



BIRGIT BIM and GIS integration
April 2025



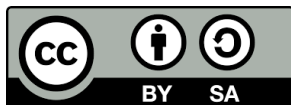
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L2.2 Application of BIM-GIS integration in project's life cycle

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LEARNING OUTCOMES

At the end of this submodule, the participant is expected to be able to:

- Explain different project's stages in which BIM GIS integration can be applied
- Understand the benefits of integration for different stakeholders
- Know which benefits integration can provide in each stage of project's life cycle

BIM-GIS integration in project's life cycle

Integrated GIS BIM systems offer several advantages in project development:

- It take into account both the physical and spatial aspects of a project → leading to a more informed decision-making.
- integrated approach ensures data consistency throughout the project lifecycle, minimizing errors and discrepancies
- Integration contributes to sustainability efforts by assessing and optimizing the environmental impact of projects

BIM-GIS integration in Planning Phase

The integration of BIM-GIS in the planning phase enables simulation of the planned construction design (made in BIM model) situated at a real estate geometry and boundaries (supported by GIS).

While BIM describes a host of techniques and methods to author buildings, GIS allows to manage and analyze data that is tied to location.

Using BIM GIS Integration in Planning Phase, more precise site assessment can be made, for instance considering geographic data such as topography, water networks, environmental conditions, enabling optimal site selection and more efficient design

BIM-GIS integration in Planning Phase

Choosing the right site for the planned building integrating the BIM with GIS in the planning phase:



Image url: <https://biblus.accasoftware.com/en/planning-and-design-with-integrated-bim-gis-approach/>

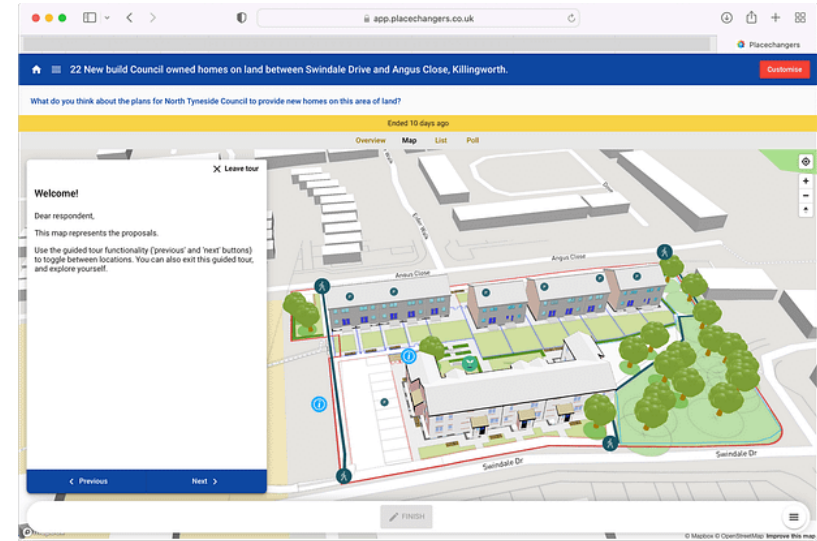


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BIM-GIS integration in Planning Phase

In the planning phase, choosing the right site is a fundamental step for the success of any construction project. BIM-GIS integration allows a much more precise and comprehensive site assessment. Incorporating geographical data, encompassing factors like terrain conditions, topography, and accessibility, into BIM models is a seamless process.

Planning phase is like a **reverse digital twining**: imagine constructing a new neighborhood in a city: GIS provides territory mapping, including details like elevation, vegetation, and existing road networks. BIM comes into play to model the neighborhood's buildings, incorporating aspects like architectural design, hydraulic and electrical networks, and building interiors.

BIM-GIS integration in Construction

BIM GIS integration follows the project's life cycle in construction phase:

- from the sketches (building design, CAD drawings),
- pre-construction analysis,
- construction planning and implementation,
- ongoing facility management

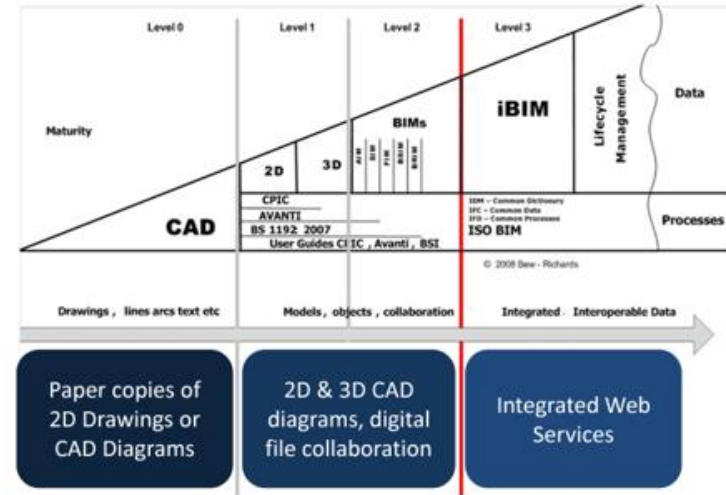


Image url: [Issue of Building Information Modelling Implementation into the Czech Republic Legislation using the Level of Development](https://www.bim-research.eu/issue_of_Building_Information_Modelling_Implementation_into_the_Czech_Republic_Legislation_using_the_Level_of_Development)

