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Feasibility,governance and stakeholder engagement in megaprojects: the case of the Turin-Lyon high-speed railway line

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Abstract

This research study aims to provide a comprehensive analysis of the development of megaprojects in Europe, focusing on the case of the Turin-Lyon high-speed railway line.The study looks into the project's cost-benefit analysis, governance systems, stakeholder engagement, and historical background.To achieve the research objectives, the methodology used combined literature review, document analysis, and interviews to key stakeholders was used. The literature review explored existing academic papers and reports on megaproject development to provide a theoretical framework and conceptual understanding of the subject. Additionally, document review was conducted to analyze project documents, feasibility studies, cost-benefit analysis (CBA) and supranational agreements, which helped to understand the project's governance, decision-making processes, and implementation strategies.Furthermore, interviews were conducted with key stakeholders involved in the project, such as deputy director etc.

The research findings highlight the complexities of megaproject development in Europe, specially regarding the Turin-Lyon high-speed railway line. The historical analysis shows the evolution of the project over time and the various socio-political factors that have influenced its progress. The examination of stakeholder engagement practices provides an understanding of the diverse interests and conflicts between local communities, authorities, and the government involved in the project and highlighting the significance of comprehensive decision-making processes and effective mediation.

Additionally, the research investigates the governance structures and decision-making processes employed in the project, revealing the roles and responsibilities of key actors and institutions. The study also discusses the divergent results of the cost-benefit analysis performed on the project and the involvement of key stakeholders in its implementation.

Keywords : megaprojects, stakeholder engagement, governance, cost-benefit analysis, feasibility.

Abstract in Italian

Questo studio di ricercamira a fornireun'analisicompletadellosviluppodeimegaprogetti in Europa, concentrandosisulcasodellalineaferroviaria ad altavelocità Torino-Lione. Lo studio esaminal'analisideicosti e benefici del progetto, isistemi di governance, il coinvolgimentodegli stakeholder e gliantecedentistorici. Per raggiungeregliobiettivi di ricerca, è statoutilizzato un approccio misto checombina la revisionedellaletteratura, l'analisideidocumenti e le interviste. La revisionedellaletteratura ha esploratoarticoliaccademici e rapportiesistentisullosviluppodeimegaprogetti per fornire un quadroteorico e unacomprensioneconcettualedell'argomento. Inoltre, è statacondottaunarevisionedeidocumenti per analizzareidocumenti del progetto, glistudi di fattibilità, le analisideicosti e benefici e gliaccordigovernativi, chehannocontribuito a comprendere la governance del progetto, iprocessidecisionali e le strategie di attuazione. Inoltre, sono state condotteinterviste con gli stakeholder chiavecoinvoltinelprogetto, come il direttoreaggiunto, ecc.

Le scoperte della ricerca evidenziano le complessità dello sviluppo di megaprogetti in Europa, in particolare riguardo alla linea ferroviaria ad alta velocità Torino-Lione. L'analisi storica mostra l'evoluzione del progetto nel tempo e i vari fattori socio-politici che ne hanno influenzato il progresso. L'esame delle pratiche di coinvolgimento degli stakeholder fornisce una comprensione degli interessi diversi e dei conflitti tra le comunità locali, le autorità e il governo coinvolti nel progetto, evidenziando l'importanza di processi decisionali esaustivi ed efficaci processi di mediazione.

Inoltre, la ricerca indaga le strutture di governance e i processi decisionali impiegati nel progetto, rivelando i ruoli e le responsabilità degli attori chiave e delle istituzioni. Lo studio discute anche i risultati divergenti dell'analisi dei costi e benefici effettuata sul progetto e il coinvolgimento degli stakeholder chiave nella sua attuazione.

Parole chiave: megaprogetti, coinvolgimento degli stakeholder, governance, analisi dei costi e benefici, fattibilità

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1. Introduction

1.1 Megaprojects

Megaprojects are symbolic milestones of human history. From the Great Pyramid of Giza and the Great Wall of China to the Hoover Dam and the Manhattan Project, history is decorated with an impressive array of megaprojects.Megaprojects are massive, intricate endeavors that frequently cost a billion dollars or more, take years to plan and construct, involve numerous public and private stakeholders, are transformative, and have an influence on millions of people. Such initiatives are referred to as "privileged particles of the development process" by Hirschman (1995: vii, xi), who also notes that they frequently involve "trait creation," which is an ambitious effort to alter the social structure. In terms of aspirational level, stakeholder engagement, lead periods, complexity, and impact, megaprojects are an entirely other breed of project(Flyvbjerg, 2017).

Gellert and Lynch (2003, pp. 15–16) consider megaprojects as 'displacements' by stating that megaprojects are "projects which transform landscapes rapidly, intentionally, and profoundly in very visible ways, and require coordinated applications of capital and state power." Indeed, examining society through its megaprojects would shed light on its goals, issues, and prospects for the future(Söderlund,2017).

A variety of industries and businesses, including infrastructure, water and energy, information technology, industrial processing plants, mining, supply chains, enterprise systems, strategic corporate initiatives and change programs, mergers and acquisitions, government administrative systems, banking, defense, intelligence, air and space exploration, big science, and urban regeneration, are increasingly using megaprojects as their preferred method of delivering goods and services(Lenfe and Loch). Examples of megaprojects are high-speed rail lines, airports, seaports, motorways, disease or poverty eradication programs, hospitals, national health or pension ICT systems, national border control, national broadband, the Olympics.

The concept of Megaproject has different structure from conventional projects at every stage of the planning and construction processes, therefore it has a completely different necessitates in management.

Table 1: Megaproject features(Flyvbjerg et al., 2017)

Project features	Definition
Definition	Cost $1 billion or more
Duration	Going beyond the political life cycle of the national government time zones
Risks	Untested complex technolohies and processes; carefully risk allocation
Planning	Requires an exceptional level of planning
Disputes	Claims,arbitration and litigation
Management	An exceptional level of planning,coordination and leadership requires
Participants	Numerous public and private stakeholders
Access	Beyond national borders (human,financial and technologica) enormous demand
Benefits	Broad social and economic benefits
Effects	Broad political implications

After reviewing the international literature in megaprojects, the commonly accepted important project characteristics are listed in Table 2.1. . (Biesenthal, 2018; Flyvbjerg, 2017; Flyvbjerg, 2011; Pollack etc., 2018).

1.1.1 The importance of mega-projects to mankind

Megaprojects are not just big and getting bigger all the time, but they are also being developed more often and more expensively. The tallest structure in the world at the time of its opening in 1930 was New York's Chrysler Building, which stood at 319 meters. Since then, the record has been broken seven times, and since 1998, the tallest structures have tended to be found in developing nations. At 828 meters, Dubai's Burj Khalifa currently holds the record. Over the course of 80 years, building height has increased by 160 percent. The longest bridge span has thus expanded even quicker, by 260 percent during roughly the same time. Over the past century, the size of infrastructure projects, as measured by value, has increased by 1.5 to 2.5 percent yearly in real terms, which is equal to a doubling in project size two to three times each century(Flyvbjerg, 2017).

Mega-projects are extremely important for society and play a significant role in meeting mankind's energy needs. The next two decades are expected to see an unprecedented level of investment in energy infrastructure, with an estimated capital investment of $48 trillion by the year 2035. Of this amount, $40 trillion will be invested directly in new energy infrastructure. Europe alone will invest $2012 billions in the energy sector during this period, with the majority being allocated to new power plants. Around three-quarters of this investment will be directed towards nuclear power and renewable energy, while the remainder will be used to build fossil fuel power plants. It's worth noting that government policy, rather than market signals, influences decisions on energy investment, even in deregulated markets where wholesale prices are often lower than the cost of production. Therefore, investments in new power plants are a significant tool in a government's energy policy and often involve substantial public expenditure. The majority of nuclear, gas, and coal power-plants are considered mega-projects. In Europe, there are currently 58 proposed nuclear power-plant mega-projects, while even renewable energy power-plants are often implemented as mega-projects, such as large offshore wind farms and photovoltaic solar farms. The UK alone is considering 13 wind farm mega-projects. It is increasingly important to understand the effective design and delivery of mega-projects for electricity generation and energy policy. Mega-projects play a significant role in energy usage, with over a third of global energy consumption occurring in transportation, where mega-projects such as airports, aircraft development, road and rail systems, ports, and sea-going transportation are crucial. A quarter of global energy usage takes place in the industrial sector, where mega-projects such as large chemical and pharmaceutical processing plants, new mass-assembly systems, and extraction processes are essential(Brookes,2015).

To keep up with the anticipated GDP growth, according to McKinsey (Garemo, Matzinger, & Palter, 2015), the globe will need to invest nearly US$57 trillion in infrastructure by 2030. More than the amount suggested by McKinsey, the Organisation for Economic Co-operation and Development (OECD) predicts that "global infrastructure investment requirements

approximately US$6.3 trillion per year for the period of 2016-2030 to support growth and development" (Mirabile, Marchal, & Baron, 2017).

The Business Insider (Desjardins, 2017), which lists the world's nine greatest megaprojects, includes a theme park in Dubai, United Arab Emirates, valued at US$64 billion, as a megaproject. Megaprojects, however, are not simply substantial infrastructure projects. Future structures, such as stadiums and museums, will likely resemble megaprojects, according to urban planners like Altshuler and Luberoff(2003).

Megaprojects are anticipated to quickly expand to 24% of the global GDP over the next 10 years, according to futurist Thomas Frey of the Da Vinci Institute. According to his forecast, future megaprojects would be planned to address human problems like sickness, process massive amounts of data, and manage extreme weather(Frey,2016).

Although economic importance alone is insufficient to define megaprojects, as they involve a range of factors throughout their lifespan that contribute to their complexity and intricacy. These factors include the participation of public and private stakeholders, as well as the contracts and relationships that exist between them.(Pitsis et al., 2018)This creates a complex institutional environment where local communities also play a vital role. As the size of the project increases, its complexity grows, which often leads to difficulties and complicated interactions between public and private partners, resulting in delays and cost overruns due to conflicts and a lack of cooperation(Marrewijk et al.,2008). Citizens may also resist such projects due to concerns about their costs and impact on their quality of life, sometimes resulting in the cancellation of the project. Additionally, when proposed within a particular political context, megaprojects often draw media attention, which presents the project's outcomes, costs, and timelines from varying perspectives(Barnali,2014)(Marrewijk et al.,2006).

One of the most fascinating phenomena in social science might be said to be megaprojects. They are examples of significant collective accomplishments that have influenced society's development and course as well as the mobilization of group power to bring about significant institutional change. In fact, starting a megaproject is a method to catch people's attention, a way to get things done—a way to inspire ambitions and lofty objectives. Megaprojects catch human attention, appeal to human senses, get media attention, and lately have been getting more scholarly attention. The general and intriguing question of why megaprojects exist is raised. In fact, the most straightforward response might be: because they are required, because they add value, and because they have put out a strong and appealing business case. In order to better understand what appears to drive the megaproject industry and why megaprojects are interesting to decision makers who are driving these ventures forward, people must first understand the justification for the choice to adopt a megaproject(Söderlund,2017).

What are the characteristics of megaprojects that appeal to decision-makers and society at large? Why are they reportedly performing poorly, although their numbers seem to be growing?

In order to describe the variables that influence megaproject development and decision-making, Flyvbjerg (2014) first presented the framework of the four sublimes of megaprojects. He determined that the most significant factors explaining the megaproject's business's explosive growth were those related to technology, politics, economics, and aesthetics. "Community pride" has been mentioned as another sublime by Thomas Frey. According to Frey (Frey, 2016, p. 1), "everyone wants to tell stories about the huge accomplishments their nation accomplished" in order to ensure that their community is superior to all others. The symbol of such achievement is the production of megaprojects, but those who believe that megaprojects will be a shortcut to success face numerous obstacles.

Table 2: The 'four sublimes' that drive megaproject development(Flyvbjerg,2017)

Type of Sublime	Characteristic
Technological	Pushing the boundaries of what is feasible in the "longest-tallest-fastest" types of initiatives excite engineers and technologists.
Political	The gratification that politicians have personally when they construct monuments honoring themselves and their causes, as well as the publicity that this results in with the general public and the media.
Economic	The prestige business people and trade unions get from making lots of money and creating jobs from megaprojects, including for contractors, workers in construction and transportation, consultants, bankers, investors, landowners, lawyers, and developers.
Aesthetic	Building and utilizing something really enormous, iconic, and beautiful gives designers and anyone who appreciate good design pleasure.For example Sydney’s Opera House.

So why are megaprojects so difficult? Why are they so challenging to support and to manage? Flyvbjerg (2017) asserts that there are ten key elements that decision-makers and other important players involved in the implementation of megaprojects frequently neglect.Flyvbjerg’s ten key point listed above.

1.Because of their complexity, deep interfaces, and long planning horizons, megaprojects are inherently risky. Normally, it takes several decades from the start of planning to the project's completion.

2.Megaprojects are frequently managed and planned by people with limited domain knowledge and expertise, which can lead to ineffective leadership and dysfunctional leadership structures. Integrating knowledge from several disciplinary and professional disciplines of study is challenging.

3.A megaproject is typically a multi-party process involving multiple stakeholders with various conflicting aspects.It is often difficult to establish governance mechanisms across institutional structures and culture. (van Wee and Priemus, chapter 6; Winch, chapter 15; Aaltonen and Kujala, 2010).

4.Technology and designs are frequently non-standard, which causes planners and managers to have a bias toward seeing their projects as unique and preventing them from learning from other projects.

5.Overcommitting to a project concept at an early stage frequently leads to "lock-in" or "capture," weak or nonexistent alternatives analysis, and increased commitment at a later stage. Failure quickly does not matter; failure slowly does. (Drummond, chapter 9; Cantarelli et al., 2010; Ross and Staw, 1993).

6.Megaprojects are similar to large corporations, which may result in principal-agent issues and optimism bias. Since there are so many variables that could potentially have an impact on a specific cause of action, it is challenging to evaluate performance, cause-effect correlations, and to manage performance (Eisenhardt, 1989; Stiglitz, 1989; Flyvbjerg el al., 2009).

7.Typically, a project's ambition level or scope will alter dramatically over time.

8.Megaprojects are high-risk operations that are overexposed to "black swans"—extreme events with incredibly negative results (Taleb, 2007). Rare and unlikely occurrences in megaprojects happen more frequently than people usually realize.

9.Megaprojects frequently overlook the complexity and unforeseen circumstances that are a part of their execution. People are only partially rational (Simon, 1976), and they frequently struggle to completely comprehend the complexity of complicated and nested decision-making and management circumstances.

10.Megaprojects are based on misinformation about risks, benefits, costs, and schedules. According to Flyvbjerg (2017), p. 8, the outcome is "cost overruns, delays, and benefit shortfalls that undermine project viability during project delivery and operations."

1.1.2 The Iron Law of megaprojects

One way to evaluate project performance quickly and commonly used is by comparing it against the "Iron Triangle" or Triple Constraint (Pollack et al.,2010). This represents the relationship between key performance criteria, with time, cost, and quality being the most widely used and intuitive KPIs (Lavagnon,2009). However, some experts argue that the Iron Triangle should include other parameters as the estimated cost and time are often unreliable and can lead to project failure. Atkinson summarized the debate on quality, cost, and time that surrounded project management in the 20th century, with some experts suggesting that only time and budget matter from a customer's perspective. While many researchers agree that cost, time, and quality should be used as success criteria, they are not exclusive, and other temporary measurements could be used to monitor progress at different stages instead of measuring ultimate success(Atkinson,1999).

Megaproject performance information is unique in its language. Such projects have cost overruns nine times out of ten. In actual terms, overruns of up to 50% are typical and overruns of 50% are not unusual. Project overruns are an issue in both the public and private sectors, and the situation is not gradually improving (Flyvbjerg, chapter 8; Hodge and Greve, chapter 16; Chung, chapter 23). Overruns have been high and steady throughout the 90 years for which comparable statistics are available. Geographical location also doesn't appear to matter; overrun affects all 104 nations and six continents for which statistics are available. Large benefit shortfalls are also common, and there are no signs of improvement over time or across geographic boundaries(Flyvbjerg et al., 2002, 2005).

It can be seen that such analyses can't usually be trusted when the significant cost overruns and benefit shortfalls as well as the fact that business cases considered, cost-benefit analyses, and social and environmental impact assessments are frequently at the center of planning and decision-making for megaprojects. For example, an average cost overrun of 96 percent combined with an average demand deficit of 11 percent applies to dam construction, while an average cost overrun of 40 percent combined with an average demand shortfall of 34 percent applies to rail project construction. When business cases, cost-benefit analyses, and social and environmental impact assessments are based on projections with such significant mistakes and biases, it is quite likely that these evaluations will also be seriously misleading(Flyvbjerg, 2009).

As a case in point, consider the Channel tunnel, the longest underwater rail tunnel in Europe, connecting the UK and France. This project was originally promoted as highly beneficial both economically and financially. At the initial public offering, Eurotunnel, the private owner of the tunnel, tempted investors by telling them that 10 percent "would be a reasonable allowance for the possible impact of unforeseen circumstances on construction costs." In fact, capital costs went 80 percent over budget and financing costs 140 percent.

Revenues started at a dismal 10 percent of those forecasted, eventually growing to half of the forecast. As a consequence the project has proved financially nonviable, with an internal rate of return on the investment that is negative, at minus 14.5 percent with a total loss to Britain of 17.8 billion US dollars. Thus the Channel tunnel has detracted from the British economy instead of adding to it. The cost overrun for Denver's US$5 billion new international airport, built in 1995, was close to 200 per cent and passenger traffic in the first year was just half of that expected(Flyvbjerg, 2003).

Operating issues at Hong Kong's brand-new, $20 billion Chek Lap Kok airport, which opened in 1998, originally had a disastrous impact on both expenses and revenues at the airport as well as the whole Hong Kong economy, which had a negative impact on GDP growth. The airport was labeled a "fiasco" by The Economist after nine months of operation, with a cost to the Hong Kong economy of US$600 million(The Economist,1999).

Although many megaprojects fail financially, they may be technologically successful. An economic and financial ex post assessment of the Channel tunnel that methodically evaluated actual with anticipated costs and benefits came to the conclusion that "the British Economy would have been better off had the Tunnel never been constructed" (Anguera, 2006: 291).

Megaprojects must deal with the independent issue of delays, which increase costs and reduce benefits. For instance, the findings of a research conducted at Oxford University, which was based on the largest database of its kind, demonstrate that delays on dams are, on average, 45 percent (Ansar et al. 2014). Based on a significant data set for large construction projects, Flyvbjerg et al. (2004) estimated the link between cost overrun and length of implementation phase. They discovered that an increase in the percentage cost overrun of 4.64 percent is often correlated with a one-year delay or other extension of the implementation phase. The main takeaway from this is that implementation phases should be kept minimal and delays should be low in order to save expenses.

Before determining whether to approve a project or stop it, careful frontend preparation is required(Williams and Samset, 2010). To go quickly afterwards, it must be initially move slowly when preparing the project. However, this is frequently the case. Front-end planning is hurried and inadequate, problematic projects are not abandoned, lengthy implementation stages and delays drive up costs, and benefits and income realization are delayed and decreased. This is a prescription for disaster for projects that are financed with debt, since project debt increases without any income to cover interest payments, which then increase the debt, etc. As a result, a lot of projects fall victim to the so-called "debt trap," where a combination of rising interest rates, delays, and rising construction costs prevents project profits from covering expenditures, making projects unprofitable. Megaproject management

success is so uncommon that it can only now be researched using small-sample research, whereas failure can be studied using huge, trustworthy samples of projects(Flyvbjerg, 2017).

Table 3: Large-scale projects have a troublesome history of cost overrun(Flyvbjerg,2017)

Project	Cost Overrun (%)
Suez Canal, Egypt	1,900
Scottish Parliament Building, Scotland	1,600
Sydney Opera House, Australia	1,400
Montreal Summer Olympics, Canada	1,300
Concorde supersonic aeroplane, UK, France	1,100
Troy and Greenfield railroad, USA	900
Excalibur Smart Projectile, USA, Sweden	650
Canadian Firearms Registry, Canada	590
Lake Placid Winter Olympics, USA	560
Medicare transaction system, USA	560
National Health Service IT system, UK	550
Bank of Norway headquarters, Norway	440
Furka base tunnel, Switzerland	300
Verrazano Narrow bridge, USA	280
Boston's Big Dig artery/tunnel project, USA	220
Denver international airport, USA	200
Panama canal, Panama	200
Minneapolis Hiawatha light rail line, USA	190
Humber bridge, UK	180
Dublin Port tunnel, Ireland	160
Montreal metro Laval extension, Canada	160
Copenhagen metro, Denmark	150
Boston-New York-Washington railway, USA	130
Great Belt rail tunnel, Denmark	120
London Limehouse road tunnel, UK	110
Brooklyn bridge, USA	100
Shinkansen Joetsu high-speed rail line, Japan	100
Channel tunnel, UK, France	80
Karlsruhe-Bretten light rail, Germany	80
London Jubilee Line extension, UK	80
Bangkok metro, Thailand	70
Mexico City metroline, Mexico	60
High-speed Rail Line South, The Netherlands	60
Great Belt east bridge, Denmark	50

The standard definition of success in megaproject management is when the anticipated benefits are delivered on schedule and within budget. One in ten megaproject is on budget, one in ten is on schedule, and one in ten is delivering benefits, according to the evidence. This means that one in a thousand projects should be considered successful if they are

meeting all three of these criteria. This demonstrates what may be referred to as the "iron law of megaprojects": over budget, over schedule, under benefits, over and over again(Flyvbjerg, 2011).

The reason why the Iron Triangle has gained popularity is due to its simplicity, which allows for a project to be considered successful when it meets the established criteria. This model effectively demonstrates the continuous presence of trade-offs during the project process, where changes in one variable can affect the other related criteria. The saying "good, fast or cheap - pick two" is a prime example of how simplicity is sought in project management. However, this approach has its limitations as it considers many choices as "either/or" decisions and excludes negotiations among constraints(Wyngaard et al.,2012). This framework is useful when dealing with overwhelming complexity as it provides a clear and unambiguous way to evaluate performance. In order to treat projects as complex social systems, research has delved into the various aspects related to cost, quality and time, avoiding an oversimplification of the discussion. The inclusion of quality in the triangle has been criticized as its assessment is more subjective and complex compared to the other two criteria(Chan,2004). This has led to a search for other possible dimensions that better fit real-life experiences. Over time, scope has emerged as the most viable alternative as a third vertex of the triangle. Quality, due to its variability and subjectivity, is now considered as a result of changes in the three other dimensions rather than a dimension itself. This has led to a change in the traditional representation of the Iron Triangle, with quality now placed in the middle(Pollack et al.,2018)(Wyngaard et al.,2012)(Badewi,2016).

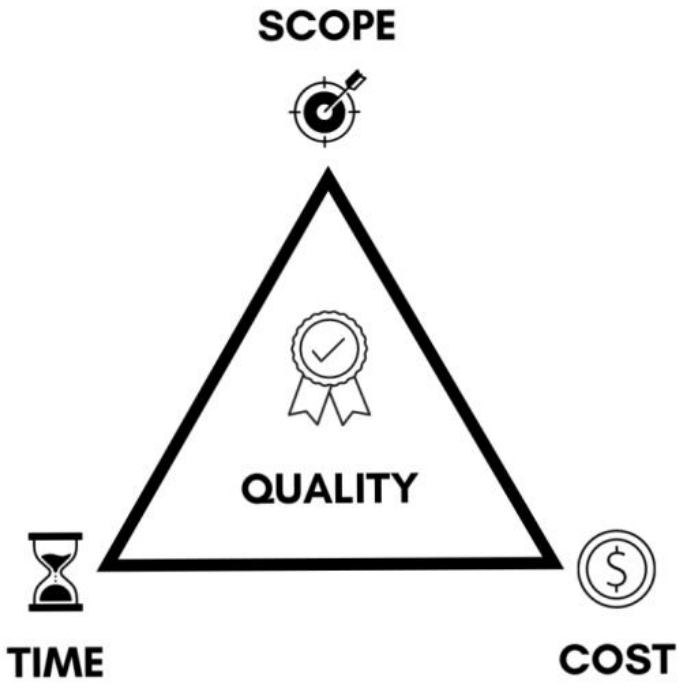

Figure 1: The Iron Triangle in project management

Regarding megaprojects, the three dimensions still hold true, but there are additional factors to take into account, particularly in the case of infrastructure projects, due to their effects on communities and sustainable development(Dimitriou et al.,2013). Moreover, it can be extremely difficult to estimate the time and cost required to finish complex and intricate projects. Nevertheless, goals must be established, even though it may be preferable to move away from the traditional Iron Triangle approach for evaluating performance in the case of megaprojects. The intended and anticipated impact must be taken into account when discussing megaproject objectives, making it limiting to adhere solely to the Iron Triangle framework(Turner et al.,2018). The majority of megaprojects ultimately do not achieve their intended objectives, typically resulting in significant cost and time overruns, which are often due to unrealistic estimates(Misic et al.,2015). The pre-evaluation of megaprojects is especially difficult due to several inherent characteristics(Lethonen,2014). For example, the perceived uniqueness of the designs and technologies employed and the absence of "lessons learned" from comparable past projects have a significant impact on the evaluation of such undertakings. The project's dynamic scope, ambition, and governance structures are not commonly found in typical project management, as well as the complex, multilevel, and multi-actor governance structures, in a highly uncertain environment resulting from the long-term orientation of megaprojects. The scope can be unclear, especially during the early stages of a megaproject, while as previously mentioned, it is also difficult to define time and cost, the other two vertices of the Iron Triangle, with reliability(Priemus,2010).

Moreover, the Iron Triangle framework could promote a hazardous inclination in project selection, as emphasized by Flyvbjerg and referred to as "survival of the unfittest."This implies that it is quite common for the least viable project to be chosen and financed among the selection of projects, for two primary reasons identified by Flyvbjerg as "optimism bias" and "strategic misrepresentation." Optimism bias (also known as planning fallacy) is the natural tendency to estimate situations, projects, and opportunities more optimistically than one would conclude from objective observations. Strategic misrepresentation (or malicious design), on the other hand, occurs when project approval decisions are mainly influenced by strategic behavior by planners who present costs and benefits in a way that maximizes the project's chances of being selected among others(Cantarelli et al.,2010).

The concept of Hirschman's Hiding Hand (Hirschman et al.,2014) is one of the key arguments used to support the belief that nothing significant would ever be built. The theory behind this notion is that if individuals were aware of the actual costs of a megaproject from the outset, no project would ever begin. Thus, according to this argument, the initial budget presented should only be considered a down payment to "start digging a hole," allowing for permission to begin, and then the project can proceed through inertia by adding more and more money. Hirschman expressed the belief that humans were capable of creating and completing large-scale projects, overcoming any obstacles, but were too afraid to fully utilize their potential. He thought that it was thus beneficial to conceal the true size and challenges

of the project to speed up humankind's problem-solving abilities. Although this reasoning may seem reasonable in some ways, it is fundamentally flawed. To begin with, Hirschman's argument was formed based on a limited number of megaprojects, approximately twelve (Flyvbjerg,2014), and his data was biased. Additionally, in a democratic society, it is illegal or at least unethical to deliberately mislead authorities, legislators, media, administrators, investors, and citizens about the actual scale of a project in terms of costs and benefits. If this way of thinking were adopted, it would result in the previously mentioned "survival of the unfittest," where the funding would be allocated to the project that appears to have the most incredible cost savings and benefits. As a result, a project presented correctly and transparently would not have a chance against a misrepresented project that promises unrealistic future benefits on paper.

1.2 Literature review

1.2.1 Governance

The objective of project governance is to ensure that the project's intended impact on the company's portfolio, and ultimately its strategic goals, are achieved in a reliable and predictable manner, while adhering to the framework of corporate governance. Thus, project governance is closely associated with corporate governance. At the project level, project governance promotes risk reduction, transparency, and separation of ownership and control(Muller,2009).

According to Brunet and Aubry's (2016) proposal, governments should implement governance frameworks for megaprojects to attain three main goals: 1) to increase project efficiency, which means achieving the highest possible productivity with minimal wastage of effort and expenses; 2) to establish greater government legitimacy, which means ensuring that the government's procedures for making and enforcing laws are acceptable to the public; and 3) to enhance accountability, which involves implementing legal, institutional, and procedural mechanisms to hold public officials answerable for their actions.

Internal governance parameters are split into two categories: structural and instrumental, according to Albers (2005, 2010) and Albers et al. (2016). Governance's primary structural parameters include elements previously studied by organizational design researchers such as centralization, formalization, and specialization. Centralization refers to the degree of decision-making concentration, formalization involves the pre-setting, description, and fixation of responsibilities through formalization instruments, and specialization concerns the degree of involvement of partners in the IOR's management, for example, specific departments or teams to coordinate activities(Gonzalez-Cruz et al., 2012). Instrumental governance parameters, on the other hand, involve analysis of coordination, control, and incentives. Coordination involves adjusting organizational activities or partners. According to Mintzberg's (1980) ideas, Albers (2005, 2010) has classified this parameter into three

primary forms: mutual adjustment, direct supervision, and standardization, which consider the form and degree of task coordination required to achieve the objectives of the relationship, the partners bestowing authorization on one of them to perform the coordination function, and specification of operational procedures or rules and regulations to formalize the activities, respectively(Fernandes,2023).

Megaprojects require the attention of both scholars and practitioners because they involve significant risks and can have significant social, economic, and environmental consequences. Despite efforts to achieve the desired goals and societal benefits within the planned budget, timeline, and scope, there is still room for improvement(Flyvbjerg,2014). To address this issue, many people believe that improving governance through formal structures and informal methods is a viable solution(Denicol,Davies and Krystallis,2020).

Sir John Armitt began his discussion on governance by referring to the popular saying that governing involves making choices. He emphasized that the primary responsibility of megaproject governance is to supervise and manage the significant decisions that the project executive team must make over time. In particular, he highlighted that effective governance involves addressing three essential aspects(Gil et al.,2012).

- The first fundamental point of effective governance is to recognize that running a megaproject may not necessarily be easier than running a mega business, despite the assumption that project goals have already been established. It is crucial for project executives and clients to work together at the beginning of the project to identify the important aspects and decisions that need to be made. This requires involving key stakeholders, such as future operators, local authorities, and customers, to jointly establish objectives and develop a strategy by asking pertinent questions and challenging responses. The questions that need to be addressed may vary depending on the project, for example, ensuring the timing is right for London2012, or gaining planning consent and political support for a nuclear program. Although early stakeholder engagement may lead to conflicts and differing interests, this is necessary to challenge dominant thinking, uncover hidden assumptions, and consider the legacy of the megaproject.

- The second important aspect of governance is to determine who the ultimate client is. Failure to answer this question can lead to project failure. Although it is a complex matter, John suggests that the ones financing the project are the ultimate clients. The source of funding is what guides project governance, in other words, the ones who provide the money have the power to make decisions.

- The third point made by John is that governance involves determining who has the authority to act on behalf of the client. This can be a challenging issue, especially if the client is a complex organization with multiple stakeholders who may have conflicting views on

who should be in charge. In such cases, governance becomes complicated when everyone wants control and feels possessive over it.

Sir John discussed the leadership qualities necessary for managing a megaproject, which involves handling a large group of interdependent parties such as the delivery team, partners, suppliers, funders, regulators, operators, and the public. One of the most challenging tasks for megaproject leaders is managing design changes. This requires creating and maintaining a clear vision for the project and ensuring everyone involved sticks to it unless there are compelling reasons to make changes(Gil et al.,2012).

Although he is uncertain about the importance of individual personality for effective leadership, John suggested that good leaders should be "silent" and not draw attention to themselves. He emphasized the importance of sincerity, consistency, and transparency in communicating the project's vision and objectives to stakeholders. He concluded by providing some recommendations(Gil et al.,2012):

- To be an effective leader, it is important to demonstrate sincerity even if it means being direct or harsh at times. Leaders should also acknowledge that they don't have all the answers and should observe and ask questions.

- They should be transparent by regularly publishing clear short and long-term goals and objectives.

- Recognizing and celebrating success is important for making everyone involved feel valued.

- Effective listening is crucial, and leaders should strive to listen more than they speak. By tailoring responses to different audiences, leaders can create a culture of empathy and mutual respect.

- Delegation is also important, but accountability must be maintained. To be effective, the chief executive must delegate tasks and decision-making power both upstream to the chairman and downstream to the executive team without diluting accountability.

The steering group is the primary body responsible for managing projects and ensuring their success. It holds the most power in carrying out the project and is answerable to top management for achieving the desired outcomes, goals, and benefits. Members of the steering group make decisions and have the power to allocate or withdraw resources, as well as approve or reject modifications to the project. They hold the highest authority in determining whether or not the project has achieved its goals. The steering group serves as a connection between the long-term organization and the temporary project team, ensuring effective coordination of governance mechanisms between both organizations(Müller,2009).

According to a study conducted by Crawford and colleagues in 2008, sponsors and the steering group evaluate the relationship between the permanent and temporary organizations from two contrasting viewpoints:

1.The perspective of the parent organization towards its project. which involves setting the objectives, methods, and outcomes of the project, as well as its relevance to and connection with the parent organization.This is Project governance.

2.The perspective of the Project towards its parent organization. This entails the allocation of resources, making decisions, such as approving project milestones, and in certain cases, granting formal permission for the project to proceed, as determined by the parent organization.This is the Project support.

The level of support and governance needed for a project varies depending on its unique circumstances. Projects may require more or less governance depending on their specific needs. For instance, Crawford et al. (2008) suggest that projects with certain characteristics may require a higher level of governance:

- If the failure of the project could result in extremely severe consequences,
- When the project is crucial to the mission of the organization,
- When the parent organization operates in fast-changing markets,
- When corporate governance mandates that a particular project receives significant attention,
- When the project needs to be adjusted to fit a new strategy.

Projects that are typically in need of high levels of support include those that:

- Are lacking in resources and other support from their parent organization,
- Encounter resistance from within the parent organization to accept the project or its outcome,
- Are being managed by inexperienced project managers.

In these cases, providing greater levels of support can help these projects succeed despite the challenges they face.

