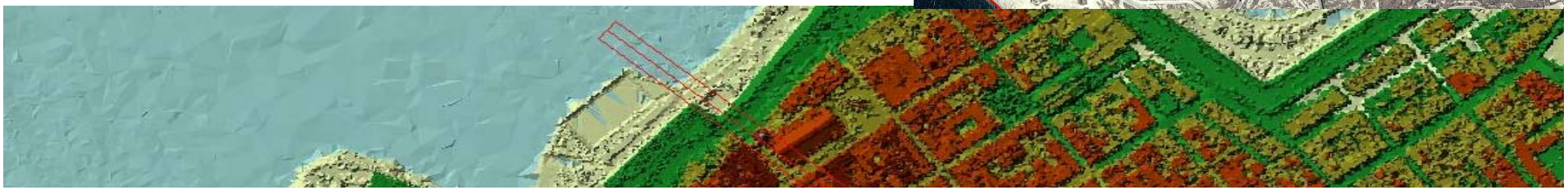
- Land Reclamation
- Urban roof area – solar power generation
- Quarries – volume analysis and solar canopies
- Archaeological surveying (Marine and Terrestrial)

- Sea level Rise
- Inundation and flood zones
- Noise Zones
- Network Creation
- Environmental monitoring (MPAs)

- Criminological Analysis
- Enforcement – change analysis
- Post-Disaster Management



Next Project – Integrative Effort

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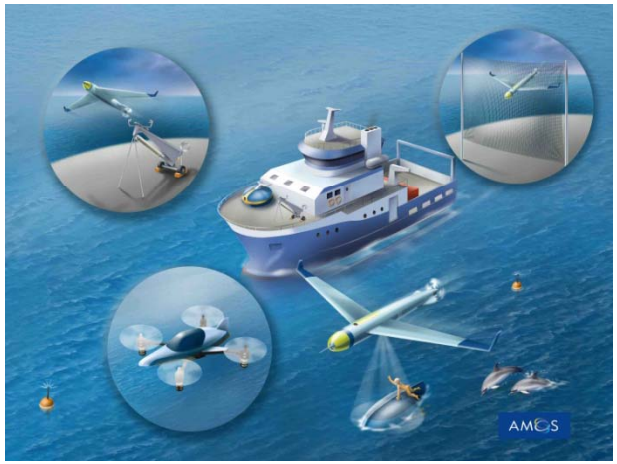
- Need for techs and serious gaming to help in interactivity monitoring and disaster management through scenarios, simulations, etc



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INVESTING IN YOUR FUTURE
EUROPEAN REGIONAL DEVELOPMENT FUND
MALTA 2014-2020

SIntegraM

Spatial Integration for the Maltese Islands:

Developing Integrated National Spatial Information Capacity

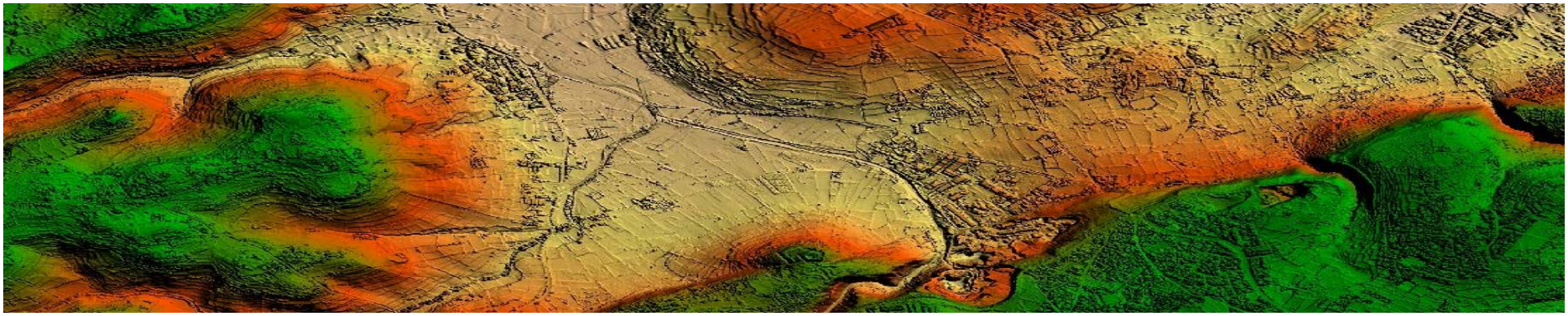
SIntegraM:

Spatial Integration for the Maltese Islands: Developing Integrated National Spatial Information Capacity

INVESTING IN YOUR FUTURE

EUROPEAN REGIONAL DEVELOPMENT FUND

MALTA 2014-2020



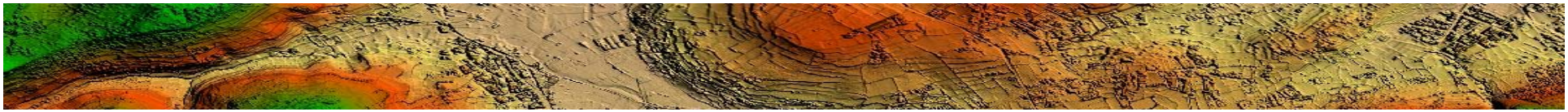
Operational Programme X – Cohesion Policy 2014-2020
Investing in Competitiveness for a Better Quality of Life
Project part-financed by the European Union
European Regional Development Fund (ERDF)
Co-financing rate: 85% EU funds; 15% National Funds

Investing in your future

The Target

- **Project Title** — Spatial Integration for the Maltese Islands: Developing Integrated National Spatial Information Capacity
- **Beneficiaries** — Government of Malta through Malta Environment and Planning Authority and 41 partners
- **Partners** — Governmental Entities serving as spatial data creators
- **Budget** — € 7m tentative

  co-funded by ERDF (85%) - National Government (15%)
- **Duration** — Q3 2015 – Q4 2018



Initial Scoping

- Due to the various national/EU data creation obligations, Malta is committed to upgrade the national's spatial data capacity, which is currently not integrated and does not follow a coherent process but is based on an approach where each organisation has built its own systems that do not communicate with other entities' systems. This project aims at ensuring that the underlying infrastructure and capacity is available in order to deliver information and analysis as per national, EU and other international requirements.