BIM-GIS integration in Construction

Significant benefits of BIM-GIS integrated approach in construction phase include:

- optimization of construction-site logistics
- Modeling on-site staff requirements to maximize safety, equity, and productivity
- construction supply chain management

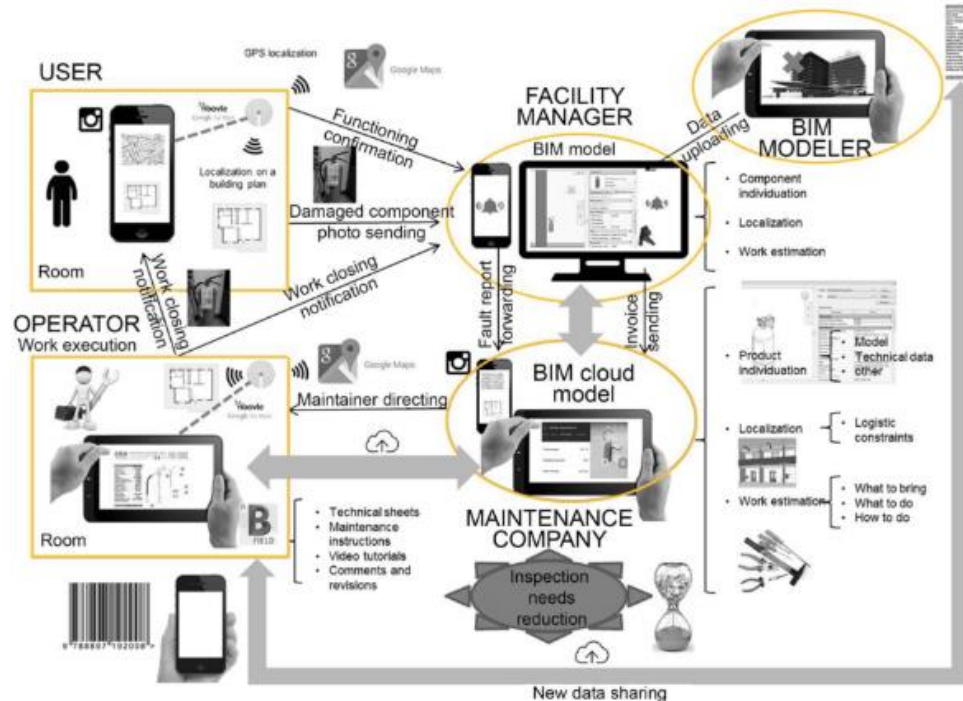


BIM-GIS integration in Facility management

Facility management is a multidisciplinary field that encompasses the **effective management** of **various aspects** of a physical environment to support the core business functions of an organization. Facility management involves the coordination of people, places, processes, and technology to ensure the optimal functionality, safety, and efficiency of built environments.

This field is critical for **maintaining** and **enhancing** the **performance of facilities**, including commercial buildings, offices, hospitals, schools, manufacturing plants, and other types of infrastructure.

BIM-GIS integration in Facility management



BIM-GIS integration in Facility management

In the domain of BIM and GIS, facility management refers to the application of these technologies to enhance the planning, operation, and maintenance of built environments.

BIM and GIS play complementary roles, providing a comprehensive and integrated approach to managing facilities throughout their lifecycle > integration provides a data-driven total overview of the property portfolio, its buildings, assets, and resources. A unified view that visualizes relevant data (from maintenance and business systems, Excel tables, PDFs, CAD drawings, DWG files, BIM, sensors) makes it possible to manage both status and future needs of a building.

GIS strength in Facility management

- GIS adds a spatial dimension to facility management by incorporating geographic data. It includes information about the facility's location, topography, climate, and surrounding infrastructure.
- GIS enables the mapping and analysis of spatial data related to facilities. This can include mapping utility networks, assessing environmental impact, and understanding the broader context of the facility in its geographic surroundings. And to see trends, for example in the form of recurring error reports in a certain location
- GIS is used to overlay facility information with zoning regulations, environmental constraints, and other geospatial data to ensure compliance with local regulations.
- GIS aids in emergency planning and response by visualizing evacuation routes, assessing the impact of natural disasters, and facilitating quick decision-making during crises.

