To build or not to build? Mobilization of uncertainty arguments in public decision-making on private megaprojects

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Abstract

Purpose – Uncertainty, a state of unknowing linked to threats and opportunities, is a key characteristic of megaprojects, making it challenging for government officials and politicians to decide on their initiation. For them, implementation by the private sector adds an extra layer of complexity and uncertainty to megaproject planning. In this context, only a few studies have focussed on governing and the mobilization of uncertainty arguments in communication between government actors and private developers either in favour of or against megaprojects. The purpose of this article is to shed light on how private megaproject proposals progress towards political acceptance or rejection in public decision-making.

Design/methodology/approach – This process of public decision-making on private megaproject proposals is examined in the case of the Helsinki–Tallinn undersea rail tunnel. In line with the interpretive research tradition, the authors' study draws on a qualitative methodology underpinned by social constructionism. The research process can be characterized as abductive.

Findings – The authors' findings suggest that while public decision-making on megaprojects is a conflictual and dynamic process, some types of uncertainty are relatively more important in affecting the perceived feasibility of the projects in the eyes of public sector decision-makers.

Originality/value – This study contributes to the debate on uncertainty management in megaprojects, proposing a new type of uncertainty – uncertainty about privateness – which has not been explicitly visible thus far.

Keywords Uncertainty, Megaproject, Decision-making, Public–private partnership, Northern Europe

Paper type Research paper

1. Introduction

Making decisions on whether or not to build a megaproject is challenging for governments (Broadbent *et al.*, 2008; van Marrewijk *et al.*, 2008). Coping with high uncertainty has been found to be a vital element of megaproject planning and development processes (Sanderson, 2012; Giezen *et al.*, 2015; Rothengatter, 2019); however, it is relatively difficult for public sector decision-makers to foresee which projects would become feasible and viable, and under which circumstances, in the long term. In more practical terms, for them, a real challenge relates to the question of how to recognize innovative megaproject initiatives with various positive impacts, including ones proposed by the private sector, and to avoid engaging in low performing or even harmful megaprojects (Shenoy and Mahanty, 2021).

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This paper, which focusses on government decisions about accepting or rejecting new megaprojects, explores different uncertainty arguments (opportunities and threats) mobilized by key actors for and against the initiation of a private megaproject, and the motivation for it is as follows. Research on megaprojects, a relatively new area of study (Pollack *et al.*, 2018), has largely focussed on megaproject appraisal and explanations of poor performance (Pitsis *et al.*, 2018), approaching the topic from two perspectives. On the one hand, according to the mainstream perspective, megaprojects often fail, and this is due to a) project managers' and politicians' intentional underestimation of costs and/or overestimation of future benefits (Flyvbjerg *et al.*, 2003; Flyvbjerg, 2009, 2014) or b) poorly designed governance mechanisms, which remain incapable of coping with risks and uncertainties over time (Winch, 2009; Sanderson, 2012). On the other hand, the "alternative" megaproject literature (Lehtonen, 2019) suggests that while uncertainty is integral to decision-making processes, megaprojects do not necessarily fail (Beria *et al.*, 2018; Dimitriou *et al.*, 2017), and if they do perform poorly, it is because of the inevitable clashes between competing rationalities and cultures (Sanderson, 2012; van Marrewijk *et al.*, 2008; Giezen *et al.*, 2015). However, both the mainstream and alternative approaches remain relatively silent about the micro-processes of organizing and the importance of uncertainties in decision-making during the early phase of megaproject planning when governments contemplate whether or not to start building.

In turn, public management and accounting research on infrastructure public–private partnerships (PPPs) has a long pedigree and has proliferated to cover a variety of uncertainty related themes, including (under) pricing of demand risk (Burke and Demirag, 2015); risk diffusion by financiers (Demirag *et al.*, 2012); risk transfer and stakeholder relationships (Burke and Demirag, 2017); as well as partners' perceptions of risk management (Burke and Demirag, 2019). Yet, prior studies have not considered how different uncertainties are mobilized in communicative interactions between public sector decision-makers and private sector developers. The purpose of this paper is to begin addressing this gap in extant knowledge by shedding more light on the capacity of different uncertainty arguments to guide public sector decision-making in megaproject planning. Our main research question is formulated as follows: How does uncertainty contribute to the process of public decision-making concerning a private megaproject? This broad question can be further divided into two sub-questions: (1) What different types of uncertainty arguments are mobilized by public and private actors for and against the construction of a megaproject and (2) How do the uncertainty arguments contribute to the megaproject's feasibility as perceived by governmental actors?

We examine these dynamics in the context of Finest Bay Area Development (FBAD), a Finland-based international private sector initiative, which seeks approvals from the Estonian government for the construction of an undersea rail tunnel between Helsinki and Tallinn. This empirical case can be seen as an instance of a broader international development whereby a variety of countries have undergone massive infrastructure investment projects motivated by a range of political goals (see Beria *et al.*, 2018; Hodge and Greve, 2018; Rothengatter, 2019). The focus of our analysis is on the mobilization of different uncertainty arguments in communication and decision-making regarding the political approval or rejection of the tunnel project in its planning phase.

This study contributes to the emerging megaproject literature on decision-making in uncertain environments (Sanderson, 2012; Giezen *et al.*, 2015; van Marrewijk *et al.*, 2016; Rothengatter, 2019; Esposito *et al.*, 2022) by analysing how the public sector's understanding of project (in)feasibility evolves as the private developer seeks to satisfy uncertainty-related concerns regarding the launch of its megaproject. In a broad sense, we respond to calls to explore the shaping of context, namely, a political environment, for a megaproject (Pitsis *et al.*, 2018; Esposito *et al.*, 2022). This study also adds to the public management and accounting

literature. We add to the study by Ward and Chapman (2003) by proposing a new type of uncertainty affecting government decision-making and demonstrate the hybrid public–private nature (Brinkerhoff and Brinkerhoff, 2011; Grossi *et al.*, 2022) of private declared infrastructure megaprojects.

2. Literature review: uncertainty and decision-making in megaprojects

Megaprojects differ significantly from conventional projects (Saunders and Townsend, 2019) or merely large projects (Pitsis *et al.*, 2018) in terms of their ambition, social and organizational relations, temporality and the timescale, and impacts (Shenhar and Holzmann, 2017). Moreover, they often imply PPPs (see Note 1 in Appendix 6 in the supplementary materials), that is, cooperative arrangements based on mutual commitment – over and above that implied in any contract – between public and private sector organizations (Bovaird, 2004).

Whilst megaprojects have often been defined in terms of high investment costs, there seems to be a consensus in the megaproject literature that the "real mark" of megaprojects is not the size of costs, but complexity and uncertainty (Pollack *et al.*, 2018, p. 373, Pitsis *et al.*, 2018; Saunders and Townsend, 2019; Flyvbjerg, 2014). Cooperation between the public and private sectors adds a distinct layer of complexity and uncertainty to public decision-making processes regarding the initiation of megaprojects. As critical public management and accounting scholars have pointed out, PPPs can be conceptualized as organizational hybrids (Miller *et al.*, 2008), which embody tensions between the private sector's arguably narrow corporate governance logic and the public sector's more complex accountability requirements (Shaoul *et al.*, 2012). In turn, research on institutional logics argues that competing logics (e.g. corporation vs state), each embodying unique taken-for-granted rules, are a major constraint to collaboration process between the PPP parties (Saz-Carranza and Longo, 2012). The ability to draw on multiple logics, which may coexist in tension through time (Kaufman and Covaleski, 2019), is a core characteristic of hybrid organizations (Vakkuri *et al.*, 2021). Hence, in a well-functioning PPP, business and public sector logics must coexist rather than one of them strongly suppressing the other. Therefore, feeling uncertainty about the institutional fit of different logics, or one of the public-private partners feeling that its logic is diminished (Purdy and Gray, 2009), can lead to a rejection or cancellation of the public–private cooperation in megaprojects.

In its broadest sense, uncertainty can be defined as a state of unknowing or, in plain English, a lack of certainty (Ward and Chapman, 2003). Uncertainty is different from risk, although these two terms are often used interchangeably (Froud, 2003; Teece *et al.*, 2016; Sanderson, 2012). In simple terms, if a calculable, numerical probability can be attached to some event occurring or not, then the unclear future state refers to a "risk" rather than an "uncertainty". If no such possibility for "calculable probabilities" (Froud, 2003) exists, then we talk about "uncertainty". However, it is often difficult to distinguish between risk and uncertainty (Burke and Demirag, 2015). For the present study, we mobilize the term uncertainty and define it similarly to Perminova *et al.* (2008) as a context for threats (i.e. events that have a negative impact on a project's outcomes) or opportunities (i.e. events that have a positive impact on project performance). In doing so, we aim to emphasize the dual nature of uncertainty, indicating that in decision-making situations, both threats and opportunities are usually considered (Ward and Chapman, 2003; Perminova *et al.*, 2008).

