Organisation Européenne d'Etudes Photogrammetriques Expérimentales

European Organisation for Experimental Photogrammetric Research

(OEEPE)

Questionnaire

of the

OEEPE Working Group

Acquisition of Laser Data

Instructions for Completing the Questionnaire

- The questionnaire is divided into six parts:

  - The first part, page 3 - 4, contains general questions about the organisation you are working at. These questions should be answered by everybody.

  - The second part, page 5 - 8, contains questions that should be answered by those who are already using laser data.

  - The third part, page 9 - 11, contains questions for those who are using or are interested to use raw laser scanning data without any specific application.

  - The fourth part, page 12 - 14, contains questions for those who are using or are interested to use laser data for the derivation of a DEM/DTM.

  - The fifth part, page 15 - 17, contains questions for those who are using or are interested to use laser data for the derivation of 3D city models.

  - The sixth part, page 18, contains questions for those who are using or are interested to use laser data for other mapping tasks, e.g., forestry or mapping of roads and electrical power lines.

- The questionnaire should be answered as following:

  - A list of ❏ indicates that you should tick only **one** alternative.

  - A list of ❍ indicates that you could tick **several** alternatives.

- In case the given alternatives don't apply, please use "others" and give short explanations.

- In some cases we couldn't give predefined answers. In those cases we ask you to answer shortly in text form.

- For additional remarks, explanations, comments and so on we left some space at the end of each part. You are free to use it and even to add more sheets if necessary.

- If you are interested to take part in the working group, please send a short message to one of the given addresses.

Definitions

The following abbreviations are used in the text:

DEM   Digital Elevation Model. An elevation model describing the bare ground surface *without* objects, e.g. buildings. A DEM is often equivalent to a DTM, Digital Terrain Model.

DSM   Digital Surface Model. An elevation model describing the ground surface *including* objects, e.g. buildings.

Both DEMs and DSMs are 2.5D representations of the surface.

Part 1:   General Information about the Organisation

The following questions are meant to give a short overview of the organisation you are working at. If it is a larger agency or company, please give the requested information for the department that is concerned with laser data or could use them. The aim is to find out where laser data are already in use or where there is an interest to use it.

1.1   Type of Organisation

Firm, Company, Industry	Government Agency, Administration	University, Research Institution
☐	☐	☐

○ Mapping   ○ Surveying   ○ Photogrammetric services

○ Planning   ○ Software development   ○ Computing services

○ Environmental analysis   ○ Architecture   ○ Public utilities, e.g. Energy supply

○ Telecommunication   ○ Education

○ Others; please name   _____

1.2   Size of Organisation

Number of employees

< 10	< 30	< 100	< 300	≥ 300
☐	☐	☐	☐	☐

1.3   If you are not using laser data

Please give some reasons why this is the case, e.g., lack of information and knowledge, no data provider, not confident about the technique, price etc.

Laser data are not used because .....

_____

_____

_____

_____

1.4   Answers /Questionnaires filled out

For the organisation I am working at I filled out part one and

○ part two,

○ part three,

○ part four,

○ part five,

○ part six.

Part 2:   General Information on the Use of Laser Data

This part of the questionnaire is set up with the intention to know some details of laser data already used at European organisations. If you have already used data of several laser flights, please give mean values if possible. If this is not suitable, please make copies and fill out this part several times. If you are not using laser data, please fill in the parts that are relevant.

2.1   Purpose of using laser data

For what purpose did you use, or intend to use, laser data?

Derivation of a DSM (please fill out part 3, too)	○
Derivation of a DEM (please fill out part 4, too)	○
Derivation of a 3D city model	○
(please fill out part 5, too)	
Other mapping tasks (please fill out part 6, too)	○
others, please name:	

Please name the software you are using for visualisation:

The laser data are used

In a test phase	☐
In production	☐

We use

our own laser system	☐
laser data as a result of laser data services	☐

2.2   Reasons for using Laser Data

Why are you using laser data? Please give the answers by comparing laser data with the method you were using before.

