

# **EuroSDR Commission 1: Questionnaire**

## **Single Photon and Geiger Mode Lidar Workshop**

### **Barcelona, Spain**

### **6th March 2019**

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- EuroSDR and Commission 1
- Background to workshop
- 2018 Questionnaire results

# EuroSDR Vision

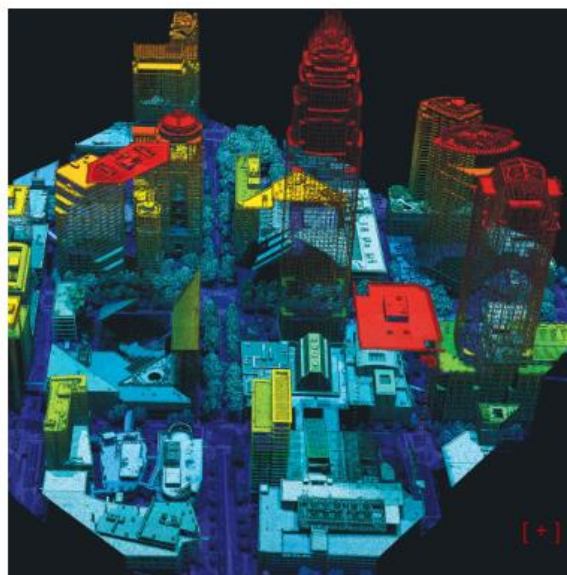
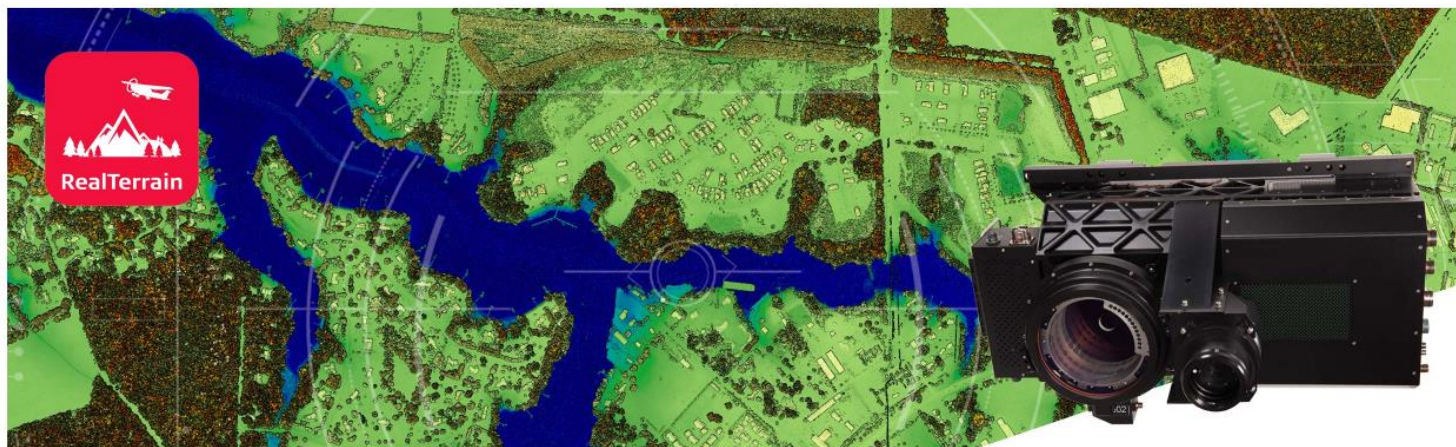
- To be the European research platform for National Mapping and Cadastral Agencies, Academic Institutes, the Private Sector, Industry and User Groups on issues related to the implementation of technology developments with respect to optimising the provision of reference information in a Spatial Data Infrastructure context

# Commission 1: Data acquisition

- **Mission:**  
To explore, test and validate platforms, sensors and algorithms to acquire geospatial data, with emphasis on accuracy, reliability and standardization of data processing procedures.
- **Keywords:** platforms, sensors, georeferencing, positioning, mobile mapping, point clouds, RPAS, oblique and nadir imagery, satellites

## Leica SPL100 Single Photon LiDAR Sensor

Captures LiDAR data over large areas at the lowest cost per data point using 100 outlet beams



## Geiger-mode LiDAR

Harris' proprietary Geiger-mode LiDAR data collection delivers the most accurate high-resolution elevation data available from an aerial platform for land-use, urban, and emergency planning; civil engineering; transportation and utilities infrastructure management; and natural resource management.

### One High-resolution LiDAR Collection Has Many Applications

Geiger-mode LiDAR technology allows us to collect elevation data points across large areas of land from high altitudes with high-resolution results and point densities up to 100 points per square meter (ppsm).

# Background: SPL and Geiger Mode Lidar

- Linear mode lidar typically requires c. 250 photons of energy for successful echo detection  
SP / GM lidar employ higher sensitivity receivers
- Implications:
  - Positive: Fly from higher altitudes / achieve higher areal coverage with similar point densities to linear mode / inherent bathymetric properties / ...
  - Negative: Lower height accuracy / higher rate of outliers / weaker vegetation penetration / ...