The steering group of a project is responsible for coordinating the efforts between the permanent and temporary organizations based on the specific governance or support needs of the project. They are also responsible for establishing the governance infrastructure, in addition to the tasks of defining project goals, providing resources to achieve those goals, and monitoring progress(Müller,2009).

The steering group is responsible for creating a framework for governing project operations within the organization, which includes establishing procedures for controlling projects, defining positions and responsibilities, and authorizing approvals. This infrastructure must be well-integrated with existing corporate governance and inter-organizational methods, company policies, and processes. The steering group is also responsible for assessing project proposals and selecting those that align with the corporate strategy and are feasible given the available resources. In addition, the steering group determines project goals by identifying business benefits, project outcomes, and success criteria, and collaborates with the project manager to establish project management procedures that align with the governance framework. The project management process may vary depending on the underlying governance framework(Müller,2009).

To ensure the success of a project, the governance function is responsible for providing various resources, including people, budgets, training, and technical infrastructure, in accordance with the project plan. The project manager is a crucial resource that is provided. The supportive function involves removing obstacles, limiting risks, connecting project and organizational factors, and reducing the effects of resource inadequacies on project outcomes or business benefits. The managers within the steering group aim to improve organizational processes, enhance skills, and increase efficiency to enable the organization to continuously deliver projects. The progress control function monitors the project's advancement, outcomes, critical success factors, and stakeholder interests, and appropriate adjustments are made. Steering group meetings are held regularly, with higher frequency during the initial and final phases and less frequently during other phases of the project(Müller,2009).

In order to govern the project as a transaction, decisions are made with the goal of minimizing the costs of governance. These costs include(Williamson 1975,1985):

•Adaptiveness: The expenses that arise from the necessity to harmonize the interests of the different parties engaged in the contract. The contract must ensure increased cooperation and reduced opportunistic behavior among the parties involved. Incentives such as bonus payments for delivering the project on or before a specific date or at or below a specific cost are frequently used as contract mechanisms for this purpose.

•Contract Management: The costs related to supervising and controlling project execution in compliance with the contract. This also includes the expenses associated with steering group meetings and Stage Gate Reviews.

•Contract Administration: The expenses associated with creating and agreeing to the contract terms, including defining the project scope and objectives, as well as governance processes such as change management or reporting.

Collaboration between the project manager and steering group is an important aspect of governance. In the research conducted by Müller in 2003, which covered over 200 projects across the world, he identified a two-dimensional model of governance that focused on the quantity and style of collaboration between the project manager and steering group.

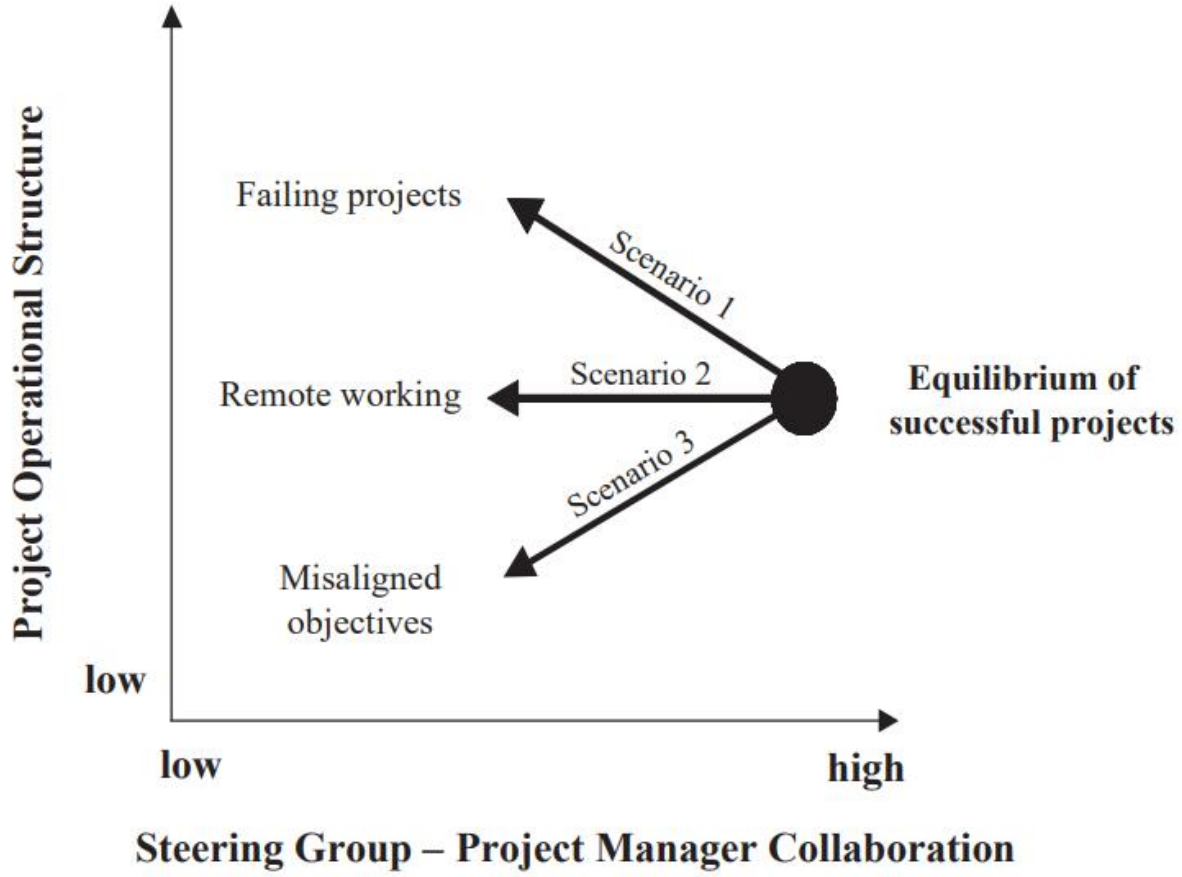

Figure 2 : Governance equilibrium and its deviations(Müller,2009)

The figure above illustrates two dimensions of project governance: collaboration between the steering group and project manager, and the level of operational structure imposed by the steering group. The success of a project is influenced by the clarity of project objectives, relational norms between the two parties, and the level of structure imposed by the steering group. Well-governed projects tend to have high collaboration and medium operational structure. This means both parties are flexible and value their joint goals, while the level of structure is sufficient but not overly burdensome. The key to achieving a governance equilibrium is to find the right balance between collaboration and structure, which minimizes communication costs and reduces administrative costs(Müller,2009).

Projects that fail often experience an increase in reporting and overhead tasks beyond the equilibrium point of high collaboration and medium structure. This occurs in three scenarios: failing projects with loss of trust lead to increased control and structure; remote working

results in reduced collaboration due to limited communication; and misaligned objectives arise through informal reporting that causes a lack of governance and loss of focus on project goals. These scenarios can cause projects to fail and may result in the replacement of the project manager, leading to increased control and structure, further reducing collaboration and productivity(Müller,2009).

To mitigate the risks that outlined above, it is recommended to establish regular communication schedules that balance formal and informal communication. This includes weekly meetings and monthly reports, even if not required by contract. Effective communication helps to build collaboration and trust, allowing the steering group to maintain a level of formal structure that empowers the project manager and provides an appropriate level of autonomy. Ultimately, this leads to the equilibrium of high collaboration and medium structure(Müller,2009).

The success of project managers depends on their managerial and leadership competencies, which vary depending on the project size, industry, and complexity. Emotional competency is essential for project success in high-performing projects of all types. Different types of projects require different competencies. Vision and imagination can compromise the task at hand and are better supplied by people in other roles. Steering groups should evaluate the specific leadership needs for each project and match them with appropriate project managers. Good project managers can be helped to develop the skills necessary for their work. The success of project managers depends on their managerial and leadership competencies, which vary depending on the project size, industry, and complexity. Emotional competency is essential for project success in high-performing projects of all types. Different types of projects require different competencies. Vision and imagination can compromise the task at hand and are better supplied by people in other roles. Steering groups should evaluate the specific leadership needs for each project and match them with appropriate project managers. Good project managers can be helped to develop the skills necessary for their work(Müller,2009).

1.2.2 Feasibility and BCA

In both Western and non-Western nations, mega-projects are extremely important in many ways. First, they are the subject of intense political debate, with the main issues being the anticipated economic effects and significant fiscal consequences(Flyvbjerg et al.,2003). Megaprojects play a significant role in society, hence the quality of decision-making depends on a thorough ex-ante examination of potential new projects. The method utilized for ex-ante evaluations of transportation infrastructure projects in the majority of Western nations is cost-benefit analysis (CBA) (Hayashi and Morisugi, 2000).Cost-benefit analysis (CBA), which

was first used in the middle of the 19th century, is now the most used method for analyzing and contrasting investment options(Pearce, 1998).

A CBA is essentially a summary of all the benefits and expenses of a project. As much as possible, these costs and benefits have been quantified and expressed in monetary terms. Consumer preferences are used to determine benefits.Within the time frame of the CBA, costs and benefits happen in various years. To address this, they are given as "net present values," which suggests that having 1 euro or dollar today is preferable to having it compared to having it in 2030, when interest and inflation are taken into account. Its valuation is expressed in terms of the discount rate. Summarizing tables are frequently used to convey final results.The cost-benefit ratio, return on investment, and difference between costs and benefits are the three key indications that are given. CBA in transport is almost often included in textbooks on transport economics(Button, 1993).

Estimating the expenses of developing and running the suggested project, as well as the anticipated benefits, is the foundation of a cost-benefit analysis. To calculate the benefit-cost ratio, the assessed expenses and benefits are compared (BCR). Projects are often considered to be viable when the BCR is at least 1, meaning that the benefits outweigh the costs (Browne & Ryan, 2011). All expenses and benefits are attempted to be converted into monetary values and the year in which they are most likely to occur is determined. The total expenses and benefits anticipated over the course of a project can then be collapsed to a net present value (NPV) using a discount factor(Van Wee, 2007).

Although its roots date back much farther, cost-benefit analysis (CBA) has been the cornerstone of evaluating transportation projects for at least the past fifty years. There has been discussion over the suitability of CBA as a method of assessing projects and making decisions regarding alternatives during this time.The traditional strategy is firmly rooted in a welfare economics paradigm where maximizing net benefits/consumer surplus is the main goal.More recently, policymakers have shifted their attention to an objective of the production or employment generated by transportation upgrades.Under this strategy, the impact of changes on resource production will receive far more attention than any attempt to estimate the welfare advantages of time savings. Impacts on gross domestic product or gross value added, both at the municipal and national levels, have so come under discussion(Vickerman,2017).

For many years, CBA was limited to factors that could be easily observed and measured, if not in a real market, then at least in a surrogate market. Consequently, factors like time savings, accident costs, and noise pollution were included, but wider environmental consequences, visual intrusion, and other similar factors were often excluded. The effect on the economy was the last significant point of debate. It is well recognized that transportation upgrades that alter accessibility can have significant effects on land values, but these changes

have traditionally been left out due to the risk of accounting twice for accessibility changes that result in time savings and their effects on property values(Vickerman,2017).

Challenges in using traditional approach to CBA

Despite the fact that CBA is widely used, there are a number of issues with it. They consist of:

1. Difficulty in evaluating the effects on the environment and society
2. Measuring the effects on the micro and macroeconomies is challenging.
3. Dependence on projections of travelers' future behavior
4. When to implement CBA during the planning phase.

CBAs frequently use people's willingness to pay to safeguard the environment to monetize the value of nature when dealing with environmental impacts. This disregards nature's fundamental worth and its influence on society as a whole, as opposed to just an individual. Several people also complain that the monetization process affects the environment (Pearce, 1998).The minimally required approach for the monetization of social impacts required for CBA is currently established. Furthermore, CBA is poorly for determining how costs and benefits are distributed within society and is a blunt tool for comparing the total benefit to the total cost(Geurs, Boon, & Van Wee, 2009).

The CBA mostly focuses on local effects, but transportation infrastructure projects, especially large and expensive projects, also have regional repercussions (Iacono & Levinson, 2013).Megaprojects that are anticipated to have transformative and macroeconomic effects are not well suited for CBA because it is a microeconomic instrument (Mackie, Worsley, & Eliasson, 2014).The majority of CBA tends to underestimate broader economic benefits because it assumes essentially constant land usage. Also, many CBAs find it difficult to take into account the effects of agglomeration and the resulting increases in production(Laird et al., 2014).

Predictions of ridership and shifts in travel habits are crucial for economic evaluations of transportation infrastructure plans. They are frequently inaccurate and typically based on models(Flyvbjerg, Skamris Holm, & Buhl, 2005; Naess, 2006).

An important risk factor in the economic evaluation of transportation infrastructure is the modeling and forecasting of transportation. When comparing first-year ridership to first-year travel expectations, Flyvbjerg and colleagues discovered that ex-ante predictions of the use of the transport system were frequently off. The range of overestimations for rail passenger projections (95% confidence interval) is 66% to 169%, and forecasts have not gotten more accurate over time. Overestimating ridership and road usage would result in an inaccurate benefit estimate based on expected but unrealized compounded time savings, which is a difficulty similar to inaccurate cost forecasting.

CBA is advertised as a tool to help choose between various transportation plans.Yet, the CBA requires a thorough and well-developed plan for the best chance at accuracy. Prioritizing transportation projects and planning for them must start far earlier, when only hazy concepts and basic drawings are available. CBA frequently enters the process too late to have a significant impact on decisions and plans(Beukers et al., 2012).

Although there isn't a single, globally accepted CBA model, most nations have a similar set of standards for evaluation requirements(Annema,2013).

Forecasting traffic for most schemes depends on a variant of the conventional four-stage transport model: generation, distribution, mode split and assignment. A variation of the standard four-stage transport model, which includes generation, distribution, mode split, and assignment, is used to forecast traffic for the majority of projects. This is suited for urban projects where routine commuting trips provide the peak-load traffic and where a specific project is not likely to significantly force the relocation of workplaces or homes. It is less suitable for larger, interurban projects that alter accessibility globally and locally and where peak-load traffic is made up of travelers on less frequent trips, such those for work or leisure(Vickerman,2017).

Many studies have demonstrated the extent to which traffic projections, particularly for large-scale projects, are inaccurate to the point that they compromise the project's ex-ante appraisal (Flyvbjerg et al. 2003, 2006). Also, the time frame used to evaluate a project's effectiveness can be too brief to capture all potential economic effects. The primary takeaway from the assessment of this methodology is that relying just on traffic estimates may not be the best method for evaluating a project's success. Since user advantages from time savings and reduced accident costs, as well as effects from congestion and reliability, dominate welfare gains, this is at the core of the traditional CBA method, which focuses primarily on traffic. Although common valuation techniques have been created for these welfare gains, there is growing concern about them(Vickerman,2017).

Cost Estimates in CBA

Strategic Behaviour

In addition to advancements in research, the reduction of strategic behavior represents a significant obstacle. It is discovered that strategic behavior has a significant role in the underestimating of the costs and the overestimation of the benefits of potential new infrastructure projects. This phenomenon is particularly significant for rail projects as opposed to those using roads (see Trujillo et al., 2002; Flyvbjerg et al., 2005; Wachs, 1989; 1990; Bruzelius et al., 2002). The introduction of "better" institutional arrangements, the creation of an independent committee evaluating the forecasts, the inclusion of an

uncertainty analysis for all forecasts, increased transparency in documentation regarding costs and benefits, and finally the use of the "reference class forecasting" method (comparing the project under discussion with other comparable projects) are all potential strategies for reducing strategic behavior. Both "costs" and "benefits" are relevant in terms of strategic behavior(Priemus et al.,2008).

Optimism bias

The advantages of a transportation project are harder to quantify quantitatively than the expenditures. First and foremost, they are made up of startup costs as well as costs for maintenance and operation. Cost inputs typically originate from readily accessible data or the outputs of common models (Iacono & Levinson, 2013). But, as many readers are aware, large-scale transportation infrastructure projects frequently end up costing more than originally anticipated. Cost overruns of 50–100% were frequent, according to a well-known analysis of transit project expenses(Skamris Holm & Flyvbjerg, 1997).

Regular cost project overruns, which make up one half of the cost-benefit analysis, can have a big impact on the CBA and NPV calculations. A risk multiplier and an optimism bias factor can be used in CBA analysis to account for the potential for cost overruns(Metrolinx, 2015).

Including broader benefits into CBA

A fundamental justification for how extensions might be made to offer a more comprehensive CBA model was identified by SACTRA (1999). They included, in part, the incorporation of numerous external affects into the same general structure. So, it is possible to enable for the financial evaluation of environmental implications in addition to the direct impacts on time savings, accident costs, etc. The majority of the extensions have addressed these negative effects, but there is growing interest in discovering potential positive externalities, with the effects on employment and economic growth taking center stage(Vickerman,2017).

It is always feared that such effects could indicate double counting of advantages. It would be incorrect to add the benefit of more employment to the current savings if transportation users appreciate time savings because they make it simpler to obtain better jobs and the reduced cost of travel enhances access to labor markets. In an urban setting, the effects on labor markets—whether through better sorting or higher participation rates—are quite obvious. By having access to more and better labor/employment possibilities, a location's effective density or economic mass is increased. It is less obvious in an interurban setting, such as when money is invested in a high-speed train link between two cities(Vickerman,2017).

An expanded CBA model that focuses on welfare impacts must allow for the distribution of costs and benefits in addition to accounting for externalities. Both the distribution between

different time periods and the effects on various societal groupings are discussed in this distribution. In essence, the latter is a discussion of discount rates and rates of time preference. Because they are connected to wage rates, the former frequently resurfaces in discussions about the proper values of time savings.In relation to how choices are based on CBA, Van Wee (2012) has gone into further detail about these equity difficulties. In essence, he talks about if and how CBA may produce democratic outcomes. This is a crucial issue since adding complexity to CBA might cause groups to feel excluded or alienated from the decision-making process. However, the rising complexity and expense of such evaluations may make it more difficult for objector organizations to effectively oppose a project or put up changes or alternate ideas on an equal basis(Vickerman,2017).

The reductions in travel time, which are sometimes the most significant advantages of infrastructure investments, are rarely completely reflected in GDP. Yet, if a commuter can leave home later because of shorter commutes or shorter distances to relatives, GDP is unaffected. Travel time savings for work trips and products transport lead to higher productivity and cheaper expenses. It is typical in CBA to take a comprehensive view of welfare, suggesting that all consumer advantages are taken into account even if they are not quantified in GDP(Priemus et al.,2008).

CBA-DK, a development of transition CBA that includes quantitative risk analysis (QRA), is presented by Salling and Banister. CBA-DK employs Monte Carlo simulations to examine the range of plausible possibilities for all the components used in the CBA rather than producing a single answer (that can be sensitivity tested). This enables a final result that displays both the distribution of other outcomes (i.e., ranges of NPV) based on the range of inputs, as well as the most probable conclusion. The accuracy of the prediction models and the base factors employed, such as the dollar value for VoT, are the two main sources of uncertainty in the CBA system. CBA-DK displays the range of uncertainty and the most likely anticipated outcomes(Salling & Banister, 2010).

The “third column”

For assessing feasibility of megaprojects, also indirect benefits not suitable to be monetize must be taken into account (HS2 Chairman’s Stocktake, 2019). These benefits can include:

- Urban and rural landscape
- Cultural heritage
- Biodiversity
- Waterfall
- Environment
- Layoffs
- Physical activity
- Accessibility

1.2.3 Stakeholder engagement

Megaprojects are well known for its "large-scale, complex investments that typically cost a billion dollars and up, take many years to develop and build, involve multiple public and private stakeholders, are transformational and impact millions of people" (Flyvbjerg, 2014).

This section of the literature covers several factors that are relate to the stakeholder engagement. This include identify stakeholders, develop a stakeholder engagement plan, conduct a stakeholder analysis, engage with stakeholders, possible engagement strategy and limitation of stakeholder engagement according to several literature.

Identify stakeholders

Identifying stakeholders is a crucial step in stakeholder engagement because it helps to ensure that everyone who is impacted by the project or who has an interest in its success is accounted for. Stakeholders can be individuals, groups, organizations, or even communities, and they can have a range of interests, needs and concerns that may influence or be influenced by the project.

A total of over 95 stakeholder group and 360 relationships have been identified, spanning various categories and levels, including public actors such as ministries, regional governments, and local mayors; third sector entities such as associations, committees, and research centers; private companies such as suppliers, contractors, and subcontractors; and other offices and management units within the company responsible for the megaproject. This mapping was conducted through an inductive approach, extrapolating the 'presence of actors from interview transcripts without any prior list provided to the interviewees. This methodology is similar to one used by Cottafava and Corazza(2020).

Literature divide stakeholders into two categories: primary and secondary stakeholders. Primary stakeholders usually engage in formal contractual relationships with a company, for example, customers, employees and shareholders. They normally have the greatest and more direct impact on the project. Secondary stakeholders on the other hand, do not engage directly with the company's going concern and without formal contractual relationships, for example public administration, mass media, environmentalist associations, religious group and other NGOs(Barabaschi,2020).

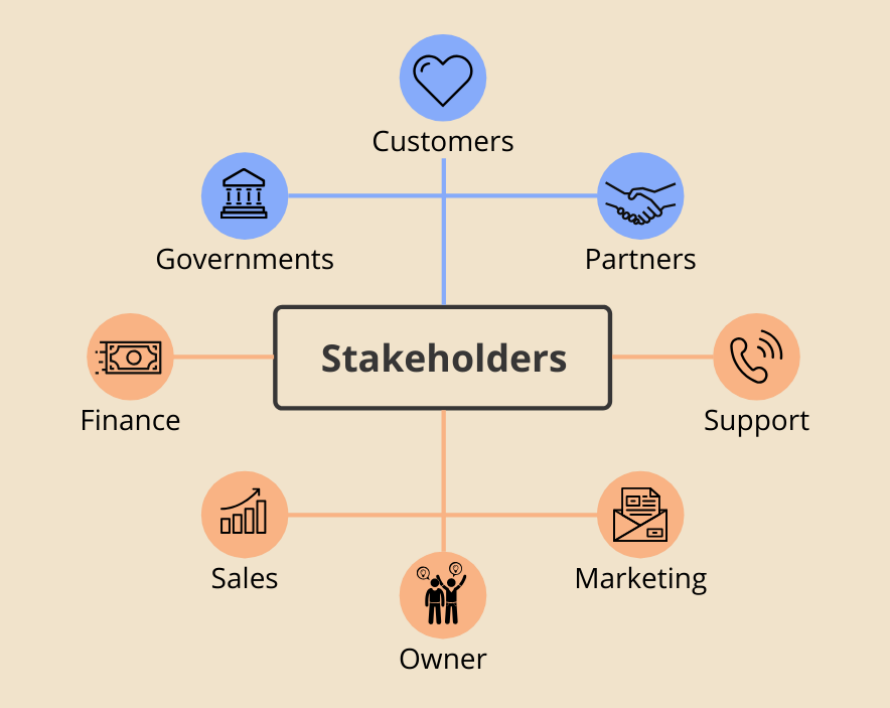

Figure 3 : How to Identify and Manage stakeholders

Moreover, there are several literatures also talk about how to identify stakeholders. For example, "Project Management: The Managerial Process" By Erik Larson and Clifford Gray. This book covers a wide range of topics related to project management, including identifying stakeholders. The main idea behind stakeholder identification in this book is to identify all individuals, groups and organizations that may have an impact on or be impacted by the project. I t recommends creating a stakeholder register and mapping out stakeholder relationships. During the literature “Effective Stakeholder Engagement: A practical Guide to Developing Sustainable Business Relationships” by Tony Llewellyn. This book provides a practical guide on how to identify and engage stakeholders, with real world case studies and examples. For this book, stakeholders are identified and engaged based on their potential impact on the success of the project or organization. Similar idea also appears at “Stakeholder Theory: The state of the Art” by Robert A. Phillips. The main idea is stakeholders are those who hold an interest in the project or organization, and understanding their need and interests is essential for managing successful relationships.

Develop stakeholder engagement plan

Once the stakeholders have been identified, the next step should be developing a stakeholder engagement plan. This plan should outline the objectives of engagement process, the methods that will be used to engage with stakeholders, and the timelines for each stage of the process.

Two approaches are discussed in this section which are Management of Stakeholders, versus Management for stakeholders. Management of stakeholders consider stakeholders as providers of resources and project managers main aim is to make the stakeholders comply with project needs. While management of stakeholders approach requires asking the question: 'How should we distribute the burdens and benefits of corporate activities among stakeholders?'(Barabaschi,2020).

According to the author, management of stakeholders sees stakeholders as providers of resources and the project manager's aim is to make stakeholders comply with project needs, while management for stakeholders prioritizes stakeholder engagement and creating as much value as possible for all stakeholders. The second approach is more holistic and considers stakeholders as valuable in their own right. While management for stakeholders' approach has potential drawbacks, scholars suggest that combing both approaches can be complementary. Overall, contemporary global development calls for paying attention to specific values such as transparency, fairness, and trust, which are crucial to assure project success(Barabaschi,2020).

During the literature "Management for Stakeholders Approach for a Socially Sustainable Governance of Megaprojects" Author provide two different engage plan which are Management of Stakeholders and management for stakeholders. The former considers stakeholders as providers of resources and projectmanagers aim to make stakeholders comply with project needs, while the latter aims to create value for all stakeholders by engaging and involving them in the project. The management-for-stakeholders approach involves creating and sharing project value with all stakeholders, with attention paid to both primary and secondary actors. However, this approach can present challenges, such as stakeholder conflicts and escalating expectations, and may require reframing the project's basic business proposition. While management-for-stakeholders and management-of-stakeholders may be considered complementary, there is a need to develop a superior stakeholder theory that aligns business with the creation of value for all stakeholders. Megaproject management should be guided by extensive strategic planning, stakeholder audits, and monitoring of performance in order to ensure a fit between stakeholders and the society within which managers operate. Additionally, there are several aspects of the management-of-stakeholders approach that are complementary to the management-for-stakeholders approach, including secondary actors' involvement, community of practices, stakeholder communication, and social responsibility monitoring throughout the megaproject's lifecycle(Barabaschi,2020).

Besides, Alexander Zimmermann describes how to develop stakeholder engagement plan at "Stakeholder Relationship Management: A Maturity Model for Organizational Implementation". The main idea is that stakeholder engagement planning should be an ongoing process that evolves over time. The book suggests using a stakeholder engagement

maturity model to assess the organization's stakeholder engagement capabilities and develop a targeted plan to improve engagement. "Stakeholder Engagement: A Roadmap to Quality Results" By Alisa G. Woods suggest that a stakeholder engagement plan should be focused, measurable, and aligned with the organization's goals. The book suggests developing a roadmap for stakeholder engagement that includes stakeholder identification and analysis, planning and executing engagement activities, and monitoring and evaluating the results.

Conduct stakeholder analysis

It is also crucial to conduct a stakeholder analysis, all stakeholders should be listed at certain order based on their level of interest and influence. This analysis should be used to prioritize stakeholders and develop specific engagement strategies.

During the literature "Interpreting Stakeholder Ecosystems through Relational Stakeholder Theory: The case of a highly contested Megaproject" Corazza established a network for the degree of centrality. For this network Corazza use IST, LOT, DIRE, and Soc to refer to different categories of respondents in his research study.

IST stands for "Institutional Stakeholders", which typically refer to people or organizations that have a formal role or interest in the project. These can include government officials, regulatory bodies, investors, and other institutional actors(Corazza,2023).

LOT stands for "Local Operational Teams", which typically refer to individuals directly involved in the daily operations of the project on the ground. This can include site managers, engineers, workers, and other technical staff.

DIRE stands for "Director and Executive level Stakeholders". These are individuals who have a high level of decision-making power within the organization or project, such as CEOs, board members, and other high-level executives.

SOC stands for "Societal Stakeholders", which refer to people and groups that are indirectly affected by the project, but are still stakeholders. This can include individuals and groups that are impacted by the social, economic, or environmental implications of the project, such as local communities, environmental groups, and other civil society organizations.

By assigning respondents into different groups, researchers are able to have a better understanding of their relationship, the interests of stakeholders and the priority of stakeholders.

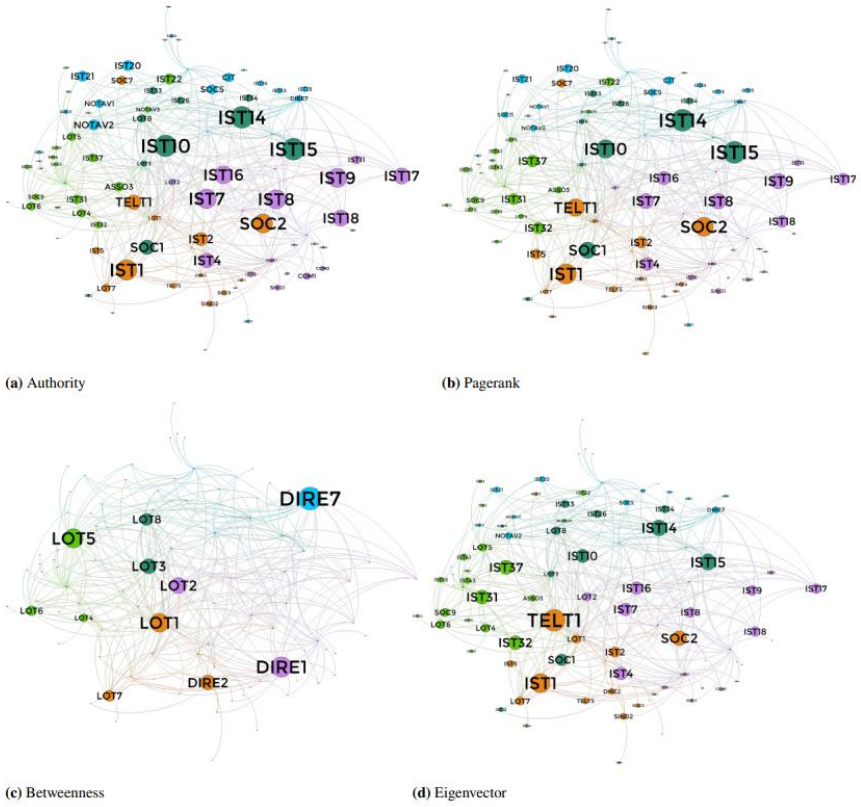

Figure 4: Degree oof centrality of the stakeholder network(Corazza et al.,2023)

According to this figure, each node represents a different stakeholder, and the size of the node shows the corresponding degree of centrality. Meanwhile the colors represent a "bottom-up" clustrization. Meanwhile Five groups were identified: 1) civil society (light blue + light green), 2) internal and external project stakeholders (light green), 3) general public institutions, e.g. Italian/French governments, European Union (dark green), 4) cross-border public institutions such as Italian/French transport ministries (purple), 5) local institutions, e.g. local mayors, valley communities (orange)(Corazza et al.,2023).

The authority (Fig. 1a) and pagerank degree (Fig. 1b) are presented in Figure 1. The authority is mainly assigned to national and international public institutions (IST category), while the pagerank focuses on national and international public institutions (IST category) and some civil society components (SOC category) that represent generic construction and engineering companies (SOC1 and 2). Moreover, public institutions related to the environment, such as Arpa Piemonte (IST 31) responsible for validating environmental quality assessment on all construction sites and the Ministry of Environment (IST 37), are more central in terms of authority. The degree of centrality betweenness (Fig. 1c) is entirely centered on internal structures and business units (LOT and DIRE categories), resulting from the network construction exclusively based on interviews with directors and internal components. Therefore, it is not very significant concerning the stakeholder ecosystem due to the

organization-centred data, even though the literature confirms that internal project managers, such as the directors of construction sites, are one of the privileged stakeholders in megaprojects (Aaltonen, 2011; Mahmoudi et al., 2021). The eigenvector degree of centrality (Fig. 1d) is again focused on institutional components (IST category) and internal components (TELT category). It highlights the centrality of both national and international institutional components (purple and dark green clusters) and national institutions that validate and check environmental assessment (light green cluster). However, the internal components (LOT and TELT categories) do not appear to be particularly central. The social component (NO TAV and SOC categories) emerges as secondary from the network constructed by the interviewees. It is important to note that the data only reflects the system of actors as described by the interviewees and is not meant to be an exhaustive and unbiased reconstruction of the ecosystem of stakeholders related to the megaproject. Nonetheless, it represents the natural dimension of managers and directors' ability to represent their privileged interlocutors.

Engage with stakeholders

Normally the process of engage with stakeholders are conduct through meetings, conference, phone call, surveys and other forms of engagement.

For engaging with stakeholders, Evan and Freeman suggest two principles that managers should follow to coordinate stakeholder interests also when managing a megaproject:

- Principle of corporate legitimacy. The company should be managed for the benefit of its stakeholders. Stakeholders must participate in decisions that substantially affect their wellbeing;
- Stakeholder fiduciary principle. Managers must act in the interests of all stakeholders as their aim coincide with those of the firm to ensure its survival(Evan&Freeman, 1990).

To better communicate and engage with stakeholders, The practice-based approach (PBA) is presented as an option to integrate the actor network theory results to compensate for some of its limitations. Communities of practice that regularly bring together people who share areas of interest have been theorized by Wenger and can be useful to explain and translate the management-for-stakeholder approach in megaprojects. These communities allow the various stakeholder groups to assume the organization of a critical asset, to understand what knowledge will give them a competitive advantage in the different phases of the project. The involvement of different views is considered an enriching factor that complements managers' knowledge. The adoption of technologies can be highly affected by the lack of negotiations between relevant actors, functional to continuous translation processes(Evan&Freeman, 1990).

Because different stakeholders have different interest from the project, so normally stakeholders are divided into primary stakeholders and secondary stakeholders. Primary stakeholder are individuals or groups that have a direct interest in the activities or outcomes of the project and secondary stakeholders are individuals or groups that are indirectly affected by the actions of the organization. While secondary stakeholders may not have a direct impact on an organization, their opinions are perceptions can influence public opinion and ultimately affect an organization's deputation or success. So, the question become, how to assure a useful engagement of both primary and secondar stakeholders. (Barbara Barabaschi)

Monitor and evaluate the engagement process

The stakeholder engagement process should be recorded and monitored all the time;the data should be collected for further analysis to ensure its effectiveness.