BIM strength in Facility management

- BIM is initially employed during the design and construction phases to create a detailed digital representation of the facility. This digital model includes information about the building's geometry, materials, components, and systems.
- BIM facilitates the integration of diverse data sources related to building components, equipment, and systems (maintenance schedules, specifications, and performance details)
- BIM provides a visual representation of the facility, enabling facility managers to navigate through the virtual model and understand the spatial relationships among different elements
- BIM captures lifecycle information, allowing facility managers to access historical data, track changes, and make informed decisions about maintenance and upgrades

BIM-GIS integration in Environmental projects

the integration of BIM GIS can **optimize site selection** based on environmental considerations and regulatory requirements

Integration also **enhance the environmental impact** assessment by utilizing a GIS to model and analyze environmental impacts such as water flow, air quality, and noise pollution and integrate a BIM model to assess the environmental consequences of construction and operational phases

GIS-BIM integration can be utilized to perform spatial analysis, considering regulatory zoning requirements for environmental protection from the GIS side, and to assess how proposed structures align with zoning regulations and environmental constraints from the side of BIM models.

BIM-GIS integration in Environmental projects

GIS data are used to analyze and visualize environmental factors such as topography, land use, and natural resources,

BIM data are used to assess the impact of buildings and infrastructure on the environment.

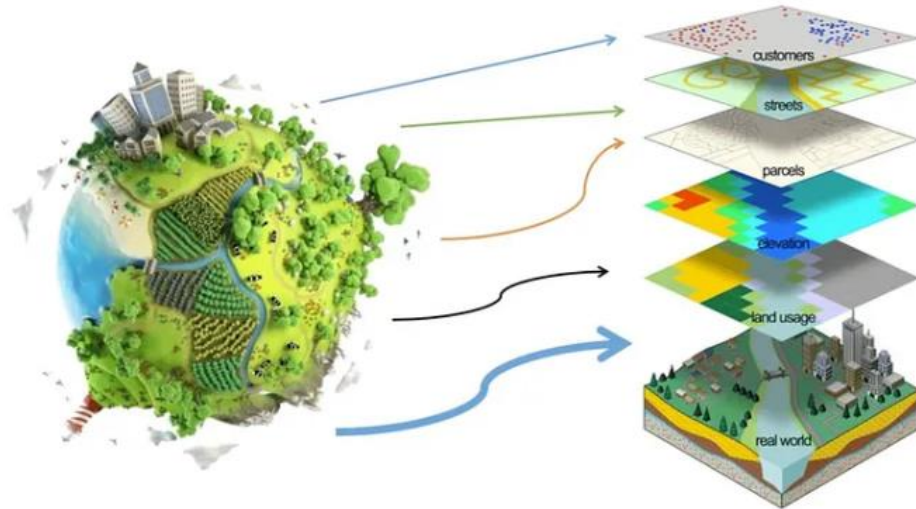


Image url: <https://medium.com/@matt-sharon/bim-and-gis-integration-for-sustainable-infrastructure-89fc1b405fe0/>

BIM-GIS integration in Environmental projects

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BIM-GIS integration in micro climate

A micro-climate refers to the climate conditions within a small, localized area that differ from the surrounding larger area. These differences can be influenced by various factors such as terrain, vegetation, bodies of water, and human activities

Therefore, an integration of GIS-BIM is necessity for a monitoring and climate change adaptation

Probably the biggest application of GIS-BIM integration will be visible in creating a plan for climate change impacts, such as sea-level rise or increased temperatures, in infrastructure projects where the integration will be used on climate change projections (from a GIS data) and then integrated with BIM models to assess the vulnerability of infrastructure and plan adaptive measures, ensuring long-term resilience

BIM-GIS integration in green building

Urban green space planning involves the strategic design, development, and management of green areas within urban environments to enhance the quality of life for residents and contribute to the ecological sustainability of cities

GIS is frequently employed in these studies to analyze spatial data, assess existing green infrastructure, and model potential interventions, while BIM may be used for detailed 3D visualization and simulation of proposed green space designs, aiding in comprehensive urban planning strategies that prioritize sustainability and community well-being

Nowadays most used application of GIS-BIM integration in an urban green space planning is visible in applying it to design and plan urban green spaces to enhance biodiversity and provide recreational areas – *examples are shown in the next slide*

Examples of BIM GIS integration in green urban planning

Zaryadye Park, Moscow

Millennium Park, Chicago

Singapore Green Plan



London Olympic Park, UK

West Kowloon Cultural District, Hong Kong

BIM-GIS integration in Environmental Impact Assessment

Using an integrated approach of a GIS and BIM, it allows us to quantify and document the expected environmental changes using standardized methodologies which are used by GIS and BIM.