# EuroSDR activity in SP / GM Lidar

- 2018  
Questionnaire  
Preliminary investigation (Charly Bernard)  
...
- 2019 - 2020  
Workshop  
Benchmark (proposed)

# Commission 1 Questionnaire

- Survey open: 13 August - 30 September 2018
- Circulated via EuroSDR and ISPRS  
120 responses
- Three sections  
Responder's details  
SP / GM lidar  
Commission 1 future topics [not reported here]



## Section 1

# Who responded?

# Company / organisation

- 112 / 120 responses specified

Eight did not specify

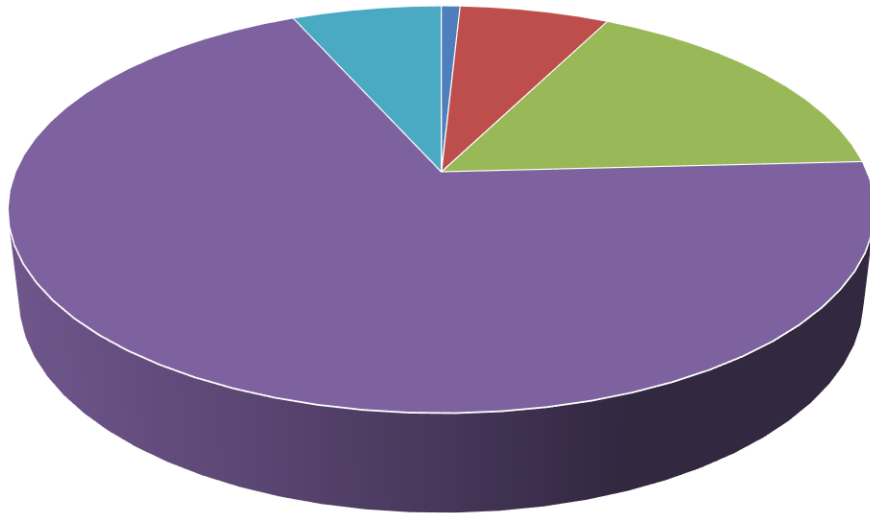
Six organisations responded twice

Two organisations responded three times

(All different respondents)

Implies minimum >100 organisations represented

# Which best describes your company / organisation?



■ Equipment manufacturer / vendor

■ National Mapping and Cadastral Agency (NMCA)

■ Other

■ Geospatial data provider

■ University or research institute

## “Other” responses:

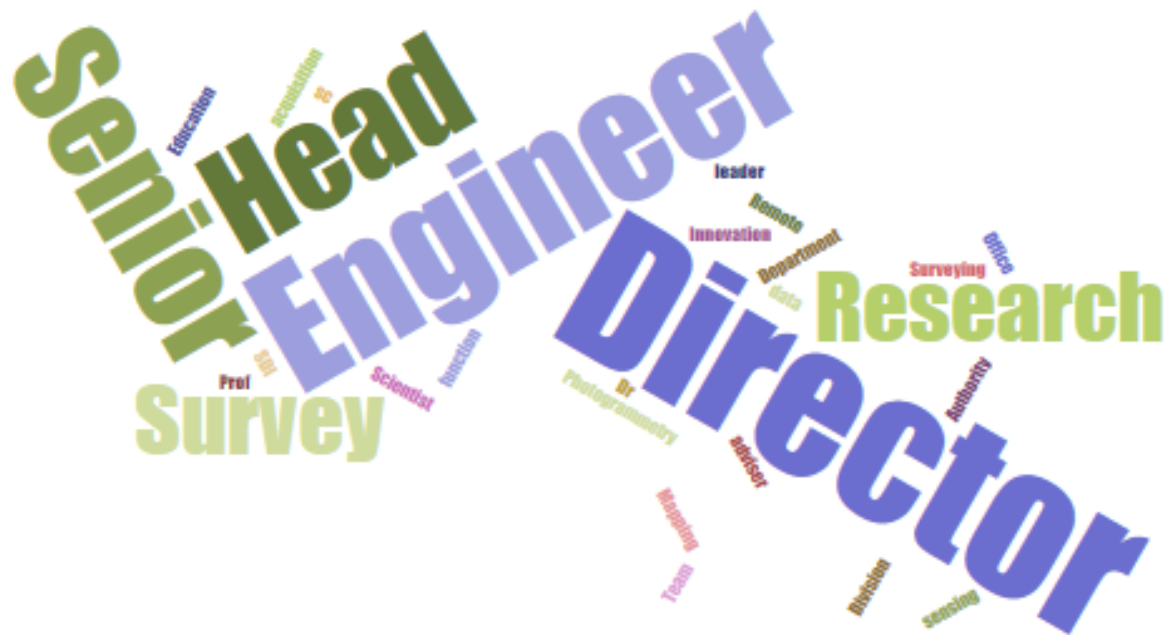
- Governmental organisation
- State Government
- Geospatial information company
- National Space Science Agency
- Municipality
- Zona Marino Costera
- Local government
- Design & Construction