However….

Spatial Infrastructure is hampered by:

- an old basemap
- non-earth data
- ancient technology
- silo-effect and inter-governmental data charging
- lack of integration
- limited human resources and training

→

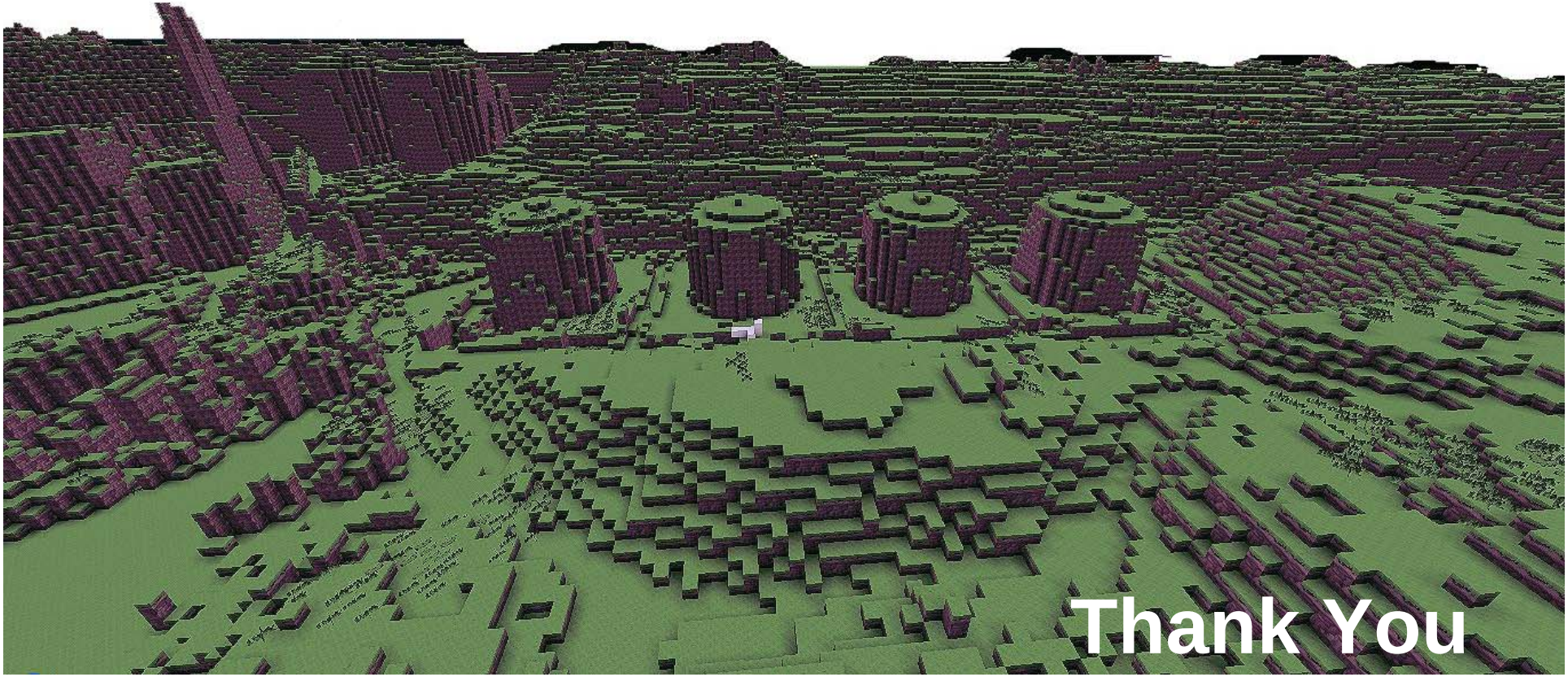
Needed….

Enhancement of data, systems, infrastructure, exchange and training:

- identification of information gaps in the data cycle
- identification of data being created
- creation of new basemaps
- integration of all data in a national system
- creation of data exchange security protocols
- building of infrastructure
- training of experts

The Scope: 5+1+2

- To develop a national spatial data infrastructure and capacity for Malta, with the focus on 5+1+2 main themes:
  - Developing a new Basemap for the Maltese Islands
  - Aligning all spatial data in a common projection (removing the current truncated data system)
  - Creating an online dissemination and analysis spatial information system
  - Building the necessary infrastructure to enable the entire data cycle (design-input-analysis-output-reporting)
  - Building the necessary infrastructure to future preparedness
  - Building human capacity in the spatial themes across all governmental entities
  - Adhering to the INSPIRE Directive and relevant legislation
  - Creating a series of protocols that enable the free exchange of data and knowledge across the entities



Dr Saviour Formosa PhD

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