Megaprojects have extensive social responsibilities and pose governance challenges for economic, social, and environmental issues due to heterogeneous stakeholders. Megaproject social responsibility cannot rest with a single individual or organization, and a multi-level systems view is needed to analyze it. The Business-Government-Society (BGS) approach analyzes interrelationships and interactions among these three sectors. The most representative features of megaproject governance are the duality of leaders, plurality of dimensions involved, and dynamism. The BGS model requires socialization mechanisms to favor the governance of megaprojects. Investors and owners must take an active role in putting together the project team and creating a detailed, practical approach to deal with eventualities. This framework can be adopted within the road map for megaproject practice to improve the governance performance of social responsibility and create shared and sustainable value for all stakeholders.

"Monitoring and Evaluation of Participatory Processes" by Emery Roe provides a comprehensive guide on the methods and tools used in monitoring and evaluating participatory processes. It highlights the importance of engaging stakeholders and the community in the design and implementation of the process to ensure its success. Meanwhile, Maricia L. Gumpertz suggest that to develop effective monitoring and evaluation system to engage with stakeholders, the following step should be taken.

1. Define program indicators

2. Identify data sources

3. Develop data collection methods

4 .Establish data management protocols

5. Analyze and interpret data

6. Use the findings to evaluate

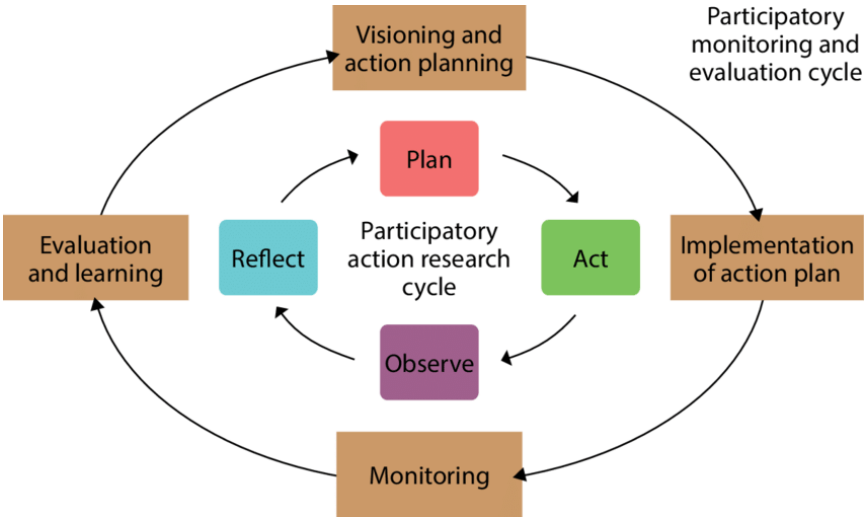

Figure 5 : Participatory monitoring and evaluation cycle

Adapt the engagement strategy

To adapt the engagement strategy, it is necessary to consider the following steps:

1. Review the current strategy: Assess the effectiveness of the current stakeholder engagement strategy. Identify which part achieved the expectation and which part failed.

2. Identify changes in the environment: Assess the change in the environment that may impact stakeholder engagement, for example, laws, regulations, economic conditions, change of government etc.

3. Conduct a stakeholder analysis: Identify and analyze the key stakeholders that are involved in the project. Analyze their interests, concerns, goals and relationships to the project.

4. Determine the stakeholder engagement objectives: Based on the stakeholder analysis report, determine the objectives of the stakeholder engagement strategy. Including what stakeholders need to be engaged, how will they be engaged and the expected outcome of the engagement.

5. Develop an adapted stakeholder engagement plan: Create an adapted stakeholder engagement plan based on the stakeholder analysis report and the objectives. This should include a clear plan on how to engage with stakeholders, what messages should be delivered and how feedback will be received etc.

6. Implement the adapted stakeholder engagement plan: Implement the adapted stakeholder engagement plan and closely monitor the effectiveness of the plan. A feedback and evaluation mechanisms should be included into this section.

7. Continuously review and adapt the stakeholder engagement plan: Review the effectiveness of the adapted stakeholder engagement plan regularly and make necessary changes too ensure that it remains relevant and effective. Continuous review and adaptation are essential to ensure the engagement with stakeholders is effective and contributes to project or program success.

Meanwhile, Jill Jamieson and Natasha Campbell-McBride also discussed the benefits of adapting engagement partices to better fit the needs of the stakeholders at "Stakeholder Engagement: The Game-Changer for Program Success".

Concerns and solutions

This section of the literature discusses several factors that are deemed to lie beyond the project setting. During article “What are the causes and cures of poor megaproject performance? A systematic literature review and research agenda” There factors can be classified three primary categories:

1. Institutional context: This includes the formal organizational structures, regulations, and informal norm that govern the project’s operations.

2. Stakeholder fragmentation: This refers to the number of parties involved in the project, which can result in a high level of interaction between stakeholders.

3. Community engagement: This involves the procedures and engagement activities used by the project to involve the local population in its implementation.

Inadequate understanding of the parties, interests, and power relationships surrounding a project is the primary cause of poor performance associated with institutional context. This often leads to conflicts, inefficiencies, and delays as various parties attempt to navigate governmental agencies and regulations. Stakeholder fragmentation is primarily caused by the involvement of numerous parties with competing and often conflicting priorities, goals, and interests. Inability to align these parties often leads to further issues. Poor community engagement, communication, and transparency during a project’s life cycle is the primary cause of negative community impact. Local communities may mobilize to ensure their interests are realized, often leveraging media to achieve their objective. (Denicol et al.,2020)

To resolve these concerns, a few solutions are listed below.

The cures for Institutional Context are ;

1. Develop transparency in process and criteria to address the role of corruption in projects from social and institutional levels(Mariani et al.,2017).

2. Minimize the impact of political influence by ensuring that the project is embedded and aligned with the institutional framework(Mahalingam & levitt, 2007) (Patanakul et al.,2016).

3. Develop strategies to engage in projects with an array of dynamic institutional actors, such as global projects with different cross-national frameworks(Mahalingam & levitt, 2007)(Naderpajouh et al.,2014).

Cures for stakeholder Fragmentation:

1. Manage the stakeholders by identifying their different drivers, interests, power, culture, resources, and expectations(Rose & Manley,2010)(Chang et al.,2013)(Gharaibeh,2014) (Hannevik et al.,2014)(Patanakul et al.,2016).

2. Establish regular individual meeting between the project manager and key executives of the senior management(Cox,1993)(Geyer and Davies,2000).

3. Invest in organizational structures for external interfacing to deal with different entities in an evolving and temporary project environment(Van Fenema et al.,2016).

Cures for community Engagement

1. Establish public outreach strategies through aggressive marketing campaigns to communicate with a wider public to increase public acceptability both nationally and locally(Bruzelius et al.,2002)(Locatelli et al.,2017)(Puerto & Shane,2014).

2. Engage early with end users to capture ideas that will inform the design concept and prioritize benefits realization for customer satisfaction(Barnes & Wearne,1993)(Chang et al., 2013)(Fainstein,2008)(Rodriguez-Segura et al.,2016)(Fenema et al.,2016).

3. Promote local supply-chain firms and enhance their awareness of the importance of working collaboratively(Kumar et al.,2007)(Invernizzi et al.,2017).

1.3 Methodology

1.3.1Literature review

Literature review play a significant role in this report. Generally, literature reviews can be valuable research method for our thesis even though it may have its limitations. It was originally developed in the medical sciences to consolidate information from several sources, a systematic literature review is a transparent, rigorous, and detailed methodology used to support decision making (Tranfield et al., 2003) This methodology involves constructing theory through a systematic examination of a substantial number of studies and methods, thereby enhancing the consistency of the findings and conclusions through the accumulation of knowledge and evidence. (Akobeng, 2005) We conducted our systematic literature review into several phases.

The initial planning stage involved identifying the review's requirements and creating a protocol that established the search strategy, inclusion criteria, and relevant keywords. During the development stage, we selected articles for data extraction, assessment, and synthesis. The third disseminating stage enabled us to connect our research findings with ongoing discussions in academic literature and practice by providing easily accessible materials for practitioners.

Purpose

To apply Literature review, the first thing to do is defining the purpose of the literature review, this includes scope and research questions. Since the goal is to study project management from Lyon Turin railway project, the purpose of the literature review would be to provide a comprehensive overview of the existing research and knowledge related to project management about megaprojects like the Lyon Turin railway project.

The literature review should serve to:

1. Provide a background knowledge for the research by describing the Lyon Turin railway project and the challenges associated with managing a megaproject with this scale.

2. Identify gaps in existing research related to project management in the context of large-scale infrastructure project and determine how the proposed study can contribute to filling these gaps.

3. Summarize the existing knowledge related to project management in the context of large-scale infrastructure projects, including best practices, challenges, and lessons learned.

4. Identify and evaluate the different project management methodologies and frameworks that have been used in similar projects and determine which approach would be most suitable for the Lyon Turin railway project.

5. Determine the key success factors for project management in the context of large-scale infrastructure projects like the Lyon Turin railway project, and identify potential areas of improvement.

Search strategy

In order to find suitable literatures, search strategy must be applied. This includes digital databases, reference chaining, snowball sampling, etc. The search strategy for the literature review needs to be comprehensive and systematic to ensure that all relevant literature is identified.

The following steps can be taken for developing an effective search strategy:

Identify the relevant keywords and search terms: keywords related to the Lyon Turin railway project and project management in the context of large-scale infrastructure projects should be identified. For example: "Lyon Turin railway project", "project management", "infrastructure project", "large-scale project", "construction management", "project execution".

Determine the appropriate databases: identify the databases that are relevant to the research topic. Examples of relevant databases include Scopus, Web of Science, Engineering Village, and Google Scholar.

Define the inclusion and exclusion criteria: the inclusion criteria should be defined to ensure that only relevant literature is included in the review. For example, only peer-reviewed journal articles published within the last 10 years may be included. The exclusion criteria should also be defined, such as excluding articles that are not in English or are not relevant to the research topic.

Conduct the search: Using the identified keywords and databases, the search should be conducted. A combination of keywords and Boolean operators can be used to refine the search.

Review the search results: The search results should be reviewed to ensure that all relevant literature has been identified. The titles and abstracts of the identified articles should be screened against the inclusion and exclusion criteria.

Retrieve and review full-text articles: The full-text articles of the relevant studies should be retrieved, and the studies should be reviewed in detail to extract relevant information for the literature review.

Criteria

The next step is to decide the criteria used to determine which studies should be included or excluded. For project management literature, it's important to focus on the date of publication, study design, project type, and geographic location etc. Selection criteria are used to determine which literature will be included in the literature review. The selection criteria should be clearly defined and aligned with the research questions or objectives. In the case of studying project management from the Lyon Turin railway project, the selection criteria may include:

Relevance: The literature should be directly relevant to the research question or objective. For example, articles that discuss project management in the context of infrastructure projects such as the Lyon Turin railway project would be considered relevant.

Quality: The quality of the literature should be evaluated based on factors such as the rigor of the research methodology, the credibility of the author and publisher, and the validity of the data and findings.

Currency: The literature should be up-to-date and relevant to the current context of project management in the context of large-scale infrastructure projects.

Scope: The literature should cover a broad range of topics related to project management in the context of large-scale infrastructure projects, such as risk management, scheduling, cost management, stakeholder engagement, and project governance.

Geographical scope: The literature should cover projects from different geographical locations to provide a broader perspective on project management in the context of large-scale infrastructure projects.

Language: The literature should be written in English to ensure that it is easily accessible and understandable to the target audience.

Data extraction

Data extraction is the process of identifying and extracting relevant information from the selected literature to address the research questions or objectives. The data extraction process should be systematic and transparent to ensure that the extracted data is accurate and reliable. The following steps can be taken for data extraction:

Identify the relevant data: The relevant data should be identified based on the research questions or objectives. For example, if the research question is focused on project management methodologies used in large-scale infrastructure projects, the relevant data may

include the name of the methodology, the steps involved, and the benefits and limitations of the methodology.

Develop a data extraction form: A data extraction form should be developed to capture the relevant data. The data extraction form should include the research question or objective, the data items to be extracted, and the criteria for evaluating the data.

Extract the data: The relevant data should be extracted from the selected literature using the data extraction form. This may involve summarizing the key findings, identifying common themes, or extracting numerical data.

Evaluate the data: The extracted data should be evaluated to ensure that it is accurate and reliable. This may involve checking for errors or inconsistencies in the data, and cross-checking the data with other sources.

Synthesize the data: The extracted data should be synthesized to address the research questions or objectives. This may involve grouping similar data together, identifying patterns or trends in the data, or comparing and contrasting the data across different studies.

Document the data extraction process: The data extraction process should be documented to ensure that it is transparent and replicable. This may involve documenting the data extraction form, the data extraction process, and any decisions or judgments made during the data extraction process.

By following these steps, the data extraction process can be systematic and transparent, which will improve the quality and usefulness of the literature review.

Quality assessment

Quality assessment explain how to critically evaluate the quality of studies included in the literature review. Some literature may contain bias or vague information while some literature may lack the strength of the evidence and some cases discussed in a literature may mot able to present any valuable information due to new technology, change of policy etc.

Synthesis

Synthesis is the process of combining the extracted data from the literature review to address the research questions or objectives. The synthesis process should be systematic and transparent to ensure that the findings are accurate and reliable. The following steps can be taken for synthesis:

Identify common themes: The extracted data should be reviewed to identify common themes or patterns. This may involve grouping similar data together or identifying key findings across different studies.

Analyze the data: The data should be analyzed to identify relationships, trends, and patterns. This may involve statistical analysis, qualitative analysis, or a combination of both.

Compare and contrast the data: The data should be compared and contrasted across different studies to identify similarities and differences. This may involve identifying common themes or patterns across studies or comparing the findings of different studies.

Draw conclusions: Based on the analysis of the data, conclusions should be drawn that address the research questions or objectives. The conclusions should be supported by the extracted data and should be presented in a clear and concise manner.

Discuss the implications: The implications of the findings should be discussed in the context of the research questions or objectives. This may involve discussing the limitations of the findings or identifying areas for future research.

Document the synthesis process: The synthesis process should be documented to ensure that it is transparent and replicable. This may involve documenting the steps taken during the synthesis process and any decisions or judgments made during the process.

By following these steps, the synthesis process can be systematic and transparent, which will improve the quality and usefulness of the literature review. The synthesis process should also be aligned with the research questions or objectives to ensure that the findings are relevant and meaningful.

Presentation

Once the result has been obtained, the next step is how to present the result in a clear and concise way. Several tools can be used to achieve that like visual aids, tables or diagrams.

Limitations

Limitations are potential weaknesses or shortcomings of the literature review methodology that may affect the validity and reliability of the findings. It is important to identify and acknowledge these limitations to ensure that the literature review is transparent and that the findings are interpreted appropriately. The following are some potential limitations of a literature review:

Availability of literature: The literature review is dependent on the availability of relevant literature, which may be limited by factors such as language barriers, geographical scope, or publication bias.

Quality of literature: The quality of the literature included in the review may vary, and some studies may have limitations or biases that affect the validity of the findings.

Scope of the review: The scope of the review may be limited by factors such as time constraints, available resources, or the research questions or objectives.

Search strategy: Despite efforts to develop a comprehensive and systematic search strategy, some relevant literature may still be missed.

Data extraction: The accuracy and reliability of the extracted data may be affected by factors such as human error, inconsistency in the data, or biases in the interpretation of the data.

Synthesis: The synthesis process may be affected by factors such as the quality and consistency of the extracted data, the analytical methods used, or the limitations of the available literature.

It is important to acknowledge these limitations and discuss their potential impact on the validity and reliability of the findings. This helps to ensure that the literature review is transparent and that the findings are interpreted appropriately. Additionally, identifying these limitations can help to inform future research and improve the methodology of future literature reviews.

Future research

Future research is the potential research that can be conducted based on the gaps and limitations identified in the literature review. The future research may aim to address the limitations or gaps in the existing literature or explore new research questions that arise from the findings of the literature review. The following are some potential areas for future research:

Further exploration of project management methodologies: The literature review may identify a need for further exploration of project management methodologies and their applicability to infrastructure projects such as the Lyon Turin railway project.

Case studies of other large-scale infrastructure projects: Future research may involve conducting case studies of other large-scale infrastructure projects to identify best practices and lessons learned in project management.

Comparative analysis of different project management approaches: Future research may involve comparing and contrasting different project management approaches to identify their strengths and weaknesses in the context of large-scale infrastructure projects.

Analysis of stakeholder engagement and management: Future research may focus on stakeholder engagement and management in the context of large-scale infrastructure projects, including the role of stakeholders in decision-making and the impact of stakeholder engagement on project success.

Evaluation of project governance: Future research may involve evaluating project governance in the context of large-scale infrastructure projects, including the effectiveness of project oversight and the impact of governance on project performance.

By identifying potential areas for future research, the literature review can inform the development of future research studies and contribute to the ongoing knowledge and understanding of project management in the context of large-scale infrastructure projects such as the Lyon Turin railway project.

1.3.2 Document review

When introducing document review as the methodology for a research study, it is important to focus on the following key points:

Definition and Purpose:

Definition and purpose are important components of introducing a research methodology, including document review. The definition and purpose provide a clear understanding of what the methodology involves and why it is relevant to the research study.

Definition: The definition of document review should include a clear explanation of what the methodology involves. Document review is a research method that involves the analysis of existing documents, such as reports, records, or archival materials, to gather data and information relevant to the research questions or objectives. The methodology may also involve analyzing different types of documents, including primary and secondary sources, and using various techniques for data collection and analysis.

Purpose: The purpose of document review should be explained in the context of the research study. The purpose of document review is to gather data from existing documents that are relevant to the research questions or objectives. This method can be used to complement other research methods, such as surveys or interviews, or used as the primary method for data collection and analysis. The goal of document review is to provide a comprehensive and systematic analysis of the data to answer the research questions or objectives.

By providing a clear definition and purpose of document review, the researcher can help the audience understand the methodology and its relevance to the research study. This can also help to establish the credibility of the research and provide a solid foundation for the rest of the methodology section.

Types of Documents:

When discussing the types of documents that will be included in a document review as a research methodology, there are several key points to focus on:

Relevance to the research questions or objectives: It is important to focus on the types of documents that are directly relevant to the research questions or objectives of the study. This can include primary sources, such as government reports or organizational records, as well as secondary sources such as academic articles or books. Explain why these sources are relevant to the research study and how they will be used to answer the research questions or objectives.

Availability and accessibility: Discuss the availability and accessibility of the documents that will be reviewed. This may include issues such as language barriers, geographical scope, or access to restricted documents. Explain how these issues will be addressed to ensure that the data is comprehensive and representative.

Credibility and validity: Discuss the credibility and validity of the documents that will be reviewed. This may involve assessing the authenticity and accuracy of the documents, as well as considering any potential biases or limitations. Explain how these issues will be addressed to ensure that the data is reliable and valid.

Sampling strategy: Discuss the sampling strategy used to select the documents for review. This may involve using a systematic approach, such as random sampling or purposive sampling, to ensure that the data is representative and unbiased. Explain how the sampling strategy will be used to select the documents for review.

Ethical considerations: Discuss any ethical considerations associated with the documents that will be reviewed. This may include issues of confidentiality, privacy, or informed consent. Explain how these issues will be addressed to ensure that the research is conducted ethically and responsibly.

By focusing on these key points, the researcher can effectively discuss the types of documents that will be included in the document review and provide a clear understanding of how these documents will be used to answer the research questions or objectives. This can also help to establish the credibility and validity of the research.

Data Collection and Analysis:

When discussing data collection and analysis as part of a document review methodology, there are several key points to focus on:

Data collection methods: Describe the methods that will be used to collect data from the documents. This may include techniques such as content analysis, thematic analysis or

discourse analysis. Explain how these methods will be used to identify patterns, themes, and trends in the data.

Data analysis methods: Describe the methods that will be used to analyze the data collected from the documents. This may include using software tools to analyze the data, or conducting a manual analysis of the data. Explain how these methods will be used to identify patterns, themes, and trends in the data.

Quality and reliability of data: Discuss how the quality and reliability of the data will be ensured. This may involve assessing the credibility of the sources, validating the data through triangulation with other sources, or using a systematic approach to reduce bias and errors. Explain how these methods will be used to ensure that the data is reliable and valid.

Data interpretation: Discuss how the data will be interpreted to answer the research questions or objectives. This may involve identifying key findings, drawing conclusions, or generating new insights based on the analysis of the data.

Data presentation: Discuss how the data will be presented in the research study. This may involve using tables, graphs or charts to present the data, or using narrative descriptions to summarize the findings.

Limitations and challenges: Discuss any limitations or challenges associated with the data collection and analysis methods. This may include issues such as missing data or difficulties in interpreting the data. Explain how these issues will be addressed to ensure that the research is valid and reliable.

By focusing on these key points, the researcher can effectively describe the data collection and analysis methods used in the document review methodology, and provide a clear understanding of how the data will be used to answer the research questions or objectives. This can also help to establish the credibility and validity of the research findings.

Quality and Reliability:

When discussing the quality and reliability of data in a research study, there are several key points to focus on:

Credibility of sources: Discuss how the credibility of the sources used to collect the data will be evaluated. This may involve assessing the authenticity and accuracy of the documents, as well as considering any potential biases or limitations. Explain how these issues will be addressed to ensure that the data is reliable and valid.

Triangulation: Discuss how the data will be validated through triangulation with other sources. Triangulation involves using multiple sources of data to cross-check findings and

ensure that the data is accurate and representative. Explain how different sources of data will be used to validate the findings.

Inter-coder reliability: If multiple coders are involved in the data collection and analysis, discuss how inter-coder reliability will be ensured. Inter-coder reliability involves assessing the consistency and agreement between different coders. Explain how this will be achieved to ensure that the data is reliable and valid.

Data saturation: Discuss how data saturation will be achieved to ensure that all relevant data has been collected and analyzed. Data saturation is the point at which new data no longer provides additional insights or information. Explain how this will be achieved to ensure that the data is comprehensive and representative.

Systematic approach: Discuss how a systematic approach will be used to reduce bias and errors in the data collection and analysis process. This may involve using a standardized data collection tool or a predefined coding scheme to ensure consistency and accuracy in the data analysis process.

By focusing on these key points, the researcher can effectively address the quality and reliability of the data in the research study. This can help to establish the credibility and validity of the research findings and ensure that the research is conducted ethically and responsibly.

Ethical Considerations:

When discussing ethical considerations in a research study, there are several key points to focus on:

Informed consent: Discuss how informed consent will be obtained from participants or sources of data. Informed consent involves providing potential participants or sources of data with information about the research study, including its purpose, methods, and potential risks and benefits, and obtaining their voluntary agreement to participate.

Confidentiality and privacy: Discuss how confidentiality and privacy will be ensured in the research study. This may involve using anonymous or pseudonymous data, or protecting the identity and personal information of participants or sources of data. Explain how these issues will be addressed to ensure that the data is handled ethically and responsibly.

Risk of harm: Discuss how the risk of harm to participants or sources of data will be minimized. This may involve avoiding or reducing potential risks, or providing support and resources to participants or sources of data who experience harm or distress as a result of their participation.

Deception: Discuss any potential deception that may be involved in the research study, and how this will be justified and minimized. Deception involves intentionally misleading participants or sources of data about the purpose or methods of the research study. Explain how this will be addressed to ensure that the research is conducted ethically and responsibly.

Conflict of interest: Discuss any potential conflicts of interest that may arise in the research study, and how these will be addressed. A conflict of interest involves a situation in which the researcher's personal or professional interests may influence the research findings or conclusions. Explain how this will be addressed to ensure that the research is conducted ethically and responsibly.

By focusing on these key points, the researcher can effectively address ethical considerations in the research study and ensure that the research is conducted ethically and responsibly. This can help to establish the credibility and validity of the research findings and protect the rights and welfare of participants or sources of data.

Limitations:

When discussing limitations in a research study, there are several key points to focus on:

Scope: Discuss the scope of the research study and any limitations associated with it. This may include issues such as geographical scope, time constraints, or limited access to data or resources. Explain how these limitations may have affected the research study and its findings.

Sampling: Discuss any limitations associated with the sampling strategy used in the research study. This may include issues such as sample size, representativeness, or generalizability. Explain how these limitations may have affected the research study and its findings.

Data collection and analysis: Discuss any limitations associated with the data collection and analysis methods used in the research study. This may include issues such as missing data, potential biases, or limitations in the analysis techniques. Explain how these limitations may have affected the research study and its findings.

Validity and reliability: Discuss any limitations associated with the validity and reliability of the research study. This may include issues such as social desirability bias, measurement error, or limitations in the research design. Explain how these limitations may have affected the research study and its findings.

Interpretation of findings: Discuss any limitations associated with the interpretation of the research findings. This may include issues such as uncertainty in the results or limitations in the conclusions drawn from the findings. Explain how these limitations may have affected the research study and its findings.

By focusing on these key points, the researcher can effectively address the limitations of the research study and provide a clear understanding of the potential barriers to the validity and generalizability of the findings. This can help the audience to interpret the research findings accurately and understand the implications of the research for future research and practice.

1.3.3 Interviews

When introducing interview as a methodology for a research study, there are several key points to focus on:

Definition and Purpose:

Definition and purpose are key components of introducing an interview methodology in a research study. The definition and purpose provide a clear understanding of what the methodology involves and why it is relevant to the research study.

Definition: The definition of an interview should include a clear explanation of what the methodology involves. An interview is a research method that involves asking questions and eliciting responses from participants to gather data and information relevant to the research questions or objectives. Interviews can be conducted in-person, over the phone, or via video conferencing, and can be structured, semi-structured, or unstructured.

Purpose: The purpose of conducting interviews should be explained in the context of the research study. The purpose of conducting interviews is to gather detailed and nuanced data directly from participants. Interviews can provide rich and complex data that cannot be obtained through other research methods such as surveys or document analysis. The goal of conducting interviews is to provide a comprehensive and in-depth analysis of the data to answer the research questions or objectives.

By providing a clear definition and purpose of interviews, the researcher can help the audience understand the methodology and its relevance to the research study. This can also help to establish the credibility of the research and provide a solid foundation for the rest of the methodology section.

Types of Interviews:

Describe the types of interviews that will be conducted in the research study. This may include structured interviews, semi-structured interviews, or unstructured interviews. When discussing the types of interviews that can be used as a methodology in a research study, there are several key types to focus on:

Structured interviews: Structured interviews involve asking a predetermined set of questions to all interview participants. The questions are usually closed-ended, with a limited set of response options. Structured interviews are often used in quantitative research studies to gather standardized data that can be easily analyzed.

Semi-structured interviews: Semi-structured interviews involve asking a set of open-ended questions, but also allowing for follow-up questions and exploration of participant responses. The questions may be predetermined, but the interview may also allow for flexibility and adaptation based on participant responses. Semi-structured interviews are often used in qualitative research studies to gather rich and detailed data that can be analyzed thematically.

Unstructured interviews: Unstructured interviews involve asking open-ended questions without a predetermined set of questions or response options. The interview may allow for free-flowing conversation and exploration of participant responses. Unstructured interviews are often used in exploratory research studies to generate new insights and ideas.

Group interviews: Group interviews involve conducting interviews with multiple participants at the same time. The group dynamic can allow for interaction and discussion among participants, which may generate new insights and perspectives. Group interviews can be structured, semi-structured, or unstructured.

Virtual interviews: Virtual interviews involve conducting interviews using technology such as video conferencing software or teleconferencing. Virtual interviews can be used to overcome geographic barriers or to allow for more flexible scheduling options. Virtual interviews can be structured, semi-structured, or unstructured.

By focusing on these key types of interviews, the researcher can effectively choose the type of interview that is most suitable for the research study and its objectives. The type of interview chosen should be aligned with the research questions or objectives, and should be selected based on its ability to generate rich and relevant data.

Sampling Strategy:

Sampling strategy is an important component of the interview methodology in a research study. The sampling strategy determines how participants will be selected for the interview, and can have a significant impact on the validity and generalizability of the research findings.

Random Sampling: Random sampling involves selecting participants from a population at random, with each participant having an equal chance of being selected. This method is commonly used when the population is large and diverse, and the researcher wants to ensure that the sample is representative of the population.

Stratified Sampling: Stratified sampling involves dividing the population into subgroups or strata, and selecting participants from each stratum in proportion to their representation in the population. This method is commonly used when the population is heterogeneous and the researcher wants to ensure that the sample includes participants from each subgroup.

Convenience Sampling: Convenience sampling involves selecting participants who are readily available and accessible to the researcher. This method is commonly used when the population is small and the researcher has limited time and resources.

Purposive Sampling: Purposive sampling involves selecting participants based on specific characteristics or criteria that are relevant to the research questions or objectives. This method is commonly used when the researcher wants to ensure that the sample includes participants with relevant experiences, perspectives, or expertise.

Snowball Sampling: Snowball sampling involves selecting participants through referrals from other participants. This method is commonly used when the population is hard to reach or hidden, and the researcher wants to ensure that the sample includes participants with relevant experiences or perspectives.

By choosing an appropriate sampling strategy, the researcher can ensure that the sample is representative of the population and that the research findings are valid and generalizable. The sampling strategy should be chosen based on the research questions or objectives, and should be described in detail in the methodology section of the research study.

Data Collection:

Data collection is an essential component of the interview methodology in a research study. The data collected from interviews can provide valuable insights and perspectives that can be used to answer the research questions or objectives. When discussing data collection in the methodology section of a research study, there are several key points to focus on:

Interview Guide: The interview guide should be described in detail. The interview guide is a set of questions or prompts that the interviewer will use to guide the interview. The guide may be structured, semi-structured, or unstructured, depending on the type of interview being conducted.

Interviewer Training: The interviewer should be trained to conduct the interview in a consistent and standardized manner. Interviewer training may include instruction on how to use the interview guide, how to establish rapport with participants, and how to ask questions in an open and non-judgmental manner.

Audio or Video Recording: Audio or video recording can be used to capture the interview data in a comprehensive and accurate manner. The recording should be of high quality and should be stored securely to protect the confidentiality and privacy of the participants.

Note-taking: Note-taking can be used to capture important information and observations during the interview. The notes should be detailed and accurate, and should be stored securely to protect the confidentiality and privacy of the participants.

Transcription: Transcription involves converting the audio or video recording of the interview into a written text. Transcription can be done manually or using software tools. The transcription should be accurate and should be reviewed carefully for errors and omissions.

Pilot Testing: Pilot testing involves conducting a practice interview with a small number of participants to test the interview guide and ensure that the data collection process is effective and efficient.

By focusing on these key points, the researcher can effectively describe the data collection process in the methodology section of the research study. The data collection process should be designed to ensure that the data is comprehensive, accurate, and relevant to the research questions or objectives.

Data Analysis:

Data analysis is a critical component of the interview methodology in a research study. The data collected from interviews can provide valuable insights and perspectives that can be used to answer the research questions or objectives. When discussing data analysis in the methodology section of a research study, there are several key points to focus on:

Data Coding: Data coding involves categorizing the data into meaningful themes or categories. The coding process should be systematic and consistent, and should be guided by the research questions or objectives.

Data Management: Data management involves organizing and storing the data in a secure and accessible manner. The data should be stored in a way that protects the confidentiality and privacy of the participants.

Data Reduction: Data reduction involves summarizing the data into a more manageable form. This may involve identifying key themes or patterns in the data, or selecting representative quotes or examples.

Data Interpretation: Data interpretation involves making sense of the data and drawing conclusions based on the research questions or objectives. The interpretation should be guided by the coding and data reduction process, and should be supported by relevant literature and theory.

Triangulation: Triangulation involves using multiple sources of data to cross-check findings and ensure that the data is accurate and representative. Triangulation can involve using different types of data, or using data from different sources or perspectives.

Validity and Reliability: Validity and reliability should be considered throughout the data analysis process to ensure that the data is reliable and valid. Validity refers to the accuracy and relevance of the data, while reliability refers to the consistency and repeatability of the data.

By focusing on these key points, the researcher can effectively describe the data analysis process in the methodology section of the research study. The data analysis process should be designed to ensure that the data is analyzed systematically and accurately, and that the conclusions drawn from the data are supported by relevant literature and theory.

Quality and Reliability:

Ensuring the quality and reliability of the data is an important consideration in the interview methodology of a research study. Quality and reliability refer to the accuracy, consistency, and credibility of the data and are essential for ensuring the validity and trustworthiness of the research findings. When discussing quality and reliability in the methodology section of a research study, there are several key points to focus on:

Credibility: Credibility refers to the extent to which the research findings accurately represent the experiences and perspectives of the participants. To enhance credibility, the researcher should use a systematic and rigorous approach to data collection and analysis, and should ensure that the data is representative of the population being studied.

Dependability: Dependability refers to the consistency and stability of the research findings over time. To enhance dependability, the researcher should use a standardized approach to data collection and analysis, and should ensure that the data is collected and analyzed consistently across all participants.

Transferability: Transferability refers to the extent to which the research findings can be applied to other contexts or populations. To enhance transferability, the researcher should provide a detailed description of the methodology, including the sampling strategy, data collection and analysis methods, and the context of the study.

Confirmability: Confirmability refers to the extent to which the research findings are supported by the data and can be confirmed by other researchers. To enhance confirmability, the researcher should use a transparent and open approach to data collection and analysis, and should provide detailed documentation of the data collection and analysis process.

Triangulation: Triangulation involves using multiple sources of data to cross-check findings and ensure that the data is accurate and representative. Triangulation can involve using different types of data or using data from different sources or perspectives. Triangulation can enhance the quality and reliability of the data by providing multiple perspectives on the research questions or objectives.

By focusing on these key points, the researcher can ensure that the interview methodology is designed to enhance the quality and reliability of the data. The researcher should use a systematic and rigorous approach to data collection and analysis, and should provide a transparent and open description of the methodology used to collect and analyze the data. By doing so, the researcher can enhance the credibility, dependability, transferability, and confirmability of the research findings.

Ethical Considerations:

Ethical considerations are an essential component of the interview methodology in a research study. The research process should be designed to ensure that the rights and welfare of the participants are protected, and that the research is conducted in an ethical and responsible manner. When discussing ethical considerations in the methodology section of a research study, there are several key points to focus on:

Informed Consent: Informed consent involves obtaining the voluntary and informed agreement of the participants to participate in the research study. The informed consent process should be comprehensive and should include a clear explanation of the purpose of the research, the risks and benefits of participation, and the rights of the participants.