High point density	O
Cost effectiveness	O
High precision	O
High reliability	O
Vegetation penetration	O
Short production time	O

others, please name: _____

The method(s) used before is (are):

_____

2.3   General impressions of acquiring/using laser data

	Needs to be improved	Satisfactory	Very good	No opinion
Acquisition time from order to delivery	☐	☐	☐	☐
Quality of data and processing software	☐	☐	☐	☐
Price compared to alternative methods	☐	☐	☐	☐

2.4   Usage of Laser Data in future

Please give the estimated size of area for that your are planning to use laser data for your purposes annually.   _____ km²

2.5   Parameters of laser scanner flight and surveyed area

Please give some parameters of the data capture, the surveyed areas of the laser scanner missions if possible, and some parameters of the laser scanning system, if available

	Mission 1	Mission 2	Mission 3	Mission 4
System used in or the name of the company who did the mission	_____	_____	_____	_____
Size of surveyed area	_____km^2	_____ km^2	_____ km^2	_____km^2
How many flights were performed over the same area?	O one	O one	O one	O one
	O two	O two	O two	O two
	O more than two	O more than two	O more than two	O more than two
	how many: __	how many: __	how many: __	how many: __
What laser operating mode was used?	O First pulse	O First pulse	O First pulse	O First pulse
	O Last pulse	O Last pulse	O Last pulse	O Last pulse
	O both	O both	O both	O both
	O other (specify)	O other (specify)	O other (specify)	O other (specify)
	_____	_____	_____	_____
Type of area (city, farmland, forests, coastal etc.)	_____	_____	_____	_____
Single strip or parallel strips (block)	_____	_____	_____	_____
Aeroplane or helicopter platform	_____	_____	_____	_____
Flight height above ground (provide all the flight heights used, if they are available)	_____m / feet	_____ m / feet	_____ m / feet	_____m / feet
	_____m / feet	_____ m / feet	_____ m / feet	_____m / feet
Flying speed	____ m / sec or	____ m / sec or	____ m / sec or	____ m / sec or
	_____km/h or	_____ km/h or	_____ km/h or	_____km/h or
	_____ mph	_____mph	_____ mph	_____ mph
Scan angle	_____ °	_____ °	_____ °	_____ °
Scan rate	_____ Hz	_____ Hz	_____ Hz	_____Hz
Swath width on the ground	_____ m	_____m	_____ m	_____ m
Overlap of swaths about	_____ m	_____m	_____ m	_____ m
Mean point density on ground	_____ m	_____m	_____ m	_____ m

Diameter of laser spot on the ground	_____ dm	_____ dm	_____ dm	_____ dm
Laser frequency (ranging rate)	_____ Hz	_____ Hz	_____ Hz	_____ Hz
Laser wave length	_____ nm	_____ nm	_____ nm	_____ nm
Laser maximum range	_____ m	_____ m	_____ m	_____ m
Is the intensity of the reflected laser radiation recorded simultaneously?	○ yes ○ no	○ yes ○ no	○ yes ○ no	○ yes ○ no
Did the laser system need any special adaptation / integration procedure in the aircraft?	○ yes ○ no	○ yes ○ no	○ yes ○ no	○ yes ○ no

2.6   Reliability of the laser data

To test the results of a laser flight and to have some information about the reliability of the laser data, different procedures are possible. Which ones do you use?

Please indicate which methods you are using to check laser data.

Control plot of the flight axis	○
Visual control concerning gaps between the laser strips.	○
Control of neighboured points in the overlapping region of the laser strips	○
Requirements to height precision: confirmation of the performing company that	○
the height precision of the laser data is _____ m	
for at least _____ %	
of the laser points.	
Requirements to height differences:	○
the height differences to known terrain surfaces (control areas) have to be _____ m	
for at least _____ %	
of the points in that area.	
Visual control, as reference we use:	○

Part 3:   Information on Users of Digital Surface Models

The following questions are meant to give an overview about the organisations that use, or intend to use, raw (unfiltered) laser data including, e.g., vegetation and buildings, either in the form of a DSM or as irregular 3D points.