Depending on the assumed predictability of the future, different categories and sources of uncertainty (see Note 2 in Appendix 6) are acknowledged in the literature (Walker *et al.*, 2010; Teece *et al.*, 2016; Sanderson, 2012). In the private sector, a common understanding is that in order to cope with high uncertainty and drastic changes in the business environment, it is of critical importance to create and maintain agility in organizational decision-making and operations (Tallon *et al.*, 2019). Herein lies a challenge for policymakers and project planners

(Lyons and Davidson, 2016) as they usually have relatively less freedom to experiment and change direction in the public sector (Ansell *et al.*, 2020).

Within the domain of project management, Ward and Chapman (2003) provide one of the first comprehensive frameworks for systematically articulating different types and sources of uncertainty in projects, which was further refined by Atkinson *et al.* (2006). Rothengatter (2019) in turn provides a specific list of issues to be considered when constructing future scenarios for a transportation sector megaproject.

Our synthesis of the uncertainties identified in the previous literature is presented in Table 1, which also serves as our analytical framework in Section 4. Next, we elaborate on each category of Table 1.

2.1 Uncertainty associated with estimates

The first type of uncertainty in Table 1 is associated with estimates, specifically the variability of estimates concerning time, costs, demand, benefits and quality, as well as the underlying assumptions and production of estimates (Ward and Chapman, 2003; Atkinson *et al.*, 2006). A number of sophisticated quantitative planning models have been developed for improved forecasting of travel demands and to justify large construction projects (Vigar, 2017). However, Flyvbjerg *et al.* (2006, p. 1) note that "forecasters generally do a poor job of estimating the demand for transport infrastructure projects". Accounting studies on PPPs show that demand levels may turn out to be far less than originally anticipated as the private sector tends to be aggressive when pricing demand risk to win PPP contracts (Burke and Demirag, 2015).

However, from the decision-making perspective, these accounting related planning models and calculations may serve as "compromising accounts" (Chenhall *et al.*, 2013) in complex and uncertain organisational settings such as megaprojects. Kaufman and Covaleski (2019) show that accounts can facilitate communication, coordination and compromise between actors with competing logics. At the same time, accounts that attract certain actors may trouble others; hence, uncertain estimates can polarize and "push apart" instead of "bringing together" actors with different evaluative principles (Chenhall *et al.*, 2013, p. 268). We know that oftentimes "on time and on budget" are used as the most important performance criteria in megaprojects. But as the topic of accounting for megaprojects has been largely ignored (Grossi *et al.*, 2022), we know little about how uncertain estimates of time

Table 1. Types of uncertainty in transport sector megaprojects

#	Type of uncertainty	Focal aspects
1	Uncertainty associated with estimates	Variability in estimates: size of parameters (i.e. time, costs, demand, benefits and quality) Basis of estimates: assumptions and production of estimates, behavioural changes and economic and social developments
2	Uncertainty about project design and logistics	Project output, the development process, construction, novelty of design and technology and technological developments
3	Uncertainty about objectives and priorities	Clarity of objectives, interdependencies and trade-offs between objectives; and new environmental targets and policies
4	Uncertainty related to fundamental relationships between project parties	Interests, roles and responsibilities of project parties

Note(s): Adapted from Ward and Chapman (2003), Atkinson *et al.* (2006) and Rothengatter (2019)

and budget are discussed between (public–private) actors, and how this ultimately brings them together or pushes them apart.

2.2 Uncertainty about design and logistics

The second form of uncertainty relates to design and logistics or, in other words, to "what is to be done, how, when, and by whom, at what cost" (Ward and Chapman, 2003, p. 100). If a megaproject is launched as a narrowly designed solution, then everything becomes a threat to it and the project becomes path dependent (Giezen *et al.*, 2015). On the other hand, a common concern is that if a project plan proceeds to execution with poorly defined specifications for construction, it can create difficulties that require extra design and planning work during the later stages of the project life cycle, consequently harming project performance regarding time, costs and quality (Atkinson *et al.*, 2006). This problem of insufficient specifications and premature choices can be particularly acute in one-off projects with innovative technical solutions and unrealistically tight time schedules.

In addition to such considerations, it would also seem pertinent to consider the uncertainties emanating from technological development (Rothengatter, 2019) that might render some design solutions outdated.

2.3 Uncertainty about objectives and priorities

The third type of uncertainty stems from a lack of clarity about the project objectives, their relative importance and acceptable trade-offs (Ward and Chapman, 2003). This uncertainty pertains not only to the project partners' objectives but also to the requirements and objectives of other stakeholders such as regulators and future users (Atkinson *et al.*, 2006). However, the relationship between megaprojects and the advocated multiple socio-economic benefits to society is far from being unequivocally certain, and it is hence disputed (Pitsis *et al.*, 2018; Lehtonen, 2019). On the one hand, megaprojects are claimed to induce wider positive economic impacts, improve environmental quality and climate and contribute to a balanced development of regions (Rothengatter, 2019). On the other hand, the scale of megaprojects in terms of construction time, use of resources, lifespan and the number of stakeholders involved implies *a priori* a broad scope of sustainability-related threats (Flyvbjerg *et al.*, 2003; Romestant, 2020). New environmental targets and policies might also convey changes to project priorities. Moreover, the impossibility of achieving all the desired objectives results in the need to make trade-offs between them (De Bruijn and Leijten, 2007; Salet *et al.*, 2013). A pragmatic solution to these uncertainty problems would be developing alternative strategies (Giezen *et al.*, 2015).

2.4 Uncertainty related to fundamental relationships between project parties

A specific uncertainty related to relationships between project parties stems from the fundamental difference between the public sector's service ethos and the private sector's business imperatives and profitability aspirations (Broadbent *et al.*, 2008; Shaoul *et al.*, 2012). From this perspective, several public sector concerns can be highlighted which potentially affect the sector's decisions about partnerships with private companies.

First, all public sector actors seek at least some positive social, environmental and/or economic impacts from PPPs to justify their participation. The proponents of PPPs argue that the leveraging of private sector efficiency and sharing of risks with the private sector provides better value for money (VFM) (Demirag *et al.*, 2012; Burke and Demirag, 2017). The main concern is that achieving any of the supposed public benefits in daily practice is uncertain (Hodge *et al.*, 2018). In the worst-case scenario, due to incomplete contracts, a private partner could even neglect public interests and benefit (Hodge and Greve, 2018).

Risk transfer is a subjective process and PPP deals often appear to provide better VFM for the private sector than to the taxpayer (Burke and Demirag, 2017).

Second, within democracies, transparency as a requirement for political or public accountability is considered extremely important (Bovens, 2006). However, private partners often demand business confidentiality and secrecy of documents related to the PPP, which can be problematic for the public partner, as confidentiality would reduce opportunities for public debate, democratic accountability and political control over the project (Willems and Van Dooren, 2016).

Third, a major concern relates to the government's role as the ultimate risk bearer. Willems and Van Dooren (2016) state that when private partners have faced financial troubles, governments have often bailed them out or made extra financial guarantees to keep crucial public infrastructure and services functioning. For governments, infrastructure-related PPP projects can simply be too big to allow them to fail, which indicates that some uncertainties or risks would be retained completely by the public sector partner (Broadbent *et al.*, 2008). Partners typically have different perceptions of proper risk allocation and private partners may be reluctant to carry certain risks. Therefore, significant financial and performance mechanisms that add costs to the public sector are often put in place to limit the liability of financiers (Demirag *et al.*, 2012; Burke and Demirag, 2015).

In short, research on PPPs recognizes clear differences in public and private actors' interests, as well as distinct concerns for the public sector, which form a considerable source of uncertainty in megaprojects. Considering these concerns, the existing body of literature on the underlying institutional factors of infrastructure PPPs (see Biygautane *et al.*, 2019; Casady *et al.*, 2020) concludes that a successful implementation of such partnerships requires political support, which should be gained before initiating any other supportive arrangements for a PPP. Despite that, though megaproject researchers recognize that power relationships are always at play in decision-making over the initiation of complex megaprojects (van Marrewijk *et al.*, 2008; Salet *et al.*, 2013), surprisingly little attention has been paid to "governing" and communication interactions as spontaneous micro-processes of organizing between the actors within these projects (Sanderson, 2012). As Biygautane *et al.* (2019) argue, extant research considers PPP implementation largely as a mechanical job depending on certain structural, technical and financial factors. The literature overlooks the role of social actors and their interactions in fulfilling the mechanical requirements during project initiation and implementation processes. In the same vein, Esposito *et al.* (2022) note that the way in which actors engage in a dialectical relationship and mobilize various narratives and arguments either in favour of or against the implementation of an uncertain megaproject, along with the way the related controversies unfold in different institutional contexts, is an underexplored area of research. Our study, inspired by the desire to develop a richer understanding of how uncertain megaproject proposals progress towards acceptance or rejection in public decision-making, responds to calls to pay greater attention to governing (Sanderson, 2012) and the role of various arguments mobilized in favour of or against megaproject implementation (Esposito *et al.*, 2022).