# Job title



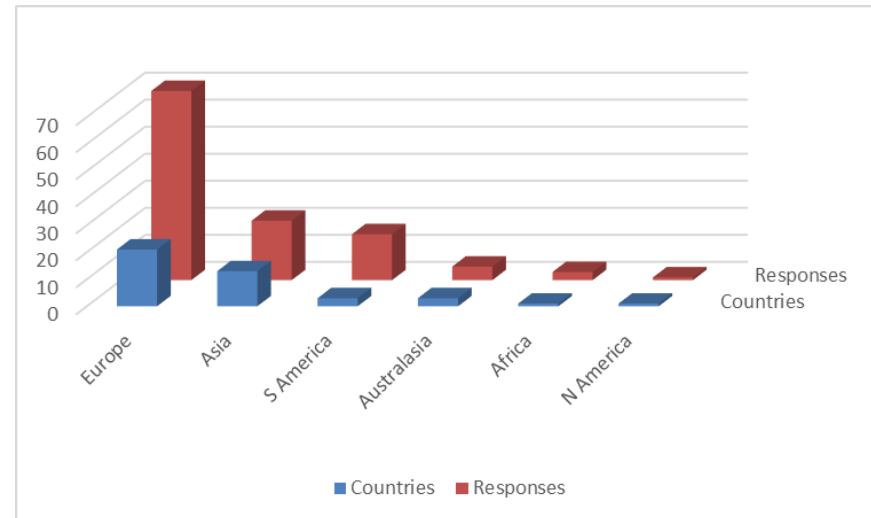
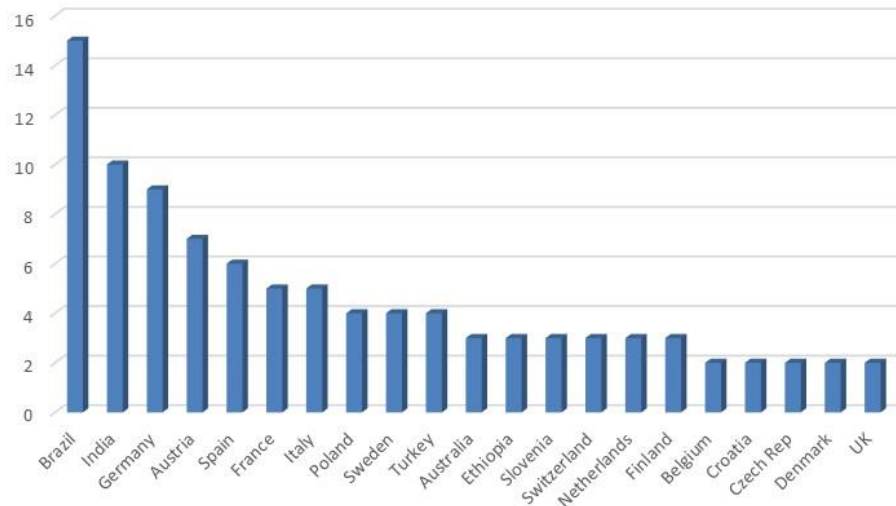
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# Job title (20 NMCA's only)



# National representation

- 118 / 120 responses
- 42 different nations on six continents
- 21 > one response (2 unspecified)



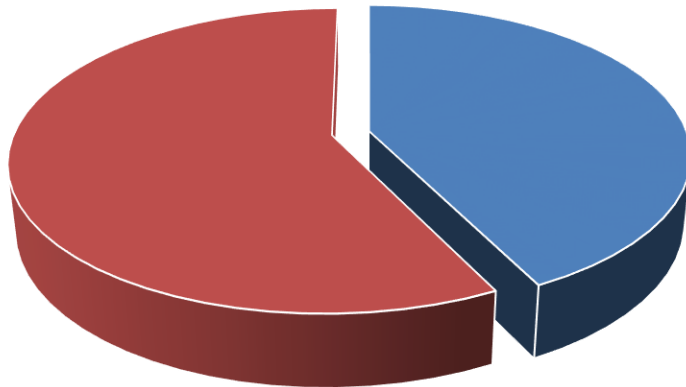
## Section 2

# SP / GM Lidar

# Awareness (120 responses)

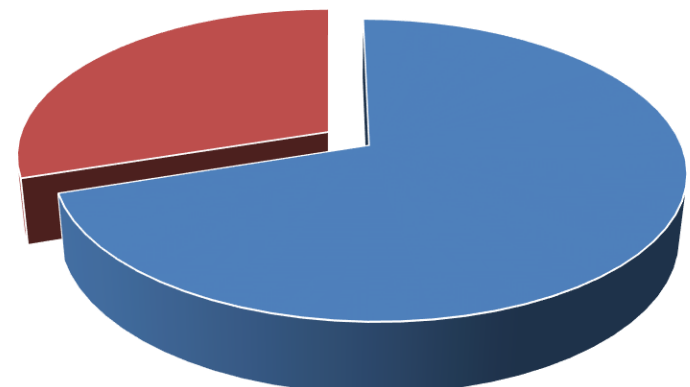
- Are you aware of SPL / GML technology?