Confidentiality: Confidentiality involves protecting the privacy and confidentiality of the participants' data and information. The researcher should ensure that the participants' data is stored securely and that only authorized individuals have access to the data.

Anonymity: Anonymity involves protecting the identity of the participants in the research study. The researcher should ensure that the participants' data is collected and analyzed in a way that protects their anonymity.

Risk Assessment: Risk assessment involves identifying and addressing any potential risks or harm to the participants. The researcher should conduct a risk assessment to identify any potential risks or harm to the participants, and should take measures to minimize or mitigate these risks.

Debriefing: Debriefing involves providing the participants with information about the research study after their participation has ended. The researcher should provide the participants with a clear explanation of the purpose and results of the research study, and should address any questions or concerns that the participants may have.

Institutional Review Board (IRB) Approval: Institutional Review Board (IRB) approval involves obtaining approval from a designated committee to ensure that the research study is conducted in an ethical and responsible manner. The researcher should obtain IRB approval before conducting the research study.

By focusing on these key points, the researcher can ensure that the interview methodology is designed to protect the rights and welfare of the participants, and that the research is conducted in an ethical and responsible manner. The researcher should provide a clear and comprehensive description of the ethical considerations in the methodology section of the research study, including the measures taken to protect the participants' confidentiality, anonymity, and privacy.

By focusing on these key points, the researcher can effectively introduce interviews as a methodology for a research study and provide a clear and concise explanation of why this method is suitable for addressing the research questions or objectives. This can help to establish the credibility and validity of the research findings.

2. Case study

2.1 Context

2.1.1 Information about the project

2.1.1.1 The stakeholders involved in the Project

The Italian stakeholders

Several institutional and non-institutional Italian stakeholders took part in the TAV Turin-Lyon project. Originally, the Associazione Tecnocity presented the idea for a passenger high-speed rail route between France and Italy in a public conference at the Fondazione Agnelli in 1989(Manfredi et al.,2015).

In order to connect East and West Europe, the concept calls for the construction of a 50 km long transalpine tunnel (Number Five Corridor). This was the New Railway Line Turin-first Lyon's project.

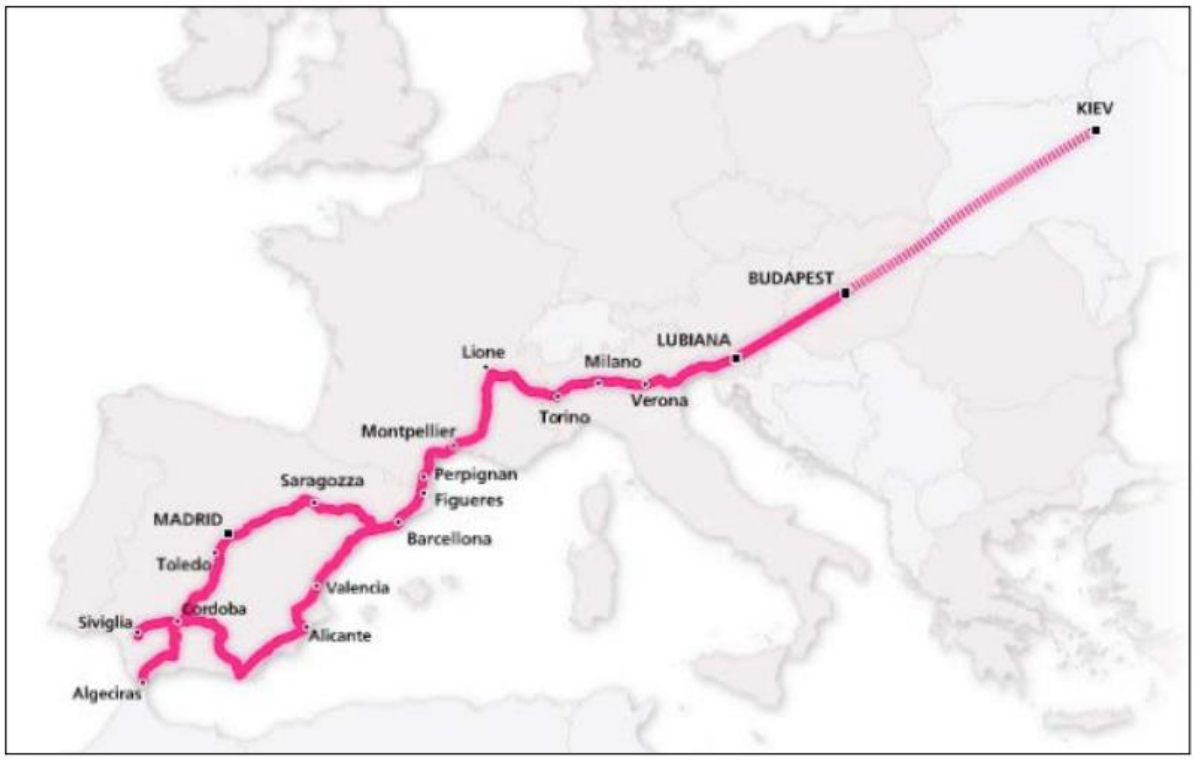

Figure 6:Corridor no 5. From the archive of the newspaper "La Stampa" of Turin (Tropeano,2011)

From Turin to Lyon, a new high-speed train line connecting Italy and France has been discussed since the early 1990s in Italy. According to Manfredi et al. (2015), the Comitato Promotore per l'Alta Velocitá (High-speed rail promotion committee) was established by

some of the most notable political and business figures in the Piedmont area of Italy to serve as supporters of the megaproject.

Tecnocity, Federpiemonte, Camera di Commercio di Torino, Confindustria Piemonte, Unioncamere Piemonte, San Paolo IMI Bank, Unione Industriale di Torino, S.I.To, and representatives of regional public institutions like Provincia di Torino and the Municipality of Turin made up this Comitato Promotore. Umberto Agnelli, the president of Juventus Football Club and a vice-president of FIAT, and Vittorio Beltrami, the president of Regione Piemonte at the time, served as the chairmen of this Comitato Promotore. Using a marketing campaign, it sought to emphasize the significance and necessity of a quick rail link between East and West Europe.The municipal and regional authorities (Regione Piemonte, Provincia, and the Municipality of Turin) have supported the idea from the beginning, and they have begun a vigorous search for potential allies and political backers at the federal level(Manfredi et al.,2015).

New HSR lines are justified by the alleged advantages of decreased carbon dioxide emissions (compared to, say, plane transportation), the development of new jobs and economic growth, the reduction of traffic congestion, and time savings (Marincioni and Appiotti, 2009). The proposed line, which would be an important part of the Trans-European Transport Network (TEN-T), would have a 270-kilometer railway with a 65-kilometer cross section that includes the world's longest tunnel, measuring 57.5 kilometers (of which 12.5 kilometers are in Italy and 45 kilometers are in France)(Corazza,2023).

They were able to quickly win over the support of the Italian Chairperson of the Budget Committee of the Chamber of Deputies, Paolo Cirino Pomicino, as well as the entire Italian Government14, which has supported the initiative since 1990 regardless of which party held the majority(Maggiolini, 2010).

The multinational Ansaldo, tasked with creating the Italian General Transport Plan, and Ferrovie dello Stato (FSI), the principal advocate for the interests of the Italian state railways, stood in stark contrast to this widespread excitement. Both agencies chose the creation of the national railway network for high-speed trains over the Turin-Lyon TAV project since they had other priorities. But things changed when the Italian government appointed Lorenzo Necci as FSI's special administrator in 1991. Among the TAV Turin-Lyon supporters, he introduced FSI (Maggiolini, 2012, p.89). Despite this significant development, there were still dissenting opinions.Since the beginning, institutions and civil society in Val Susa, the project's target region in Italy, have questioned the usefulness of this new train system(Manfredi et al.,2015).

With its strategic location with two mountain routes that allow northern Europeans to reach the Mediterranean Sea, Val Susa (the valley) has a history of instability and resistance. The valley has been the scene of unrest for millennia, from invasions by the Saracens, Romans,

and Hannibal through the Nazi occupation and substantial partisan resistance during World War II. It consists of two mountain villages, the upper valley, which has 13 municipalities and 12,000 residents and is mostly a tourist destination, and the lower valley. There are 24 municipalities in this primarily industrial and residential area (64000 inhabi-tants). A river flows through the lower valley, which has an average width of 1.5 km and is crossed by two state highways, a toll road, a two-track railroad. The high-speed rail line that runs from Lyon to Turin(TAV) has a direct impact on the lower valley(Burnside-Lawry, Ariemma, 2014).

The NO TAV campaign, which is grassroots opposition to the proposed rail line, firstemerged in Val Susa in the 1990s, originally for environmental considerations. Local governments and the Mountain-Community Association, which speaks for the several municipalities, were the second line of defense. Along with health issues, the project's sustainability from an economic and transportation standpoint also became a problem(Burnside-Lawry, Ariemma, 2014).

Initially, the Comunità Montana, a group seen by locals as highly representative and democratic, served as a platform for the opposition voices in Val Susa. The Comitato di Coordinamento di Valle was established by Comunità Montana in 1995 and brought together the mayors of Val Susa, Sangone Valley, and the West Belt of Turin, as well as the territory's deputies, provincial and regional councillors, local health system branches, Coldiretti representatives, and representatives from unions and trade associations.In order to convey local opinion on the TAV project, this Comitato sought to encourage the active participation of residents of Val Susa. Until 2009, the year of its dissolution, it was able to represent the Valley, which has been an interesting experiment in representative democracy.Yet, the Valley's opposition to the TAV proposal did not only come from the Comunità Montana and its Comitato di Coordinamento di Valle. There were Valley people who did not entirely share the Comunità Montana's opposition attitude; in particular, they disassociated themselves from some issues like how to fight or the selection of potential allies and political backers. As a result, they established the organisation ‘’Habitat’’ in December 1991 with the intention of safeguarding the area's liveability and ecology. It would become another local partner with whom the proponents of the high-speed railway may consult in order to reach an agreement.In the Valley, there were, at last, regular people who made the decision to oppose things on their own and found a voice and representation in the grassroots No-TAV movement(Manfredi et al.,2015).

The No-TAV movement, which the press and institutions frequently alternately referred to as an anarchist, terrorist, extreme, and dangerous movement, came to stand in for everyone who strongly opposed the TAV project, regardless of their social backgrounds or political beliefs.Even though the motivations behind these oppositions to the TAV project varied, they were all driven by two goals(Manfredi et al.,2015):

1. To gain access to the project's basic technical studies in order to comprehend its effects;
2. To foster a forum for discussion where social and institutional stakeholders who are involved or might become involved in the project can air their concerns and complaints.

The Region of Piemonte established the Coordination Committee in 1995 to develop a new high-speed train route between Turin and Lyon. However, the Committee was dissolved in 1996 due to a lack of communication between parties, specifically the refusal to grant local authorities access to preliminary project documents. In 2002, the technical-political board was created for the parties to debate the project but it failed due to local authorities' rejection to participate in monitoring activities. The Rivalta Commission was founded in 2005 to analyze critical issues related to the project but it closed after four months due to social conflict in Val Susa(Manfredi et al.,2015).

In 2006, severe clashes involving the entire valley, saw the police against the population, with the mayors in front line.Again in 2006, the Italian Government initiated a process of mediation due to rising tensions between supporters and opponents of the project. The government allocated funds to the Provincia di Torino to create a strategic plan for the project. The decision was made in March 2006 to remove the project from the Legge Obiettivo, and the Institutional Forum of Palazzo Chigi and the Osservatory were created to overcome the standstill. The Osservatory was composed of representatives from various Italian Ministries, local authorities, and the French-Italian intergovernmental Commission for NLTL. Mario Virano was appointed as the President of the Osservatory by the Italian Prime Minister, Silvio Berlusconi.The Observatory had ambitious ambitions, but a number of obstacles prevented it from easily achieving those goals(Maggiolini,2013).

The French stakeholders

Starting from the early 1990s, local authorities have been actively involved in promoting the TAV project, which they believe will boost their economic growth and enhance trade with neighboring countries. In France, the Rhône-Alpes Region has pledged financial support for the implementation of the Lyon Turin rail link, and both the Region and the Département de Savoie have endorsed the State's "Large projects" initiative, which aims to optimize the living conditions of workers involved in the project. France has committed to the project completely, and on 29th January 2001, the French and Italian Governments signed an international treaty to establish a new rail link between Lyon and Turin, connecting Saint-Jean-de-Maurienne in the Savoie region to Susa in Piedmont/Val di Susa through a main tunnel. This 2001 agreement was further confirmed by another intergovernmental agreement in January 2012(Manfredi et al.,2015).

2.1.1.2 History of the project

For centuries, people have had a desire to cross the Alps, from historical figures like Hannibal and Napoleon to merchants, monks, and postal services. This desire has continued through time and is still present today, with a shared goal of connecting the mountains to the future of the entire continent, albeit in a different way. In 1844, the Fréjus tunnel project commissioned the Belgian engineer Henry Maus to conduct a study on building a railway connection across the Alps, linking Piedmont and Savoy. Italy had only a limited railway network in operation, and none in Piedmont at the time. However, King Charles Albert and his government recognized the significance of transalpine rail connections even then. Construction of the Fréjus tunnel commenced in 1857, during the Kingdom of Sardinia. The original intention of the project was to establish a stronger connection between two territories within the same state. However, after Savoy was ceded to France in 1860, the tunnel became an international link. The initial phase of the excavation relied on miners drilling the explosive holes manually, but later on, the process shifted to a large-scale utilization of mechanical drills. In 1868, a British company took a gamble and assumed that the construction of the Fréjus tunnel would take significantly longer than anticipated. As a result, they constructed the Fell mountain railway, which encountered significant challenges and difficulties crossing the Mont Cenis pass. Despite these efforts, the Fréjus tunnel was eventually completed in 1871, rendering the Fell railway line obsolete and abandoned. The Fréjus railway tunnel, connecting France and Italy, was finished on September 17th, 1871. This achievement was heavily promoted by Cavour, and at the time, it was the longest tunnel in the world. The diligence of the miners, combined with the utilization of modern tools like pneumatic drills and specific technologies, enabled the tunnel to be constructed in less than 14 years. Traditional methods, in contrast, would have necessitated 40 years to accomplish this feat(TELT,2020).

The Turin-Modane railway has connected Turin to Lyon via the Fréjus Rail Tunnel, which is 13.7 km (8.5 mi) long and has a maximum tunnel altitude of 1,338 metres (4,390 ft), since 1872. Originally a single-track line, it was later electrified and doubled in the early 1900s. The Italian side of the railway was renovated twice, between 1962 and 1984 and again between 2001 and 2011. This historic railway has some limitations, such as low maximum allowed height and sharp curves that require lower speeds. Additionally, its profile is very poor, with a maximum gradient of 30‰, which necessitates doubling or tripling the locomotives of freight trains(Osservatorio Torino-Lione,2007).

The features of the line differ significantly throughout its entire length. The Osservatorio both the Italian and international segments into four parts:

1. Modane-Bussoleno (includes Frejus tunnel and the high valley area)
2. Bussoleno-Avigliana (covers the low valley area)
3. Avigliana-Turin (pertains to the metropolitan zone)

4. Turin node (relates to the urban region).

The initial segment of the line features the Fréjus tunnel, which has low tunnel ceilings, steep slopes, sharp curves, and a high elevation of 1,338 m (4,390 ft), making it the main bottleneck for the entire line's capacity. A study in 2007 utilized the CAPRES model to estimate that, under the applicable safety regulations at that time, the maximum capacity of the line was 226 trains per day for 350 days per year. However, the maximum traffic was limited to around 150 freight trains per day due to logistical inefficiencies caused by asymmetric traffic flows between the two countries. Further analysis indicated that the line could only reach a maximum transport capacity of about 20 million tonnes per year, accounting for inefficiencies, and an absolute limit of approximately 32 million tonnes under "perfect" conditions. The population residing near the line, numbering around 60,000 people within 250 m (820 ft) of the historical line, opposes excessive train traffic due to the noise it creates, imposing additional traffic restrictions. As a result of these limitations, including steep gradients (26-30‰), sharp curves, and a lower maximum allowable train height, the conventional line was only utilized for one-third of its calculated total capacity in 2007(Osservatorio Torino-Lione,2007).

In contrast to previous analyses, a study conducted in 2018 discovered that the Fréjus tunnel was operating at or near full capacity due to new safety regulations. These regulations forbid passenger and freight trains from crossing in a single-tube tunnel, resulting in a significant reduction in the tunnel's maximum allowable capacity(Thiers,2018).

The inception of the Turin-Lyon high-speed railway initiative can be traced back to 1991. During the spring of that year, the Comitato Promotore per l'Alta Velocità presented a feasibility study for the new Turin-Lyon railway to FSI and SNCF. According to the study, two key assumptions were made: first, passenger traffic would increase by 500% by the year 2002, and second, the existing railway line would reach its maximum capacity by 1997. The study also estimated the cost of the new railway line at 7.2 trillion Lire (equivalent to €3.7 billion), but did not propose any specific design for the track(Manfredi et al.,2015).

In October, the study was presented once more at the Annual Summit between Italy and France in Viterbo. During the event, the Italian Minister of Transports, Carlo Bernini, and his French counterpart, Paul Quilès, signed an agreement expressing their intention to build the Turin-Lyon high-speed railway. FSI and SNCF were given the responsibility to conduct further feasibility studies and construct the railway. However, various institutions and civil society groups in Val Susa began to voice their opposition to the project, with the Comunità Montana sending letters to Regione Piemonte explaining their reasons for opposition, and Habitat organizing a meeting in Condove on 14 December 1991 that attracted more than 60 people, including citizens, politicians, administrators, and university professors who provided technical arguments against the project(Manfredi et al.,2015).

Despite opposition to the Turin-Lyon high-speed railway, FSI and SNCF established a specialized group, known as GEIE Alpetunnel (later renamed Società Lyon-Turin Ferroviaire or LTF), to conduct preliminary feasibility studies. Additionally, in November of 1992, the French-Italian Steering Committee(Comitato di Pilotaggio Italo-Francese) was formed, consisting of representatives from both countries, stakeholders, and local authorities involved in the project. The Committee's role was to review all GEIE Alpetunnel studies, and it was supported by the French-Italian Inter-governmental Commission (CIG). The CIG was responsible for creating the inter-governmental agreement on the key aspects of the project(Manfredi et al.,2015).

Nearly a year after the meeting in Viterbo, the first official proposal for the Turin-Lyon high-speed railway project was put forward by Regione Piemonte in October 1992, in conjunction with the Comitato Promotore per l'Alta Velocità(Manfredi et al.,2015).

According to the proposal, the plan was to build a high-speed railway that would pass through Moncenisio via a 54-kilometer-long double barrel tunnel, with an estimated cost of 12,000 billion Lire (equivalent to €6.2 billion). The project received approval from the French-Italian Steering Committee in Rome in September 1993(Manfredi et al.,2015).

Simultaneously, in Val Susa, there was an increasing desire to prevent the commencement of construction on the new railway. In December 1994, 17 mayors from the Comunità Montana signed a document titled "Four no to the TAV project," which succinctly outlined all the issues opposing the project. The debate between those in favor and those against the railway became a driving force in the history of the project. Progress towards starting the work was frequently halted or slowed down depending on the state of the often-difficult dialogue between the parties involved. Throughout the project's history, both supporters and opponents were not entirely unified, and some individuals changed sides depending on the situation(Manfredi et al.,2015).

The first disagreement among supporters of the new railway line emerged in 1996 when the Provincia expressed its concerns about the exaggerated estimates of passenger traffic and the escalating costs(Castronovo,2008). During that meeting, supporters responded to these objections by emphasizing that the new railway would not only increase passenger traffic but also freight. The advocates saw this as an opportunity to propose a potential modification to the original project, shifting from TAV (High-Speed Train) to TAC (High-Capacity Train) for both passengers and goods.

FSI also started to question the necessity of the railway project, which weakened the position of the project's supporters. The doubts arose in September 1996 when FSI's President Lorenzo Necci was arrested for various charges, including swindle, criminal association, false accounting, embezzlement of public money, corruption, and abuse of functions. In 1998, FSI's new President Giancarlo Cimoli stated that it would be preferable to focus on the

Gottardo Pass or the Genoa-Marseilles railway, whose double track was almost complete.The Italian Minister of Transports, Claudio Burlando, supported Cimoli's position(Castronovo,2008).

The promoters' internal discussion became tense in 1997 when Alpetunnel and Provincia presented two different plans at separate public meetings. Alpetunnel showcased their proposal at La Mandria, a nature reserve near Turin, in the presence of the Comunità Montana and the Municipality of Susa. Their plan involved a tunnel from Mompantero to Bruzolo, a six-meter-high embankment up to Borgone, an eight-kilometer-long tunnel to Novaretto, running alongside the motorway towards Alpignano, and eventually towards the municipalities of the Metropolitan area of Turin(Manfredi et al.,2015).

In contrast, Provincia presented their plan in Oulx, which involved changing mountainsides towards the low valley, crossing the Sangone Valley, and passing near S.I.To. Despite Alpetunnel's proposal appearing to be the preferred choice, the internal debate among promoters persisted and delayed the start of the project. As a result, in October 1997, Italy and France reaffirmed their commitment to the Turin-Lyon TAV project during a bilateral meeting in Chambery. They agreed to implement a three-year action plan worth 55,000,000 ECU(Maggiolini ,2010).

The deadlock was finally broken following a tragedy. On March 24, 1999, 39 individuals lost their lives in a fire that broke out in the Monte Bianco motorway tunnel. For Ghigo, the newly appointed President of Regione Piemonte, this tragedy presented an opportunity to emphasize to Italian Prime Minister Massimo D'Alema the need to shift from motorway traffic to railway transportation and to urge a prompt start to the TAV project. His plea was met with swift action(Manfredi et al.,2015).

During the Annual Summit Italy-France held in Nimes on September 24, 1999, both governments issued a joint statement committing to several actions, including the adoption of measures to shift freight traffic from motorways to railways, the prompt realization of the Turin-Lyon high-speed train project, the implementation of measures agreed upon during the 1997 Chambery meeting, and a formal request to the intergovernmental Commission to complete the feasibility studies initiated in 1998 to make a final decision at the next meeting in 2000(Manfredi et al.,2015).

The Intergovernmental Commission responded, stating that the Alpetunnel project was officially preferred. Moreover, Alpetunnel feasibility studies were released in 2001, and the French and Italian prime ministers Giuliano Amato and Jacques Chirac signed an intergovernmental agreement for the construction of a new Turin-Lyon railway in Turin the same year. There are more high-speed train projects in Europe besides the Turin-Lyon one. The so-called "No. 5 Corridor" from Lisbon to Kiev would be completed by passing through Barcelona, Lyon, Turin, Venice, Trieste, and Lviv in Ukraine. Due to this, the Turin-Lyon

TAV project was designated by the European Commission as one of the top priorities in the White Book on Transport Policy.The so-called "Legge Obiettivo" (L. 443/2001) was approved in December 2001 by the new Italian Government, led by Silvio Berlusconi, to accelerate the completion of the projects(Manfredi et al.,2015).

The objectives of this act were to:

- identify the public and private infrastructures and strategic production sites with a crucial national interest that must be realized for the development and modernization of the nation;
- plan the modernization of existing infrastructures in Italian territory;
- define at legal, financial, and operational level the realization of strategic public works of national interest.

The Government wanted to boost the public works' pace of realization. This rule restricted municipal authorities' ability to voice their opposition to public works in order to accomplish this goal. They could only request changes because the government deemed these initiatives necessary, therefore they were unable to halt the projects. Also, this law significantly altered and limited the Environmental Impact Assessment (EIA) processes, making them the responsibility of the Comitato Interministeriale per la Programmazione Economica (CIPE) rather than the Ministry of the Environment.In this method, a ministerial body, an assessor of economic priorities rather than environmental expenses, analyzed the project's environmental costs/benefits ratio, which is typically examined by technicians and specialists. The "general contractor," a person who is entirely responsible for the realization of a strategic infrastructure, was also introduced by this law(Manfredi et al.,2015).

The 2,278 million euro high-speed railway between Turin and Lyon was added to the list of strategic projects to which the Legge Obiettivo rules apply on December 15, 2003 (Cicconi, 2009).

In order to prevent the exclusion of local governments from the decision-making process, the Comunità Montana filed an appeal against the Legge Obiettivo with the Regione Lazio's TAR (Regional Administrative Court). However, the French government began to have concerns about the value, expense, and environmental impact of this work. As a result, the Alpetunnel project came under further scrutiny. Regione Piemonte, Provincia, and the Municipality of Turin started exploring for additional alternatives in an effort to reach a new compromise.

Figure 7: Base tunnel.From the archive of the newspaper "La Stampa"(Tropeano,2011)

On December 3, 2003, CIPE authorized the preliminary plan for the 2 billion and 300 million euros international track from San Didero to the base tunnel, marking a significant advancement in the project. A conference of the Comité interministériel d'aménagement et de développement du territoire (CIADT), the French equivalent of the Italian CIPE, was held in Paris less than a week later with the goal of making a definitive decision about the distribution of funding for public works from 2004 to 2020. The high-speed train between Turin and Lyon was listed among the public projects that must be completed in the next ten years.However the following day, the French government said that Turin-Lyon was not a priority, thus the mayor of Lyon set the start of construction for 2012(Milani and Najjar, 2011).

Despite this, the Italian government, under by Prime Minister Silvio Berlusconi, persisted in trying to at least signal the start of construction. So, Piero Lunardi, the Minister of Infrastructure, and Berlusconi traveled to Paris in May 2004.

A new cost-sharing arrangement between France and Italy was reached, totaling 13 billion euros:

- France: 4 billion for the Monmelian-Saint Jean de Maurienne track, whose construction was assigned to RFF;
- Italy: 2.3 billion euros for the Turin-Burzolo track, whose construction was assigned to RFI and 6.7 billion euros for the payment of the 67% of the international track from Burzolo to Saint Jean de Maurienne.
- EU: 20% of the costs related to the international track whose construction was assigned to LTF.

In this way, although though only a third of the track is located in Italy, Italy was obligated to pay for the remaining two-thirds of the entire railway line (4,221 billion euros). The Italian

Government might, however, announce the start of construction on the Turin-Lyon during the election campaign after reaching this agreement. The Court of Turin began an investigation into the Turin-Lyon public procurement bidding at the beginning of May 2005. CIPE authorized the preliminary plan for the national track from Settimo to Bussoleno in August 2005, allocating a record sum of 460 trillion lire (nearly 240 trillion euros), notwithstanding the seriousness of this investigation. At last, the drilling could start(Manfredi et al.,2015).

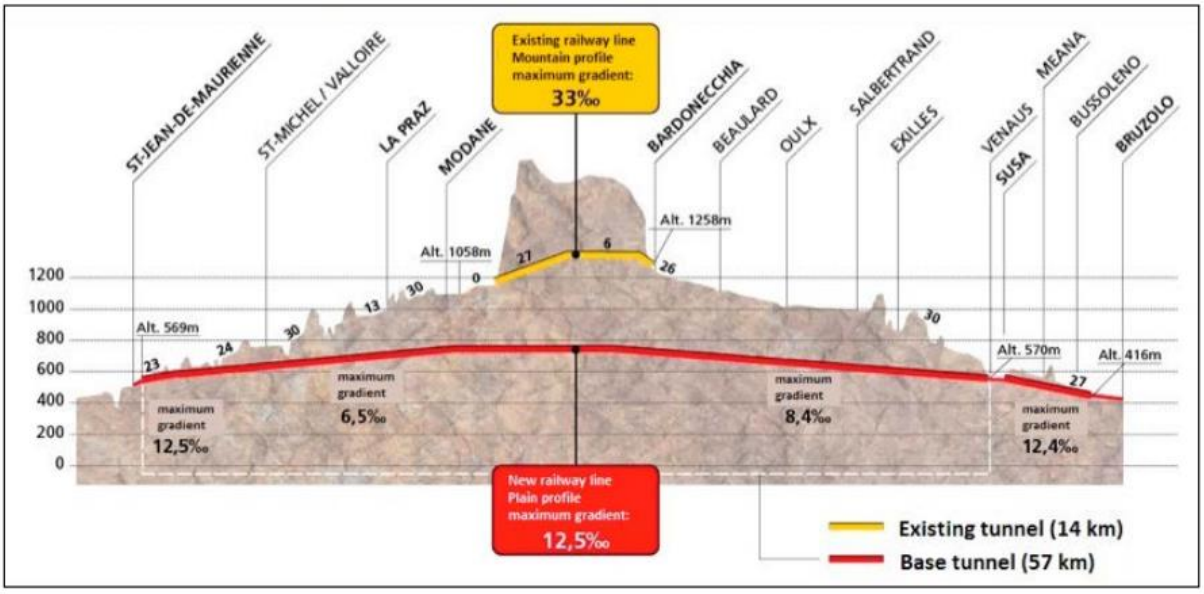

Figure 8: The interbational track, the project for a railway line under the mountain. From the archive of the newspaper "La Stampa"(Tropeano,2011).

But with the construction of the exploratory tunnels at Modane, Le Praz, and Saint Martin de la Porte, France got things going first. Conflicts broke occurred in Val Susa, Italy, as a result of the similar tunneling operation for the Venaus.

In an argument that swiftly grew and resulted in the militarization of the valley, the No TAV movement carried out a number of acts of resistance in the winter of 2005 in defense of the construction sites.The march on December 8th, when 30.000 people occupied and reclaimed the locations, was particularly significant (Leonardi, 2013; Fournier, 2013). The sites were turned into garrisons to coordinate resistance as well as places for social solidarity and community. The demonstration persuaded the Italian government to change course and cancel its plans for Venaus(Corazza,2023).

The Berlusconi government convened a conference of all stakeholders to provide a respite in order to find solutions as the start of the Winter Olympic Games was imminent (February 2006). To clarify all of the difficulties, the NoTAV movement requested the involvement of some European Commission representatives. A delegation from the European Committee on Petitions of the European Parliament, led by MEP De Palacio, conducted an on-site

inspection in Val Susa at the end of November 2005 to comply with this request(Manfredi et al.,2015).

The Committee stated that it was important to consider all technical issues as well as the concerns highlighted by locals and members of civil society. However, it stated that it was in favor of moving traffic from the highway to the railroad and requested a detailed investigation of the initial report. Ultimately, MEP De Palacio made the decision to entrust the study of the dossier submitted by LTF for the new railway's international track to a group of impartial specialists.The team issued a favorable assessment of the LTF dossier and emphasized the need for an Environmental Impact Assessment (EIA) for the Venaus pilot tunnel, which had to be completed by 2007(Manfredi et al.,2015).

In order to facilitate inter-stakeholder dialogue on environmental, social, and economic issues, the Italian Government established the Italian Technical Observatory in 2006 as one of its initial responses to the crisis. This organization includes various stakeholders and was created with the aim of addressing the crisis. Mario Virano, who will thereafter lead TELT as its general director, was proposed to lead the Observatory(Corazza,2023). Specifically in terms of communication and openness to the Other (Bauman, 2000), all those parties that felt underrepresented or neglected, the Observatory acknowledged that past project proponents had made mistakes, as reported by the Observatory's current Special Commissioner, Foietta and Costantino (2020).

The start of the EIA studies and the Committee's opinion were insufficient to stop the protests in Val Susa; the Institutional Forum and the Technical Observatory were unable to mediate between the parties. When Regione Piemonte attempted to reconcile with the local authorities of the Valley, the No-TAV movement proceeded to obstruct the drilling operations in Venaus. The Regione Piemonte suggested holding a Conferenza di Servizi in an effort to find a solution, but all parties began to argue over the organization, and the Comunità Montana came out forcefully against it.First exploratory talks between the Conferenza di Servizi were held on October 12, 2006. A proposal was made during this conference to alter the Turin-Lyon international track. Soluzione in destra Dora ("Solution on the right sides of the River Dora") was the term given to the proposal, which suggested that the railway line be built on the opposite side of Val Susa. This theory was backed by the Regione Piemonte, Provincia, and Municipality of Turin because it would present a chance to revitalize this area without consuming any soil.The official Conferenza di Servizi was convened on November 27, 2006, which was over a month later, but the Majors of Val Susa chose not to attend. Nonetheless, the participants opted to continue the work.The Government stated the significance of the connection with the logistic center of Orbassano (S.I.To) and, as a result, that the track through Val Sangone appeared to be most suitable(Manfredi et al.,2015).

Alessandro Bianchi, the Italian Minister of Transport, met with the mayors of Val Susa at the beginning of 2007 and attended the Technical Observatory conference. By stating that he backed the technical observatory's mediation despite Conferenza di servizi, Bianchi was able to persuade the majors to change their minds about engaging in communication with governmental organizations. From the Interporto di Orbassano to Avigliana with a tunnel under the moraine hill, in parallel with the old Lower Val Susa railway until Meana, where both the railway would be buried under built-up areas, moving toward Chiomonte until the international tunnel entrance, one km before Venaus, were the proposed routes.The No-TAV movement objected to this suggestion and demonstrated their disagreement(Manfredi et al.,2015).

Concerned about this situation, Barrot, the EU Commissioner for Justice, Freedom, and Security, gave Italy an ultimatum: if the project for the international track was not delivered by June 2007, the European contribution for the realization of the task would unquestionably be lost. Hence, in order to speed up the mediation process, Italian Premier Romano Prodi called a meeting of the Palazzo Chigi Institutional Forum(Manfredi et al.,2015).

The following changes were discussed at this political board:

- A shorter base tunnel, delating the project for the tunnel of Venaus;
- The track could pass along the left side of river Dora, to avoid the crossing of soils containing asbestos;
- The rails in Val Susa would follow the old railway in part through its empowerment and in partwith the burying of the rails;
- The track could cross Turin through Corso Marche, connecting itself with the high-speed railwayfrom Milan.

In the end, this board stated that it preferred a different project that empowered the current railway. To construct a project that is shared with the Val Susa authorities, the technical observatory is asked to evaluate several hypotheses. Italian efforts were taken into consideration by the EU as it continued the process for the request for European contributions, with Commissioner Jacques Barrot and the European Commission having the final say(Manfredi et al.,2015).