3. Context, data and method

3.1 Case context and data

Our empirical study longitudinally follows communication between the Finnish development company FBAD Ltd. and the Government of Estonia about permission to plan and build an undersea rail tunnel from Helsinki to Tallinn. This initiative provides a unique research perspective for several reasons. First, with a length of 90–120 kilometres, this would be the longest undersea tunnel in the world, expected to cost over 15 billion euro. Second, FBAD and its tunnel project are fully privately financed, run by angel investors and IT entrepreneurs

with most of the funds for construction expected to come from a financial firm that invests the resources of, amongst others, state-owned Chinese enterprises. This stands in contrast to the majority of megaprojects, which are usually commissioned by governments as part of a PPP model (van Marrewijk *et al.*, 2008). Third, the tunnel would connect the capitals of two EU member states – Finland and Estonia – requiring close transnational cooperation between the politicians and public authorities of these two countries. Both countries are characterized as PPP sceptics (see Note 3 in Appendix 6); however, national laws, processes and requirements related to the planning of such large transport infrastructure projects differ in Estonia and Finland (see Note 4 in Appendix 6).

In Estonia, FBAD submitted a request for the initiation of the preparation of a tunnel-related national designated spatial plan (NDSP) including strategic environmental assessment thrice to the Ministry of Finance, which is responsible for taking such matters to government decision-makers. The NDSP is a seldom used special form of planning aimed at choosing the most suitable location for constructions with a significant spatial impact and whose location or functioning elicits significant national or international interest. It is a rather long, comprehensive and expensive process, but once it is finished, the scope and level of detail in prepared materials would enable a speedy initiation of construction works. Our analysis focusses on the most intensive period of the debate between the Estonian Ministry of Finance (MoF) and FBAD, when they provided arguments for and against this megaproject in 2018–2020. After two rounds of proposal amendments and associated discussions in Cabinet meetings, the minister responsible for the NDSP in Estonia announced that he would propose to the country's government not to proceed with FBAD's tunnel project.

Our primary empirical material consists of over 100 text documents in Estonian, English and Finnish, including official letters and requests, ministerial decisions and responses to FBAD, feasibility studies, impact assessment materials, business plans and profitability calculations, newspaper articles, online news, performance and risk reports on comparative megaprojects, legislation, policy papers and intelligence reports. Our complementary source of data consists of the transcripts of interviews undertaken to validate our interpretation of the documentary data.

3.2 Analytical method

In line with the interpretive research tradition (Ahrens and Chapman, 2006), this study draws on a qualitative methodology underpinned by social constructionism (Berger and Luckmann, 1991), and our research process can be characterized as abductive (Lukka, 2014). To organize and analyse the case data, coding was conducted when reading the collected documents and designating the meanings of sentences both in relation to the theory and other empirical materials. Hence, some codes (e.g. types of uncertainty) were pre-defined while others (e.g. topics of debate) emerged during the data analysis (see Note 5 in Appendix 6). There was no language barrier as one of the authors is a native Estonian speaker and the other a native Finnish speaker.

The analysis proceeded through four main stages. First, we created a timeline of the major events and actors who voiced their support or concerns regarding the Helsinki–Tallinn undersea rail tunnel. We identified FBAD and the MoF as the key actors and then examined the ways in which they made sense of the construction of the tunnel megaproject. Subsequently, we turned our focus to key topics in the key actors' communications during the application process by studying the official correspondence in detail and coding it accordingly (see Appendix 2 in the supplementary materials). After the first-order coding effort, we found and then directed our attention towards several recurring and significant second-order topics of debate (e.g. "demand," "financing agreement and business plan") that prevailed in the communication between the actors. Appendix 4 shows the percentage

distribution of textual data segments (n = 1150) containing arguments for or against the tunnel megaproject across the identified topics of debate by episodes of communication.

Next, following previous studies of uncertainty in projects (Ward and Chapman, 2003; Atkinson *et al.*, 2006; Perminova *et al.*, 2008), we interpreted and coded the texts according to the given types of uncertainty and their dual nature (i.e. threat or opportunity). Appendix 5 depicts the distribution of our textual data segments across the different types of uncertainty by episodes of actor communication. The vast majority (90%) of the coded text units communicated by FBAD refer to opportunities, while the same number of communications by the MoF addresses threats regarding the megaproject. The focus of the debate between FBAD and the MoF shifted, and the mobilization of different uncertainty arguments related to the construction of the megaproject evolved during the observed application period (see Appendices 4 and 5 in the supplementary materials).

Finally, since our interest was in fleshing out the capacity of different uncertainty arguments to guide public decision-making in megaproject planning, we lastly conducted 13 semi-structured face-to-face interviews with managers and experts of the development company, as well as politicians and officials involved in transport or tunnel planning from Finland and Estonia (see Appendix 1 in the supplementary materials) to verify the findings of our textual analysis. The interviews were conducted either in personal meetings or via video calls, and they usually lasted between 60 and 90 min. The interviews conducted either in English or Estonian were recorded and transcribed immediately after each interview.

4. Dealing with uncertainty regarding the construction of the Helsinki–Tallinn tunnel

Building on the typology of uncertainties, Table 2 illustrates the major uncertainty related topics of debate (Column 2) between the public and private actors along with the threat and opportunity arguments we identified from our empirical material (see Appendix 2 for examples of analysed text segments in the supplementary materials). In other words, the table indicates (1) which uncertainty-related arguments were mobilized by the Estonian public sector decision-makers (Column 3) and FBAD (Column 4) against and/or for the construction of the tunnel megaproject and (2) how these arguments in combination affected the perceived feasibility judgement of the megaproject (Column 5).

Based on this, we next analyse the characteristics of the threat and opportunity arguments, the emerging tensions and the dynamics towards the decision regarding whether to build the undersea rail tunnel.

4.1 Uncertainty in estimates

An obvious area of uncertainty concerns the variability and the basis of demand, time and cost estimates provided by the private developer to the Estonian MoF. In its initial request in *December 2018*, FBAD highlighted wider economic benefits of 7 billion euros, as the number of passengers and the volume of goods transported were expected to increase steadily between Helsinki and Tallinn after the construction of the tunnel.

The MoF returned the request to eliminate shortcomings before it could be forwarded to the government for decision-making. First, the forecasted numbers of travellers and cargo volumes were questioned (Code 1.1 in Appendix 2), as they were three to four times larger than in the earlier government-ordered FinEst Link feasibility study (see Appendix 3 in the supplementary materials). Second, for smooth movement of people and goods between Helsinki and Central Europe, the following were listed as major prerequisites for the project to progress: the tunnel must link to the Rail Baltica rail network (see Note 6 in Appendix 6), and (European gauge) 1,435-mm rails must be used. Finally, a general uncertainty-adding threat

Table 2.
Major types of uncertainty arguments mobilized by public and private actors and affecting the initiation of the tunnel megaproject

Type of uncertainty	Topic	Public decision-maker		Private developer		Combined effect on perceived feasibility
		Threat arguments	Opportunity arguments	Threat arguments	Opportunity arguments	
Variability in estimates	Demand	Overly optimistic traffic forecasts			Realistic traffic forecasts Additional GDP growth	Negative, demand and the timescale significant
	Timescale	Unrealistic opening date			The realistic date if all parties are quick and efficient	
	Costs	Lack of clarity about the amount of costs			Costs remain to be specified in further stages	
Basis of estimates	Demand	Earlier government-ordered studies predicted less traffic			Increased tourism, linked airports, new inhabitants and boosted regional potential	Negative, demand and costs significant
		Lack of clarity about links to Rail Baltica Linking a major prerequisite for the project			The link to Rail Baltica value-adding; and not a prerequisite for forecasts	
	Timescale	Requirements of laws challenged by the developer			Expert opinions in support of the shorter timescale	
	Costs	General breakdown without sufficient details			Breakdown sufficiently detailed for the given purpose	
Project design and logistics	Railway track/main infrastructure	Lack of clarity about the rail gauge in the tunnel 1,435-mm rails as a major prerequisite for the project			1,435-mm rails, 1,524-mm rails or both possible Open to (hyper)loop	Negative and moderate
	Order of proceedings	Typical order of (superficies license) decision-making challenged by the developer		Slow decision-making hinders opening Superficies license advanced in parallel with the NDSP process		
	Groundwater	Risk of devastating impacts on drinking water during construction			Environmental impact analyses conducted in further stages	
	Artificial island/ support infrastructure	Lack of clarity about the purpose of the island and deep-water harbour			Mooring facility only Potential use for public tasks of national importance	
Objectives and priorities	Climate and nature	Unknown influence on the achievement of national climate goals			Impacts of the project included in the EIA programme(s)	Negative, the timescale and inter-governmental cooperation significant
	Timescale	Developers' refusal to adjust the initial opening date			Tight time schedule adds efficiency and avoids budget overspending	
	Inter-governmental cooperation	Lack of clarity about the signing of the memorandum of understanding between the Finnish and Estonian governments. Major prerequisite for the project			Conclusions of the FinEst Link project. Significant (inter)national interests	

(*continued*)

Table 2.