All responses



■ Yes ■ No

NMCA responses



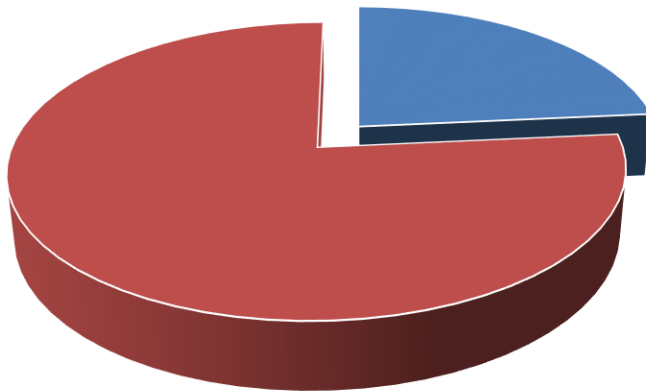
■ Yes ■ No



## Awareness (51 / 14 responses)

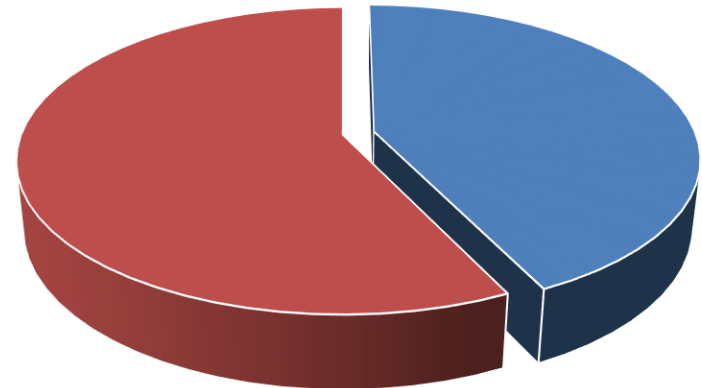
- Have you ever acquired or used SPL / GML data?