The EU allocated a sum of 671,8 million euros as the first payment to the Turin-Lyon high-speed train on November 1, 2007, despite the No TAV campaign and the mayors of Val Susa presenting papers and petitions to the relevant EU offices outlining their objections to the project. The signing of "the agreement for projecting the new railway line and for the new transport policy of the area" was the lone advancement in the Italian dispute. The Technical Observatory and local government signed this agreement on June 28, 2008, in Pra Catinat.It aimed to encourage the Italian government to implement appropriate procedures to ensure local government and resident consultation prior to the construction of infrastructure and

public works, as opposed to after, as was the case with the Turin-Lyon railway, where the decision to establish communication between LTF and affected parties was made 15 years after the high-speed rail project was first proposed (Burnside-Lawry, Ariemma, 2014).

Although though this agreement was ineffective in the short term, it was nonetheless seen as a crucial document attesting to the shared desire to resolve issues.However, there were still protests, and the drilling didn't actually begin until December 2009, when the Prefecture of Turin presented the final, in-depth work plan that had been approved by the Comunità Montana's technicians to begin the exploratory phase. In parallel, the media reported that Chiomonte's first construction site will begin by the end of 2010.Even though the drilling had begun, the work had not. The EU issued a second ultimatum to Italy and France on June 9, 2010: if construction did not begin by June 30, the money allotted for the Turin-Lyon high-speed train would be cut(Manfredi et al.,2015).

No work has been done. On October 27, 2010, the European Commission announced that it had reduced the first loan for the Turin-Lyon international track by 9,18 million euros following a funding review of the loans 2007–2013 allocated for the TEN-T (trans-European networks)projects. The original loan amount was 671,8 million euros. In addition, the European Commission stated that the entire amount of loans would be forfeited if the La Maddalena exploratory tunnel project was not completed by the beginning of 2010 and if Italy and France had not reached a new agreement for the allocation of funding by the end of that year(Manfredi et al.,2015).

In response to this pressure from Europe, CIPE authorized the tunnel La Maddalena's final project in November 2010. The trial that began in 2005 finished less than three months later, in February 2011, with eight convictions and six acquittals.

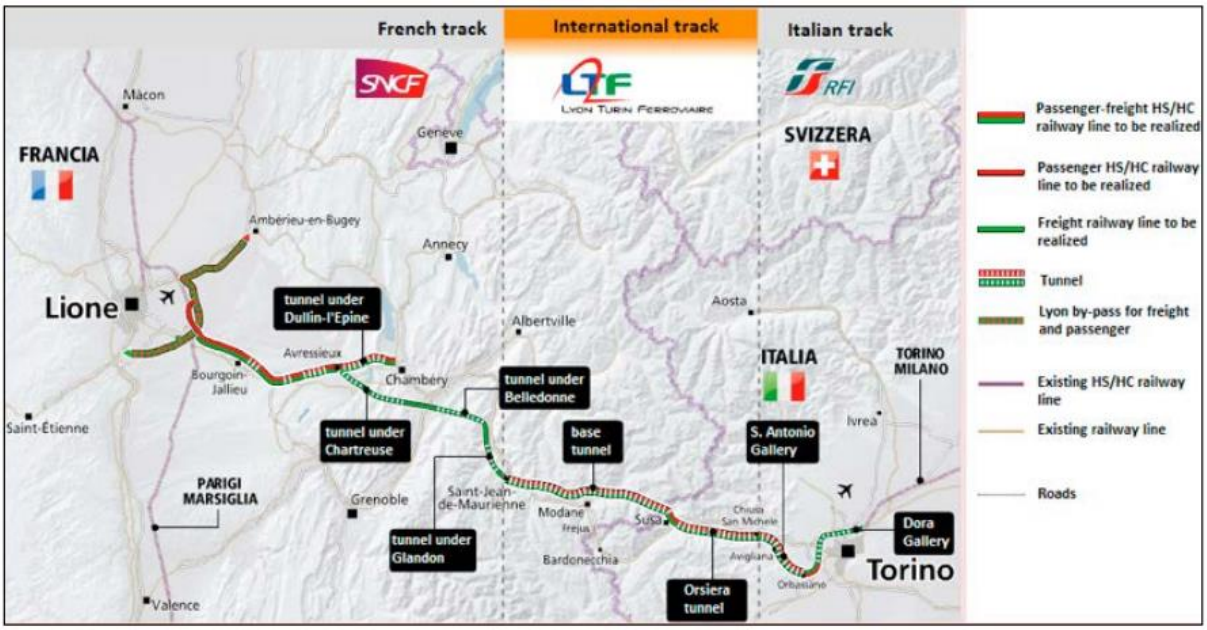

Figure 9: Preliminary project approved in 2010. From the archive of the newspaper "La Stampa" (Tropeano,2011)

This significant controversy, which involved the initial project proponents, did not prevent the opening of the Chiomonte construction site on June 27, 2011. Yet less than a week later, the opponents attempted to enter the location, setting up the “Free Republic of the Maddalena” ,sparking violent clashes. In the end, 400 individuals were injured, including police officers. Because of this, the Italian government has determined that the construction site is of strategic national importance, enabling for continuous military monitoring and any necessary military action to defend the facility (Burnside-Lawry, Ariemma, 2014).

The majority of the representative institutions of Val Susa left the Observatory as a result of all of these occurrences demonstrating the Observatory's ineffectiveness as a mediator (Maggiolini, 2012).

The 5 Stars Movement is a new political force that has entered the political sphere for the first time since the No-TAV movement transitioned from the grassroots to politics in 2009 through the election of civic lists of movement representatives. In the 2010 regional elections, the dynamics of voting in the Susa Valley also played a role in determining the winner (Movimento 5 Stelle -M5S). This one, a group supported by writer and comedian Beppe Grillo, openly supported the No-TAV movement in Susa Valley and centered its election campaign around this subject (Maggiolini,2013). In Susa Valley, the M5S received 40% of the vote, making it the most popular party there (Burnside-Lawry, Ariemma, 2014). On this basis, movement representatives joined the political circles at the municipal and regional levels.

In order to fulfill European expectations, the works were attempted to go forward during this time by the new Italian government, led by Mario Monti. Italy and France signed a new deal on the cost-sharing arrangements on September 30, 2011: Italy, with 40% of the overall tracks, would be responsible for paying 63% of the costs, while France, with 20% of the total tracks, would be responsible for paying 58%(Milani Najjar 2011).

Nothing developed after that until the Italian and French governments reached an intergovernmental agreement on January 30, 2012, dividing the railroad's construction into priority segments.A few steps have been taken to continue the works even though this agreement has not yet been put into effect. The project's ultimate conclusion is still pending, and three potential solutions are still up for discussion:

1. Preliminary project;
2. "0"alternative: empowerment of the existing railway line;
3. Division of the preliminary project in successive phases.

The construction site's activities came to an end. France started to lose interest in this project, and even if Italy continued to support it politically, NLTL Turin-Lyon appeared to have fallen into a vicious cycle from which it will be hard to get out. With the approval of the final project for the Italian portion of the international track by CIPE and the establishment of TELT - Tunnel Euroalpin Lyon-Turin -, the new public promoter, which takes over from LTF as responsible for the realization and management of the new infrastructure, new steps forward have been made since the beginning of 2015. Maurizio Lupi, the minister of infrastructure for Italy, met with Alain Vidalies, his counterpart, in Paris to sign the extra protocol for the start of construction and present the request for assistance to the EU(Manfredi et al.,2015).

In 2017, the location for the excavation tunnel for the project was decided to be Chiomonte on the Italian side. However, in 2018, the new leadership in the Italian government halted the project to conduct a new Cost-Benefit Analysis, which was carried out by external parties. Despite negative financial evaluations, the government approved the project after an increase in EU funding. TELT approved the specifications for work on the French side and the creation of interchange niches in the geognostic tunnel of Chiomonte by the end of 2019(Wijck,2020). Although there was a period of relative calm, the No TAV movement and police clashed in April 2021 in the town of San Didero, following the occupation of the area where the new interport will be located, which will replace the one currently situated 20km away in Susa(Corazza,20203).

Italy and France have contracted the realization of the works to TELT (Tunnel Euralpin Lyon Turin), which works on the basis of a program shared by the EU States within a total budget

of 8.6 billion € total. This is the cost certified by a third party (the Belgian Tractebel/Tuc Rail group) and approved by the two Goverments for the construction of the cross-border Section, which includes the new tunnel. According to this plan, the construction will be finished in 2029, and the new line will start operating in 2030.At that time, TELT, the public promoter, will also become the owner and take management of the new line in addition to ownership of the old tunnel(TELT,2023).

The Agreements between Italy and France

The decisions regarding the Nltl project are based on specific agreements between the Italian and French governments, which were signed during several binational summit meetings from 1990 to 2016. These agreements, which were ratified by the respective parliaments and have the power of law in both countries, determine the development and features of the project and establish control bodies and analysis and design structures that are binational(Manfredi et al.,2015).

The Intergovernmental Commission (IGC) was established in 1996 and is the control and general orientation body with representatives from both governments and the territory. The study and design special purpose vehicle, Alpetunnel, was established in 1993 to undertake feasibility studies, followed by LTF (Lyon Turin Ferroviarie), tasked with developing the international section of the line to final design level. The public promoter TELT (Tunnel Euralpin Lyon Turin) has the mandate to realize the works in accordance with the legal, economic, financial, and management plan(Manfredi et al.,2015).

The project has gone through three decisional phases: from 1990 to 2005, during which the two governments agreed on the macro-themes and technical structures produced the design; from 2006 to 2012, a pause for thought, during which the design of the Italian side underwent a revision to take account of the need to territorialize the works; and from 2012 to 2016, a leap forward, with the development of the project up to the executive level(Manfredi et al.,2015).

There were significant variations on the Italian side, including new designs of the alignment and its territorialization, and the adaptation to phasing logic to prioritize individual works on the French and Italian sides. All these decisions were made during five meetings at short intervals, three of which were ratified by the two parliaments (2012, 2015, 2016)(Manfredi et al.,2015).

Several agreements with the legal authorities were also signed, including the 2001 Treaty committing the two governments to realizing the works and defining the phases of the design for the shared parts. The parliamentary ratifications came about in 2002, with the French in February and the Italian in September(Manfredi et al.,2015).

In 2012, an agreement was signed in Rome amending the 2001 Treaty, approving the final alignment of the line, and its realization in phases with a "low cost" option to reduce immediate costs. The agreement also defined the applicable law, the structure, and the functions of the new public promoter (TELT), as well as the tender procedures, distribution of costs, and accompanying measures. This was ratified in France in 2013 and in Italy in 2014(Manfredi et al.,2015).

In Paris in 2015 and the following year in Venice, the two governments signed an agreement followed by an additional protocol, permitting the start of final works on the shared parts. The additional protocol confirmed the cost of 8.3 billion Euro and established the method for calculating cost adjustments, the realization in construction lots, and perfected the contract regulations with the undertaking to apply anti-organized crime legislation to the construction sites on both sides of the Alps. These agreements were ratified by both parliaments in January 2017(Manfredi et al.,2015).

2.1.2 Descripton of the Project

The new railway route will feature a gentler maximum slope of 12.5‰, as opposed to the steeper 30‰ slope of the old line. In addition, the maximum elevation will be 580 m (1,902 ft 11 in), which is lower than the previous maximum of 1,338 m (4,389 ft 9 in). Moreover, the new route will have wider curves that can accommodate heavier freight trains traveling at 100 km/h (62 mph) and passenger trains reaching a top speed of 220 km/h (140 mph). As a result, the amount of energy required will be significantly reduced. When the higher-speed line is fully completed, it will reduce travel time from Milan to Paris from seven hours to four, making it a competitive alternative to air travel for town-center to town-center transportation(LTF,2014).

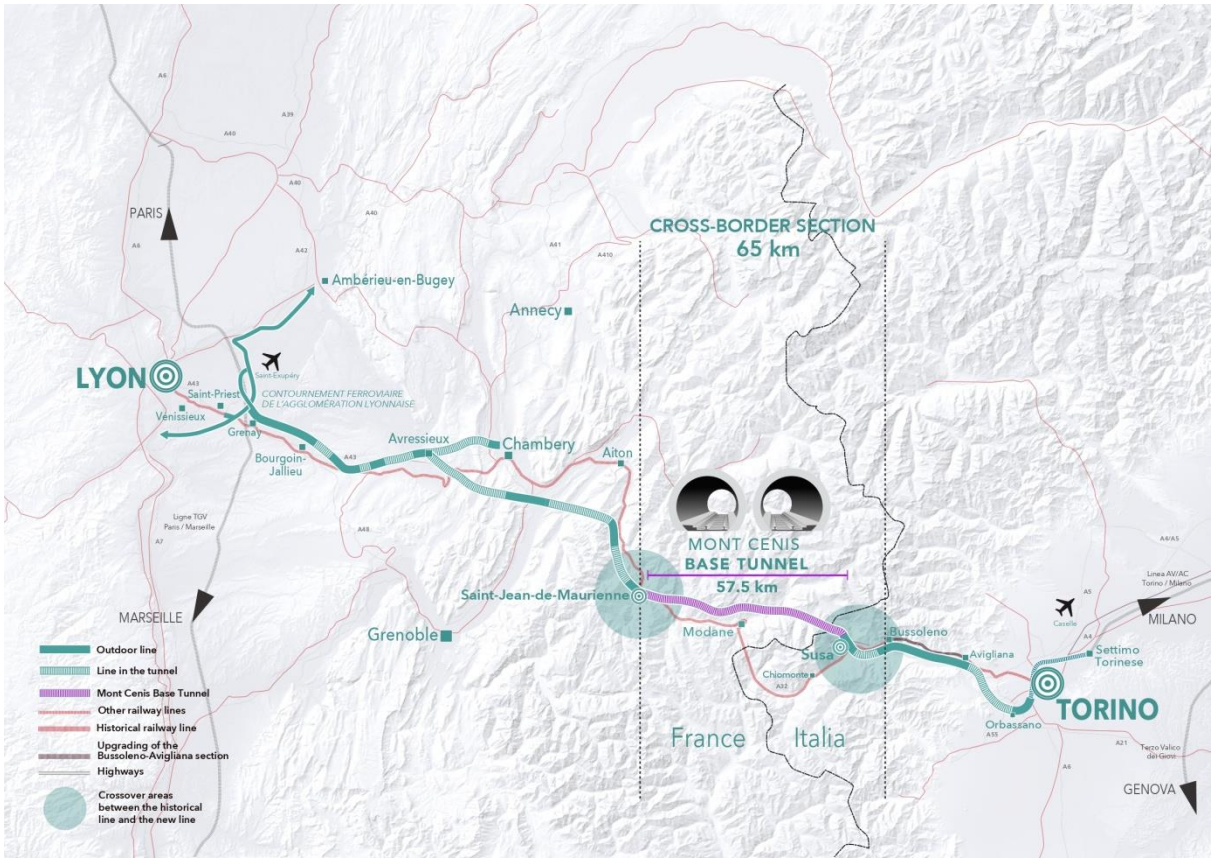

Figure 10: Turin-Lyon railway base tunnel (TELT,2023)

The railway line is split into three parts that are constructed and managed by different organizations;

- the French section between Saint-Jean-de-Maurienne and the outskirts of Lyon will be built under SNCF Réseau management;
- the Italian section between Bussoleno (Susa valley) and Torino is under RFI;

- the international section between Saint-Jean-de
  Maurienne in Savoie and Bussoleno includes the Mont d'Ambin Base Tunnel. It is managed by Tunnel Euralpin Lyon Turin (TELT SAS), a joint venture of RFI and SNCF which replaced Lyon Turin Ferroviaire.

1. French Section

The new railway line in France is designed to have separate tracks for passenger and freight trains between Lyon and the Maurienne valley, eventually.The new passenger line will connect the LGV Sud-Est(through a connection South of Gare de Lyon Saint-Exupéry) and Lyon's central stations to Italy and Chambéry, with a connection near Chambéry to the Annecy via Aix les Bains and the Bourg Saint-Maurice via Albertville lines. It is expected to reduce travel time by almost 45 minutes from Paris or Lyon to Aix-les-Bains or Chambéry, and by nearly an hour to Annecy. Additionally, the new line could help alleviate congestion on the Lyon-Grenoble line, which is currently saturated with TGV traffic at mismatched speeds, freeing up much-needed train paths for additional local trains.

The freight line will begin at a connection to the future Lyon rail freight bypass, run along the A43 Motorway, and pass through a tunnel under the Chartreuse Mountains south of Chambéry. Although initially single-track, the tunnel will eventually have two 23-kilometer long tubes. The line will then reach Saint-Jean-de-Maurienne through a second 20 to 23 km tunnel under the Belledonne mountains. The separate freight line is intended to redirect freight traffic away from Aix-les-Bains and Chambéry, as well as from the Lac du Bourget's shores, where a freight accident on the existing line could result in severe pollution to this large freshwater reservoir.

2. Italian Section

In August 2011, the Italian government approved the path of the new railway line's Italian section, which was the result of extensive consultations from 2006 to 2011 led by Government Commissary Mario Virano through the "Italian Technical Observatory." The new path in the Susa valley involves additional tunneling to avoid the strong opposition to a previous plan that would have required a viaduct in Venaus and a tunnel in Bussoleno on the left bank of the Dora Riparia.

3. International Section

Construction has begun on the international section of the Lyon-Turin line, which stretches approximately 70 km (43 mi) between Saint-Jean-de-Maurienne in Savoie and Bussoleno in Piemonte. The major engineering work of the future Turin-Lyon line is the Mont d'Ambin base tunnel, which spans 57.5 km (35.7 mi) and is being excavated under the Mont d'Ambin. that tunnel will be the longest rail tunnel in the world, ahead of the 57.1 km (35.5 mi) Gotthard Base Tunnel. An underground service and rescue train station is planned to be located around the halfway point of the tunnel, to the east of Modane(TELT,2020).

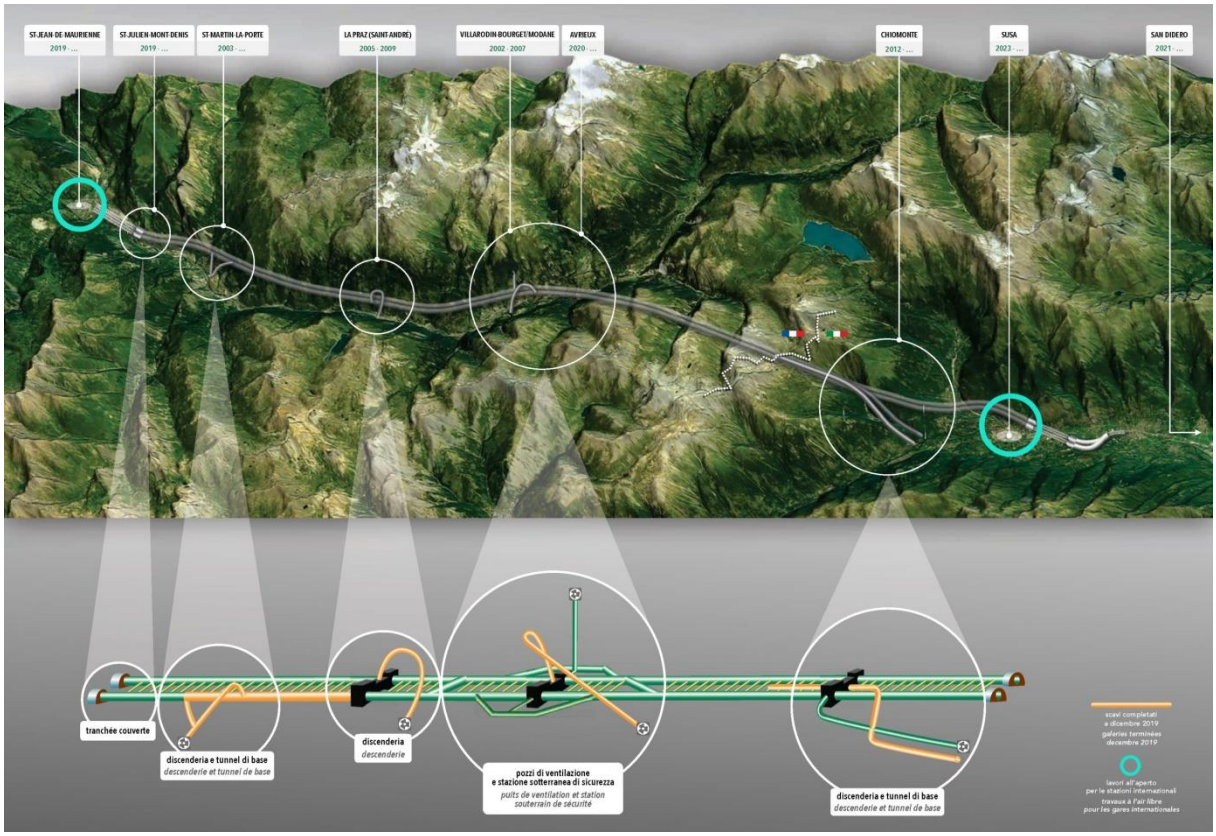

Figure 11:The underground infrastructure (TELT,2023)

There are a total of four access adits - three on the French side (Villarodin-Bourget/Modane, La Praz, and Saint-Martin-La-Porte) and one in Chiomonte on the Italian side. These access adits are approximately 18 km long and will be used for both the construction and maintenance of the base tunnel, as well as for emergency access.Each access adit served a specific purpose in the construction of the base tunnel. For example, the Villarodin-Bourget/Modane site focused on reusing excavation materials, while the La Praz site focused on managing water in the tunnels. At Saint-Martin-la-Porte, the main concern was rock convergence, and at Chiomonte, mechanized excavation was employed.During the construction phase, the access adits will be used to access the construction site of the base tunnel. Once the tunnel is completed, they will serve as maintenance access tunnels and as emergency exits(TELT,2023).

The plan for the cross-border section of the Lyon-Turin railway involves constructing two international stations located just a few kilometers away from the base tunnel. These stations, situated in Saint-Jean-de-Maurienne, France, and Susa, Italy, are designed to cater to multimodal exchanges and meet the diverse requirements of passengers. They will have various services, such as parking facilities for cars, bicycles, and buses, and will be connected to local transport networks in their respective regions.By putting the Olympic mountains of the Susa Valley and the French Alps' ski area on the TEN-T primary network, the international stations will make these destinations accessible within a few hours from most European capitals.The design of these projects will take into account the surrounding natural

and built-up landscape and aim to blend in seamlessly with the environment. These stations will also act as interchange nodes between the international line and local transport networks(TELT,2023).

The estimated cost of the project is around €8 billion. In September 2016, France and Italy reached a significant agreement regarding the construction of the tunnel. Three years later, competitive bids were requested to carry out specific parts of the construction work.
In 2002, the civil engineering work for the tunnel began with the construction of access points and geological reconnaissance tunneling. The plan was to start building the tunnel itself in 2014-2015, but it was not approved until 2015 at a cost of €25 billion, with €8 billion allocated for the base tunnel. The French Senate approved the corresponding international treaty between the two countries on January 26, 2017. Before the treaty was ratified, a 9 km (5.6 mi) gallery was dug from Saint-Martin-de-la-Porte towards Italy in 2016. Although it was presented as a reconnaissance gallery, it was actually dug along the axis of the South tube of the tunnel and at its final diameter. The tunneling encountered a challenging geological zone of water-soaked fractured coal-bearing schists in late 2016, and progress was slow for several months until 30 tons of reinforcing resin were injected.The land was dug down to reach the coast of the base tunnel. The high retaining walls have been extended and the ground attacking the opening has been reinforced thanks, in particular, to the Jet Grouting method (injections of concrete into the ground). The equipment necessary for the proper functioning of the site, such as the concrete plant, the water treatment station are also operational. An acoustic hangar is also installed to protect local residents from noise pollution throughout the excavation. The excavation materials will first be transferred to the Plan d'Arc site. Eventually they will be transported by conveyor belt to the Resses site, located in the town of Villargondran(TELT,2022) .

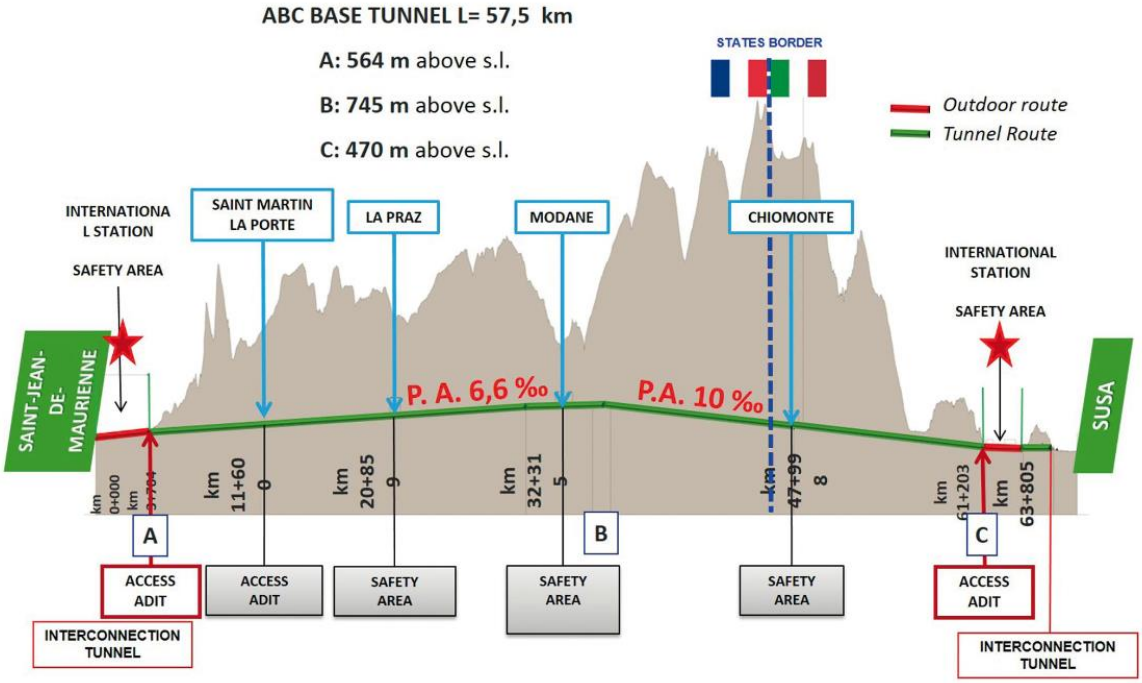

Figure 12 : The cross-border section (Bufalini et al,2017)

Tunneling resumed at nominal speed in Spring 2017 after passing through this zone. The gallery was completed in September 2019, within budget and on time, making up the first 9 km (5.6 mi) of the South tube of the tunnel.

The Italian coalition government, composed of the Five Star Movement and Lega parties, had significant disagreements about the value of the Turin-Lyon project, which caused delays in contracting for most of the tunnel construction. In March 2019, Italy's Prime Minister, Giuseppe Conte, requested that TELT (Tunnel Euralpin Lyon-Turin) halt the launch of tenders for further construction work. However, just before the delay threatened the funding of the project from the European Union, the Italian government agreed to publish calls for tenders for the main tunneling work on both the French and Italian sides. As of June 2020, construction contracts worth 2.8 billion euros had been signed. In July 2021, contracts worth an additional 3 billion euros were attributed and signed for the excavation of 80% of the tunnel located on the French side of the border(TELT,2019). These contracts include:

- Lot 1 (€1.47 bn) for 22 km (13.7 mi) between Villarodin-Bourget/Modane and the Italian border is expected to take 72 months for 2 tunnel boring machines(Le Dauphiné Libéré,2021).

- Lot 2 (€1.43 bn) for 23 km (14.3 mi) between Saint-Martin-de-la-Porte/La Praz and Modane is expected to take 65 months for 3 tunnel boring machines (10 kilometers of the South tube are already dug)(Le Dauphiné Libéré,2021).

- Lot 3 (€228 mn) for 3 km (1.9 mi) between Saint-Martin-de-la-Porte and the Western (French) Portal at Saint-Julien-Mont-Denis; this is the shortest lot by far, but its difficult geology of fractured and sheared coal-bearing schists is ill-suited for tunnel boring machines and it instead will be bored entirely by drilling and blasting; it is expected to take 70 months(Le Dauphiné Libéré,2021).

The site, which previously employed 150 people from Monday to Friday, is now being transformed into a 24/7 site that will employ up to 300 people at peak activity by 2024 . As part of this project, the two tubes of the Mont-Cenis base tunnel will be drilled over 2.8 km using the traditional method (with explosives and a hydraulic hammer) towards the Saint-Martin-la- Porte where the consortium led by Vinci Construction is continuing to install the 06/07 operational site, pending the arrival of the tunnel boring machines which will pierce, from 2024, 23 km between Saint-Martin-la- Porte and Villarodin/Bourget-Modane(TELT,2022).

TELT plans to award contracts for the excavation of the 25 km (16 mi) of tunneling on Italian territory in 2023 and is currently preparing to call for tenders for the outfitting of the tunnel. Drilling and blasting for the 3 km (1.9 mi) Lot 3 section began from the French portal on December 8th, 2022. Ongoing work is being carried out at other French work sites to prepare for the arrival of the 5 tunnel boring machines, which have already been ordered, in 2024. As of late-2022, the expected completion date for the base tunnel is 2032(TELT,2022).

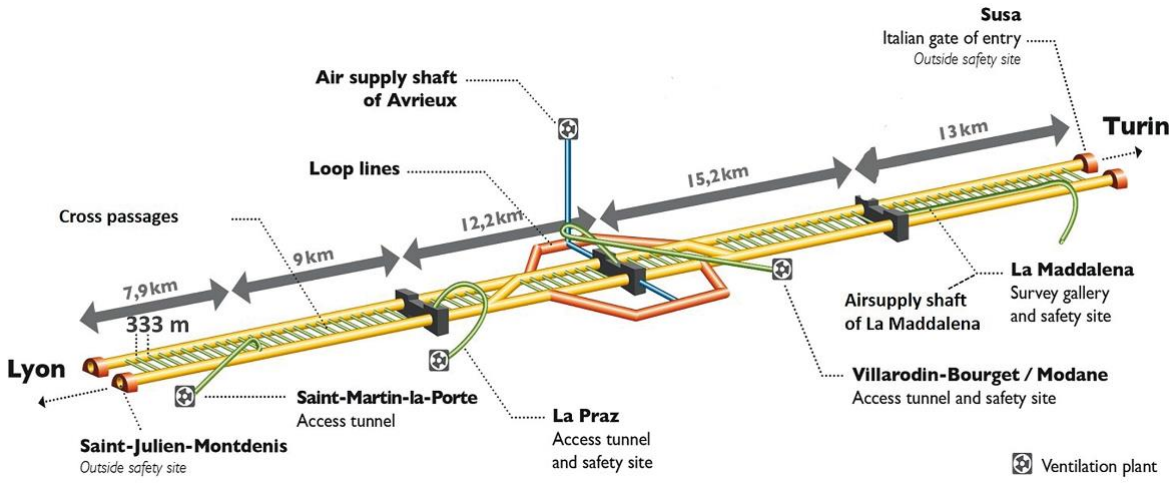

Figure 13: The base tunnel structure (Bufalini et al,2017)

In the Avrieux and Villarodin-Bourget/Modane area, the first two pilot holes of the four ventilation shafts of the base tunnel were completed at the end of 2022 and the excavation of a third pilot hole as well as the drilling of a wells is in progress. Underground , the construction of the galleries of the security site and the various technical caverns, up to 22 meters high and 23 meters wide, which will be used to assemble the tunnel boring machines which will then dig towards Italy, continues. At the end of 2022, the consortium ordered the two tunnel boring machines planned for the excavation of this section.Work is also

underway on open-air sites : after the opening of the transitional multimodal exchange hub in June 2022, rail interconnection work in the Saint-Jean-de-Maurienne area is continuing under the responsibility of SNCF Réseau. Near this new station, site development work is underway to allow future companies to settle and accommodate their staff by spring 2023. In Villargondran, the “Saut de Mouton” structure is under construction for the junction between the historic line and the new line. In Modane, the construction of the bypass road which avoids the town center and of the new bridge over the Saint-Antoine stream is progressi(TELT,2023).

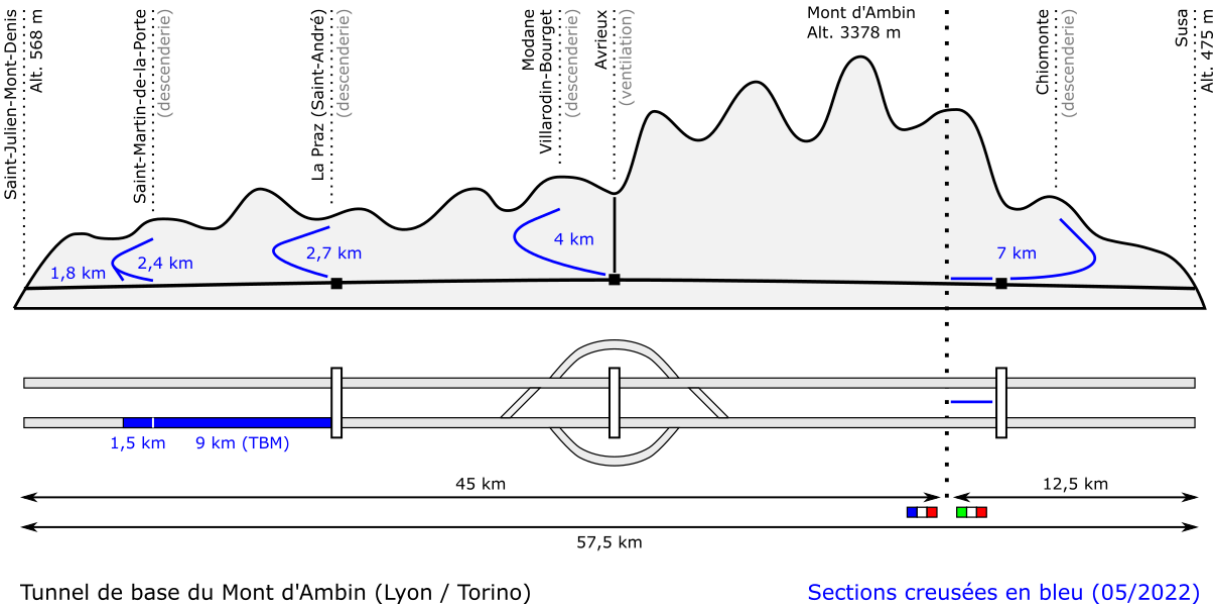

Figure 14: Sections excavated as of May 2022 in blue(TELT,2023)

4. Operational Sites

The work is separated into 12 operational sites located in Italy and France. Out of these, 9 are related to civil construction and are divided based on their location, while the remaining 3 are associated with other activities. As per estimations, the project will require the involvement of over 20,000 companies and about 8,000 workers who will be working on the project either directly or indirectly when it reaches its maximum activity level.