Type of uncertainty	Topic	Public decision-maker		Private developer		Combined effect on perceived feasibility
		Threat arguments	Opportunity arguments	Threat arguments	Opportunity arguments	
Relationship between the project parties	Safety and security of infrastructures	Lack of specific rescue capabilities. Unexpected costs for government			Cost coverage by the developer. Different types of guarantees available	Negative, financing agreements and business plan significant
	Public or non-public railways/service	Lack of clarity about the envisaged nature of the planned railways			Irrespective of the legal definition, high safety and security standards ensured	
	Acquisition and operation of trains	Lack of clarity about the purchaser, operator and costs of trains			Different options. Remains to be specified in further stages	
	Financing agreements and business plan	Developer's refusal to share the documents. Lack of clarity about the financing conditions and risks		Sharing unnecessary. Revealing business secrets hinders the realization of the project. Public money and guarantees not needed. IRR positive		
	Ownership	37.5% owned by China's Touchstone Capital Partners (TCP). Ambiguity of intentions and lack of clarity about (control) rights			China's TCP as a minority shareholder. European investors, Nordic pension funds. Public listing of shares	

argument pertains to the declared opening date of the tunnel in 2024. To guide the developer towards a new "realistic" time schedule, the MoF attached an appendix with expected durations of the environmental studies required by laws.

FBAD submitted a supplementary request to the MoF in *April 2019*; however, the developer remained rather superficial when responding to the main concerns expressed by the MoF. FBAD explained that its significantly larger number of forecasted travellers was based on the assumptions that (1) the fast link between the Helsinki–Vantaa and Tallinn airports effectively merges them into one airport, while the number of Asian tourists will continue to grow; (2) Overall 50,000 new inhabitants will be living on the artificial island built in the Finnish waters; and (3) Helsinki and Tallinn will form one region. When justifying the significantly higher cargo volumes predicted for the tunnel, FBAD referred to the UK, which allegedly exports 26% of its goods via the Channel tunnel. However, the developer admitted that more specific calculations would be conducted later as part of the environmental impact assessment (EIA) process in Finland.

With the new request, FBAD provided a time schedule for quarterly planning and construction activities that, however, were all expected to end in 2024 again. Even though the developer admitted that unforeseeable obstacles may occur, it also argued that the given time schedule builds on legal analyses and expert opinions.

Three months later, in *July 2019*, the MoF returned the request to FBAD for corrections for the second time. First and foremost, the given explanations of forecasted traffic volumes were considered unsatisfactory. Furthermore, the MoF included a link to the EU Guide of cost–benefit analysis of investment projects and asked the developer to perform a "realistic analysis" about the tunnel project (Code 3.1 in Appendix 2). Finally, FBAD's unwillingness to correct the final milestone of its time schedule – the grand opening in 2024 – was surely disappointing for the MoF. In this context, the MoF emphasized that the proposed time schedule was not in line with the requirements of law and that the superficies license could not be advanced in parallel with the NDSP process.

In *November 2019*, FBAD submitted its third request, which included an extra study from a Finnish market research company on the expected economic effects (Code 1.3 in Appendix 2). The study confirmed FBAD's previously claimed traffic potential; however, the developer now paid more careful attention to explaining the assumptions behind the forecast figures (see Note 7 in Appendix 6).

Last but not least, FBAD refused to change its initial timing plan. The developer agreed that this deadline is ambitious; however, by referring to the experience of its Finnish and Chinese construction partners and describing a case of a Finnish industrial megaproject as best practice, it stated that devising a new timing plan was not reasonable at that moment.

In summary, this intensive argumentation illustrates how strong disagreement over demand and timescale estimates guides government decision-making towards rejecting the developer's request for the initiation of the megaproject planning. It also appears that to reduce uncertainty in the most sensitive areas for public decision-makers, there is ultimately little help in providing more data on the assumptions behind the positive business outlook while overlooking alternative, less optimistic development scenarios (e.g. lower demand and longer timespans) to assess the resilience of a megaproject idea. This debate (see also Appendices 4 and 5) shows that uncertainty about estimates remains a major concern for public decision-makers who nevertheless seek to assist and direct private developers towards acceptable calculations and a harmonized understanding of legal constraints.

4.2 Uncertainty about design and logistics

In terms of technological opportunities, FBAD proactively acknowledged in its initial planning request that either (European gauge) 1,435-mm rails or (Russian gauge) 1,520-mm

rails would be used in the tunnel and that it would also remain open to completely different future technologies, such as Hyperloop and Loop.

Interestingly, the only time the private developer used the word "risk" in its initial request was in relation to the planning process (the law) itself, which could hinder the opening of the tunnel in 2024. To speed up the whole planning process for "reasonable and expedient" timing purposes, FBAD also asked the MoF to immediately start the procedure for the superficies license for the tunnel (Code 5.1 in Appendix 2). That is written in a situation where "the applicant is aware that final decisions on the superficies license can be made only after the national designated spatial plan is adopted" by the government.

In its first response, as noted above, the MoF made it clear that the tunnel must employ 1,435-mm rails. The Ministry of the Environment in turn warned about the devastating impacts the construction works might have on the volume and quality of groundwater in the Tallinn area (Codes 6.1 and 6.2 in Appendix 2). The letter clearly informed FBAD well in advance that no tunnel would be built if further analyses prove a significant potential threat to the supply of drinking water.

In the supplementary request of *April 2019*, FBAD interestingly overlooked the requirement for 1,435-mm rails and repeated its initial position that either 1,435-mm or 1,520-mm rails would be used in the tunnel (Code 4.1 in Appendix 2). Therefore, in its next response of *July 2019*, the MoF once again highlighted the 1,435-mm-wide rails connected with the Rail Baltica rail network as a main prerequisite for launching the tunnel project and emphasized that the government institutions did not have sufficient information on the purpose of the planned artificial island. The MoF also pointed out that FBAD's proposal to speed up the planning process was not in line with the requirements of law. In this context, in *November 2019*, FBAD made assurances that the artificial island on the Estonian side, differently from the one built on the Finnish side, would remain uninhabited and that the landing facilities would be used only for tunnel construction and maintenance purposes (Code 7.2 in Appendix 2).

In summary, this line of argumentation demonstrates that the topics related to technology and construction processes, though important for project motivation in the early stages of the application process (see Appendix 4), are relatively less disputed and have a relatively smaller negative effect on the perceived feasibility of the tunnel project in its planning phase. The Estonian government directed the private developer towards clarity and certain choices when demarcating necessary – technical, environmental and legal – conditions for the acceptance of the project, thereby indicating the risks the politicians would never take. Amongst the public sector decision-makers, there was a clear position (path dependency) regarding some major technical standards and requirements of the rail tunnel as it was required to have a good fit with another politically accepted megaproject, Rail Baltica.

4.3 Uncertainty about objectives and priorities

The topics discussed under this area of uncertainty illustrate the importance of clear project objectives as well as the relative priorities and acceptable trade-offs for public decision-makers. In its initial request, FBAD began the motivation of the tunnel project by stressing the economic opportunities the tunnel would bring to the region in the form of new investments and improved competitiveness (Code 10.2 in Appendix 2). Interestingly, FBAD remained silent about the potentially positive effects on the environment or society at large. It noted only fleetingly that the rail tunnel could be seen as an environmentally friendly transportation alternative (Code 8.2 in Appendix 2) enabling the development of Helsinki and Tallinn as twin cities.

In the response letter from *February 2019*, the MoF made it clear that the initiation of the planning process would be conditional on the Finnish government and a memorandum of

understanding to be signed between the two governments. The former Minister of Public Administration, responsible for NDSP at the time, clarified the need for such a political memorandum:

> No matter who builds the tunnel, a common understanding between the Estonian and Finnish states, the cities of Tallinn and Helsinki, of what this could be and what this process might look like is inevitable. / . . . / Otherwise the parties are simply not interested in contributing enough to this project together, and that is a . . . big problem.

In the supplementary request of *April 2019*, FBAD strengthened the motivation behind its tunnel project by referring to decisions of the Finnish–Estonian intergovernmental meeting advancing the vision of a tunnel between Helsinki and Tallinn in May 2018 (see Appendix 3). In the same letter, the relative priority of time(scale) for FBAD arose when the developer refused to correct the planned opening date.

In *July 2019*, for the first time, the government raised the question of the impacts the tunnel might have on carbon dioxide emissions and the achievement of Estonia's climate goals. That is, the MoF intended to highlight the importance of Estonia reducing greenhouse gas emissions in the transportation sector well in advance (Code 8.1 in Appendix 2). Nevertheless, FBAD essentially avoided reflecting on Estonia's climate goals and discussing the opportunities that the rail tunnel would offer regarding the reduction of greenhouse gas emissions in its supplementary request of *November 2019*. The Chief Operations Officer (COO) of FBAD explained this as follows:

> We could in a very . . . way start to talk about the greens and the positives of the project, but we have decided not to do that so that people will not criticize us . . . if we don't have enough data and information to justify our statements.