All responses



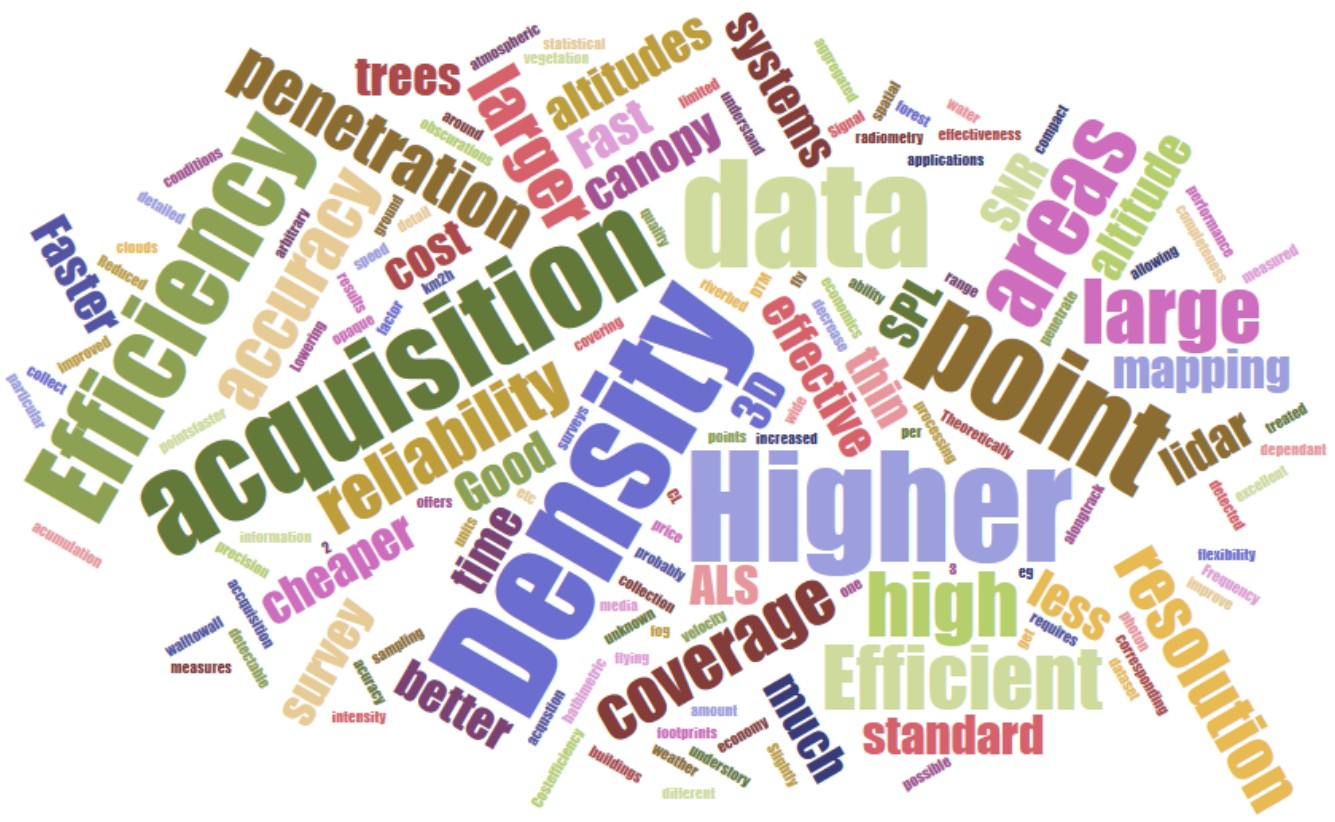
■ Yes ■ No

NMCA responses



■ Yes ■ No

# Perceived advantages of SPL / GML (51)

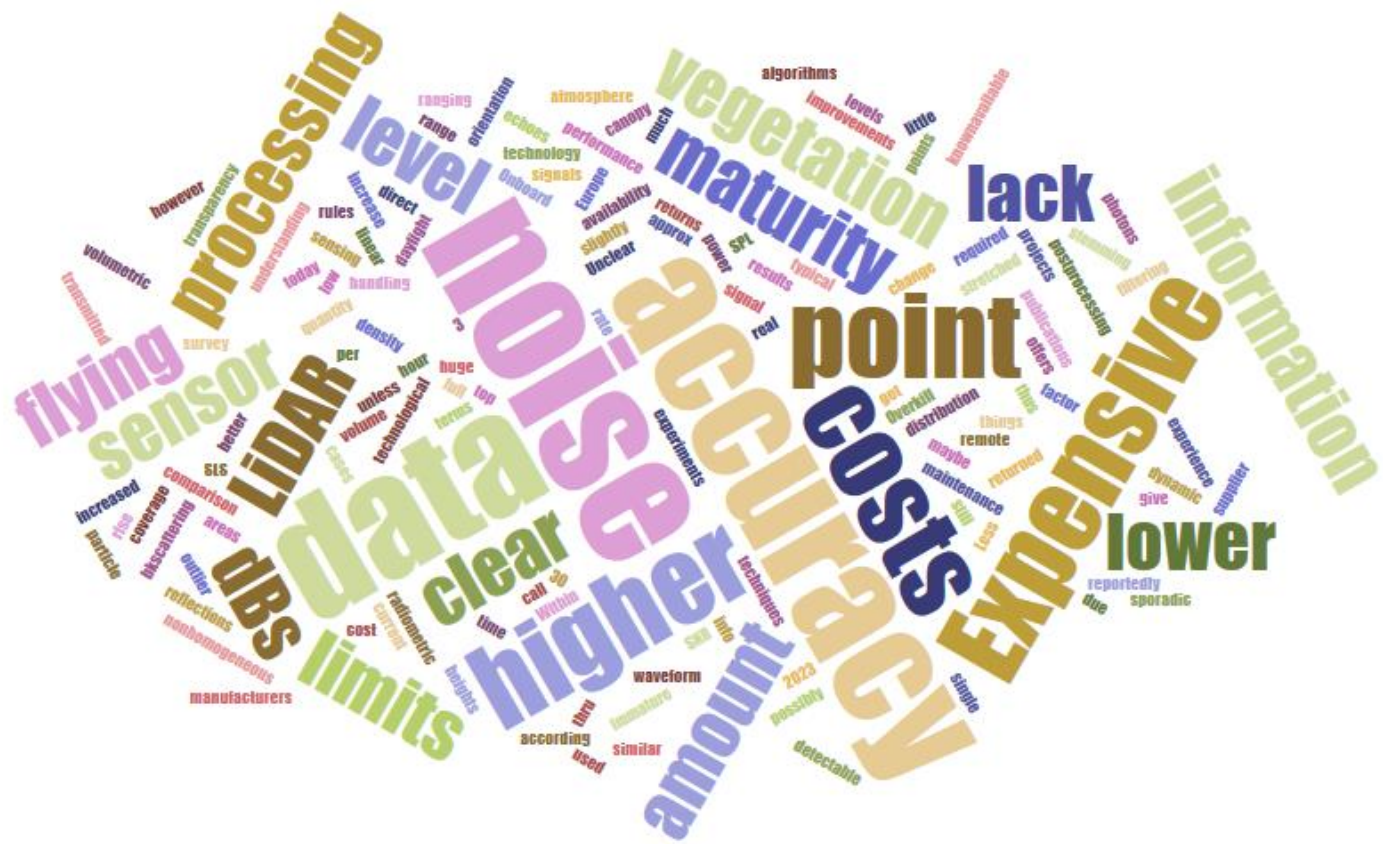


<https://www.jasondavies.com/wordcloud/>

# NMCA - perceived advantages (14)

- Efficiency
- Under survey
- High altitude acquisition
- Point density + limited survey time
- More data in less time
- High point density
- Much higher point density, faster acquisition, riverbed acquisition
- Cost-efficiency with excellent weather over large areas
- Higher density data for large areas
- Improved DTM; more detail around buildings; larger coverage
- Efficiency; ability to penetrate obscurations such as vegetation, ground fog, thin clouds, etc.
- Higher density, better SNR, less dependant on atmospheric conditions