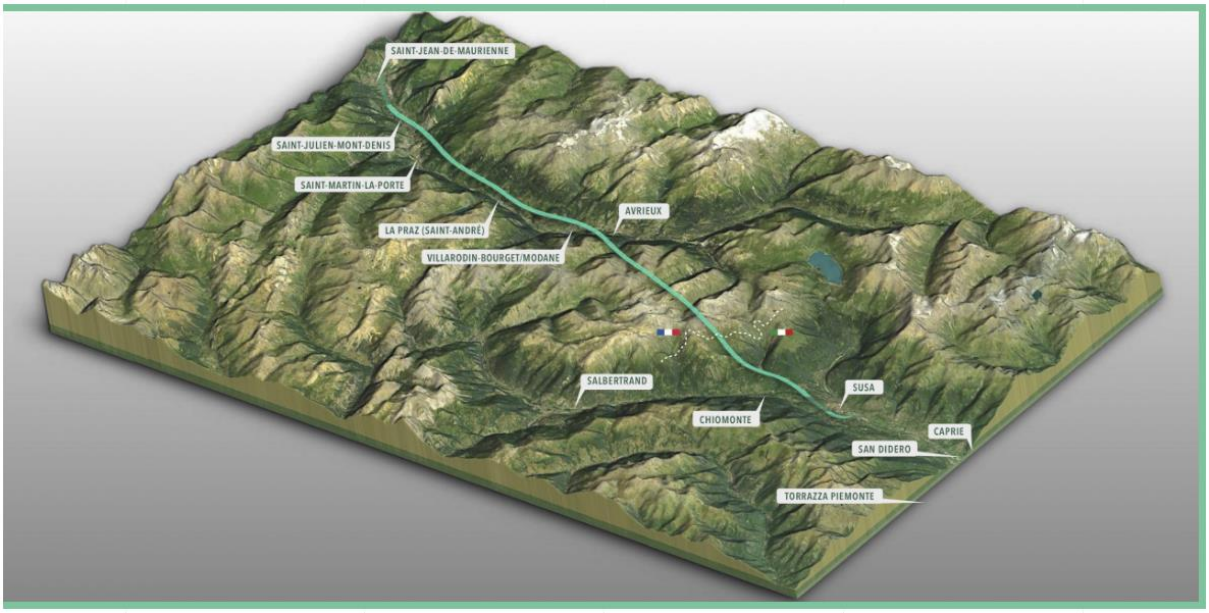

Figure 15: Operational sites of Turin-Lyon high-speed railway (TELT,2023)

Active or completed construction sites(TELT,2023) ;

1. Chiomonte

This construction site in Italy is the biggest one for the Lyon-Turin railway line. In February 2017, the Chiomonte geological survey tunnel was finished, which was dug out to gain a better understanding of the mountain's structure where the new Lyon-Turin line is going to pass. The Italian entrance to the base tunnel construction site is through this tunnel.Mechanical tools, primarily the "Gea" TBM, were used to excavate the area, which was situated under roughly 2,000 meters of mountain. The site has been deemed a matter of national strategic importance since 2012, and at present, activities to maintain the site are being carried out in preparation for the final construction stages.

In March 2018, a modified version of the final plan was approved by the CIPE after the NITEL, a consortium of 20 Italian universities with more than 500 researchers, conducted a Security Study. The revised plan necessitated starting the primary construction activities for the Italian base tunnel at the Chiomonte construction site rather than Susa, as originally intended. This change was made to guarantee the safety of workers and citizens.The site will be extended by 4 hectares, bringing the total area to 12 hectares, and will stretch beneath the A32 motorway viaduct into the towns of Chiomonte and Giaglione. The area had already been utilized by SITAF during the construction of the motorway. A second tunnel will be built parallel to the survey tunnel at a distance of approximately 40 meters. The second tunnel will have the same diameter as the base tunnel and will serve as the access point for the TBM to begin boring towards Susa.Once operational, the first section of the tunnel will be

used for ventilation and smoke extraction for the base tunnel, as well as a safety site called Clarea. The second section of the tunnel may be used for the long-term storage of green rocks. Construction of a safety site and ventilation center for both the tunnel and the construction site is also planned. The center will be designed with a semi-underground solution, including terraces with greenery, rows of vines, and apple trees to integrate seamlessly into the surrounding environment. Materials such as weathering steel, wooden slats, and local stone will be used. The competent authorities have determined that this new configuration is the most suitable for ensuring safety while limiting soil consumption and minimizing environmental impacts.

2. Saint-Martin-La-Porte Site

Following an initial period of work from 2003 to 2010, excavation of the second descent resumed in 2015. Between the summer of 2016 and September 2019, the south pipe of the base tunnel was excavated by the TBM Federica, covering a distance of 9 kilometers in both axis and diameter.By constructing a 9-kilometer geognostic tunnel, which includes a 1.5-kilometer section dug into the carboniferous fault using traditional methods, the understanding of a geologically sensitive region has been improved in preparation for final construction activities.

The tunnel-boring machine used for this project was created with the intention of dealing with the unique geological features of the area. Produced in France at the NFM Technologies plant in Creusot (Saône-et-Loire), the machine is equipped with a head measuring 11.26 meters in diameter, holding 76 cutters, and has a power output of 5 Megawatts, equivalent to that of 8 Formula 1 engines. The machine advanced through the tunnel at an average rate of 10 meters per day. The construction site employed a total of 480 people, including those from the group of companies, contractors, and subcontractors involved in the project.

3. La Praz Site

The La Praz access adit is situated on the right bank of the River Arc and has a length of 2,800 meters, featuring a downward slope of 12%. The adit consists of two sections, with the second running parallel to the future base tunnel.The municipality of Saint'André is where the La Praz access adit is situated, which was excavated using conventional methods (explosives) between 2005 and 2009. This process required around 110 workers, 49% of whom were from the Rhône-Alpes region. Following the completion of the base tunnel, the adit will function as a ventilation duct, as well as a maintenance and safety passageway.

The geological analysis conducted on the collected data indicates that the rock in the area is highly stable. The hydrological conditions encountered during the first 500 meters of excavation included the presence of underground aquifers, which required careful management to avoid interference with surface water resources. To address this issue, a

solution was devised by injecting resin inside the tunnel to minimize water seepage and ensure lower permeability in the tunnel.

4. Villarodin-Bourget / Modane Site

The tunnel is situated on the right side of the River Arc and has a total length of 4,036 meters. It is divided into two parts: the first section, which spans approximately 1000 meters and has a slope of 1%, and the second section which runs parallel to the future base tunnel and features a downward gradient of 12%.The construction site was operational between 2002 and 2007, and it hired around 290 workers, with 40% of them from the Rhône-Alpes area. Traditional excavation techniques that involved the use of explosives were primarily used during the construction process. Following the commissioning of the base tunnel, the decline will serve as a ventilation shaft, as well as a maintenance and safety passage.

By building an experimental treatment plant on the same site, using the decline, it was possible to test the conversion of inert excavation materials into concrete aggregate, utilizing the latest production and grinding methods. Approximately 143,000 tons of materials were processed, which were representative of the materials expected to be excavated from the base tunnel. The resulting aggregates were used in shotcrete or kept in storage for future concrete testing.

5. Saint-Julien-Montdenis Site

The construction of the cut-and-cover tunnel, which serves as the French entrance to the base tunnel, was carried out in the Villard Clément region of Saint-Julien-Montdenis. The project commenced in 2019 and was successfully completed in November 2021, as planned, within a timeframe of 32 months.To minimize disruptions to traffic on the adjacent main roads and highways, TELT has divided the project into three major phases. The total cost of the construction site amounts to 32 million Euros.

The cut-and-cover tunnel is a concrete box structure located at the surface level, positioned beneath the elevated platforms of the A43 motorway and the RD1006 highway. To prevent traffic interruption, the construction process began by shifting the highway and motorway aside and then excavating the ground to the required depth. Next, the floor and the walls were constructed, and finally, the excavation was covered.

6. IL Saint-Jean-De-Maurienne Site

Construction of a transitional multimodal hub, which will replace the current station until the connection to the existing railway line is established via the new base tunnel on the Lyon-Turin line, has been ongoing since January 2019.TELT and SNCF Réseau have collaborated to create a temporary multimodal interchange hub to support commuters and maintain the

operation of the bus and train stations during the construction works. This hub was in place until 2021 and was facilitating connections with other transportation systems.

The construction project will involve the creation of various facilities such as a bus station, a passenger building with counters and waiting rooms, parking spaces for cars and bikes, urban bus stops, a designated taxi rank, and additional access points to the railway station platforms. These facilities will be established to support travelers and maintain the functioning of the bus and train stations during the construction period. The provisional station will later become the permanent international station by 2030.

7. Villargondran Site

The project focuses on reinforcing the embankments to prevent flooding in the Saint-Jean-de-Maurienne basin and also to prepare the site for building other structures of the Lyon-Turin cross-border section.Approximately 6 meters of land will be elevated using 25,000 tons of excavated material obtained from the construction sites at Saint-Martin-la-Porte and the cut and cover tunnel.

8. Avrieux Site

   The objective of the construction site is to build four vertical shafts, running parallel to each other, which will start from the bottom of the Villarodin-Bourget/Modane winze and emerge at the surface in the Avrieux municipality. These shafts, with a diameter of 5.2 metres and a depth of 500 metres, will be excavated using Raise Boring Machines, which are machines developed in the mining industry specifically for digging narrow vertical shafts using mechanized methods.

   Compared to traditional drilling methods, these borers are safer for workers and have less impact on the surrounding territory due to the limited extent of the excavations. Additionally, the construction site will include seven caverns, each up to 22 meters high and 23 meters wide, which will be used for assembling the borers that will excavate the base tunnel towards Italy. The excavated material will be transported outside using the existing winze.

9. San Didero Site

In April 2021, the construction work began on a new car and truck terminal that will serve the Susa Valley between San Didero and Bruzolo, replacing the current terminal in Susa. The relocation of the terminal is part of the works for the new Lyon-Turin railway line, and it is planned to be located near Susa as part of the facilities for the new international station that will serve the area. The terminal is managed by Sitaf on behalf of TELT.The rest and safety area needs to be situated near the mountainous area and in close proximity to the Fréjus tunnel to be efficient.

2.1.3 Specific methodolgy applied to the case

During the methodology section, a detailed description of the overall research approach has been provided. During this section, the specific methodology used in the research study will be provided. This includes literature review, document review and interviews.

2.1.3.1 Literature review

For Literature review, the purpose of literature review will be discussed, along with search strategy, criteria, data extraction, synthesis, limitation, and future research.

Purpose

To apply Literature review, the first thing to do is defining the purpose of the literature review, this includes scope and research questions. Since the goal is to study project management from Lyon Turin railway project, the purpose of the literature review would be to provide a comprehensive overview of the existing research and knowledge related to project management about megaprojects like the Lyon Turin railway project.

The literature review should serve to:

1. Provide a background knowledge for the research by describing the Lyon Turin railway project and the challenges associated with managing a megaproject with this scale.

2. Identify gaps in existing research related to project management in the context of large-scale infrastructure project and determine how the proposed study can contribute to filling these gaps.

3. Summarize the existing knowledge related to project management in the context of large-scale infrastructure projects, including best practices, challenges, and lessons learned.

4. Identify and evaluate the different project management methodologies and frameworks that have been used in similar projects and determine which approach would be most suitable for the Lyon Turin railway project.

5. Determine the key success factors for project management in the context of large-scale infrastructure projects like the Lyon Turin railway project, and identify potential areas of improvement.

Search strategy

In order to find suitable literatures, search strategy must be applied. This includes electronic databases, reference chaining, snowball sampling, etc. The search strategy for the literature review needs to be comprehensive and systematic to ensure that all relevant literature is identified.

The following steps can be taken for developing an effective search strategy:

Identify the relevant keywords and search terms: keywords related to the Lyon Turin railway project and project management in the context of large-scale infrastructure projects should be identified. For example: "Lyon Turin railway project", "project management", "infrastructure project", "large-scale project", "construction management", "project execution".

Determine the appropriate databases: identify the databases that are relevant to the research topic. Examples of relevant databases include Scopus, Web of Science, Engineering Village, and Google Scholar.

Define the inclusion and exclusion criteria: the inclusion criteria should be defined to ensure that only relevant literature is included in the review. For example, only peer-reviewed journal articles published within the last 10 years may be included. The exclusion criteria should also be defined, such as excluding articles that are not in English or are not relevant to the research topic.

Conduct the search: Using the identified keywords and databases, the search should be conducted. A combination of keywords and Boolean operators can be used to refine the search.

Review the search results: The search results should be reviewed to ensure that all relevant literature has been identified. The titles and abstracts of the identified articles should be screened against the inclusion and exclusion criteria.

Retrieve and review full-text articles: The full-text articles of the relevant studies should be retrieved, and the studies should be reviewed in detail to extract relevant information for the literature review.

Criteria

The next step is to decide the criteria used to determine which studies should be included or excluded. For project management literature, it's important to focus on the date of publication, study design, project type, and geographic location etc. Selection criteria are used to determine which literature will be included in the literature review. The selection criteria should be clearly defined and aligned with the research questions or objectives. In the case of studying project management from the Lyon Turin railway project, the selection criteria may include:

Relevance: The literature should be directly relevant to the research question or objective. For example, articles that discuss project management in the context of infrastructure projects such as the Lyon Turin railway project would be considered relevant.

Quality: The quality of the literature should be evaluated based on factors such as the rigor of the research methodology, the credibility of the author and publisher, and the validity of the data and findings.

Currency: The literature should be up-to-date and relevant to the current context of project management in the context of large-scale infrastructure projects.

Scope: The literature should cover a broad range of topics related to project management in the context of large-scale infrastructure projects, such as risk management, scheduling, cost management, stakeholder engagement, and project governance.

Geographical scope: The literature should cover projects from different geographical locations to provide a broader perspective on project management in the context of large-scale infrastructure projects.

Language: The literature should be written in English to ensure that it is easily accessible and understandable to the target audience.

Data extraction

Data extraction is the process of identifying and extracting relevant information from the selected literature to address the research questions or objectives. The data extraction process should be systematic and transparent to ensure that the extracted data is accurate and reliable. The following steps can be taken for data extraction:

Identify the relevant data: The relevant data should be identified based on the research questions or objectives. For example, if the research question is focused on project management methodologies used in large-scale infrastructure projects, the relevant data may include the name of the methodology, the steps involved, and the benefits and limitations of the methodology.

Develop a data extraction form: A data extraction form should be developed to capture the relevant data. The data extraction form should include the research question or objective, the data items to be extracted, and the criteria for evaluating the data.

Extract the data: The relevant data should be extracted from the selected literature using the data extraction form. This may involve summarizing the key findings, identifying common themes, or extracting numerical data.

Evaluate the data: The extracted data should be evaluated to ensure that it is accurate and reliable. This may involve checking for errors or inconsistencies in the data, and cross-checking the data with other sources.

Synthesize the data: The extracted data should be synthesized to address the research questions or objectives. This may involve grouping similar data together, identifying patterns or trends in the data, or comparing and contrasting the data across different studies.

Document the data extraction process: The data extraction process should be documented to ensure that it is transparent and replicable. This may involve documenting the data extraction form, the data extraction process, and any decisions or judgments made during the data extraction process.

By following these steps, the data extraction process can be systematic and transparent, which will improve the quality and usefulness of the literature review.

Synthesis

Synthesis is the process of combining the extracted data from the literature review to address the research questions or objectives. The synthesis process should be systematic and transparent to ensure that the findings are accurate and reliable. The following steps can be taken for synthesis:

Identify common themes: The extracted data should be reviewed to identify common themes or patterns. This may involve grouping similar data together or identifying key findings across different studies.

Analyze the data: The data should be analyzed to identify relationships, trends, and patterns. This may involve statistical analysis, qualitative analysis, or a combination of both.

Compare and contrast the data: The data should be compared and contrasted across different studies to identify similarities and differences. This may involve identifying common themes or patterns across studies or comparing the findings of different studies.

Draw conclusions: Based on the analysis of the data, conclusions should be drawn that address the research questions or objectives. The conclusions should be supported by the extracted data and should be presented in a clear and concise manner.

Discuss the implications: The implications of the findings should be discussed in the context of the research questions or objectives. This may involve discussing the limitations of the findings or identifying areas for future research.

Document the synthesis process: The synthesis process should be documented to ensure that it is transparent and replicable. This may involve documenting the steps taken during the synthesis process and any decisions or judgments made during the process.

By following these steps, the synthesis process can be systematic and transparent, which will improve the quality and usefulness of the literature review. The synthesis process should also be aligned with the research questions or objectives to ensure that the findings are relevant and meaningful.

Presentation

Once the result has been obtained, the next step is how to present the result in a clear and concise way. Several tools can be used to achieve that like visual aids, tables or diagrams.

Limitations

Limitations are potential weaknesses or shortcomings of the literature review methodology that may affect the validity and reliability of the findings. It is important to identify and acknowledge these limitations to ensure that the literature review is transparent and that the findings are interpreted appropriately. The following are some potential limitations of a literature review:

Availability of literature: The literature review is dependent on the availability of relevant literature, which may be limited by factors such as language barriers, geographical scope, or publication bias.

Quality of literature: The quality of the literature included in the review may vary, and some studies may have limitations or biases that affect the validity of the findings.

Scope of the review: The scope of the review may be limited by factors such as time constraints, available resources, or the research questions or objectives.

Search strategy: Despite efforts to develop a comprehensive and systematic search strategy, some relevant literature may still be missed.

Data extraction: The accuracy and reliability of the extracted data may be affected by factors such as human error, inconsistency in the data, or biases in the interpretation of the data.

Synthesis: The synthesis process may be affected by factors such as the quality and consistency of the extracted data, the analytical methods used, or the limitations of the available literature.

It is important to acknowledge these limitations and discuss their potential impact on the validity and reliability of the findings. This helps to ensure that the literature review is transparent and that the findings are interpreted appropriately. Additionally, identifying these limitations can help to inform future research and improve the methodology of future literature reviews.

Future research

Future research is the potential research that can be conducted based on the gaps and limitations identified in the literature review. The future research may aim to address the limitations or gaps in the existing literature or explore new research questions that arise from the findings of the literature review. The following are some potential areas for future research:

Further exploration of project management methodologies: The literature review may identify a need for further exploration of project management methodologies and their applicability to infrastructure projects such as the Lyon Turin railway project.

Case studies of other large-scale infrastructure projects: Future research may involve conducting case studies of other large-scale infrastructure projects to identify best practices and lessons learned in project management.

Comparative analysis of different project management approaches: Future research may involve comparing different project management approaches to identify their strengths and weaknesses in the context of large-scale infrastructure projects.

Analysis of stakeholder engagement and management: Future research may focus on stakeholder engagement and management in the context of large-scale infrastructure projects, including the role of stakeholders in decision-making and the impact of stakeholder engagement on project success.

Evaluation of project governance: Future research may involve evaluating project governance in the context of large-scale infrastructure projects, including the effectiveness of project oversight and the impact of governance on project performance.

By identifying potential areas for future research, the literature review can inform the development of future research studies and contribute to the ongoing knowledge and understanding of project management in the context of large-scale infrastructure projects such as the Lyon Turin railway project.

2.1.3.2 Document review

When introducing document review as the methodology for a research study, it is important to focus on the following key points:

Definition and Purpose:

Definition and purpose are important components of introducing a research methodology, including document review. The definition and purpose provide a clear understanding of what the methodology involves and why it is relevant to the research study.

Definition: The definition of document review should include a clear explanation of what the methodology involves. Document review is a research method that involves the analysis of existing documents, such as reports, records, or archival materials, to gather data and information relevant to the research questions or objectives. The methodology may also involve analyzing different types of documents, including primary and secondary sources, and using various techniques for data collection and analysis.

Purpose: The purpose of document review should be explained in the context of the research study. The purpose of document review is to gather data from existing documents that are relevant to the research questions or objectives. This method can be used to complement other research methods, such as surveys or interviews, or used as the primary method for data collection and analysis. The goal of document review is to provide a comprehensive and systematic analysis of the data to answer the research questions or objectives.

By providing a clear definition and purpose of document review, the researcher can help the audience understand the methodology and its relevance to the research study. This can also help to establish the credibility of the research and provide a solid foundation for the rest of the methodology section.

Types of Documents:

When discussing the types of documents that will be included in a document review as a research methodology, there are several key points to focus on:

Relevance to the research questions or objectives: It is important to focus on the types of documents that are directly relevant to the research questions or objectives of the study. This can include primary sources, such as government reports or organizational records, as well as secondary sources such as academic articles or books. Explain why these sources are relevant to the research study and how they will be used to answer the research questions or objectives.

Availability and accessibility: Discuss the availability and accessibility of the documents that will be reviewed. This may include issues such as language barriers, geographical scope, or

access to restricted documents. Explain how these issues will be addressed to ensure that the data is comprehensive and representative.

Credibility and validity: Discuss the credibility and validity of the documents that will be reviewed. This may involve assessing the authenticity and accuracy of the documents, as well as considering any potential biases or limitations. Explain how these issues will be addressed to ensure that the data is reliable and valid.

Sampling strategy: Discuss the sampling strategy used to select the documents for review. This may involve using a systematic approach, such as random sampling or purposive sampling, to ensure that the data is representative and unbiased. Explain how the sampling strategy will be used to select the documents for review.

Ethical considerations: Discuss any ethical considerations associated with the documents that will be reviewed. This may include issues of confidentiality, privacy, or informed consent. Explain how these issues will be addressed to ensure that the research is conducted ethically and responsibly.

By focusing on these key points, the researcher can effectively discuss the types of documents that will be included in the document review and provide a clear understanding of how these documents will be used to answer the research questions or objectives. This can also help to establish the credibility and validity of the research.

Data Collection and Analysis:

When discussing data collection and analysis as part of a document review methodology, there are several key points to focus on:

Data collection methods: Describe the methods that will be used to collect data from the documents. This may include techniques such as content analysis, thematic analysis or discourse analysis. Explain how these methods will be used to identify patterns, themes, and trends in the data.

Data analysis methods: Describe the methods that will be used to analyze the data collected from the documents. This may include using software tools to analyze the data, or conducting a manual analysis of the data. Explain how these methods will be used to identify patterns, themes, and trends in the data.

Quality and reliability of data: Discuss how the quality and reliability of the data will be ensured. This may involve assessing the credibility of the sources, validating the data through triangulation with other sources, or using a systematic approach to reduce bias and errors. Explain how these methods will be used to ensure that the data is reliable and valid.

Data interpretation: Discuss how the data will be interpreted to answer the research questions or objectives. This may involve identifying key findings, drawing conclusions, or generating new insights based on the analysis of the data.

Data presentation: Discuss how the data will be presented in the research study. This may involve using tables, graphs or charts to present the data, or using narrative descriptions to summarize the findings.

Limitations and challenges: Discuss any limitations or challenges associated with the data collection and analysis methods. This may include issues such as missing data or difficulties in interpreting the data. Explain how these issues will be addressed to ensure that the research is valid and reliable.

By focusing on these key points, the researcher can effectively describe the data collection and analysis methods used in the document review methodology, and provide a clear understanding of how the data will be used to answer the research questions or objectives. This can also help to establish the credibility and validity of the research findings.

Quality and Reliability:

When discussing the quality and reliability of data in a research study, there are several key points to focus on:

Credibility of sources: Discuss how the credibility of the sources used to collect the data will be evaluated. This may involve assessing the authenticity and accuracy of the documents, as well as considering any potential biases or limitations. Explain how these issues will be addressed to ensure that the data is reliable and valid.

Triangulation: Discuss how the data will be validated through triangulation with other sources. Triangulation involves using multiple sources of data to cross-check findings and ensure that the data is accurate and representative. Explain how different sources of data will be used to validate the findings.

Inter-coder reliability: If multiple coders are involved in the data collection and analysis, discuss how inter-coder reliability will be ensured. Inter-coder reliability involves assessing the consistency and agreement between different coders. Explain how this will be achieved to ensure that the data is reliable and valid.

Data saturation: Discuss how data saturation will be achieved to ensure that all relevant data has been collected and analyzed. Data saturation is the point at which new data no longer provides additional insights or information. Explain how this will be achieved to ensure that the data is comprehensive and representative.

Systematic approach: Discuss how a systematic approach will be used to reduce bias and errors in the data collection and analysis process. This may involve using a standardized data collection tool or a predefined coding scheme to ensure consistency and accuracy in the data analysis process.

By focusing on these key points, the researcher can effectively address the quality and reliability of the data in the research study. This can help to establish the credibility and validity of the research findings and ensure that the research is conducted ethically and responsibly.

Ethical Considerations:

When discussing ethical considerations in a research study, there are several key points to focus on:

Informed consent: Discuss how informed consent will be obtained from participants or sources of data. Informed consent involves providing potential participants or sources of data with information about the research study, including its purpose, methods, and potential risks and benefits, and obtaining their voluntary agreement to participate.

Confidentiality and privacy: Discuss how confidentiality and privacy will be ensured in the research study. This may involve using anonymous or pseudonymous data, or protecting the identity and personal information of participants or sources of data. Explain how these issues will be addressed to ensure that the data is handled ethically and responsibly.

Risk of harm: Discuss how the risk of harm to participants or sources of data will be minimized. This may involve avoiding or reducing potential risks, or providing support and resources to participants or sources of data who experience harm or distress as a result of their participation.

Deception: Discuss any potential deception that may be involved in the research study, and how this will be justified and minimized. Deception involves intentionally misleading participants or sources of data about the purpose or methods of the research study. Explain how this will be addressed to ensure that the research is conducted ethically and responsibly.

Conflict of interest: Discuss any potential conflicts of interest that may arise in the research study, and how these will be addressed. A conflict of interest involves a situation in which the researcher's personal or professional interests may influence the research findings or conclusions. Explain how this will be addressed to ensure that the research is conducted ethically and responsibly.

By focusing on these key points, the researcher can effectively address ethical considerations in the research study and ensure that the research is conducted ethically and responsibly.

This can help to establish the credibility and validity of the research findings and protect the rights and welfare of participants or sources of data.

Limitations:

When discussing limitations in a research study, there are several key points to focus on:

Scope: Discuss the scope of the research study and any limitations associated with it. This may include issues such as geographical scope, time constraints, or limited access to data or resources. Explain how these limitations may have affected the research study and its findings.

Sampling: Discuss any limitations associated with the sampling strategy used in the research study. This may include issues such as sample size, representativeness, or generalizability. Explain how these limitations may have affected the research study and its findings.

Data collection and analysis: Discuss any limitations associated with the data collection and analysis methods used in the research study. This may include issues such as missing data, potential biases, or limitations in the analysis techniques. Explain how these limitations may have affected the research study and its findings.

Validity and reliability: Discuss any limitations associated with the validity and reliability of the research study. This may include issues such as social desirability bias, measurement error, or limitations in the research design. Explain how these limitations may have affected the research study and its findings.

Interpretation of findings: Discuss any limitations associated with the interpretation of the research findings. This may include issues such as uncertainty in the results or limitations in the conclusions drawn from the findings. Explain how these limitations may have affected the research study and its findings.

By focusing on these key points, the researcher can effectively address the limitations of the research study and provide a clear understanding of the potential barriers to the validity and generalizability of the findings. This can help the audience to interpret the research findings accurately and understand the implications of the research for future research and practice.

2.1.3.3 Interviews

When introducing interview as a methodology for a research study, there are several key points to focus on:

Definition and Purpose:

Definition and purpose are key components of introducing an interview methodology in a research study. The definition and purpose provide a clear understanding of what the methodology involves and why it is relevant to the research study.

Definition: The definition of an interview should include a clear explanation of what the methodology involves. An interview is a research method that involves asking questions and eliciting responses from participants to gather data and information relevant to the research questions or objectives. Interviews can be conducted in-person, over the phone, or via video conferencing, and can be structured, semi-structured, or unstructured.

Purpose: The purpose of conducting interviews should be explained in the context of the research study. The purpose of conducting interviews is to gather detailed and nuanced data directly from participants. Interviews can provide rich and complex data that cannot be obtained through other research methods such as surveys or document analysis. The goal of conducting interviews is to provide a comprehensive and in-depth analysis of the data to answer the research questions or objectives.

By providing a clear definition and purpose of interviews, the researcher can help the audience understand the methodology and its relevance to the research study. This can also help to establish the credibility of the research and provide a solid foundation for the rest of the methodology section.

Types of Interviews:

Describe the types of interviews that will be conducted in the research study. This may include structured interviews, semi-structured interviews, or unstructured interviews. When discussing the types of interviews that can be used as a methodology in a research study, there are several key types to focus on:

Structured interviews: Structured interviews involve asking a predetermined set of questions to all interview participants. The questions are usually closed-ended, with a limited set of response options. Structured interviews are often used in quantitative research studies to gather standardized data that can be easily analyzed.

Semi-structured interviews: Semi-structured interviews involve asking a set of open-ended questions, but also allowing for follow-up questions and exploration of participant

responses. The questions may be predetermined, but the interview may also allow for flexibility and adaptation based on participant responses. Semi-structured interviews are often used in qualitative research studies to gather rich and detailed data that can be analyzed thematically.

Unstructured interviews: Unstructured interviews involve asking open-ended questions without a predetermined set of questions or response options. The interview may allow for free-flowing conversation and exploration of participant responses. Unstructured interviews are often used in exploratory research studies to generate new insights and ideas.

Group interviews: Group interviews involve conducting interviews with multiple participants at the same time. The group dynamic can allow for interaction and discussion among participants, which may generate new insights and perspectives. Group interviews can be structured, semi-structured, or unstructured.

Virtual interviews: Virtual interviews involve conducting interviews using technology such as video conferencing software or teleconferencing. Virtual interviews can be used to overcome geographic barriers or to allow for more flexible scheduling options. Virtual interviews can be structured, semi-structured, or unstructured.

By focusing on these key types of interviews, the researcher can effectively choose the type of interview that is most suitable for the research study and its objectives. The type of interview chosen should be aligned with the research questions or objectives, and should be selected based on its ability to generate rich and relevant data.

Sampling Strategy:

Sampling strategy is an important component of the interview methodology in a research study. The sampling strategy determines how participants will be selected for the interview, and can have a significant impact on the validity and generalizability of the research findings.

Random Sampling: Random sampling involves selecting participants from a population at random, with each participant having an equal chance of being selected. This method is commonly used when the population is large and diverse, and the researcher wants to ensure that the sample is representative of the population.

Stratified Sampling: Stratified sampling involves dividing the population into subgroups or strata, and selecting participants from each stratum in proportion to their representation in the population. This method is commonly used when the population is heterogeneous and the researcher wants to ensure that the sample includes participants from each subgroup.

Convenience Sampling: Convenience sampling involves selecting participants who are readily available and accessible to the researcher. This method is commonly used when the population is small and the researcher has limited time and resources.

Purposive Sampling: Purposive sampling involves selecting participants based on specific characteristics or criteria that are relevant to the research questions or objectives. This method is commonly used when the researcher wants to ensure that the sample includes participants with relevant experiences, perspectives, or expertise.

Snowball Sampling: Snowball sampling involves selecting participants through referrals from other participants. This method is commonly used when the population is hard to reach or hidden, and the researcher wants to ensure that the sample includes participants with relevant experiences or perspectives.

By choosing an appropriate sampling strategy, the researcher can ensure that the sample is representative of the population and that the research findings are valid and generalizable. The sampling strategy should be chosen based on the research questions or objectives, and should be described in detail in the methodology section of the research study.

Data Collection:

Data collection is an essential component of the interview methodology in a research study. The data collected from interviews can provide valuable insights and perspectives that can be used to answer the research questions or objectives. When discussing data collection in the methodology section of a research study, there are several key points to focus on:

Interview Guide: The interview guide should be described in detail. The interview guide is a set of questions or prompts that the interviewer will use to guide the interview. The guide may be structured, semi-structured, or unstructured, depending on the type of interview being conducted.

Interviewer Training: The interviewer should be trained to conduct the interview in a consistent and standardized manner. Interviewer training may include instruction on how to use the interview guide, how to establish rapport with participants, and how to ask questions in an open and non-judgmental manner.

Audio or Video Recording: Audio or video recording can be used to capture the interview data in a comprehensive and accurate manner. The recording should be of high quality and should be stored securely to protect the confidentiality and privacy of the participants.

Note-taking: Note-taking can be used to capture important information and observations during the interview. The notes should be detailed and accurate, and should be stored securely to protect the confidentiality and privacy of the participants.

Transcription: Transcription involves converting the audio or video recording of the interview into a written text. Transcription can be done manually or using software tools. The transcription should be accurate and should be reviewed carefully for errors and omissions.

Pilot Testing: Pilot testing involves conducting a practice interview with a small number of participants to test the interview guide and ensure that the data collection process is effective and efficient.

By focusing on these key points, the researcher can effectively describe the data collection process in the methodology section of the research study. The data collection process should be designed to ensure that the data is comprehensive, accurate, and relevant to the research questions or objectives.

Data Analysis:

Data analysis is a critical component of the interview methodology in a research study. The data collected from interviews can provide valuable insights and perspectives that can be used to answer the research questions or objectives. When discussing data analysis in the methodology section of a research study, there are several key points to focus on:

Data Coding: Data coding involves categorizing the data into meaningful themes or categories. The coding process should be systematic and consistent, and should be guided by the research questions or objectives.

Data Management: Data management involves organizing and storing the data in a secure and accessible manner. The data should be stored in a way that protects the confidentiality and privacy of the participants.