Instead, FBAD highlighted the relative importance of staying committed to strict time schedules as an opportunity to remain focussed, be efficient and avoid budget overspending (Code 9.1 in Appendix 2). Furthermore, it hinted that the state should review its planning rules and procedures, concluding that

> No NDSP has ever been implemented in Estonia; hence, there is no comparable successfully conducted project in Estonia that could be used as a basis for evaluation of the time schedule.

In summary, the potentially positive social and environmental impacts of the rail tunnel never became a seriously discussed topic affecting the public decision-making about this tunnel project. Instead, while the Finnish government was lukewarm about signing the intergovernmental memorandum of understanding, FBAD's reluctance to make compromises and change the unrealistically perceived timescale created tensions and significantly reduced its chances of gaining support for the tunnel project amongst the Estonian public sector decision-makers. That is, uncertainty related to priorities arising from both the developer's own project proposals (timescale) and some contextual developments (the Finnish government) significantly affected the feasibility of this private megaproject idea (Codes 2.1 and 10.1 in Appendix 2).

4.4 Uncertainty about fundamental relationships between project parties

For public sector decision-makers, a key area of uncertainty concerns ambiguity about the responsibilities and roles of FBAD and its partners in sharing costs, bearing risks, and profiting from the tunnel project (Codes 12.1 and 13.3 in Appendix 2). FBAD began to address these issues in its supplementary request of *April 2019,* when it first emphasized that all the works would be financed by private investors without any state guarantees. Most importantly, FBAD informed that it recently signed a 15-billion-euro memorandum of understanding with China's Touchstone Capital Partners (TCP) to finance the construction of the tunnel. TCP,

a financial firm that invests the resources of state-owned Chinese enterprises, would provide one-third of the 15-billion-euro funding as a private equity investment – affording it a minority stake in the tunnel project – and two-thirds would come as debt financing.

In addressing the MoF's concern of mitigating environmental safety risks and covering the potential conservation costs of unfinished constructions, FBAD shortly noted that possible emergency situations would be described later during the EIA.

In *July 2019*, the MoF put forward an early request for better understanding of who would purchase and operate the trains and what those activities would cost. Evidently worried about financial risks and unexpected costs again, the MoF asked the developer to share the memorandum and financing agreements signed with China's TCP. Furthermore, the Ministry wished to see a detailed business plan stipulating the assumed roles of the government and the developer in sharing the costs and financial risks. Interestingly, a new legal question about the nature of the constructed infrastructure was raised as well: Would the developer consider the infrastructure as public railways in the future? (Code 12.1 in Appendix 2) The MoF also wanted the developer to provide a full analysis of risks or costs to the public sector that may result from the project.

By that time, the MoF had additionally consulted with the Estonian Foreign Intelligence Service and the Estonian Internal Security Service (Code 15.1. in Appendix 2), and FBAD was required to reveal the conditions under which China's TCP would acquire ownership and the rights that would be vested to it in the project. The former minister of public administration explained the threats as follows:

> I think that transparency of funding is also important so that the state is not blackmailed. / . . . / And the private sector may sometimes be at odds with the state, but if the private sector's chairman is from some country against which there is an information war or a cold war . . . then . . . it leads to plenty of tensions that take a lot of time and energy to resolve.

The MoF eventually asked the developer to prepare a comprehensive security and safety concept for the tunnel project to assess FBAD's readiness to ensure the security and safety of its infrastructures. This would take place in a situation where Estonia does not have planned rescue capabilities and resources for undersea rail tunnels (Code 11.1. in Appendix 2).

In the last request of *November 2019*, in answering to the MoF's economic concerns regarding the purchase and operation of trains, FBAD noted that it is too early to make such decisions (Code 13.2. in Appendix 2). However, it assured the MoF that the financing scheme would not be dependent on the operational scheme and that there were no risks regarding train operations for the state.

Furthermore, in response to the MoF's worry about financial risks and unexpected costs, FBAD pointed out that the memorandum signed with TCP covered all of the various planning and construction costs of the tunnel. TCP would obtain 37.5% ownership against its 4.5-billion-euro equity payment in the project, and no guarantees would be required from the governments; however, the negotiations on financing conditions were to be continued. That said, the developer refused to share the memorandum and other financing contracts and drafts with the MoF, referring to a typical practice of protecting business secrets.

The confidentiality requirement came into play again when FBAD claimed that it had spent a remarkable amount of resources to prepare its own business model, which, when fully published at that stage, would hinder the realization of the whole tunnel project (Code 14.2 in Appendix 2). The COO of FBAD commented on this retrospectively:

> The 1,500 pages that were submitted are basically more than a business plan already. They answer all the questions they [the MoF] asked, and more.

However, FBAD provided a long table describing various risks, the parties involved and possible mitigation measures across the different development phases of the project as a full risk analysis.

Even though the risk analysis addressed different guarantees for covering unexpected costs (e.g. conservation costs), it remained superficial without mentioning any guarantors or financial numbers (Code 11.3 in Appendix 2). This time, the developer instead thoroughly responded to the MoF's safety and rescue concerns and declared that it could cover all the costs related to safety and the organization and availability of rescue services (Code 11.2 in Appendix 2).

The specific security-related concern raised in the MoF's previous letter was about the rights that China's TCP would have in the tunnel project. Apart from the revealed minority ownership, the developer remained silent about other agreements with TCP.

In summary, this argumentation illustrates how little transparency in security-related project financing matters along with rather superficial risk (mitigation) analysis by the private developer guides the government's decision-making towards rejecting the request for initiation of the tunnel planning (Codes 14.1 and 15.1 in Appendix 2). For public sector decision-makers, the lack of clarity about the capabilities, responsibilities and roles of FBAD and its partners formed a major source of uncertainty that negatively affected the perceived feasibility of the megaproject. Topics related to the uncertainty about fundamental relationships between project parties, such as the safety and security of infrastructure, and ownership, emerged gradually and came more into focus in the last stages of the communication process (see also Appendices 4 and 5). The back-and-forth argumentation between the parties shows that a negative perception of FBAD's request evolved when the developer constantly failed to provide detailed information to counter the MoF's threat arguments, indicating that the level of uncertainty the public sector would accept remains significantly lower than that of private (start-up) investors in megaprojects.

5. Discussion and conclusions

In answering the research question regarding how uncertainty contributes to the process of public decision-making about a planned private megaproject, our study first suggests that some types of uncertainty tend to be relatively more important than others. The case suggests that although all four types of uncertainty from Table 1 could be identified in the analysed communications, the most significant debates evolved around uncertainties in estimates (Type 1) and in the relationships between the project parties (Type 4). One of our aims was to identify topics of debate concerning the uncertainty and feasibility of a megaproject. While we identified 14 major topics of debate (see Table 2) from our empirical material the communication of threats and opportunities regarding uncertain demand, financing and business plan, timescale, safety/security and fit with other infrastructures, formed the gist of the whole debate (see Appendix 4) emanating from the hybrid nature of the private declared megaproject. Uncertain demand was the most debated topic showing that demand risk matters not only in the formalized road PPP process studied by accounting scholars (see Burke and Demirag, 2015) but also in other types of megaproject arrangements. In contrast to Esposito *et al.* (2022), worrisome environmental topics – except for the possible threat to groundwater – did not emerge at this early stage of planning. We believe that similar topics are at the core of other public debates concerning government approvals to private megaprojects in their planning phase, especially those projects that would (monopolistically) dominate the provision of essential public services where many citizens and institutions depend on their smooth functioning, such as bridges, roads, dams or power stations.