# Perceived disadvantages of SPL / GML



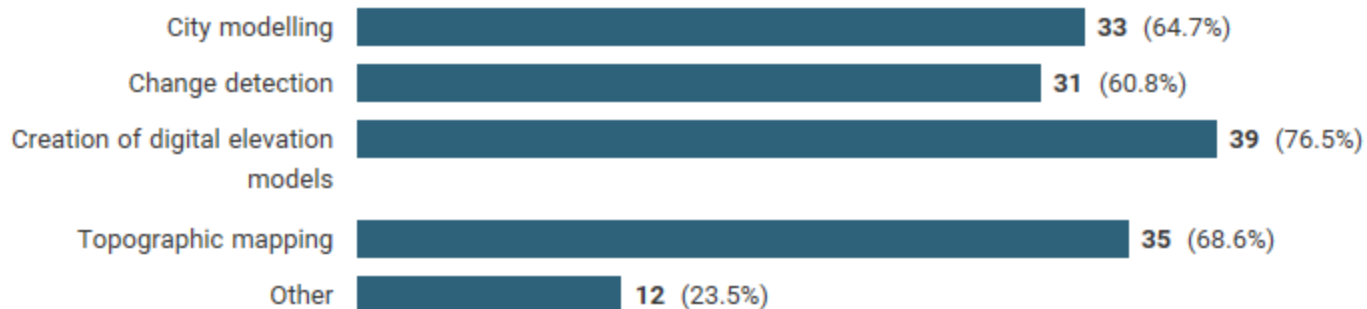
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# NMCA – perceived disadvantages

- Accuracy
- Noise and survey cost
- Little experience and single supplier
- No information about results of real projects in Europe
- Higher costs, volume of data, huge amount of noise, non-homogeneous point distribution
- Expensive; post-processing technology still immature
- Economics

# Applications

- For which applications would you consider using SPL / GML technology?



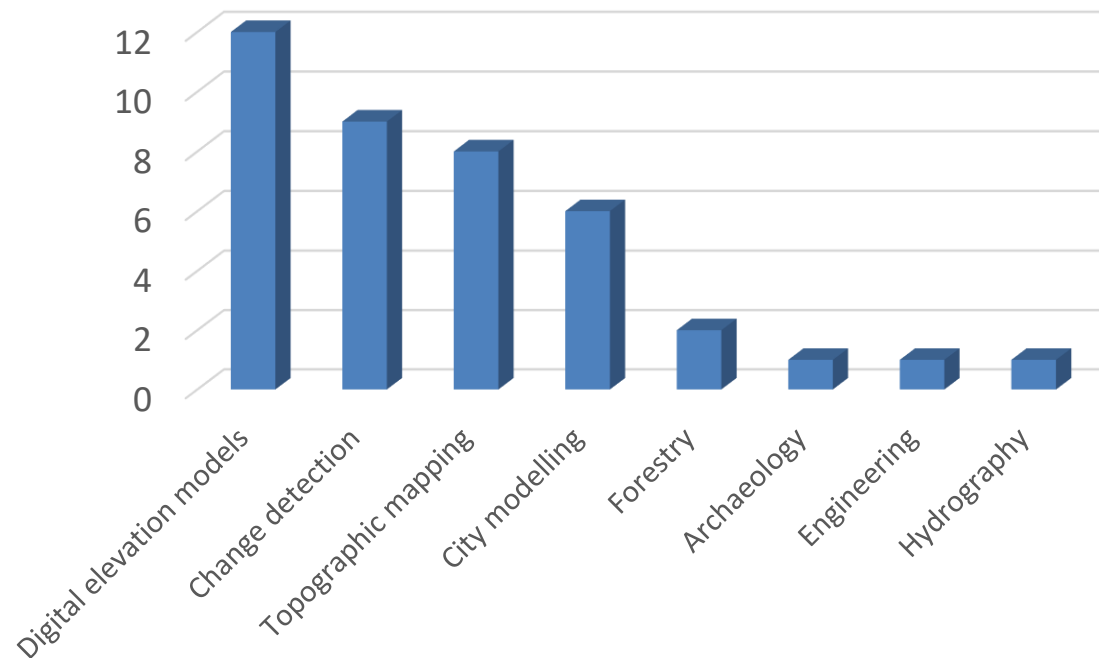
*Multi answer: Percentage of respondents who selected each answer option (e.g. 100% would represent that all this question's respondents chose that option)*