Data Reduction: Data reduction involves summarizing the data into a more manageable form. This may involve identifying key themes or patterns in the data, or selecting representative quotes or examples.

Data Interpretation: Data interpretation involves making sense of the data and drawing conclusions based on the research questions or objectives. The interpretation should be guided by the coding and data reduction process, and should be supported by relevant literature and theory.

Triangulation: Triangulation involves using multiple sources of data to cross-check findings and ensure that the data is accurate and representative. Triangulation can involve using different types of data, or using data from different sources or perspectives.

Validity and Reliability: Validity and reliability should be considered throughout the data analysis process to ensure that the data is reliable and valid. Validity refers to the accuracy

and relevance of the data, while reliability refers to the consistency and repeatability of the data.

By focusing on these key points, the researcher can effectively describe the data analysis process in the methodology section of the research study. The data analysis process should be designed to ensure that the data is analyzed systematically and accurately, and that the conclusions drawn from the data are supported by relevant literature and theory.

Quality and Reliability:

Ensuring the quality and reliability of the data is an important consideration in the interview methodology of a research study. Quality and reliability refer to the accuracy, consistency, and credibility of the data and are essential for ensuring the validity and trustworthiness of the research findings. When discussing quality and reliability in the methodology section of a research study, there are several key points to focus on:

Credibility: Credibility refers to the extent to which the research findings accurately represent the experiences and perspectives of the participants. To enhance credibility, the researcher should use a systematic and rigorous approach to data collection and analysis, and should ensure that the data is representative of the population being studied.

Dependability: Dependability refers to the consistency and stability of the research findings over time. To enhance dependability, the researcher should use a standardized approach to data collection and analysis, and should ensure that the data is collected and analyzed consistently across all participants.

Transferability: Transferability refers to the extent to which the research findings can be applied to other contexts or populations. To enhance transferability, the researcher should provide a detailed description of the methodology, including the sampling strategy, data collection and analysis methods, and the context of the study.

Confirmability: Confirmability refers to the extent to which the research findings are supported by the data and can be confirmed by other researchers. To enhance confirmability, the researcher should use a transparent and open approach to data collection and analysis, and should provide detailed documentation of the data collection and analysis process.

Triangulation: Triangulation involves using multiple sources of data to cross-check findings and ensure that the data is accurate and representative. Triangulation can involve using different types of data or using data from different sources or perspectives. Triangulation can enhance the quality and reliability of the data by providing multiple perspectives on the research questions or objectives.

By focusing on these key points, the researcher can ensure that the interview methodology is designed to enhance the quality and reliability of the data. The researcher should use a

systematic and rigorous approach to data collection and analysis, and should provide a transparent and open description of the methodology used to collect and analyze the data. By doing so, the researcher can enhance the credibility, dependability, transferability, and confirmability of the research findings.

Ethical Considerations:

Ethical considerations are an essential component of the interview methodology in a research study. The research process should be designed to ensure that the rights and welfare of the participants are protected, and that the research is conducted in an ethical and responsible manner. When discussing ethical considerations in the methodology section of a research study, there are several key points to focus on:

Informed Consent: Informed consent involves obtaining the voluntary and informed agreement of the participants to participate in the research study. The informed consent process should be comprehensive and should include a clear explanation of the purpose of the research, the risks and benefits of participation, and the rights of the participants.

Confidentiality: Confidentiality involves protecting the privacy and confidentiality of the participants' data and information. The researcher should ensure that the participants' data is stored securely and that only authorized individuals have access to the data.

Anonymity: Anonymity involves protecting the identity of the participants in the research study. The researcher should ensure that the participants' data is collected and analyzed in a way that protects their anonymity.

Risk Assessment: Risk assessment involves identifying and addressing any potential risks or harm to the participants. The researcher should conduct a risk assessment to identify any potential risks or harm to the participants, and should take measures to minimize or mitigate these risks.

Debriefing: Debriefing involves providing the participants with information about the research study after their participation has ended. The researcher should provide the participants with a clear explanation of the purpose and results of the research study, and should address any questions or concerns that the participants may have.

Institutional Review Board (IRB) Approval: Institutional Review Board (IRB) approval involves obtaining approval from a designated committee to ensure that the research study is conducted in an ethical and responsible manner. The researcher should obtain IRB approval before conducting the research study.

By focusing on these key points, the researcher can ensure that the interview methodology is designed to protect the rights and welfare of the participants, and that the research is conducted in an ethical and responsible manner. The researcher should provide a clear and

comprehensive description of the ethical considerations in the methodology section of the research study, including the measures taken to protect the participants' confidentiality, anonymity, and privacy.

By focusing on these key points, the researcher can effectively introduce interviews as a methodology for a research study and provide a clear and concise explanation of why this method is suitable for addressing the research questions or objectives. This can help to establish the credibility and validity of the research findings.

2.2 Analysis

2.2.1 Literature review

2.2.1.1 “Interpreting Stakeholder Ecosystems throughRelational Stakeholder Theory: the case of a highlycontested Megaproject”

During the literature “Interpreting Stakeholder Ecosystems through Relational Stakeholder Theory: the case of a highly contested Megaproject” provide valuable point for the research.

Introduction

According to Corazza, megaprojects such as large infrastructure projects like railways, ports, power grids, and telecommunication lines, are needed to meet the United Nations Sustainable Development Goals, but their construction can lead to aspects ofunsustainability. Transportation megaprojects are particularly linked to sustainability issues, as transportation is responsible for 60% of global carbon emissions.The construction phase of these projects can also generate ethical issues, such as social and environmental injustices, cost overruns, corruption, and conflicts with local populations. To address these issues, the concept of Megaproject Social Responsibility (MSR) has been promoted to ensure the sustainable management of the impacts of such projects. This is further emphasized by the United Nations' SDG 9 goal of Innovation and Infrastructure to bridge the infrastructure gap in developing countries in a sustainable way. The involvement of numerous stakeholders and complex interrelationships make managing megaprojects challenging. Thus, due to megaprojects vast size and intricate nature, typically involve a multitude of stakeholders, resulting in intricate interconnections and conflicting interests. These projects often span extended periods and are characterized by high levels of uncertainty, necessitating a robust multirole administrative framework. (Mok et al., 2015).The inclusion of stakeholders' concerns in designing and realizing megaprojects is a wicked problem for sustainable management. Stakeholder theory defines stakeholders as individuals or groups who can influence or be influenced by a company's operations. Identifying stakeholders is crucial for the success of the project and should adopt a relational approach, focusing on sustainable development and the common good. This complexity leads to non-trivial issues in terms of identification, prioritization, and engagement of relevant stakeholders. Salience models are no longer sufficient to address this wicked problem, and frameworks such as Stakeholder2Nature and social network analysis are being implemented to assess evolving ecosystems of stakeholders and stakeholder social capital.Thispaper examines the stakeholder network of a contested bi-national megaproject for a high-speed rail infrastructure, with a focus on understanding how megaproject managers prioritize stakeholders and whether they adopt a relational perspective of stakeholder theory. The paper applies a mixed method, including semi-structured interviews and focus groups with

managers, and social network analysis to analyze the stakeholders' network. The paper highlights the limitations of the salience model in a complex institutional context and points out discrepancies between the literature's suggestions and the actual management of stakeholder networks. The paper's findings have implications for managing stakeholder relations and for a more sustainable governance of megaprojects.

Literature Review

The article discusses the importance of stakeholder theory moving from a transactional approach to a relational theoretical approach for better management of stakeholder relationships. It highlights the need for a more pluralistic conception and a more multi-stakeholder-oriented value creation process where stakeholders should be active in the discourse about the co-creation of value. The article presents a case to empirically test the importance of visualizing and making sense of stakeholders' networks. It also mentions some key contributions of scholars who advocate for a revision of the firm-centric model of stakeholder identification process, substituting firm-centrism with networks of relations. The Finnish school of thought related to the understanding of socio-ecological ecosystems where nature is seen with a holistic and ecosystem view is also discussed.This passage also discusses the evolution of stakeholder management in project and megaproject management. The importance of stakeholder involvement has been recognized, and scholars have developed various models and principles for identifying, mapping, classifying, and prioritizing stakeholders. However, recent studies suggest that the stakeholder engagement process should consider dynamism as part of the equation and that an ecosystem view of stakeholder relationships is necessary. Scholars have also emphasized the importance of considering both internal and external stakeholders and engaging secondary stakeholders early on in the project. The use of social network analysis as a tool for understanding stakeholder relationships and ecosystems is also highlighted. The passage concludes by discussing the convergence towards a relational approach in stakeholder theory and the need for organizations to adopt an ecosystem view of their stakeholder relationships (Mitchell et al., 1997).

Methods

Author proposes using Social Network Analysis (SNA) to examine the stakeholder relationships in the controversial Turin-Lyon high-speed rail project in Italy. The literature agrees that the use of SNA tools can be useful in providing a visual representation of stakeholder ties and relationships (Rowley, 2017). The study uses a mixed-method approach involving interviews, focus groups, and a field visit. The purpose is to understand the complexity of stakeholder identification, prioritization of stakeholder needs and relationships, and the existence of paradox or contradiction. The researchers aim to determine if managers of the project are aware of their stakeholders' network and networks-

of-networks and if they have adopted a relational perspective. The mixed-method approach is chosen because of the uniqueness and complexity of the bi-national megaproject

The study conducted 21 semi-structured interviews and a focus group with stakeholders involved in the Turin-Lyon high-speed rail construction project. The interviews were conducted between November 2020 and March 2021, and ranged from 60 to 100 minutes in duration. The respondents were selected from different hierarchical levels, including directors, coordinators, middle managers, operational construction site supervisors, and senior managers. Almost all interviews were recorded and transcribed, while detailed notes were taken for the rest. The interviews focused on stakeholder definition, prioritization, stakeholder-oriented organizational culture, and the influence of the binational context on stakeholder mapping. A participant observation of the construction site and secondary materials were also used for triangulation.

Stakeholder identification and prioritization

The stakeholder identification process involved building a network of stakeholders through snowball sampling based on respondents' inputs from the focus group and interviews. The stakeholder network, as reconstructed from the interviews, was analysed by a social network analysis and the evaluation of different degrees of centrality (Kleinberg, 1999;Brin and Page, 1998; Segarra and Ribeiro, 2014; Freeman,1977; Brandes, 2001) Each node in the network represents a relevant actor identified by the respondents, and links between nodes were attributed when a relationship was described during the interviews. The network was then analyzed using four centrality degrees to prioritize stakeholders: authority, pagerank, eigenvector, and betweenness. Additionally, bottom-up clusters were identified through the modularity algorithm to classify stakeholders and highlight dense groups of collaborations.

Qualitative analysis

The author used qualitative analysis to discusses the definition of stakeholders in the context of a megaproject. Some interviewees did not distinguish between the stakeholders of the company and the stakeholders of the megaproject itself, while others emphasized the importance of the local community and broader society. The article also notes that prioritization is a dynamic concept and some interviewees found it challenging to prioritize stakeholders on different time and geographical scales.

Quantitative analysis

This section describes the quantitative analysis of stakeholder identification and prioritization for a megaproject. The study identified over 95 groups of stakeholders and 360 relations from public actors, third sector, private companies, and management units within the company. The stakeholder network was analyzed using social network analysis and degrees of centrality, including authority, pagerank, betweenness, and eigenvector centrality.

The analysis revealed five clusters of stakeholders, with national and international public institutions being the most central according to various degrees of centrality. The study acknowledges that the data depicts the system of actors as described by interviewees, which may not provide an exhaustive and bias-free reconstruction of the stakeholder ecosystem related to the megaproject.

Quantitative and qualitative comparison

The qualitative and quantitative analysis conducted in the study revealed discrepancies between the broad and holistic vision of senior managers regarding stakeholder management and the actual prioritization of stakeholders through social network analysis. The majority of respondents adopted a broad definition of stakeholders, including taxpayers and citizens, which was not reflected in the prioritized stakeholders through SNA. This discrepancy could be explained by the structure of the network, which did not take into account differences in power between middle and top managers. However, this could also highlight discrepancies between managers' perceptions and the reality of the stakeholder ecosystem.The research provides a theoretical foundation for advancing knowledge on the relationships among stakeholders in a megaproject, based on a case study of the Turin-Lyon HSR, a binational megaproject in Italy and France. The analysis was limited because it was based on the perspective of the internal stakeholders only. The research points out the importance of ecosystem approach and stakeholder mapping process that involve both internal and external stakeholders, including the environment and nature. The importance of conducting stakeholder mapping activities ex ante and during the megaproject design phase, and the need for a dynamic mapping process is emphasized. The future research should focus on integrating a process of de-institutionalization of stakeholders by encompassing external stakeholders at different institutional and political levels. This paper confirms the necessity to apply a Social Network Analysis to enhance the directors and managers' awareness about external stakeholders and their influence on the project, as pointed out by Mok et al. (2015) in their article.

Conclusion

The paper focuses on stakeholder management for the sustainable development of megaprojects, particularly infrastructural ones, and the inclusion of nature and the environment in stakeholder discussions which has been well documented in the MSR literature (Ma et al., 2017; Lin et al., 2017).. The authors conducted an empirical analysis of the Turin-Lyon HSR project and identified stakeholder groups through qualitative and quantitative analysis. The analysis showed that public institutions and construction companies are considered the most important stakeholders by the megaproject managers, while social components of the local territory are not seen as important actors. The lack of proper stakeholder engagement and a holistic ecosystem vision may contribute to

unpredictable reactions from civil society and other powerless stakeholders. The authors suggest further research is needed to develop ethical management of megaprojects that includes powerless stakeholders. The study was partially funded by TELT, and the researchers maintained their neutrality and reflexivity in accordance with university regulations.

2.2.1.2 "The institutional shaping of global megaprojects: The case of the Lyon-Turin high-speed railway" by Giovanni Esposito, Teresa Nelson , Ewan Ferlie, Nathalie Crutzen

1. Introduction

This paper focuses on the practices and governance skills required by diverse societal actors to shape global megaprojects through interactions with formal administrative structures and legal systems. The authors draw on the concept of institutional work, which encompasses both constructive and destructive aspects of organizational agency. They use the Lyon-Turin megaproject as a case study to examine how different actors with divergent interests and logics of action struggle to influence megaproject development. In conventional methods, megaproject management is primarily perceived as a mechanism or a toolbox filled with techniques for organizing and managing the necessary resources to achieve a specific objective within a well-defined scope, adhering to quality standards, time constraints, and budget limitations(Morris, 2002,2013).

The Lyon-Turin megaproject is a complex high-speed railway infrastructure project promoted by the European Union, French, and Italian governments. It has faced delays due to opposition from local communities in the Susa Valley who have contested the project in various ways. The paper aims to analyze the socio-economic dynamics of global megaprojects and contribute to the understanding of the skills needed by professionals to accomplish shaping work in such challenging contexts.

2 .Theoretical framework: shaping global megaprojects through institutional work

Actors can manipulate the regulative contexts within which they operate and create new institutions through a form of work that they call defining. Defining specifically refers to the creation of formal rule systems that confer status or identity. (wrence & Suddaby, 2006).The concept of institutional entrepreneurship focuses on actors who create and transform institutional conditions, shedding light on the institutional strategies associated with different actors and contexts. Institutional work, introduced by Lawrence & Suddaby, 2006, refers to the processes by which individuals and groups affect the institutional contexts they participate in with intended agency.

Institutions consist of regulative, normative, and cognitive elements. Regulative elements involve explicit rules and surveillance activities; normative elements refer to prescriptive and

obligatory dimensions, and cultural-cognitive elements rely on shared beliefs based on individual cognition.

Regulative institutions are essential for successful megaprojects, as they guide and frame the rules, incentives, and penalties that influence behavior and coordination. Megaprojects are temporary organizations, defined by externally imposed tasks and deadlines. Actors can use various regulatory instruments, such as legislation, international treaties, and performance-based contracts, to shape megaproject deadlines and tasks.

Forms of institutional work that contribute to megaproject development include defining, embedding and routinizing, enabling, policing, and disconnecting rewards. These practices help create, maintain, and disrupt institutions, ultimately shaping the development of global megaprojects.

2.1 Defining

Defining, as discussed by Lawrence & Suddaby (2006), refers to the creation of formal rule systems that confer status or identity. This form of institutional work enables actors to manipulate the regulative contexts within which they operate and create new institutions. A valuable example is the 2014 Juncker's Investment Plan for Europe, in which a set of EU legislative acts conferred strategic status on a group of energy and transport megaprojects. These acts defined the list of megaprojects, the financial resources, and the time period for implementation.

The allocation of funds is done through a call-for-proposals system, a quasi-market mechanism that organizes the investment program into different strands. Applicants can be various actors, such as local and regional authorities, corporations, state administrations, investment funds, or special purpose entities. This system helps temporally structure the implementation of planned megaprojects by opening windows of opportunity for bidders to submit detailed descriptions of future deliverable tasks and implementation schedules.

Defining can be seen as a "macro-shaping" institutional practice, where non-business actors create demand and the megaproject itself by setting the overarching policy plan, temporal frames, and available resources.

2.2 Embedding and Routinizing

Embedding and routinizing is a form of institutional work that involves infusing an institution into the participants' day-to-day routines and organizational practices. Megaprojects defined by supranational actors can be embedded and routinized in the day-to-day routines and organizational practices of national actors through the use of treaties and additional legal interventions.

For example, the Lyon-Turin high-speed railway section of the TEN-T network required an international agreement between Italy and France to formalize and implement the EU's construction decisions within the Italian and French legal systems. This agreement, duly ratified by the national parliaments, officially mandated the national public administrations and railway firms to cooperate with EU's officers in realizing the Lyon-Turin project. In this context, embedding and routinizing work helps maintain and reproduce supranational megaproject decisions within the national environments of the concerned states, shaping the working agenda of other megaproject actors

2.3 Enabling

Enabling work focuses on actors interacting with formal rules to facilitate, supplement, and support institutions, for example, to authorize a given set of activities or mobilize financial resources (Lawrence & Suddaby, 2006; Leblebici, Salancik, Copay, & King, 1991). Global megaprojects are extremely complex public management endeavors whose actual implementation requires special authorization, funding, and revenues (Davies & Mackenzie, 2014). Grubbauer and Camprag˘'s (2019) and Peri´c's (2019) research on the Belgrade Waterfront megaproject shows that governments may perform such enabling work in an authoritarian mode by overriding all traditional laws that govern general planning and construction matters. Their analysis documents how, upon the adoption of the Belgrade Master Plan 2021, the central government approved a formal act that enabled a fast-lane construction procedure for several megaprojects deemed of high importance for the Republic of Serbia. As they explain, the main purpose of this act was to quickly unlock investments and accomplish construction operations as soon as possible.

2.4 Policing

Policing is another form of institutional work used to maintain and reproduce institutions in megaproject shaping. This form of work, say Lawrence and Suddaby, maintains and reproduces institutions by "ensuring compliance through enforcement, auditing, and monitoring. Policing can involve the use of both sanctions and inducements, often simultaneously and by the same agents".

Megaprojects are often met with frequent cost overruns and construction delays that might contribute to megaproject negative performance (Flyvbjerg, 2017; Van Marrewijk, 2017). Therefore, auditing, as a form of policing, is used for marginal shaping to ensure efficiency, effectiveness, and timeliness. It is particularly used to verify that the overall megaproject's management system can continue to meet the contractual requirements and operate normally (Yang, 2017; Cova & Salle, 2011). In megaprojects, the auditing process is often entrusted to independent certification institutions that review and evaluate the overall performance of the general contractor according to the contract between the owner company

of the megaproject and the general contractor (Yang, 2017; Priemus, Bosch-Rekveldt, &Giezen, 2013).

2.5 Disconnecting rewards

Cost overruns and implementation delays can be ascribed to inefficient and ineffective megaproject management systems – but not entirely. External (local) communities residing around the megaproject areas can also play a role. They have the potential to influence and shape implementation through support – or through overt opposition and resistance (Salet et al., 2013; Burnside-Lawry and Ariemma, 2014; Park et al., 2017; Sarkheyli&Rafieian, 2018). Support may be generated by assumed positive effects on the economy and on collective benefits associated with the provision of services to citizens (Aschauer, 1990; Flyvbjerg, 2014). On the other hand, nearby residents might oppose the megaproject because of top-down planning processes and due to sustainability and public health concerns (Lehrer & Laidley, 2008). These different postures towards a megaproject derive from the fact that actor groups have different sociotechnical imaginaries about the megaproject contribution to public purposes, collective futures, and the common good (Cousins, 2020; Hsu, 2018, Awakul&Ogunlana, 2002). When this happens, the megaproject team and local communities may clash. When this clash occurs, the megaproject team and local communities are likely to develop different temporal orientations intended here as different time durations for carrying out planned tasks (McGivern et al.,2018) and, therefore, for implementing strategic change in global megaprojects.

Local resistance to megaprojects is commonly labeled the 'Not in My Backyard' syndrome. This may be mild or severe. Opposition takes the form of strong protest movements attacking the proponents on a plurality of issues that depict the megaproject as a social injustice that should be stopped (Strauch et al., 2015; Teo &Loosemore, 2014). In these cases, activist groups may use legal recourse to trigger orders or financial sanctions and/or to implement costly compensation schemes to impede or halt construction operations (Esposito, Terlizzi, &Crutzen, 2020; Jordhus-Lier, 2015).

This strategic use of legal instruments to disrupt megaprojects has a strong shaping potential. It resembles Lawrence & Suddaby, 2006 category of disconnecting rewards. Actors such as social movements work through a state apparatus to disconnect rewards from some setof practices, rules, or decisions - here about megaproject operations. The most direct manner in which this occurs is through the judiciary, which is capable of directly invalidating institutional rule makers.

In the following sections, we draw on these described forms of institutional work to examine how business and non-business actors interact with formal administrative and legal systems to shape a global megaproject. We particularly examine how actors use a variety of regulatory instruments to influence (create, maintain, or disrupt) temporal structures to

orient strategic change in the case of the Lyon-Turin megaproject. These include regulatory instruments that:

Supra-governmental actors use to (a) define and (b) police Lyon-Turin;

National governments use to (c) embed and routinize Lyon-Turin;

National administrations and firms use to (d) enable Lyon-Turin;

Civil society groups use to (e) disconnect rewards from Lyon-Turin.

By examining the interaction between different types of actors and the regulatory instruments they use, this analysis helps us understand the complex dynamics involved in shaping global megaprojects like the Lyon-Turin. It also highlights the importance of institutional work in managing the strategic change necessary for the successful implementation of such large-scale projects.

3 .Case study and methods

In 1992, the EU established the TEN-T infrastructure policy, aiming to develop a Europe-wide transport network. This included a 270 km high-speed railway line connecting Lyon and Turin, jointly financed by the EU (40%), Italy (35%), and France (25%). The project is managed by SNCF Réseau in France and Rete FerroviariaItaliana (RFI) in Italy, both subsidiaries of state-owned holding companies. The ambitious project involves constructing a 57 km tunnel through the Alps, allowing heavy freight and passenger trains to travel at higher speeds.

Nearly 30 years after the announcement, the project remains incomplete, with cost estimates increasing from €12 billion to €26 billion, and the completion date has been changed three times, with the latest forecast set for 2030. Cost overruns in France are due to underestimation of geological difficulties, while in Italy, opposition from civil society groups and poor management of that opposition have led to delays and increased costs. (French Court of Audit, 2012)

To study the Lyon-Turin megaproject, an embedded case study methodology was employed, with 79 semi-structured interviews conducted between 2014 and 2016 with participants from various organizational entities. Interviewees were asked about their individual roles, their organization's role, their interactions with the TEN-T policy framework, and an account of the major phases of the Lyon-Turin development. Data triangulation was achieved through archival analysis of various documents, including legal texts, press releases, international treaties, financial agreements, policy papers, and third-party studies and reports.

The interviews were analyzed following established procedures for grounded theory building, discerning between first-order and higher-ordered categories, and developing

distinct clusters of regulatory instruments used in the management of the project. This led to the identification of five dimensions that describe the purposive work of business and non-business actors interacting with formal administrative and legal systems, focusing on interactions mediated by regulatory instruments enabling actors to influence the temporal structures that orient strategic change in the Lyon-Turin project.

4. Findings

4.1. Defining construction tasks and deadlines through legislation and quasi-markets

The EU uses legislation and quasi-market systems to define Lyon-Turin construction tasks and deadlines. A legislative proposal was approved in 1996, providing €1.8 billion for infrastructure megaprojects, including Lyon-Turin. The European Commission used a call for proposals system to break down megaprojects into smaller tasks.

4.2. Embedding and routinizing construction tasks and deadlines through the use of international treaties

Italian and French governments signed several international agreements throughout the 1990s and 2000s to embed and routinize EU construction tasks and deadlines. Treaties mandated collaboration between national public administrations, railway firms, and EU authorities. In 2001, an additional treaty directed the creation of an international joint venture for preliminary studies and geological reconnaissance tunneling work.

4.3. Enabling construction tasks and deadlines through administrative procedures more or less opened to civil society participation

National public administrations and railway firms enabled EU construction tasks and deadlines using different administrative procedures, with varying degrees of civil society participation.

4.3.1. France: administrative procedure opened to participation

In France, the authorization for geological reconnaissance tunneling work was obtained through a public inquiry procedure involving public consultations and an independent commission. Local opposition led to additional inquiries and adjustments to address environmental concerns. The French branch of the joint venture firm provided information and organized local events to address residents' concerns, leading to the completion of preliminary work in 2010.

4.3.2. Italy: administrative procedure closed to participation

The Italian Target Law for the Lyon-Turin project did not require citizen consultation, leading to the authorization of preliminary work without local involvement. Citizen

opposition emerged in the Susa Valley, focusing on the project's perceived uselessness, public health concerns due to uranium and asbestos, and environmental concerns. In response to expropriation letters and construction work in 2004, locals launched the NOTAV (No High-Speed Train) protest campaign, occupying the construction site. After a police evacuation, 30,000 people reoccupied the site, and protests continued. The government eventually halted construction in 2005 and initiated public consultations in 2006, which continued for six years.

4.4. Policing construction tasks and deadlines through performance management systems

The EU monitors the Lyon-Turin project's performance and imposes financial sanctions when tasks and deadlines are not met. The European Commission uses action status reports and mid-term reviews to evaluate firms' performance. Firms deemed under-effective or ineffective face funding cancellation. In the Lyon-Turin case, the project was considered under-effective in 2010, leading to a €9.2 million funding cut and deadline extension.

Local civil society, such as the NOTAV activists, aimed to slow down and stop construction operations to trigger financial sanctions. In response, the Italian government passed a law allowing the military to evacuate dissenting occupants and secure the construction site. After continued protests, a cost-benefit analysis was conducted, which indicated a negative return on investment. The project's future in Italy remains uncertain as of 2019.

5. Discussion

This study shows how various actors shape global megaprojects through strategic interactions with regulatory institutions. Supranational authorities define construction tasks and deadlines and monitor compliance, while national governments and businesses embed these into their operations. Civil society groups can delay the project by disrupting resource allocation. The authors identify categories of institutional practices employed by different actors to pursue their goals, from swiftly implementing the project to stopping it altogether. Successful management of these massive, complex endeavors requires professionals with skills in planning, diplomacy, politics, and stakeholder engagement to navigate the multi-level institutional environment. Considering how actors shape projects through institutional work can help avoid crises of legitimacy and govern global megaprojects effectively.

Besides, this paper also argues that governing global megaprojects requires more than traditional project management skills. Professionals need to shape the institutional environment and "meta-lifecycle" of these massive, complex endeavors through strategic interactions with regulatory institutions across countries and levels of governance. The authors recommend improving skills in planning, diplomacy, politics, communication, and stakeholder management. Global megaprojects should assume conflicts will arise from temporal and interpretive differences among stakeholders. Cooperation, shared

understanding, and intentional small changes can help achieve performance goals while remaining flexible. Although technical skills remain important, global megaproject success depends on "megaproject diplomats" and managers adept at navigating political complexities, preventing crises of legitimacy, and governing strategic change.

6. Conclusion

The study contributes categorizations of institutional practices actors use to shape global megaprojects, either by creating, maintaining or disrupting them. It identifies required skills in planning, diplomacy, politics, communication and stakeholder management. It provides insights into global megaproject governance by focusing on the institutional environment and strategic interactions across levels and contexts.

The study acknowledges limitations from using a single case, as megaprojects can differ in geographies, cultures, contexts, policies, actors and institutions. Comparative and dynamic studies are needed on international organizations, governments, firms, residents and social movements. More research should examine cognitive and normative institutions, not just regulatory ones.

Further research could explore:

Megaprojects with geopolitical goals, e.g. China's Belt and Road initiative.

Different geographical and policy contexts, e.g. in Africa where project management practices and corruption levels differ.

How informal and cultural institutions shape megaprojects.

Interactions and non-linear aspects of practices, institutions and actors.

Skills for influencing cognitive and normative institutions.

The study calls for examining global megaproject issues comparably in new geographies, policy areas and among different actors. A systems perspective focusing on dynamics and interactions could provide a more complex understanding.

The study makes an important contribution through in-depth analysis and theoretical connections, though generalizability is limited. Additional research embracing more contexts and actors, and a wider range of institutions, can build upon these insights into the political and diplomatic complexities of governing strategic change in massive global endeavors.

2.2.1.3 "Participatory governance in megaprojects: the Lyon–Turin high-speed railway among structure, agency, and democratic participation" Giovanni Esposito, Andrea Felicetti and Andrea Terlizzi

This paper examines two cases of participatory governance related to infrastructure megaprojects. While this approach is prevalent in other policy areas, it remains scarce in megaproject literature, and we've identified significant democratic shortcomings. We argue that adopting a more deliberative governance approach could help overcome these limitations.

Two specific issues affecting participatory governance in megaprojects are analyzed. First, structural problems may arise because megaproject governance is often framed within institutional settings that aren't designed to promote bottom-up participation, stakeholder representation and involvement, information exchange between external stakeholders and the megaproject team, or allowing external stakeholders to influence decisions made by the team. Our findings align with previous studies on institutional barriers to public participation that impede fairness and effectiveness in megaproject decision-making processes (Groves et al., 2013; Leifsen et al., 2017; Sneddon & Fox, 2007). We contribute to this literature by incorporating agentic factors and providing further evidence on the limitations of participatory governance in megaprojects.

Additionally, this paper points to an agency problem concerning the ethical conduct of public officials and managers within the megaproject team. They may strategically misrepresent and disseminate megaproject information, avoiding or navigating resistance from external stakeholder groups instead of engaging in proper and careful discussions. These findings add to the literature on optimism bias and strategic misrepresentation in megaproject management (Flyvbjerg, 2021).

We advocate for a deliberative turn in megaproject management, building on recent deliberative democracy debates. This perspective emphasizes the need for a systemic understanding of innovative governance forms and encourages critical engagement with scholarship from various policy areas. It also suggests embedding democratic governance in megaproject management, rather than just institutionalizing it. We urge future research to systematically explore these aspects and develop a much-needed evidence base to help democratize megaproject governance. Our research demonstrates how the growing body of deliberative democracy scholarship can provide a valuable framework for addressing the democratic challenges posed by megaprojects in policy-making.

Theoretical framework: Participatory governance in megaprojects

Shifting focus from solely technical and operational aspects to incorporating participatory governance is crucial in managing megaprojects, which are often complex, uncertain, and marked by conflicts involving numerous public and private stakeholders. Participatory governance engages a diverse range of actors from the private sector, civil society, and the general public, fostering collaboration and institutionalizing interactions between the government and civil society.

In the context of the Lyon-Turin high-speed railway project, researchers examined factors that can either promote or impede participatory decision-making by exploring two participatory governance venues. The analysis focused on structural and agentic aspects of these practices. Structural elements relate to the institutional design of a participatory venue, encompassing its establishment, representation and involvement, information exchange, and decision-making influence. Agentic aspects, however, pertain to the actions taken by various actors within the participatory space and how they gather and communicate technical knowledge and evidence about the megaproject.

Emphasizing the importance of evidence quantification for shaping projects, the research investigated the collection and dissemination of information. Ultimately, this work contributes to the wider debate on the effectiveness of participatory governance, particularly in the field of environmental policy-making.

Materials and methods

The Lyon-Turin high-speed railway project, part of the Trans-European Transport Network (TEN-T), has experienced significant delays and escalating costs, due in part to the opposition of civil society groups in the Susa Valley in Italy. The project, which involves building a 270 km railway line and a 57 km tunnel through the Alps, was initially estimated to cost €12 billion, but this figure has since risen to €26 billion. Furthermore, the completion date has been pushed back repeatedly, with the latest forecast now set for 2030.

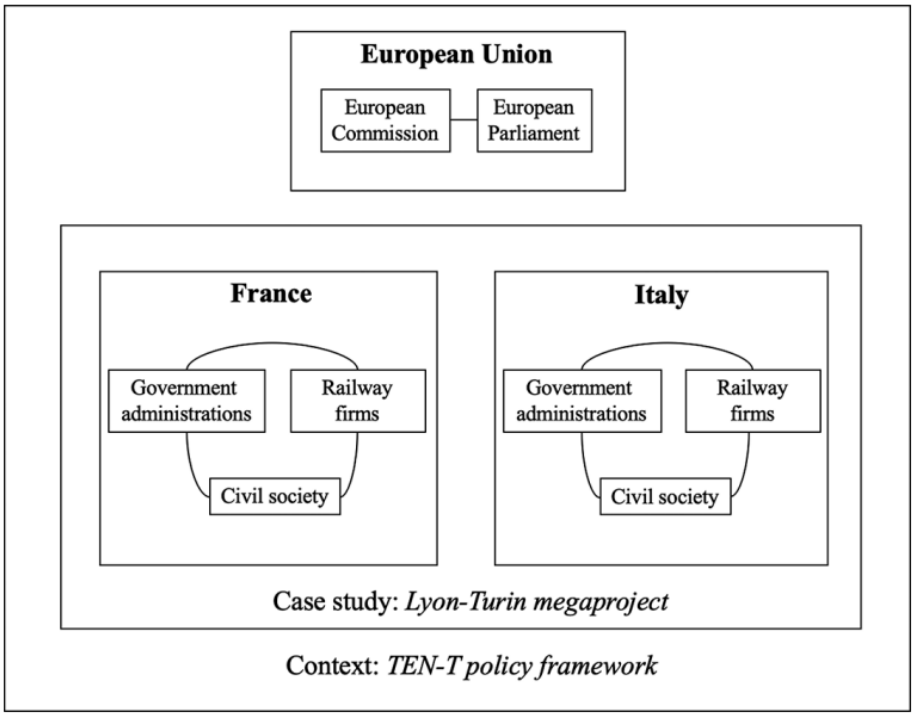

Figure 16: Case study design (Esposito et al.,2021)

The project's implementation in France and Italy has been characterized by two distinct participatory governance systems. In France, the Public Inquiry procedure requires the national railway firm to engage in public consultations with local citizens and civil society organizations before making decisions. In contrast, Italy initially opted for a fast-tracked approval process without prior consultations, leading to considerable opposition from various groups in the Susa Valley, who formed the NOTAV (No High-Speed Train) campaign. In response to this opposition, the Italian government established the Observatory for the Turin–Lyon Railway in 2006 to facilitate public consultations and address concerns, aiming to advance the project's planned operations.