Second, based on the analysis of the arguments mobilized by the public and private actors, we argue for a distinct type of uncertainty that affects public decision-making about permitting the initiation of private megaprojects. Specifically, in our case, communication between the actors regarding the focal infrastructure project revealed that many of the government's concerns were underpinned by an uncertainty about the privateness of the (private declared) megaproject. We add to the study by Ward and Chapman (2003) by

proposing a new type of uncertainty in projects – uncertainty about privateness – which cuts across the four types of uncertainty listed in Table 1, and which has not been made explicitly visible thus far. From the government's perspective, this uncertainty relates to a lack of clarity about the nature of services provided (e.g. public vs private rail services) within a project, the extra functions created and funded by the public sector (e.g. undersea rescue capability), the ultimate risk bearer (e.g. responsibility for unfinished constructions) and the interests of other countries (e.g. China and Finland) regarding the particular megaproject. In this regard, infrastructure megaprojects, even if argued to be fully private, embody the characteristics of a PPP (Bovaird, 2004); hence, they cannot be left to administer themselves (Casady *et al.*, 2020). In other words, the word "private" here does not mean that governments can simply externalize transport services provision to a megaproject organization and walk away. In contrast, the governments must ensure that there is a balance between the public and private values delivered by the megaproject. However public or private the megaproject is, it needs strong institutional capabilities, such as legitimacy, capacity and trust, to succeed (*ibid*). By giving their political approval and officially launching the process of megaproject planning, governments also begin to signal trust, make commitments and add legitimacy to the private megaproject initiative. This way in pursuit of yet uncertain public benefits (Brinkerhoff and Brinkerhoff, 2011), governments become lead players in long and costly development projects difficult to exit once started. Recognizing this area of uncertainty is important for the public sector to reduce the chance of being bound to a private megaproject in an unexpected or undesirable way. In this light, the private developer's requests to the MoF in our case can be viewed as a manifestation of attempts to enter a long-term PPP, even if never explicitly communicated as such. For future research, the notion of uncertainty about privateness raises the question of whether private megaprojects are more a language game than a real (governance) scheme for the provision of infrastructure services.

Third, previous research has conceptualized PPPs as hybrids with tensions between the private sector's corporate (business) logic and the public sector's (state) logic (Miller *et al.*, 2008; Shaoul *et al.*, 2012; Kaufman and Covaleski, 2019). It has pointed out that different private and public stakeholders have different risk appetites in PPPs (Burke and Demirag, 2015, 2017). We have acknowledged a new type of institutional logic dominant in our megaproject organization – agile start-up logic – which conflicts with the bureaucratic public sector logic and creates temporal tensions (Cunha *et al.*, 2020) about how to plan and build a megaproject. These tensions, emanating from different uncertainty framings (e.g. when and how to deal with unknown futures), shape the tone of communication and the spirit of cooperation between private developers and public decision-makers around the megaproject. Start-up entrepreneurs are highly reactive, and innovation focussed, used to working under extreme uncertainty, time pressure and a lack of resources. They often adopt speed-related agile practices in an *ad-hoc* manner (Nguyen-Duc *et al.*, 2021). In our case, the different uncertainty framings and attitude to risk resulting from the actors' divergent logics became an underlying obstacle for the planning of the tunnel megaproject. The results of our study indicate that the agile start-up logic with very specific taken-for-granted rules (Saz-Carranza and Longo, 2012) from the private IT sector yet remains incompatible with the bureaucratic public sector logic for megaproject development. However, as noted by Grossi *et al.* (2022), future research could take a deeper look at hybridity in megaprojects. More specifically, we propose to explore the coexistence and evolution of different (institutional) logics (Vakkuri *et al.*, 2021) that inform decision-making on megaprojects within organizations.

Fourth, our study revealed that decision-making on complex and uncertain megaprojects is a conflictual and dynamic process, where public decision-makers and private developers combine different threat and opportunity arguments for (socially) constructing a desired outlook for the future. That can be the case already in the early stage of political decision-making (i.e. when only deciding on whether to initiate a planning process at all) outside a typical PPP (bid) process and

rhetoric of VFM (Burke and Demirag, 2015; Demirag *et al.*, 2012). As this megaproject proposal did not make it to the next round of its development process, the application process indicates several shortcomings in the private developer's argumentation that largely emphasized opportunity arguments in its communication with the MoF. One shortcoming was that it primarily mobilized economic opportunity arguments to justify the construction of the tunnel. While being extremely optimistic about the positive impacts of the tunnel on the economies, the developer remained rather silent about possible positive impacts on nature (e.g. climate goals) and society at large. That is, some important potential public benefits (Brinkerhoff and Brinkerhoff, 2011; Hodge *et al.*, 2018) and sustainability goals (Meadowcroft, 2007), which governments typically seek in such megaprojects, were largely overlooked in building a positive outlook for this tunnel project. The forecasts, planning models and calculations, which may serve as "compromising accounts" (Chenhall *et al.*, 2013) in complex and uncertain organizational settings such as megaprojects, rather pushed our actors apart in the tunnel project. For finding compromises, it is not fruitful to stick to one strategy (estimate) without creating redundancy and offering alternative scenarios to the partner throughout the communication process. In this context, we paradoxically recognize that certainty, that is, actors' firm conviction that only their own accounts can be correct, becomes a major polarizing factor between public and private partners. Almost every request or proposal (e.g. adjusted time schedule and reduced traffic volume) seems to become a threat to the project, if it is too narrowly calculated and designed (Giezen *et al.*, 2015).

Another related shortcoming and reason why the private developer failed to remove uncertainty (Atkinson *et al.*, 2006) regarding the megaproject was that it either ignored, strongly resisted or only superficially addressed some of the major public sector concerns. The financial, managerial, security and safety arguments provided by the private developer rather increased those concerns and hence negatively affected the perceived feasibility of the project in the eyes of public decision-makers. To gain political support and succeed in the long term, a megaproject should align its performance objectives with national and international strategic policy goals, such as a binding target to cut emissions in the EU. In the case of our project, these forward-thinking links were either not explicitly presented or missing altogether in the developer's application documents, which left the question of why to build this tunnel in the first place unanswered. However, the case shows that when faced with high uncertainty, public sector decision-makers do not close the planning process in megaprojects quickly. While demarcating topics and preconditions for the project to proceed, careful and suspicious government actors seem to be curious about learning how a dreamlike vision of an infrastructure megaproject can become and remain viable in the eyes of a private investor. In that way, uncertainty also brings actors together, and public decision-making becomes a gradual process, with disputes possibly lasting for years when additional details are provided in favour of and/or against the megaproject.

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Supplementary materials

Appendix 1

No	Date	Function	Organization	Duration
1	25.10.2019	Chief Operations Officer and Founding Partner	FBAD	90 min
2	6.11.2019	Head of Unit, Work Package Leader in the FinEst Link Project	City of Helsinki	60 min
3	7.11.2019	Executive Officer, Project Partner and Member of the FinEst Link Task Force	Estonian Ministry of Economic Affairs and Communication	60 min
4	19.11.2019	Chief Specialist, Economic Impact Assessment and Development	Finnish Ministry of Transport and Communication	70 min
5	5.12.2019	Programme Director and Chair of the FinEst Link Task Force	Intelligent Transport Systems Finland and Finnish Ministry of Transport and Communication	65 min
6	28.8.2020	Minister of Public Administration, NDSP	Estonian Ministry of Finance and the Government of Estonia	60 min
7	28.8.2020	Deputy Head of Planning Department, NDSP	Estonian Ministry of Finance	70 min
8	2.9.2020	Chief Operation Officer and Founding Partner	FBAD	100 min
10	15.9.2020	Head of Department, Hydrogeology and Environmental Geology	Geological Survey of Estonia	45 min
11	16.9.2020	Research Director, Economic research commissioned by FBAD	Market Research Company Taloustutkimus Oy	55 min
12	17.9.2020	Managing Director, Work Package Member in the FinEst Link Project International Cooperation Advisor, Work Package Leader in the FinEst Link Project	Association of Municipalities of Harju County, Estonia	100 min
13	17.9.2020	Research Director, Economic research commissioned by FBAD	Market Research Company Taloustutkimus Oy	50 min

Table A1. Description of the interviews

Appendix 2

Type of uncertainty	Second-order topics and first-order codes	Examples of analysed textual segments
Uncertainty in estimates	1. Demand	
	1.1. Cargo volume	Reference to a threat by the MoF: "*In order to assess the feasibility of planned activities, and considering the abovementioned possible risks, we would like to see how such a big difference in cargo forecasts is received in comparison to the feasibility analysis of the FinEst Link project.*" (February 2019)
	1.2. Passenger traffic	Reference to an opportunity by FBAD: "*To be able to connect the airports, the logistical and technical solution must be made so that it makes it possible to reach with 30 minutes from one airport to the other.*" (November 2019) Reference to a threat by the MoF: "*The passenger traffic is predicted five times bigger . . . is a big risk that the assumptions of cargo and passenger flows presented in the application are unrealistic (overly optimistic) and the project will not be profitable if only financed by the private sector.*" (July 2020)
	1.3. Economic growth	Reference to an opportunity by FBAD: "*Total cumulative economic effects during 2021–2050 (without any multipliers) will be 225 billion euro and 47 billion euro in Finland and Estonia, respectively.*" (November 2019)
	1.4. Links to Rail Baltica	Reference to an opportunity by FBAD: "*For the [realization of] financing and operation plans, Rail Baltica is not a necessary precondition, and the developer has also considered the possibility that Rail Baltica will not be constructed. For the developer's finance model and business plan calculations, Rail Baltica has no direct impact.*" (November 2019)
	2. Timescale	
	2.1 Opening date	Reference to a threat by the MoF: "*According to the application, the rail tunnel will be open in December 2024./ . . . /From the beginning on, the project must be planned based on a realistic time-schedule, so that also the planned budget and business plan could be realistic too.*" (July 2020)
	2.2. Process time	Reference to a threat by the MoF: "*Actually, the applied NDSP process . . . can take five years, or more./ . . . /The unrealistic time-schedule . . . ignoring current norms and laws, can make the project significantly more expensive.*" (July 2020)
	3. Costs	
	3.1. Amount	Reference to a threat by the MoF: "*To assess the feasibility of the project as well potential costs and risk for the state, it still does not come out from the amended application how is the operation of the tunnel planned, and what does it cost.*" (July 2019)
	3.2. Breakdown	Reference to an opportunity by FBAD: "*Before the planning proceedings get finished, the cross-border environmental assessment conducted, and the rail route chosen, it is impossible to assess . . . necessary activities and related costs at a reasonable level of detail. In many cases, to assess activities a preliminary project must be prepared.*" (November 2019)

