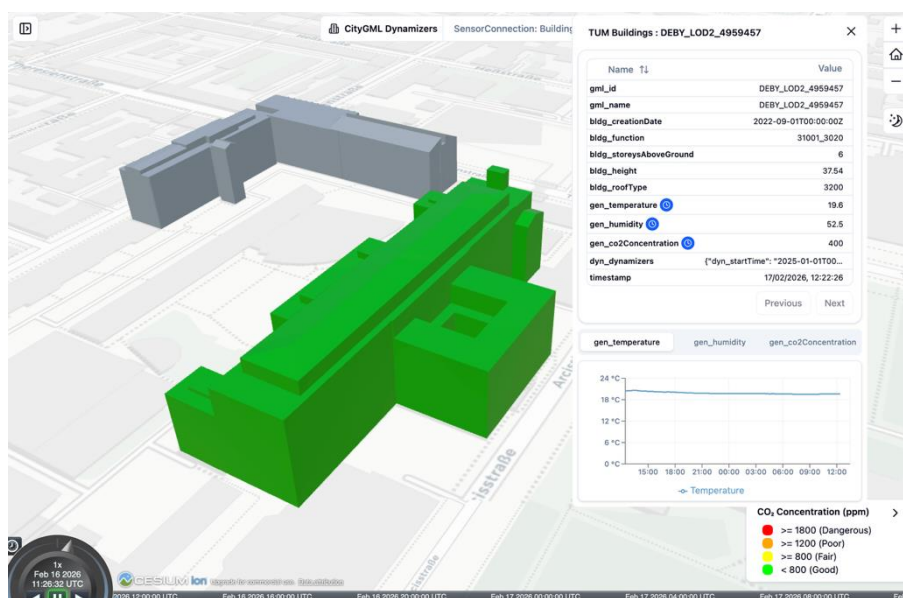


# Master's Thesis Proposal

## Automated Integration of Semantic 3D City Models and Sensor Data for Generating CityGML Dynamizers

Urban Digital Twins (UDTs) are increasingly used to support data-driven city management by integrating static 3D city models with dynamic data from the Internet of Things (IoT) and simulations. A significant challenge in implementing UDTs is integrating heterogeneous datasets, such as linking static 3D digital models with temporal data for real-time city monitoring. The Dynamizer module in CityGML 3.0 seeks to address this challenge by offering a standardised framework for associating the time-dependent properties of semantic 3D city models with external temporal data sources, such as IoT platforms, databases, and tabular files.



*Integrated visualisation of 3D building model and indoor environment data from IoT sensors*

Generating Dynamizers requires establishing associations between 3D city models and their corresponding temporal data sources. This process often requires manual effort due to the lack of common identifiers across datasets, thus limiting large-scale data integration and the transferability of UDT applications. For urban datasets modelled using standards such as OGC CityGML and OGC SensorThings, spatial and semantic relationships can be leveraged to automate these associations. However, challenges remain due to inconsistent data quality, incomplete metadata, and spatial discrepancies between 3D city objects and deployed IoT devices.

This thesis aims to develop a framework for automatically linking semantic 3D city models and IoT sensor datasets to generate CityGML Dynamizers. The research will examine how spatial and semantic properties of 3D city models and sensor datasets can be utilised to establish reliable associations. Additionally, it will evaluate the extent to which existing urban data modelling standards support the automated integration of static and dynamic urban data. The proposed framework will be validated through a prototype implementation using real-world urban datasets to generate Dynamizers within 3DCityDB.

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