

Use Case 18: Monitoring of deformations / settlements during construction

Purpose

Monitoring of ground deformations in tunnelling is a principal means for selecting the appropriate excavation and support methods among those foreseen in the design, for ensuring safety during tunnel construction (including personnel safety inside the tunnel and safety of structures located at ground surface). The objectives of ground deformation monitoring are different in mountain and urban tunnels. This use case is especially important in urban environments.

All geometric-semantic information of the tunnel project must be transferred. This includes the tunnel model itself (as-built, production parameters), the terrain (before and after), the geology and hydrogeology of the ground (as-identified), prior existing underground facilities as well as the buildings on the surface.

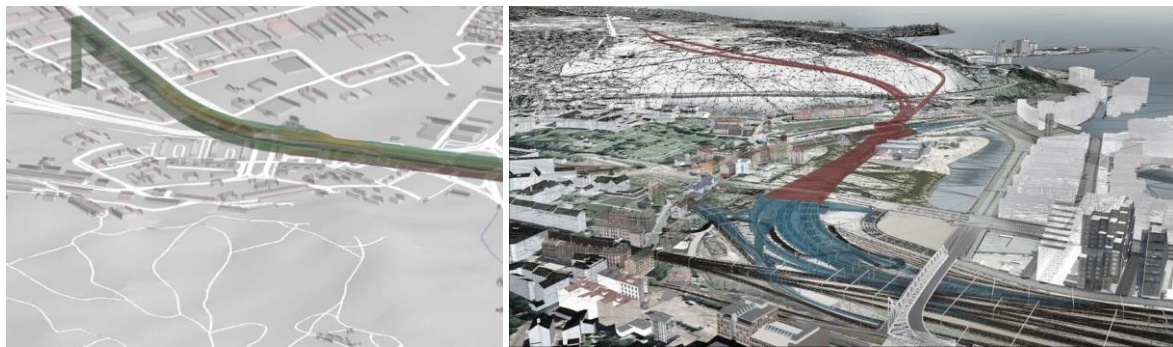


Figure 1: Example of integration of data for settlement monitoring

The underlying exchange scenario that IFC-Tunnel is supposed to support is the exchange of models from BIM applications (authoring and coordination tools) to Geographical Information Systems (GIS) and/or to geological/technical models management systems.

OGC standards need to be investigated for this use case, especially in terms of its capacity to handle geology, time-varying geotechnical parameters (compaction, consolidation, creep and swelling), deformations and settlements in 3D.

Requirements for IFC-Tunnel:

The requirements for IFC-Tunnel lie in the geometric-semantic description of

- the tunnel itself
- terrain
- buildings
- existing underground facilities
- geology, hydrogeology and waterflow
- time sequence data (from initial stage, construction stages, to operation stages)
- links to UC1b and 2a for initial stage information, to UC7 and 8b for construction and operation stages.

Geometry: GIS systems are only capable to use explicit geometry descriptions, it will be necessary to coordinate the IFC and GIS

Semantics: All existing entities must be described with appropriate semantics. The most complex aspect is the appropriate description of the geology and time-varying geotechnical parameters, e.g. compaction, consolidation, creep and swelling. Visualization of relevant excavation parameters involved in settlement generation must be investigated (TBM data, conventional type section, support installed, excavation time).