Examination paper for GEOG3523 - GIS Data Capture and Mapping

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Examination date: 18th December 2014
Examination time: 3 hours
Credits: 7.5
Grades to be announced on: 19th January 2015
Permitted examination support material: None

Language: English
Number of pages: 4
Number of pages enclosed: 0
The exam is made up of three parts and you should answer all of them. The parts are weighted as indicated in the parentheses.

**Part 1** Briefly explain these concepts (20%)

a) **Geoid** and (reference) **ellipsoid**. Why is it important to use a suitable ellipsoid for the area you map?

b) What are **single use** and **multiuser geodatabases**? What are the differences and advantages of the two types of geodatabases? Which database would you choose for web-GIS?

c) **Spatial resolution**, **spectral resolution**, **radiometric resolution** and **temporal resolution**. Hint: give examples with satellite data and aerial photographs

d) What is the difference between **active** and **passive** remote sensing techniques?

**Part 2** Cartography (40%)

Provide an assessment of the map shown on the next page. Does the map communicate the main content efficiently? Is the map easy-to-read and show its main content well? Does the map “stand on its own”, although it is taken out of a book and you can not read the book text? If you think the map could be improved, suggest some ways on how. Ground your answers on why these changes would improve the map.

The map is found in landscape view on the next page!
Part 3 Short essay (40%)

You work as a GIS specialist at a consultancy company in Trondheim. The local authorities hire your company to assess the vulnerability of central parts of Trondheim to future sea level rise. You will have access to a GIS database containing the following datasets:

I) a digital elevation model with 10 m resolution (1 m accuracy in height)
II) a digital elevation model with 1 m resolution (5 cm accuracy in height) generated from LiDAR data
III) vector data with buildings and infrastructure
IV) population counts (number of people) for parcels (blocks) in Trondheim

All datasets are referenced to Euref89/UTM32N and the reference elevation datum (NN2000) of Norway.

The normal sea level stand in Trondheim is estimated to rise with between 22 cm (minimum scenario) and 77 cm (maximum scenario) until the year 2100. However a storm surges (high tide water that coincides with a strong low pressure storm event) may reach 274 cm (minimum scenario) to 329 cm (maximum scenario) above the reference datum of Norway (NN2000).

<table>
<thead>
<tr>
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<tbody>
<tr>
<td>Normal sea stand in 2100</td>
<td>+22 cm</td>
<td>+77 cm</td>
</tr>
<tr>
<td>Storm surge levels in 2100</td>
<td>+274 cm</td>
<td>+329 cm</td>
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</tbody>
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The main deliverable would be a map showing areas in Trondheim that will be affected by a rising normal sea level stand in the year 2100. The map should include minimum and maximum scenarios. You should also produce a map showing which areas will be affected by future minimum and maximum storm surges in the year 2100. Also calculate and indicate in your map, which infrastructure and how many people will be affected.

Describe how you would tackle the problem;

- Which datasets will you use and how do you judge their accuracy?
- Which GIS analyses are necessary?
- What are the cartographic considerations? How can you communicate these data and future sea level scenarios in a successful way? Sketch a simple map layout showing how you would present the data and include the sketch in your essay.