3.1   Purpose of using unfiltered laser data

Please note for what purpose you are using unfiltered data

	at the moment	or you would like to use them.
_____	O	O
_____	O	O
_____	O	O
_____	O	O

Please name the software you are using or would like to use:

_____

3.2   Type of data for the DSM

Please indicate the kind of data you use or would like to use for your purposes.

Easting / northing / height for each point, irregularly distributed (geodetic coordinates)		☐
Regular grid with a spacing of	< 1 m	☐
	1 m	☐
	5 m	☐
	10 m	☐
	other	☐

3.3   Precision of the DSM

Please indicate the precision of well defined surfaces or objects
(e.g. buildings) you need inside your DSM.

Planimetry	_____ m
Height	_____ m

Please indicate the precision you need for your task(s).

Planimetry	_____ m
Height	_____ m

3.4   Additional information to the DSM - Reflectance

Some systems are able to give the strength, or the amplitude, of the reflectance as an additional attribute to every measured laser point. By this attribute an "image" in a very narrow wavelength band can be created and a rough differentiation of vegetation and artificial objects can be done. Could this value be of relevance for your purposes?

Please indicate the relevance (1 = not relevant, 5 = very relevant)

1	2	3	4	5
☐	☐	☐	☐	☐

3.5   Additional information to the DSM - Multiple Echoes

Some systems are able to give multiple echoes for each laser shots, especially in vegetation/forest areas where the laser beam can penetrate the canopy. This can be used for forest inventories and separation of vegetation and ground surface. Could this ability be of relevance for your purposes?

Please indicate the relevance (1 = not relevant, 5 = very relevant)

	1	2	3	4	5
First echo	☐	☐	☐	☐	☐
Last echo	☐	☐	☐	☐	☐
Multiples echoes	☐	☐	☐	☐	☐

3.6   Additional visual information

In general it is possible to use an additional (video) camera during the survey flight, and some companies are already offering this. Depending on the additional instrument used, the obtained accuracy of the product would be different: a video camera is normally used only for visual inspection while a photogrammetric camera can be used for orthophoto production. Could this possibility be of relevance for your purposes?

Please indicate the relevance (1 = not relevant, 5 = very relevant)

	1	2	3	4	5
Video (checking purposes)	☐	☐	☐	☐	☐
Photogrammetric camera	☐	☐	☐	☐	☐
Airborne photogrammetric scanner (line scanner, rotational scanner)	☐	☐	☐	☐	☐
Other equipment (e.g. spectrometer); please specify	☐	☐	☐	☐	☐

3.7   Resulting product

Those organisations which use the laser data to produce a refined product should answer the following question, too.

The resulting product is.....

Part 4:   Information on Users of derived DEM

The scope of this part of the questionnaire is to know more about the information stored in the DEM, independent of the data it was derived from. In addition we would like to have some more information on the usage of laser data for the derivation of the DEM and any problem related to this. If you don't use laser data up to now but are planning to do so, please fill out 4.1 to 4.3 as far as possible!

4.1   Information on the DEM

Please indicate how your DEM is / will be stored.

regular grid			O
	with a width of	< 1 m	□
		1 m	□
		5 m	□
		10 m	□
		> 10 m	□
triangular irregular network (TIN)			O
Other (describe)			O

_____

Please name the software you are using for the calculation of the DEM:

_____

Please indicate which additional information is / will be stored in your DEM.

structure lines	O
break lines	O
especially weighted points (Top of hill etc)	O
planimetric data	O

4.2   Precision of the DEM

Please indicate the absolute precision of the DEM.