Table A2.
Code categories and examples of analysed textual segments

(*continued*)

Type of uncertainty	Second-order topics and first-order codes	Examples of analysed textual segments
Uncertainty about project design and logistics	4. Main infrastructure	
	4.1. Rail gauge	Reference to an opportunity by FBAD: *"In case of [route] alternatives VE1a, VE1b and VE1c, the European (1435 mm) rail gauge, the Finnish (1524 mm) rail gauge or both rail gauges will be used."* (April 2019)
	4.2. Location	Reference to a threat by the MoF: *"According to the descriptions, route alternatives VE1a, VE1b and VE1c run only to Ülemiste terminal/Tallinn airport, not compatible with Rail Baltica. We ask to liquidate the shortcomings in the application."* (February 2019)
	5. Order of proceedings	
	5.1. Superficies licence	Reference to an opportunity by FBAD: *"The aim of submitting the application of superficies licence is to harmonize the proceedings of NDSP and superficies licence in a way that would ensure that the time spent on necessary proceedings related to the planning of the rail tunnel is reasonable and expedient."* (December 2018)
	6. Groundwater	
	6.1. Supply of drinking water	Reference to a threat by the MoF: *"In the area where almost half of the Estonian population lives, the supply of drinking water can suffer due to planned [construction] activities . . . / . . . /Additionally the quality of drinking water can worsen./ . . . /We have already today problems with water supply in Viimsi [district]."* (February 2019)
	6.2. Drilling of the tunnel	Reference to a threat by the MoF: *" . . . the tunnel passes all layers of groundwater and can influence the replenishment, the level and quality of groundwater."* (February 2019)
	7. Support infrastructure	
	7.1. Deep-water port or mooring facility	Reference to a threat by the MoF: *"According to the application, there will be a permanent deep-water port with a waterway and quay established on the artificial island. It is necessary to specify, what do you mean by that [port] (aim, size, volumes) . . . It also remains unclear, who would own and operate the deep-water port."* (February 2019)
	7.2. Functions of the artificial island	Reference to an opportunity by FBAD: "*Considering the good location of the island, the state might be interested in setting up a logistical base, or other kind of base for maritime rescue, environmental protection, police, border guard, customs, state defence or some other nationally important tasks."* (November 2019)
Uncertainty about objectives and priorities	8. Climate and nature	
	8.1. National climate goals	Reference to an opportunity/threat by the MoF: *"The influence of the project on CO2 emissions, both during the construction and operation, as well as how the project can influence the achievement of Estonia's climate goals, must be assessed. It is important for Estonia to move towards the reduction of greenhouse gases in the transport sector."* (July 2019)
	8.2. Positive environmental impacts	Reference to an opportunity by FBAD: *"In their [HELCOM, VASAB] documents, a rail tunnel is mentioned several times as an environmental friendlier alternative to the ferry connection."* (November 2019)

(*continued*)

Table A2.

Type of uncertainty	Second-order topics and first-order codes	Examples of analysed textual segments
	9. Timescale	
	9.1. Priority and changes in the time-schedule	Reference to an opportunity by FBAD: *"A clearly communicated possible project deadline is important. Though the deadline is ambitious, it helps to focus and make different project-related work processes more efficient./ . . . /Such a timescale is also an important working tool to stay within budget."* (November 2019)
	10. Intergovernmental cooperation	
	10.1. Memorandum of understanding	Reference to a threat by the MoF: *"In joint interests of the countries [Finland and Estonia], in Estonia's foreign policy interests, in public interests and in the interests of planning feasibility, it is not right to start the NDSP of the rail tunnel without an agreement [memorandum of understanding signed] between the countries./ . . . / . . . it is not possible to predict, how long will the negotiations on the memorandum of understanding take between Estonia and Finland . . ."* (July 2020)
	10.2. Significant (inter) national interests	Reference to an opportunity by FBAD: *"The rail tunnel connecting Estonia and Finland is of great international interest as it is related to the development of the Finnish and more broadly the entire Baltic transportation network. It is also an important link, which influences the connectivity of both Finland and the Baltic states with the rest of Europe."* (December 2018)
Uncertainty about relationships between project parties	11. Safety and security of infrastructure	
	11.1. Missing capabilities	Reference to a threat by the MoF: *"Thereby it is important to know that at the moment the state does not have necessary resources to offer rescue, public order and security services in the rail tunnel and its related buildings. Neither has [the state] planned any resources for the development and maintenance of such services."* (July 2019)
	11.2. Extra costs and obligations of the project parties	Reference to an opportunity by FBAD: *"The developer agrees to cover the costs of security and rescue and to plan the functioning of these services. Also, the developer agrees to ensure security of trains and end-stations during the operational phase . . . / . . . /Based on its initial assessments, the developer has arrived at conclusion that solving the rescue and security questions would have little impact on the total cost of the project."* (November 2019)
	11.3. Guarantees and risk mitigation	Reference to an opportunity by FBAD: *"It comes out that previous studies have briefly recognized risks but have not addressed the impact and mitigation measures of those risks./ . . . /Risks related to security and rescue must be carefully mapped in the planning phase and it must be ensured that the risks are properly assessed, and mitigation measures put in place."* (November 2019)
	12. Public or non-public railways/ service	
	12.1. The nature of services	Reference to a threat by the MoF: "*If the charges for the use of railway infrastructure by railway undertakings do not cover the costs related to the rail tunnel, the state must compensate the difference to the manager of public railways through a targeted [financial] support.*" (July 2020)

Table A2. (*continued*)

Type of uncertainty	Second-order topics and first-order codes	Examples of analysed textual segments
	13. Acquisition and operation of trains	
	13.1. Operation	Reference to an opportunity by FBAD: *"It is possible that the developer establishes a separate daughter company for operating the tunnel, but it is also possible that for operations cooperation agreements will be signed with existing railway undertakings."* (April 2019)
	13.2. Purchase	Reference to an opportunity by FBAD: *"Only based on more detailed analyses it would be possible to say which trains and at what speed could run in the tunnel./ . . . /Hence, more specific decisions can be made after the planning process . . ."* (November 2019)
	13.3. Costs	Reference to a threat by the MoF: "*We ask to add a description of infrastructure solutions, conditions and cargo/traffic volumes to the application to assess the annual operation and maintenance costs of the infrastructure and trains.*" (February 2019)
	14. Financing agreement and business plan	
	14.1. Transparency and business secrets	Reference to a threat by the MoF: *"The developer has not . . . essentially responded to the questions . . . and presented appropriate evidence. According to the application, it is not possible for the developer to reveal or present the memorandum of understanding or other financing agreements or draft contracts because of usual business secrets in them. Therefore, it is not proved that the developer has [necessary] funds to implement the applied NDSP [project]."* (July 2020)
	14.2. Business model and project payback	Reference to an opportunity by FBAD: *"According to those calculations, the payback period of the project is 17 years and IRR 10.11%."* (November 2019) Reference to a threat by FBAD: *"This [full disclosure of the business model] can put the developer at a disadvantage in negotiations and would give unfair advantage to possible competitors."* (November 2019)
	15. Ownership	
	15.1. Interests and rights of the Chinese investors	Reference to a threat by the MoF: "*Based on the public report by the Estonian Foreign Intelligence Service, based on its analyses from 12.7.2019 and 3.9.2019 protected by the state secret, it is doubtful that there would be funds to implement the NDSP [project] and that the potential investor would be reliable.*" (July 2020)
	15.2. Ownership structure	Reference to a threat by the MoF: *"In the finance minister's opinion, considering the nature of the rail tunnel and the share of ownership acquired by the investor, the regulation [(EU) 2019/452 Establishing a framework for the screening of foreign direct investments into the Union] would apply to the planned investment."* (July 2020)

Table A2.

