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Financial uncertainty profiles of the Fehmarn Belt immersed tunnel project by @RISK analysis

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Abstract

The Fehmarn Belt immersed tunnel project approved by the Danish parliament on 28 April 2015 is supposed to be built, owned (apart from the German land works), and operated by a Danish state agency Femern A/S, a subsidiary of Sund & Bælt Holding A/S, and financed by loans guaranteed by the Danish government. The loans are going to be amortized by incomes from the tunnel users. According to official plans construction work will start full scale this fall (awaiting clarification of three major uncertainty issues, though: 1) obtainable subsidies by the EU, 2) total construction costs, and 3) approval by German authorities) and the tunnel is going to be inaugurated and opened to public traffic by the beginning of 2022. Since the official financial model of Femern A/S is publically unavailable the uncertainty profiles presented in this paper are based on a model developed by the author and validated in terms of project payback period within an absolute accuracy of ± 1 year compared to published results generated by the official model. Such features as subsidies by EU, inflation, nominal and real interest rates, depreciation, VAT, and joint taxation with Sund & Bælt Holding A/S are included. Based on publically available information the project is critically recalculated with respect to realistic uncertainty analyses not hitherto presented to the public. Uncertainty is represented and calculated by probabilistic uncertainty representation and Monte Carlo simulation by @RISK. The resulting project uncertainty profiles are presented in terms of a traffic light metaphor: Green light corresponds to a payback period less than 40 years, yellow to 40-50 years, and red to larger than 50 years. It turns out that the likelihood of financial project failure in terms of the payback period being outside of the green light zone is substantially larger than acknowledged by the project proponents and presented to the Danish parliament. This is primarily due to apparently too optimistic base case assumptions of critical, but uncertain, project variables and methodologically insufficient partial sensitivity analyses.

Presenter

Hans Schjær-Jacobsen holds a M.Sc. and Ph.D. from the Technical University of Denmark and a B.Com. degree from Copenhagen Business School. He has held leading positions in industry as well as academia. His major research interest is now in uncertainty and risk analysis where he contributed to the understanding, representation and calculation of aleatory as well as epistemic uncertainty, primarily in connection with large infrastructure projects. He pursues his scientific interests as a senior consultant in RD&I Consulting which he founded after recently retiring as a professor and director at the Technical University of Denmark.