# Other applications



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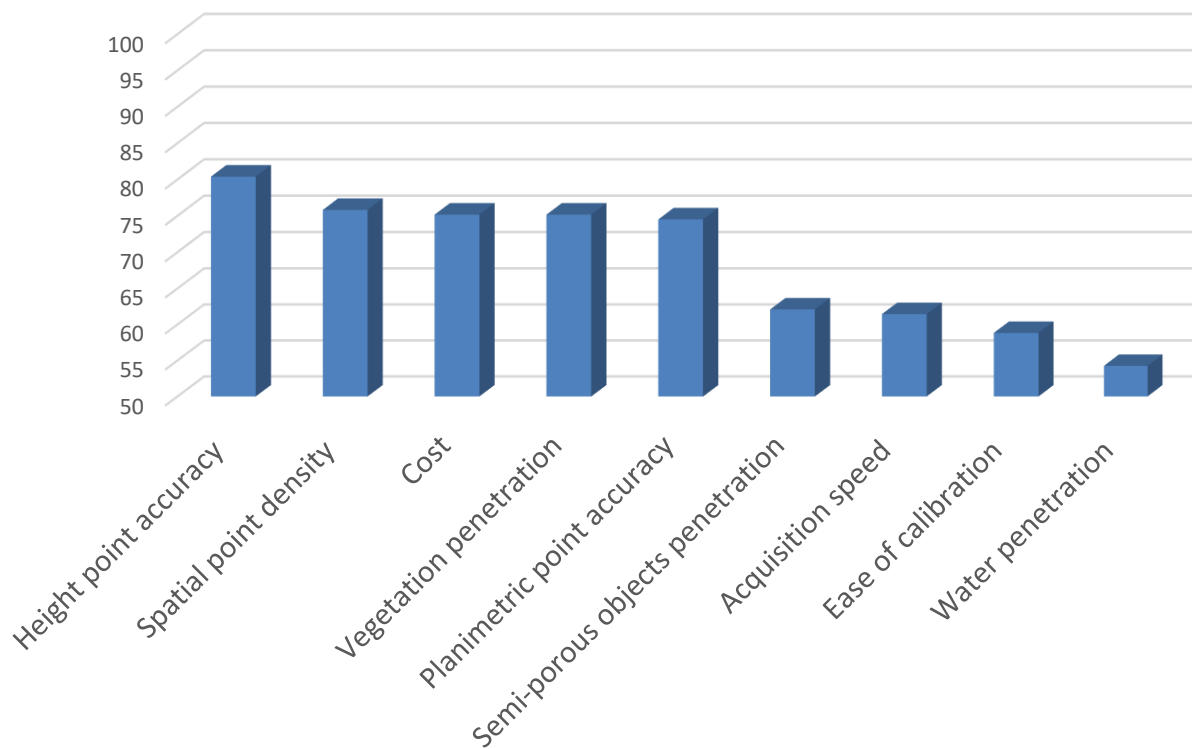
# NMCA responses



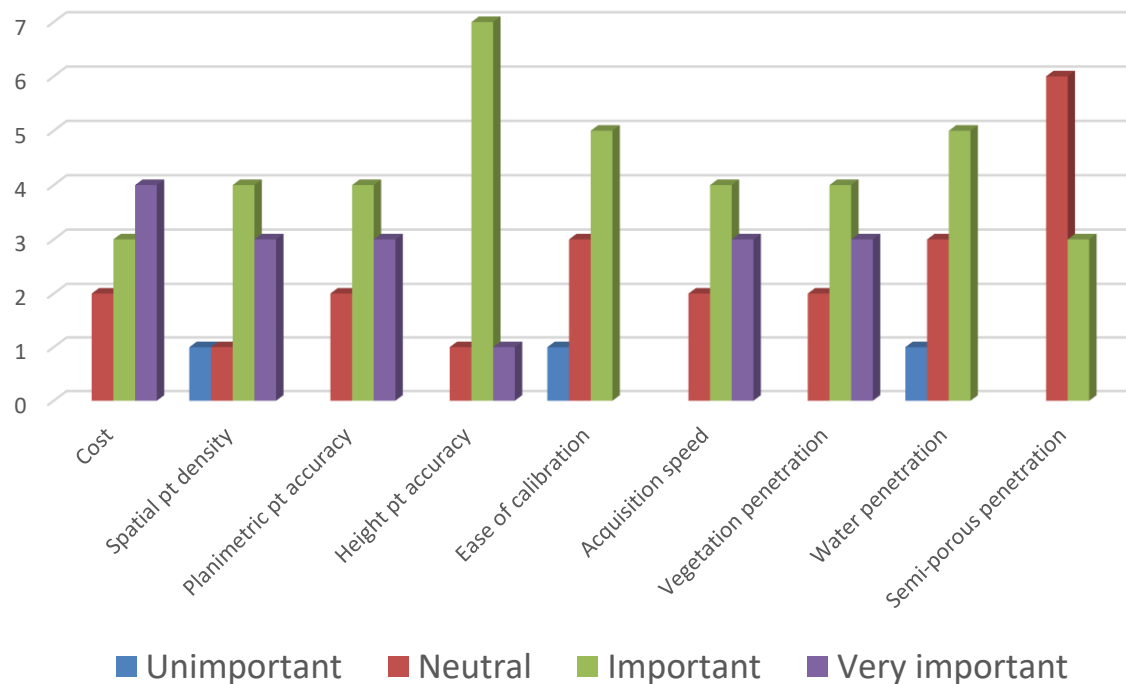
- “We need more information about this technology before deciding what it will be useful for”
- “Basically all large-area applications where detection of object is not based on few points”