Appendix 3

	1993	The first brief study by Finnish geologists and engineers regarding the technical and economic potential of a tunnel
	2014	City of Helsinki, City of Tallinn, and Harju County Government of Estonia order a pre-feasibility study on a fixed link between the two cities (Talsinkifix project)
	2015	Talsinkifix pre-feasibility report published – socio-economic impacts found to be substantial. Investment of 9–13 billion euro. Potential start of construction in 2025–2030. A full feasibility study proposed
	2016	For a full feasibility study, FinEst Link cooperation document signed by the Finnish Ministry of Transport and Communication, the Estonian Ministry of Economic Affairs and Communication, the City of Helsinki, the City of Tallinn, the Helsinki-Uusimaa Regional Council, and the Harju County Government of Estonia. Focus on technical and economic feasibility
	2017	Private initiative, Finest Bay Area Development, run by some famous Finnish IT entrepreneurs and began designing an alternative concept for the tunnel
February	2018	The final report of the FinEst Link feasibility study published. Investment of 16 billion euro. Financially most feasible when partly financed by EU grants. As a next step, formation of a development vehicle is suggested
March	2018	Task force – a joint effort between the public authorities of Finland and Estonia – established to analyse the findings of the FinEst Link study
May	2018	Task force report published – various positive effects found. Eight recommendations for the governments of Finland and Estonia. Private sector involvement seen as necessary. A memorandum of understanding between the two countries is suggested by the end of 2018
December	2018	Private initiative, Finest Bay Area Development, submits a request for initiation of a national designated spatial planning process in Estonia for building an undersea rail tunnel between Helsinki and Tallinn as well as a related artificial island in the Finnish Gulf
November	2019	The new Finnish government prioritizes the construction and modernization of domestic rail infrastructures. No concrete activities planned regarding the Helsinki–Tallinn rail tunnel. The Finnish government's previous decision to acquire ownership of the international Rail Baltica project is cancelled
April	2021	Finland and Estonia sign a memorandum of understanding (MoU) on cooperation in the transport sector. The MoU states that the Helsinki–Tallinn tunnel is a unique project of the future that would require innovative actions and diversified sources of funding. Together with Rail Baltica, it would provide a quick access to Central Europe. The states are not bound by the MoU to any individual projects

Table A3.
Milestones of decision-making with regard to building a tunnel between Finland and Estonia

Appendix 4

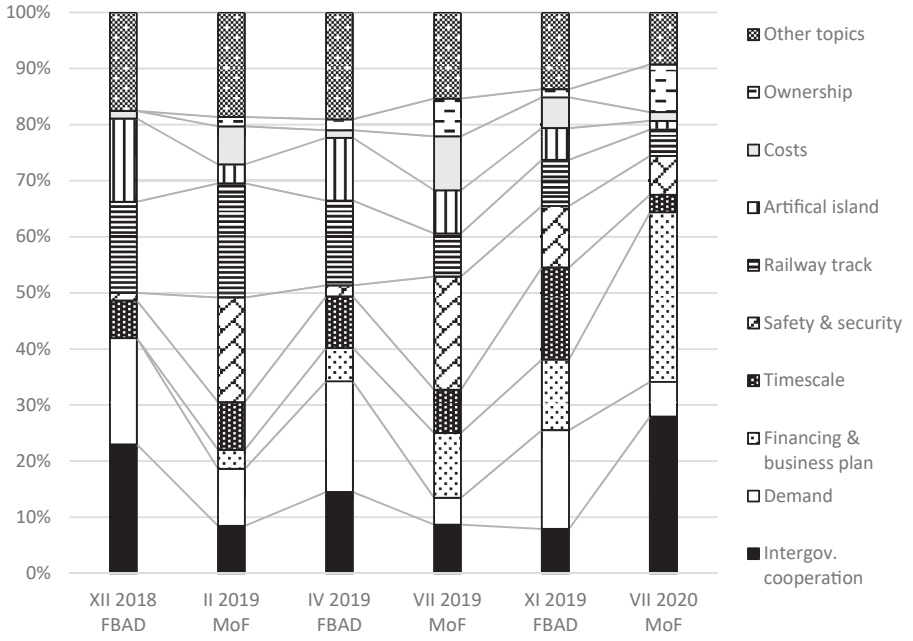

Figure A1. Percentage distribution of textual data segments across the topics of debate, 2018–2020

Appendix 5

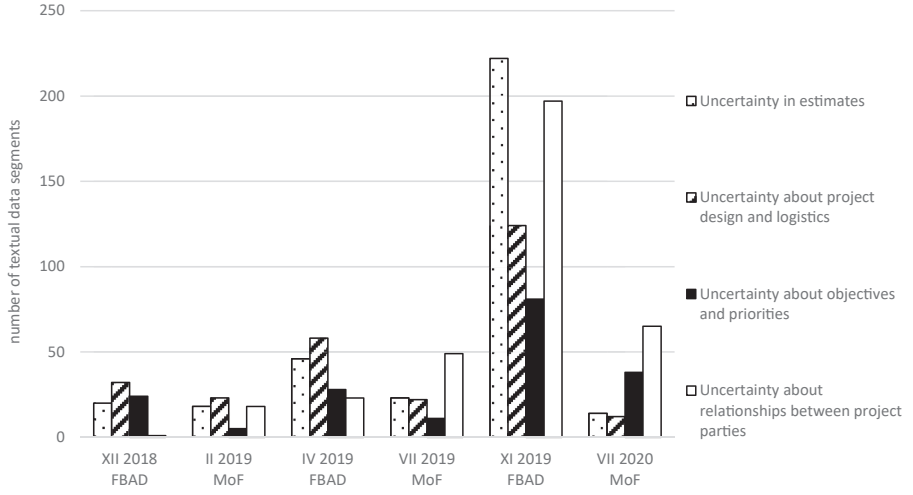

Figure A2. Distribution of textual data segments across the types of uncertainty, 2018–2020

Appendix 6

Table A4.
Explanatory notes

#	Note
1	Contractually, megaprojects are often defined in terms of PPPs (van Marrewijk *et al.*, 2008). Typical function-specific definitions of PPPs concern structured long-term (contractual) relationship for sharing risks, benefits, resources and responsibilities in infrastructure financing, construction operation and maintenance (see Brinkerhoff and Brinkerhoff, 2011). In this study, we rely on the definition of PPPs by Bovaird (2004), which is broader and emphasizes the importance of shared dedication to achieve joint outcomes beyond the (principal–agent) dynamic of a contractual relationship
2	Sanderson (2012) argues for two different types of uncertainty in megaprojects: one related to a lack of relevant and reliable data and the other related to the fact that as the future is socially constructed, the nature and range of future events is unknown. In megaprojects, the latter form dominates, and many of the problems that arise are characterized by 'deep uncertainty' (Teece *et al.*, 2016), which cannot be solved simply by collecting more data for analytical purposes (Walker *et al.*, 2010)
3	In the European context, both Estonia and Finland have a very low degree of PPP activity at national level and no dedicated PPP-supporting units, that is, institutions (e.g. public agencies) set up to formulate PPP policy, build capacity or create, support and evaluate PPP agreements within government (van den Hurk *et al.*, 2016). The political commitment to pursuing PPPs has remained low, and largely due to the fear that PPP projects would be relatively costly, there are not any large-scale infrastructure PPPs implemented in Estonia. Also in Finland, most of the infrastructure networks are owned by local governments or the state, and there is a strong confidence in long-established institutions and practices regarding public procurement (Leviäkangas *et al.*, 2015; van den Hurk *et al.*, 2016)
4	In Finland, the process of spatial planning and the strategic environmental assessment (SEA) are organized at a regional level, whereas in Estonia, the central government is responsible for initiating and organizing these two related processes for megaprojects with significant strategic impacts. In Finland, the environmental impact assessment (EIA), aimed at reducing or preventing negative environmental impacts of development projects, is an independent procedure, while in Estonia, it is part of the superficies license process, which is typically conducted after the SEA has been completed
5	Espousing a social constructivist position implies that we do not believe uncertainties to exist 'out there' for us to discover, but rather we examine the communications of the main actors in order to understand what they perceive to be uncertainties related to the megaproject. Since such actors rarely explicitly use the term 'uncertainty' the analysis necessitates that we look for excerpts that can be seen as corresponding to our definition of uncertainty. In our research, we constantly moved 'back and forth between empirical findings and theoretical elements perceived to be of relevance and interest' (Lukka, 2014, p. 563). In other words, we developed our theoretical ideas regarding uncertainty alongside our empirical exploration of the case
6	Rail Baltica is an EU-funded greenfield rail transport mega-project currently under construction with a goal to integrate the Baltic countries in the European rail network
7	The significantly higher traffic volume compared to the FinEst Link forecasts was argued to be reachable when reducing travelling times down to 20 min between Helsinki and Tallinn for an increasing number of flight travellers (71 million travellers in total, with 15% of them using the tunnel for changing flights) and building a new artificial island with a tunnel station in the Finnish Gulf. Moreover, regarding the predicted cargo volumes, the developer defended its numbers by underlining that export from Finland continues to grow. Furthermore, in another argument for economic viability, FBAD claimed that linking the tunnel with the Rail Baltica network is not a prerequisite for achieving the cargo volumes (Code 1.4 in Appendix 2 above)

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