Planimetry	_____	m
Height	_____	m

4.3   Details stored in the DEM

Please indicate which details are stored in your DEM

	at the moment:	not yet, but should in the near future:
Natural terrain forms	○	○
Natural ramps	○	○
Man made ramps	○	○
Roads / railways on embankments	○	○
.....	○	○
others, please name:		
_____	○	○
_____	○	○

4.4   Additional processing of data

Are you using filtered laser data without any additional processing, or are you doing some editing and corrections?

Please indicate which additional methods you are using to improve the DEM.

Editing of the data, as reference we use:

Photogrammetric editing	○
Photogrammetric measuring of structure lines	○
Terrestrial measurements	○
Automatic calculation of break lines	○
Others, please name:	○

4.5 Additional visual information

In general it is possible to use an additional (video) camera during the survey flight, and some companies are already offering this. In the post-processing the video and laser data can be merged. Depending on the additional instrument used, the obtained accuracy of the terrain model is different: a video camera is normally used only for visual inspection while a photogrammetric camera can be used for orthophoto production. Could this possibility be of relevance for your purposes?

Please indicate the relevance (1 = not relevant, 5 = very relevant)

	1	2	3	4	5
Video (checking purposes)	☐	☐	☐	☐	☐
Photogrammetric camera	☐	☐	☐	☐	☐
Airborne photogrammetric scanner (line scanner, rotational scanner)	☐	☐	☐	☐	☐
Other equipment (e.g. spectrometer); please specify _____	☐	☐	☐	☐	☐

Part 5: Information on Users of 3D-City models derived from laser scanner data

The following questions shall help us know a little bit more about the use and requirements of 3D-city models.

5.1 Details of the 3D-City model

Please indicate which details are stored in your 3D-city model

	at the moment:	not yet, but should in the near future:
Buildings	O	O
Vegetation	O	O
Telecommunications	O	O
Others, please name:		
_____	O	O
_____	O	O

Please name the software you are using for processing, editing and storing the 3D-city model.

_____

Please indicate how your 3D-city model is / will be stored.

_____

regular grid		O
with a width of	< 1 m ☐	
	1 m ☐	
	5 m ☐	
	10 m ☐	
	> 10 m ☐	
triangular irregular network (TIN)		O
CAD/vector representation (geodetic coordinates)		☐
Other (describe)		O

_____

Please indicate the kind of representation that your 3D-city model
has or will have.

2D (only planimetric information)	☐
2,5D (X,Y coordinates, height as an attribute)	☐
3D (real 3D structure)	☐

5.2   3D-city model from laser data

If it is possible to differentiate vegetation and buildings in laser data,
will this meet the requirements for your 3D-city model?

Yes	☐
No	☐

In order to differentiate vegetation and buildings it can be helpful to
use existing information about the buildings. Are there any such
information available at present?

In analogue maps   ☐

Map scale   1 : _____

Precision of buildings   _____ m

Degree of completeness   _____ %

These maps are also rasterized.   ☐

Vector data in a GIS, buildings can be selected   ☐

Precision of buildings   _____ m

Degree of completeness   _____ %

5.3   Buildings Precision and completeness in the 3D City model

Please indicate the absolute precision of the buildings you need for the 3D-city model.

Planimetry	_____ m
Height	_____ m

Please indicate the level of details needed for buildings in the 3D-city model.

Simple block representation	☐
Block and the form of the roofs	☐
Roof details and elements as chimneys	☐
Building details	☐

Part 6: Information on Users of laser data for engineering and special mapping/modelling tasks

6.1 Type of Surveying task

Forestry	O
Road networks	O
Electrical power lines	O
Telecommunications	O
Erosion, landslides	O
Others _____	O

_____

6.2 Characteristics of laser data for the task

Estimate the used point density	____ points/m^2
Accuracy needed for the task	_____ m
Accuracy of laser data	_____ m
Is laser scanning the main source of surveying technique for the task?	☐ yes
If no, it is used in combination with	_____
Is the main application dependent data processing done by the data provider?	☐ yes
Is the main application dependent data processing done in your organisation?	☐ yes

Further comments:

_____

_____