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BIM-GIS integration in Environmental Impact Assessment

Some of the major applications considering EIA (Environmental Impact Assessment) :

- Visualizing environmental impacts
- Terrain analysis and solar exposure
- Ecosystem mapping and habitat assessment
- Water management and drainage modeling
- Noise and air quality modeling
- Waste management planning
- Cultural heritage preservation
- Public engagement and communication

BIM-GIS integration in Life Cycle Assessment

Combining BIM information on building systems and energy usage with GIS data on regional energy grids and renewable energy potential evaluate the operational energy consumption of a structure in the context of its geographic location.

Ensuring consistency in data across the life cycle by integrating BIM and GIS data using standardized formats can help in creating a seamless and reliable information flow for LCA calculations.

BIM-GIS integration in Life Cycle Assessment

Some of the major applications considering LCA (Life Cycle Assessment):

- Embodied carbon analysis:
- Energy consumption modeling:
- Transportation and logistics impact:
- End-of-life analysis:
- Water and resource management:
- Renewable energy integration:
- Regional environmental context:
- Data consistency and standardization:

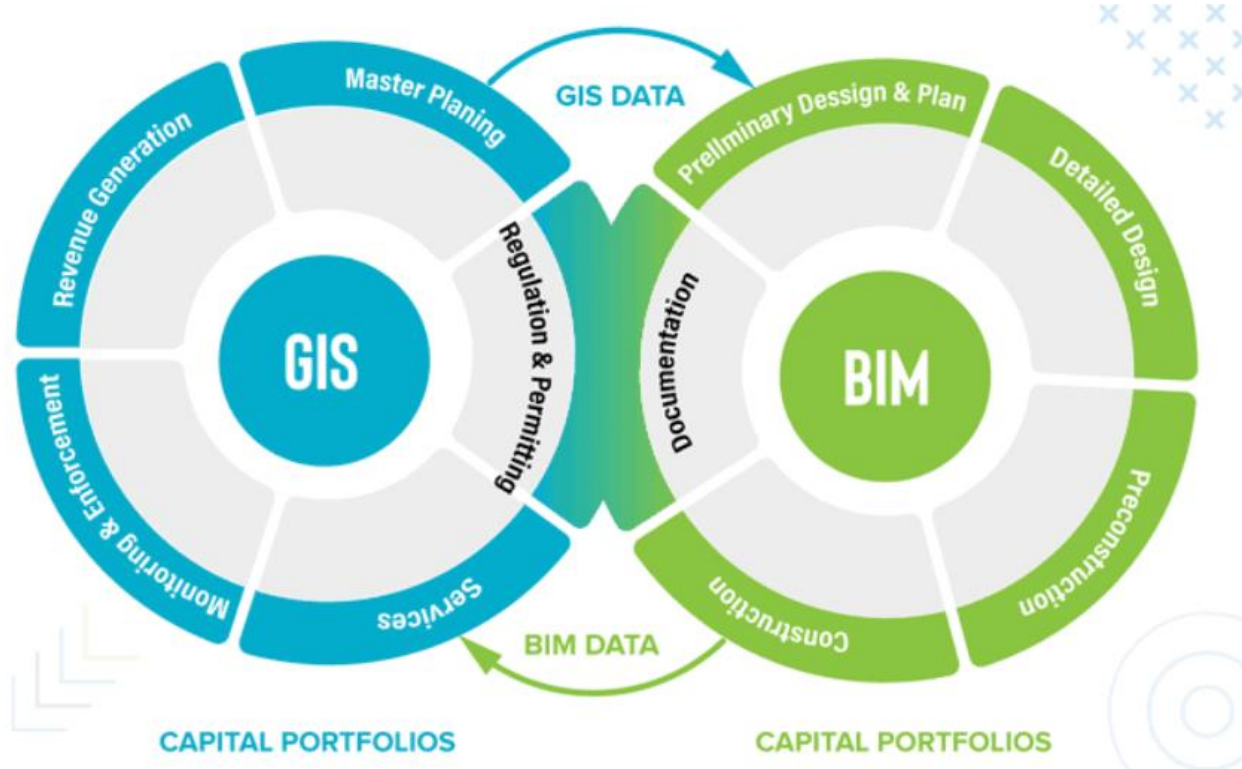


Image credit: John Victor, web: <https://www.gislounge.com/gis-and-bim-integration-in-infrastructure-design-and-construction/>

Thank you for your attention



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