

## A Holistic Digital Design Approach for a Metro Project in Portugal

**Jose R. Duarte, Filipa Duarte, Bruno Fernandes**

*Quadrante Engenharia e Consultoria, S.A., Porto, Portugal*

**Zeljka Devedzic, Johann Stampler, Blaz Mulavec**

*Allplan Software Engineering GmbH, Graz, Austria*

Contact: [zdevedzic@allplan.com](mailto:zdevedzic@allplan.com)

### Abstract

The Ruby Line Porto is a new 6.5 km metro project connecting the urban areas of Porto and Vila Nova de Gaia in northern Portugal to be built in the upcoming years till 2025.

The authors have been responsible for the design of six main work packages including the new track, new roads, five viaducts, three underpasses, one pedestrian overpass, one top-down tunnel, multiple retaining walls, and the structures of seven new stations and platforms. Due to multiple collaboration needs with other parties, a consistent digital BIM workflow with a common data structure and alignment of sub-models was of utmost importance for delivering the project successfully.

The introduction and application of a new software tool was predestined for this ambitious plan to model the quite different parts of the project in a common digital environment. The paper shows, which techniques offered by the software had to be used for successful modeling.

**Keywords:** Metro Project, Sustainability, Digitization, Open BIM, Interoperability

### 1 Introduction

The two cities Porto and Vila Nova de Gaia situated north and south of the estuary of the Douro River form together the Porto Metropolitan area, which is the second largest urban area in Portugal with more than 500 000 residents. The two cities are inextricably linked, with lots of inhabitants daily traveling between them.

Meanwhile, the hitherto existing five operational bridges – one railway, three roadway and one with

a roadway deck plus a metro deck – do not meet anymore the increasing travel demands. Therefore, Metro do Porto was commissioned to provide a new 6.5 km metro line connecting the two cities [1].

This new line will not only provide additional capacity, but also encourage more sustainable travel by shifting commuting habits from individual car traffic to using the Metro. In addition, the new bridge over the Douro River will also carry cycle