# Important characteristics



# NMCA – important characteristics



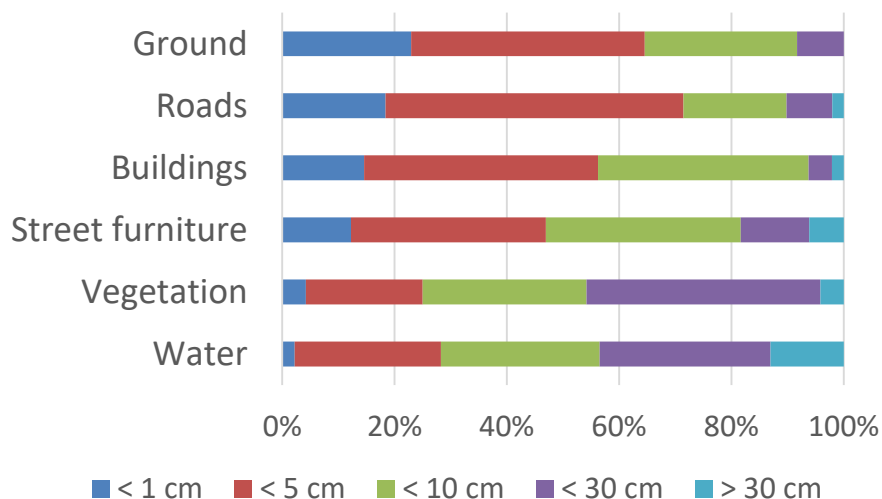
# Other important characteristics

- Accessibility of new technology
- Lack of large scale projects with such needs
- Ability to get repeat data acquisitions
- Consistent data quality over large areas
- Automation in data processing \*
- SPL technology generally provides intensity readings, but the usefulness and the relation to target properties (reflectance) is not very well understood
- Platform facilities (UAV, Airborne etc.)
- Full waveform forming capacity

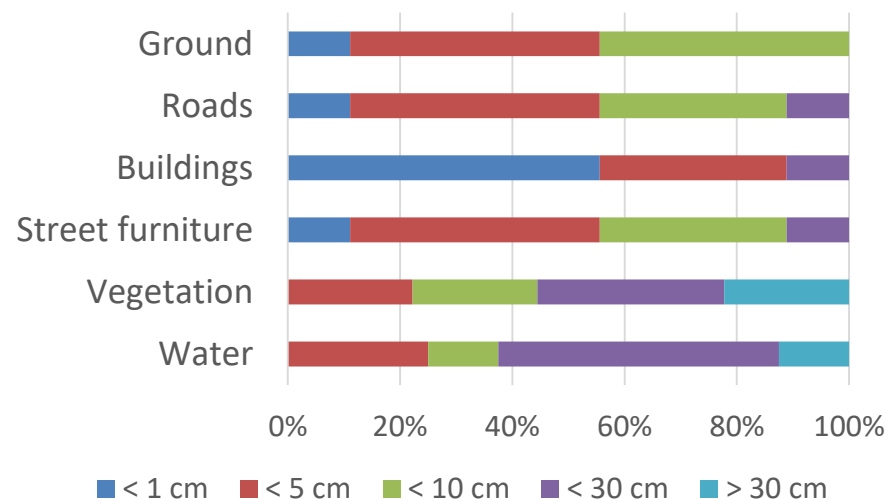
\* NMCA comment

# Required accuracy

All responses (49)



NMCA responses (9)

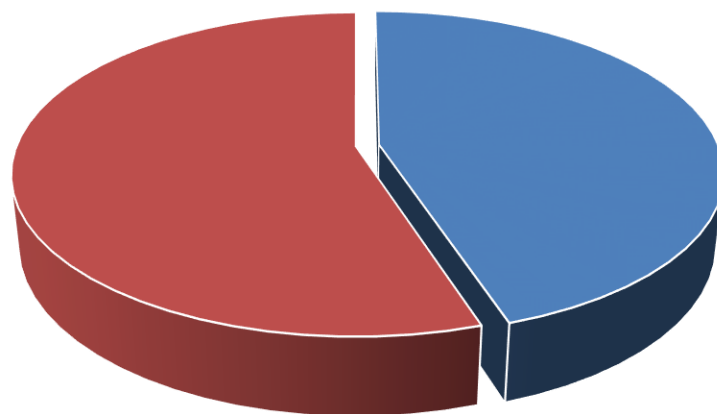


# NMCA observations

- Practical considerations: what is the operational stage
- Existence algorithms and workflows of data processing should be updated and adapted
- Lack of benchmark
- Noise in the point cloud
- I have not used this sensor or data yet so I can not give too much of the possible expectations
- We found some problems with matching adjacent scans. The benefits to us were not enough to justify the cost at present
- I need more experiments first

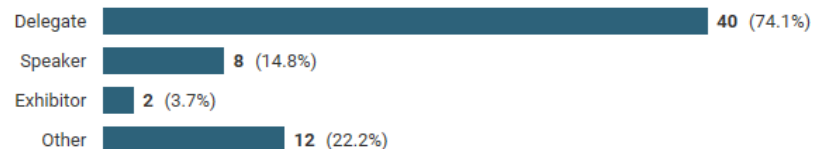
# Workshop participation

- Would you participate?



■ Yes ■ No

- How would you participate?



*Multi answer: Percentage of respondents who selected each answer option (e.g. 100% would represent that all this question's respondents chose that option)*

# Conclusions

- Awareness, but some confusion over the status, capabilities and drawbacks of SPL / GML
- Preliminary study by Charly to follow
- Workshop approved by EuroSDR BoD in November 2018...

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