GeoBIM – Basic Principles and Use Cases

Instructors:
Prof. Lars Harrie, Lund University (Sweden),
e-mail: lars.harrie@nateko.lu.se
Dr. Claire Ellul, University College London (UK),
e-mail: c.ellul@ucl.ac.uk

Target audience: Staff of national mapping agencies, public authorities, other organisations and private companies dealing with or interested in GeoBIM. Some basic knowledge of, and experience working with, geospatial data is required.

Course objectives: There is an increasing awareness amongst practitioners in both the geospatial and Architecture Engineering and Construction (AEC) communities that enabling interoperability and moving towards integration of data from the two domains can provide benefits to sectors such as construction, asset management, safety and security, local and regional planning and building permit processes, national mapping agencies and many more. Taking a data-driven perspective on interoperability and integration – i.e. looking at the integration of Building Information Modelling (BIM) and geospatial data - the course will provide a comprehensive overview of GeoBIM, starting from first principles - comparing BIM and Geo, identifying opportunities for using integrated data and challenges arising. Two case studies then give the opportunity to explore the topic more in depth – planning/permits processes and asset/facilities management. The course concludes by allowing students to explore GeoBIM in a wider context, as a location-enabled foundation for digital twins, smart cities and the internet of things.
Various examples from practical applications and hands-on practical work will illustrate the theory.

Simplified BIM model (red) visualised in the city model of Malmö in Bentley CityPlanner,
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Topics tackled: GIS and BIM – similarities and differences; interoperability and integration; interoperability progress and remaining challenges; applications for GeoBIM; short introduction to relevant standards; in depth case studies on planning/permits processes and on asset/facilities management; geoBIM and the wider context of digital twins and smart cities; open research issues.
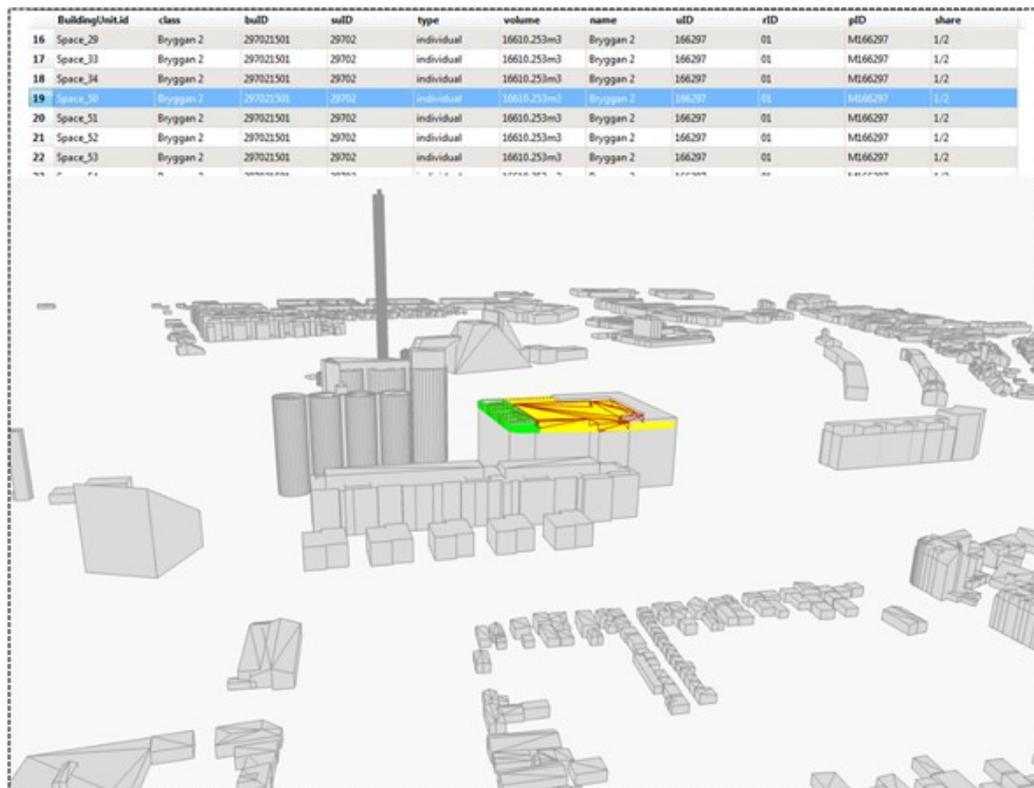
Visualisation of 3D cadastre in a simplified BIM-model integrated in part of Malmö city model. Source: Sun et al. (2019)

Module 1: Defining GeoBIM (Claire Ellul/Lars Harrie - 10 hours)
This module will introduce the students to the topic, starting from basic principles of geospatial data and reviewing the varying definitions of Building Information Modelling. Similarities and differences between the two will be explored, along with different types of integration – from data exchange to a fully interoperable integrated system.
To provide context for the remainder of the course, the module will also cover the different applications where GeoBIM integration could be useful – i.e. 'why GeoBIM' - as well as giving a brief overview of key standards involved in each discipline.

Based on the background readings provided, and on their own experience, students will be asked to list three non-technical challenges that could prevent the uptake of GeoBIM in their organisation.   They will also be asked to describe a conversion process from BIM data to Geospatial data – and optionally can undertake this conversion using FME and provided data.

Module 2: GeoBIM and Planning/Building Permits (Lars Harrie - 8 hours)
This module will delve into the first in-depth Case Study of the course, and provide a general introduction to planning, planning permits and how they could benefit from GeoBIM integration. Students will be walked through detailed examples of how digital planning constraints can be used at various phases of a planning/permit process to validate the submitted proposal.

Students will then be asked to describe the planning/permit process in their home country and identify where GeoBIM could help. A practical exercise will involve students using a viewer to examine BIM and Geospatial data together in a planning context, and an optional exercise using FME for data handling will also be included.

Module 3: GeoBIM and Facilities/Asset Management (Claire Ellul - 8 hours)
The second case study of the course will explore the use of GeoBIM in asset and facilities management, exploring how spatial data (in particular 3D data from BIM and geospatial sources) can be used to provide a framework to integrate information ranging from maintenance plans to sensor readings to condition surveys. The importance of full-lifecycle data management (to accompany full lifecycle asset management) will be explored, as well as approaches for retro-fit data capture of existing buildings.
Students will be provided with some base data (from BIM and Geospatial) and asked to capture/measure some condition data ("geo") to link to this data, and then shown how to perform some basic analysis to underpin Asset/Facilities decision making.

Module 4: GeoBIM - Research and the Wider Context (Claire Ellul /Lars Harrie - 4 hours)
The final module of the course will link GeoBIM to emerging trends such as digital twins, smart cities and the internet of things, and look at drivers for GeoBIM uptake. We will also explore some wider GeoBIM research challenges – e.g. the application of GeoBIM to infrastructure, data interoperability issues, and longer term challenges relating to who is responsible for ownership and maintenance of the data, as well as the challenges of keeping an 'as built' model of the built environment up to date.