Data collection and analysis

To gather comprehensive data on the Lyon-Turin high-speed railway project, researchers conducted an embedded case study focusing on different jurisdictional environments (France, Italy, and the EU) and organizational units (supranational authorities, national government administrations, firms, and local civil society). Between 2014 and 2016, they conducted 79 semi-structured interviews with participants from various organizational entities, including supra-governmental (21), governmental (24), business (5), and civil society (29) actors. A snowball sampling method was used to identify interviewees.

Open-ended questions helped researchers understand the interviewees' roles in the project. To ensure reliability, they triangulated interview data with documents such as national and supranational legal texts, press releases, international treaties between Italy and France,

financial agreements, policy papers, and third-party studies and reports. Both interviews and archival documents were analyzed through quantitative content analysis, with the coding frame structured according to the theoretical framework presented earlier, covering both structural and agentic elements.

Participatory governance in the LT case (France and Italy)

Setting up of the participatory venue

France: A binding ordinary administrative procedure required public consultations with concerned citizens and civil society organizations. An administrative authority of independent experts was established to collect opinions and inform the government.

Italy: The central government set up an extraordinary participatory venue called the Observatory in response to local protests against the LT project. The Observatory included experts appointed by relevant public administrations and the railway company.

Representation and involvement

France: Citizens and associations could express their opinions during the Public Inquiry procedure. Independent experts decided which opinions were legitimate. Meetings were held to explain the technical aspects of the project.

Italy: The Observatory involved technical experts appointed by various stakeholders. Their role was to defend and promote the interests of the parties they represented.

Information flows and influence over decisions

France: Information was exchanged between local citizens, civil society, and national administrations during public meetings. However, citizens had limited access to the information needed to properly express their opinions, and the consultation process had no binding effect on the final decisions.

Italy: The main question discussed within the Observatory was whether the new line should pass on the right or left side of the Dora River. The preferences provided by the experts had no binding effect on the final governmental decision. The political table acted as a liaison between project promoters and technical experts of the Observatory, checking compatibility with political macro-orientations.

In both countries, participatory governance mechanisms experienced limitations in providing access to information, and influence over the final decisions. In France, the Public Inquiry procedure was criticized for being rushed and manipulative, while in Italy, the Observatory faced implementation delays and pressure from the European Commission to endorse the project implementation.

Agency

In the Lyon-Turin (LT) high-speed railway case, both French and Italian promoters and opponents used different strategies to present data and justify their positions.

French promoters: They strategically misrepresented traffic data through aggregation to persuade locals of the project's worthiness. The initial support was secured using in-depth studies to support their claims.

Italian promoters: They employed strategic misrepresentation through forecasting assumptions, formulating conceptual assumptions about future traffic evolutions rather than using historical data.

French opponents: They countered the promoters' strategic misrepresentation by providing alternative descriptions of existing data. They analyzed individual traffic curves to demonstrate the drop in freight tonnage between France and Italy.

Italian opponents: They relied on historical data to show a decrease in road and rail traffic between Italy and France since 2000, arguing against the need for the LT project. They also highlighted the environmental impact of the construction operations, which the promoters seemed to overlook.

These strategies reflect the differences in participatory governance and the dissemination and collection of information in both countries.

Discussion: Toward a Deliberative Approach to Megaprojects

In this article, the authors argue for a deliberative democratic approach to the governance of infrastructure megaprojects. They identify limitations in existing participatory governance and propose integrating participatory and deliberative stages in democratic governance. Deliberative democracy is an area of development in contemporary democratic theory and has been applied in disciplines like urban planning, social movement studies, and public policy analysis. However, deliberative democratic ideas have not been widely applied to megaproject management.

The authors suggest that a deliberative democratic approach to megaproject governance demands inclusive discursive practices that engage in an authentically deliberative and consequential way. This approach addresses core democratic concerns, such as who participates, how communication occurs, and the effects of deliberation. Key features of deliberative communication include being non-coercive, reflexive, and consequential.

The authors explore two cases of participatory governance in megaproject management and find that neither enabled substantial deliberation. They highlight the limitations in representation and involvement, the nature of communication, and the influence over

decisions. The authors argue that a deliberative approach could improve the democratic quality of megaproject governance by promoting a shift in focus from isolated forums or participatory processes to systemic thinking.

A deliberative system in megaproject governance would include various actors and spaces, such as empowered actors in institutions producing collective decisions and actors in public spaces like the media, social movements, and citizen-based forums. The challenge is to foster accountability from empowered to public spaces and transmission of preferences from public to empowered spaces

The authors acknowledge that a deliberative democratic approach to megaproject governance is unlikely to result in a unitary set of recommendations specific to this policy area. Instead, it will stem from the ability to develop a growing body of analyses of success and failures that critically engage with findings from other policy areas. Public deliberation should be built in addition to existing forms of engagement, not against them, to democratize decision-making and recognize the role and perceptions of involved actors, especially the less powerful ones.

2.2.1.4"Thirty years of socio-economic evaluation of the Lyon–Turin High–Speed rail project" by J´eromeMassiani , Ila Maltese

The article reviews past evaluations of the Lyon-Turin high-speed rail project over 30 years, including the controversial 2019 cost-benefit analysis (CBA) by the Italian Ministry of Infrastructure and Transport (MIT). The MIT study generated substantial public debate and criticism. During this article, a few key points are presented and list below.

The Inadequacy and Limitations of Evaluations Supporting the Lyon-Turin Megaproject

The article finds that none of the evaluations of the Lyon-Turin project were simultaneously documented, realistic, considered cost overruns, based on a coherent transport model, detailed, and methodologically consistent. In particular, the risk of cost overruns was not properly addressed. The 2019 MIT study was the first to provide enough documentation to review the calculations, though it still had limitations. (MIT, 2019)

The evaluations were not simultaneously:

Documented: Only the 2019 MIT study provided enough documentation to review the calculations, though still limited. Other studies lacked transparency.

Realistic: They did not consider the risk of cost overruns realistically. Sensitivity analyses are not suitable for addressing cost overrun risks, as the expected value of overruns is positive, not zero.

Based on a coherent transport model: The transport models underpinning the evaluations were limited or not detailed enough.

Detailed: The studies lacked sufficient detail in their representation of demand and supply.

Methodologically consistent: The methods used in the studies contained internal inconsistencies or were not fully justified

Two critical limitations were lack of documentation and realistic treatment of cost overruns. Without documentation, the calculations and assumptions behind the results cannot be verified. And ignoring the likely prospect of cost overruns leads to a biased assessment of project viability and benefits.

The lack of a comprehensive, transparent evaluation means that the information provided to decision makers has been limited. Parts of the analysis and justification for the project were not publicly available or verifiable.

While these conclusions are drawn from the documentation that is available, the lack of full access to documents strengthens rather than weakens these conclusions. More details on the evaluations may reveal additional issues.

In summary, the first key point is that major rail infrastructure projects like Lyon-Turin should be backed by a sound cost-benefit analysis and multi-criteria assessment. The evaluations of this project to date have lacked key attributes like documentation, realism, coherence and internal consistency to be considered robust or provide full confidence in the results and decisions. Addressing issues like cost escalation risk is crucial for proper project governance and management.(J´erome ˆ Massiani, Ila Maltese)

The Flaws and Inconsistencies in Criticisms of the 2019 MIT Lyon-Turin Megaproject Study

The article examines two major criticisms of the 2019 MIT study: (1) the use of the Rule of Half to estimate benefits of transferred users, and (2) the inclusion of taxation effects. It finds that the suggested "corrections" to these approaches were inconsistent and would introduce bias. The Rule of Half provides a robust estimate of user benefits. Including taxation explicitly leads to a consistent estimate, while partially excluding taxation would lead to inconsistency.More specifically:

None were fully documented - They did not provide enough detail on sources, assumptions, and methodologies to allow other researchers to verify their findings. Without documentation and transparency, the credibility of the results is limited.

None accounted for the likely potential of cost overruns - They did not budget in contingencies for unforeseen costs and obstacles, making the projects seem more viable than they may end up being in reality if overruns emerge.

None were based on a detailed, coherent transportation model - Reliable evaluations of transportation infrastructure projects require robust modeling of factors like transportation demand, capacity, alternative options, and impacts. Less sophisticated modeling limits the reliability

None were consistent and realistic - To be persuasive, multiple evaluations of the same project should reach consistent conclusions and account for real-world complexities. Prior studies failed on both counts.

The 2019 MIT study was the first to provide documentation, but still lacked cost overrun consideration - So while a step forward, even the best evaluation to date still fell short of fully addressing this key issue, limiting its conclusions.(MIT, 2019)

In summary, the point being made seems to be that project proponents and stakeholders could not rely on any of these previous evaluations as a credible evidence base for decision making. More rigorous, comprehensive, and prudent analysis was still needed to generate persuasive conclusions - especially taking realistic cost scenarios into account. A documented, well-modeled, multi-method analysis accounting for contingencies may have led to quite different findings and recommendations.

The Failure of Evaluation: The Case of Lyon-Turin

The criticisms of the 2019 MIT study, even though flawed, could negatively impact future project appraisal in Italy. Analysts may feel pressure to use improper methods to avoid similar criticism. The evaluation process for the Lyon-Turin project has also raised concerns, as such an important project has not been evaluated in a transparent, consistent and well-documented manner.

Flawed or misleading criticisms of rigorous policy studies can undermine good evaluation practices by exerting pressure to use improper methods. Even though the article argues the MIT study was sound in its approaches, analysts in the future may feel compelled to alter their methods in insufficiently justified ways to avoid similar criticism - whether warranted or not. This could corrupt the evaluation process and reduce the quality of research to the detriment of good decision making.

The long evaluation process for the Lyon-Turin project itself has been problematic due to a lack of transparency, consistency, and documentation. For a project of this importance and expense, much higher standards of evaluation would be expected. The various studies

conducted seem to have fallen well short of this, calling into question why adequate evaluation has been so challenging over so many years.

This suggests a need to defend good practices against unfounded criticisms to avoid "methodological chilling effects", and also a need to determine why proper, comprehensive project appraisal has been so elusive here despite its importance. Reforms to evaluation procedures and oversight may be needed to address this second issue, ensuring key interests pay more than lip service to "evidence-based policy"

It appears the key concerns and takeaways being highlighted here relate to:

- The need to push back on flawed criticisms of rigorous studies to protect evaluation integrity
- Determining why proper appraisal has proven so hard here and if procedural reforms are required
- The Lyon-Turin project itself serving as a cautionary tale of how lacking transparency and realism threatens good governance
- Powerful interests gamely paying lip service to "evidence-based policy" but ignoring evidence that undermines predetermined positions.

In summary, the implications point to some hard questions around why good evaluation specifically and governance more broadly seem to be falling short in this case, and what can be done to address these fundamental issues - with "evidence" being more than a rhetorical device, and "evidence-based policy" meaning policy actually guided by sound evidence.

Exploring Future Research Avenues: Unraveling Paradoxes, Criticisms, and Ethical Concerns in Evaluation Studies and the Role of Methodological Rigor

The article identifies directions for future research, including examining other criticisms of the 2019 study, paradoxes in the results, differences with past evaluations, social and ethical issues in the evaluation process, and the marginalization of analysts who use proper methods.

Examining other criticisms of the 2019 MIT study evaluation and their validity. The article focused on two specific criticisms - determining if any others that have been made are better founded or similarly flawed could provide more complete perspective on the overall credibility of the study. (MIT, 2019)

Exploring paradoxes and inconsistencies in the results. No study or model is perfect, so identifying areas where the internal logic or results seem paradoxical could identify limitations or point to needed improvements in approach.

Comparing in more depth with past evaluations and why such different conclusions were reached. Reconciling or determining reasons for these differences could provide important

context. Previous sections noted lack of realism and documentation as issues - but a more targeted comparative analysis may pinpoint additional factors.

Evaluating the "social and ethical issues" in how the project evaluation process was carried out over so many years. This suggests examining how political, social and economic interests and pressures may have inappropriately influenced what was meant to be an objective, evidence-based process - and what could be done to safeguard against such dynamics.

Exploring the "marginalization of analysts who use proper methods". This hints at a "chilling effect" where researchers who rigorously apply valid but unpopular methods and get inconvenient results may face obstacles and deter others. But more analysis is needed to substantiate if and how this may have occurred here.

The implied conclusions are:

- Much remains unknown and uncertain here, pointing to the need for additional research.
- More perspectives on the MIT study are needed to fully judge its credibility and role.
- The long and twisting evaluation process itself demands closer scrutiny to determine how and why it went astray, and what reforms may be required.
- Questions around inappropriate influence and biases that may have undermined objectivity need to be answered.
- The treatment of researchers whose rigorous work leads to unfavorable conclusions requires consideration as an issue of integrity.

Overall, it appears the article sees this complex topic as ripe for considerably more examination and analysis to determine lessons that could inform improvements in governance and policymaking processes more broadly. With so many open questions and concerns remaining, additional study seems warranted to reach persuasive conclusions and recommendations.

In summary, the article finds that the evaluation process for the Lyon-Turin rail project has been problematic, but criticisms of the 2019 MIT CBA's methods were misguided. When done correctly, the Rule of Half and inclusion of taxation lead to consistent estimates of costs and benefits. The suggested "corrections" would introduce inconsistency and bias. More broadly, the debate around this project evaluation raises concerns for the practice of project appraisal.

2.2.2 Document review

2.2.2.1 Governance

2.2.2.1.1 Administration of the Company(Tunnel Euralpin Lyon Turin),Management Powers,Regulated Agreements

Tunnel Euralpin Lyon Turin S.A.S. (the "Company" or "TELT S.A.S." or "TELT") is a "Société par actions simplifiée" (SAS) under French law. TELT's registered office is located at 13 Allée du lac de Constance, Le Bourget du Lac, France, and its administrative office is located at Via Paolo Borsellino 17/B, Turin, Italy. The Company's share capital amounts to €1,000,000. It is divided into 2,000 shares with a par value of €500 each. The shares are held equally (1,000 shares each) by the Company's two shareholders, Ferrovie dello Stato SpA and the French State. The two shareholders jointly control TELT. TELT, founded on February 23, 2015, succeeded (following a transformation) Lyon Turin Ferrovaire (LTF) SAS, which was the company responsible for the initial studies and preliminary analyses related to the joint Franco-Italian section of the railroad. LTF was jointly owned by Rete Ferroviaria Italiana SpA and Réseau Ferré de France SAS. Following the Franco-Italian agreement dated January 30, 2012 for the construction and management of a new Turin-Lyon railroad line, and in accordance with TELT's revised by-laws dated February 23, 2015, TELT, as public promoter, aims to create and then manage the cross-border railway section between Saint- Jean-de-Maurienne in France and Susa-Bussoleno in Italy(Rapport Financier TELT,2021).

The Company's business model is based on the use of subsidies received by the States, in their capacity as government representatives, and by the European Union to finance the construction of the Turin-Lyon railroad line. At the close of the 2021 financial year, TELT had obtained commitment authorizations from the French State for a total of €6,625.53 million, of which €1,726.3 million financed by the French State, in line with the 2001-2020 program of studies and works approved by TELT's Board of Directors on December 12, 2019, for the new Lyon-Turin railroad line, and broken down as follows(Rapport Financier TELT,2021):

- 1,627.33 million under agreement no. 1 of July 11, 2005 for the construction and financing of the studies and preliminary work, and its fourteen amendments, including €410.4 million financed by the French government;

- 185.0 million under agreement no. 2 of the Italian State under chapter 7532 of the Ministry of Infrastructure and Sustainable Mobility (MIMS);

- With the 2021 and 2022 balance sheet law, the Italian State has financed a further €466 million, which will be used to finance Construction Lot 4 once the authorization process has been completed through a new CIPESS deliberation.

It should be noted that the overall amount of commitment authorizations approved by France and Italy cannot be equal, due to the different methods of financing public works between the two countries. The Franco-Italian Treaty of Turin of January 29, 2001 and its amendment signed on February 24, 2015, supplemented by the Franco-Italian Treaty of January 30, 2012 and the Grant Agreement signed on November 23, 2015 set out the terms and conditions of this financing. The grants from the three funding bodies (the European Union, the French State and the Italian State) have been acquired by TELT and are intended to finance the project in its entirety(Rapport Financier TELT,2021).

The additional costs incurred in the past were financed exclusively by one of the two countries, as they fell within its territorial jurisdiction. The total budget for the project is now €8.6 billion, of which €1.9 billion has been paid to date. This total budget is included in the financing programs of the three sponsors. Potential additional costs will be analyzed by the two States and financed by them. In compliance with the treaties, agreements and conventions concluded by the French and Italian States and the European Union TELT will continue to develop and operation of the cross-border section between Saint-Jean-de-Maurienne, France, and Suse-Bussoleno, Italy. Details of the line's operation are not yet known, and will be the subject of bi-national agreements(Rapport Financier TELT,2021).

Within the Company, a collegial body called the "Board of Directors" is set up to ensure the permanent control of the management of the Company under the conditions of these Articles of Association(TELT,2023).

The Board of Directors is composed of ten (10) members with voting rights (the "Directors"), including the Chairman and the Chief Executive Officer, who are members by right, and four (4) Directors appointed by each State and ratified by the Shareholders, for a renewable term of six (6) years. The Chairman is assisted by an employee of the Company (the "Secretary") chosen by the Chairman in agreement with the Chief Executive Officer, to act as secretary to the Board of Directors. The Secretary attends the meetings of the Board of Directors but does not take part in the debates or votes(TELT,2023).

The appointment of the Directors by the French and Italian States is made by written notification to the Company and ratified by decision of the Shareholders. Among the Directors, the French State appoints the Chairman and the Italian State appoints the Chief Executive Officer(TELT,2023).

Directors other than the Chairman and the Chief Executive Officer may be natural persons or legal entities. Directors who are legal entities are represented by their legal representatives or by any natural person duly appointed.Any Director, other than the President and the ChiefExecutive Officer, may be dismissed at any time, without cause or compensation, by decision of the State which appointed him or her, which may replace him or her, subject to informing the President and the Chief Executive Officer by registered letter with

acknowledgement of receipt, with a copy to the other State and to the Members. The revocation thus pronounced may take effect immediately(TELT,2023).

The European Commission may appoint a representative to sit on the Board of Directors as a non-voting member for a renewable term of six years. The Rhône-Alpes (France) and Piedmont (Italy) regions are authorized to participate in the meetings of the Board of Directors as observers without voting rights. For this purpose, each of them is invited to appoint a representative for the duration of the mandate of its executive and to inform the President by letter. In the event of the death of the representative, the region may appoint a new representative, if necessary, for the duration of the impediment(TELT,2023).

The Secretary shall inform the regions of the dates and agendas of regular and special meetings of the Board of Directors. The participation of the regions is allowed by the President only for the discussion of the part of the agenda that does not contain confidential matters such as the awarding of a contract(TELT,2023).

The Board of Directors meets when convened by the President, after consultation with the General Manager(TELT,2023):

- in so-called "ordinary" meetings: at least four (4) times a year and whenever the Agreement of January 30, 2012 requires the Board of Directors to take a decision, including cases where, pursuant to Article 7.5 of the Agreement and Article 11.3 (xi) of these By-laws, the President is requested to convene the Board by the General Manager,
- in so-called "special" meetings, as often as the interests of the Society require.

The Chairman and the Chief Executive Officer are responsible for the execution of decisions taken by the Board of Directors in accordance with their respective powers(TELT,2023).

The Board of Directors shall have sole authority to(TELT,2023):

1. To make decisions concerning the general and strategic policies and orientations of the Company, and in particular the legal, economic and financial structure of the project, in accordance with Appendix 2 of the January 30, 2002 Agreement ;

2. To approve the corporate financial statements, which are prepared and presented to it by the Chief Executive Officer prior to their submission to the Partners;
3. To approve the annual management report and the management forecasts prepared and presented to it by the General Manager;

4. To approve the bylaws of the Corporation and the bylaws of the Board of Directors;

5. Take note of the contract regulations validated by the Intergovernmental Commission for Lyon-Turin ;

6. Decide on the creation, transfer and closure of all branches, agencies, offices, secondary establishments ;

7. To give its prior authorization to the conclusion, modification or termination of the regulated agreements;

8. To authorize the constitution of guarantees on the Company's assets, the granting of endorsements, sureties or guarantees by the Company in an amount exceeding a threshold established by the ordinary general meeting;

9. To decide, by a majority of at least eight directors, on financial commitments and in particular the subscription of loans and bank commitments for an amount exceeding a threshold established by the ordinary general meeting;

10. To authorize the signature of contracts, amendments and transactions necessary to achieve the Company's corporate purpose;

11. Authorize the Director General to override the lack of opinion or the negative opinion of the Contracts Committee; such authorization shall be validly voted upon only if it receives a majority, from among the Directors appointed by the French State and from among the Directors appointed by theItalian State;

12. To authorize the purchase, sale or exchange of real estate, rights and goodwill in an amount exceeding a threshold set by the ordinary general meeting;

13. To vote on the budget of the Contracts Commission and the Permanent Control Service, on the proposal of their respective chairmen; these budget proposals may be rejected only if such rejection is approved by a majority of the Directors appointed by the French State and by a majority of the Directors appointed by the Italian State;

14. To authorize the Chairman of the Contract Committee to sign contracts necessary for the operation of the Contract Committee for amounts in excess of a threshold set by the Ordinary General Meeting; such authorization may be validly withheld only if such withholding is approved by a majority of the Directors appointed by

the French State on the one hand, and by a majority of the Directors appointed by the Italian State on the other;

15. To authorize the Chairman of the Permanent Control Department to sign contracts necessary for the operation of the Permanent Control Department in excess of a threshold set by the Ordinary Shareholders' Meeting; such authorization may be validly refused only if such refusal is approved by a majority of the Directors appointed by the French State and of the Directors appointed by theItalian State;

16. To decide on the remuneration of the Chairman and the Chief Executive Officer, on the proposal of the Remuneration Committee ;

17. To approve, on the proposal of the Chief Executive Officer, the content of the duties of the Chief Financial Officer and the General Counsel; in the event of non-approval by the Board of Directors, the Chief Executive Officer submits a new proposal.

18. To decide, in accordance with the Agreement of January 30, 2012, that a contract shall not stipulate a comproinissory clause for the benefit of the Arbitral Tribunal instituted by article 27 of the Agreement of January 30, 2012; this decision can only be taken if it obtains a majority, on the one hand, of the Directors appointed by the French State and, on the other hand, of the Directors appointed by theItalian State;

19. To determine the annual amount of expenses to be reimbursed to Directors on the basis of supporting documentation and to authorize any excess over this amount;

20. To decide on the dismissal of the Chairman under the conditions provided for in article 12.2 of these Articles of Association and to decide on the dismissal of the Chief Executive Officer, under the conditions provided for in article 13.3 of these Articles of Association; the decision to dismiss the Chairman or the Chief Executive Officer may only be taken if it is approved by a majority of the Directors appointed by the French State and by a majority of the Directors appointed by the Italian State;

21. As a last resort, decide on situations of conflict of interest or relationship of interest in the awarding of contracts of the Corporation, under the conditions provided for in the contract regulations.

When a member of the Board of Directors is concerned by a conflict of interest or a link of interest, he or she does not take part in the vote but may be heard; in order to ensure compliance with the principle of parity, the State whose Directors are not concerned shall designate from among them the one who will not take part in the vote(TELT,2023).

The President ;

The "President" is appointed by the French State. The President is appointed for a renewable term of 6 (six) years. The functions of the President must be held by a natural person. The French State may terminate his functions at any time without notice or compensation and without the need for just cause(TELT,2023).

The President of the Company is ex officio a member and Chairman of the Board of Directors of the Company. He ensures the proper functioning of the Company's bodies. After consultation with the Chief Executive Officer, he convenes the Board of Directors and its meetings. In accordance with the law, the Chairman represents the Company with respect to third parties. He has the necessary powers, including the power of legal representation, to act in all circumstances on behalf of the Company within the limits of the corporate purpose, subject to the powers that the law and these Articles of Association confer on the Members, the Board of Directors and the Chief Executive Officer(TELT,2023).

In the event of the permanent impediment, resignation or dismissal of the President of the Company, the French State appoints a new President of the Company for the remainder of his predecessor's term. In the event of temporary impediment, the French State shall appoint a new Chairman and determine the duration of his term of office. Pending the decision of the French State, the duties of the President shall be performed by the most senior Director among those appointed by the French State. The Chairman is not an employee of the Company but receives remuneration from it for his duties, the terms of which are decided by the Board of Directors, in accordance with the conditions set out. The President may be dismissed for serious reasons by a decision of the Board of Directors taken under the conditions of articles. In this case, the President is heard by the Board of Directors, but does not take part in the vote(TELT,2023).

The General Manager ;

The company is managed and administered by a single managing director,appointed by the Italian State for a renewable term of six years(TELT,2023).

The Chief Executive Officer is an ex officio member of the Board of Directors. The functions of the General Manager must be held by a natural person. The Italian State may terminate the position at any time without notice or compensation and without the need for just cause(TELT,2023).

Subject to the powers of the General Meeting of Shareholders, the Board of Directors and the Chairman, the Chief Executive Officer is responsible for the management of the Company(TELT,2023).

In this capacity, and under this reserve, it ensures in particular:

- The preparation of the budget and its execution report a s well as the economic and financial management of the Company;
- The preparation and adaptation of the Company's strategy;
- The preparation, awarding, conclusion and monitoring of the execution of contracts, in particular those necessary for the design, construction and operation of the cross-border section defined in the Agreement of January 30, 2012, and for the operation of the historic Fréjus line;
- the organization and monitoring of the studies, projects and works necessary for the realization of the new line project;
- the management of the Company's headquarters and establishments, as well as its construction sites and worksites.

The Chief Executive Officer has the power to represent the Company with respect to third parties, including the power to represent it in court, in order to act in the name and on behalf of the Company within the framework of the management powers attributed to him personally and directly by these Articles of Association, or delegated to him by the Chairman or the Board of Directors. In the event of the permanent impediment, resignation or dismissal of the Chief Executive Officer of the Company, a new Chief Executive Officer is appointed by the Italian State for the remaining period of his predecessor's term(TELT,2023).

The General Manager performs his duties from the operational management based in Turin. The Chief Executive Officer is not an employee of the Company, but receives compensation from the Company for his or her duties, the terms of which are decided by the Board of Directors(TELT,2023).

The Chief Executive Officer is assisted by an Administrative and Financial Director, appointed by the Italian State, and by a Legal Director, appointed by the French State, who have neither the status nor the title of Chief Executive Officer nor Deputy Chief Executive Officer.The duties of the Chief Financial Officer and the General Counsel are proposed by the Chief Executive Officer and approved by the Board of Directors. In the event of non-approval by the Board of Directors, the General Manager submits a new proposal to the Board(TELT,2023).

The Chief Executive Officer may be removed from office for cause by a decision of the Board of Directors taken under the conditions provided by laws. In this case, the General

Manager is heard by the Board of Directors, but does not take part in the vote(TELT,2023).

Contract Commision ;

In accordance with the January 30, 2012 Agreement, a Contracts Committee shall be established within the Corporation to ensure compliance with the principles set on January 30, 2012 Agreement and your requirements for the selection of the most economically advantageous bid and for financial rigor in the execution of contracts. The Contracts Committee is competent only for contracts for services, works and supplies whose conclusion is subject to a public procurement procedure and formalized competition pursuant to Directive 2004/17/EC or any subsequent text having the same purpose(TELT,2023).

In carrying out its duties, the Contracts Committee takes into account the reasoned proposals submitted to it by the Chief Executive Officer, as well as the analyses of its departments, and in particular the opinion of the General Counsel. In this sense, the Contracts Committee performs, within the limits of its powers, an external control function within the Company. Depending on the importance and the stakes of the contract submitted for its review, and when it considers that the information presented to it is sufficient, the Contracts Committee may, in a reasoned decision, decide not to give an opinion(TELT,2023).

The Contracts Committee is composed of independent experts recognized for their competence in the technical, legal, economic and financial aspects of the awarding and execution ofthe aforementioned contracts entered into by the Corporation. These experts may not be members of the Board of Directors. The Contracts Committee shall consist of 12 members, half of whom shall be appointed by each State for a renewable term of five years. The Chairman of the Contracts Committee is appointed by the French State(TELT,2023).

The Contracts Committee shall not validly deliberate unless half of its members are present or represented. Its opinions, recommendations, reports and other acts of the Contracts Committee shall be adopted by a simple majority; in the event of a tie, the Chairman shall have the casting vote(TELT,2023).

The General Manager shall send to the Contracts Committee all applications and tenders submitted by the economic operators, together with a report on their contents and the analyses of his departments, including the legal analysis approved by the General Counsel. The Contracts Committee shall give an opinion prior to any decision relating to the applications and tenders of economic operators, to the unsuccessfulness of the procedure, to the declaration of no further action or, more generally, to the possible

interruption of the procedure and to the final choice of the successful tenderer. In particular, it checks the validity of the elimination of applications and offers as well as the relevance of the analyses and proposals of the General Manager concerning the offers. The Contracts Committee shall monitor the content of the negotiations conducted under the authority of the Director General; it shall receive regular reports from the Director General by any means. By decision of the Chairman of the Contracts Committee, all or some of the members of the Contracts Committee may be involved in contract negotiations or competitive dialogues prior to contract award. The Contract Commission may make recommendations on the conduct of negotiations.During the performance of contracts, the General Manager shall refer to the Contracts Committee any claim or request for modification emanating from the holders of contracts entered into by the Corporation, any draft amendment, any draft general and final statement of account or equivalent document, and any draft transaction with the holders of contracts entered into by the Corporation, accompanied by the analyses of its departments, and in particular the legal analysis, approved by the General Counsel(TELT,2023).

Within the Contracts Committee, an evaluation committee (the The "Evaluation Committee" is responsible for preliminary investigation of the final offers received, which is carried out prior to the opinion given by the Contracts Committee, when the latter decides to give an opinion. This work is based on the reasoned proposals of the Director General and on the analyses of his departments, in particular the legal analysis, approved by the General Counsel. The Evaluation Committee's task, after examining the final bids submitted by the competitors, is to submit a technical report to the plenary session of the Contracts Committee in which it formulates aproposed opinion on theaward of the contract. The Evaluation Committee shall consist of 6(six) members appointed after receipt of the final bids of the competitors by the Chairman of the Contracts Committee, who shall make his choice from among the members of the Contracts Committee, in equal composition between the two States, giving reasons for his choice on the basis of the professional and specialist competence of the experts concerned. The chairperson of the Evaluation Committee is appointed by the chairperson of the Contract Committee and has a casting vote in the event of a tie(TELT,2023).

Permanent control service ;

The Permanent Control Service shall ensure that public funds are used properly, that the Company's economic, financial and technical efficiency is maintained, that the new line project is properly executed and, more generally, that the Company operates properly, in compliance with the January 30, 2012 Agreement. The Permanent Control Department is made up of experts in the fields concerned by the Company's activities. As members of the Permanent Control Department, they do not receive any remuneration from the Company. However, they are reimbursed by the Company for expenses incurred in the performance of their duties, subject to supporting documentation. Each State shall notify

the other State of the name of each member of the Permanent Control Service it intends to designate, which shall then have a period of 15 days to make its decision known. In the absence of any objection within this period, the other State shall be deemed to have approved the appointment. The challenge of a member must be justified and motivated in writing. In the event of a challenge, the State concerned must nominate another candidate, who may not be challenged again. The President of the Permanent Control Service is appointed by the French State(TELT,2023).
The Permanent Control Department issues reports and alerts on all aspects of the Company's project execution. It has the widest powers of investigation, both on documents and on site. Where necessary, it makes reasoned recommendations for improving theCompany's efficiency. The Permanent Control Service may be seized by the Board of Directors, including at the request of the representative of the European Commission attending its meetings, one of the States, the Director General or the Chairman of the Contracts Committee. It may also deal with any matter that it deems useful for the performance of its mission. The reports and warning notes of the Permanent Control Service shall be forwarded immediately to the referring authority and to the States. The Director General shall ensure, under the supervision of the States, that the Permanent Control Service has sufficient material and financial resources to enable it to function properly. To this end, the Chairman of the Permanent Control Service shall propose an annual budget to the Board of Directors. The Permanent Control Service may, within its budget, call upon experts of its choice to carry out specific studies and, more generally, to assist it in its mission and in the preparation of the reports that it must submit. The President of the Permanent Control Service alone has the resources allocated to the Service to enable it to accomplish its mission. The Chairman of the Permanent Control Department reports periodically on the use of the Department's resources to the States, the Board of Directors and the Chief Executive Officer, as well as to the Company's other supervisory authorities, as appropriate(TELT,2023).

Collective decisions of the partners ;

The decisions of the Members are adopted by unanimity of the Members. The Members are solely competent to take the following decisions(TELT,2023):

- Modification of the statutes;
- Modification of the share capital;
- Appointment of auditors;
- Approval of the annual accounts and appropriation of the results;
- Ratification and approval of the regulated agreements referred to in Article 15;
- Transformation of the Company and more generally all operations having the effect of increasing the commitments of the Members;

- Mergers, demergers or partial contributions of assets subject to the regime for demergers;
- Determination of the maximum amount of guarantees on corporate assets, endorsements, sureties or guarantees of the Company that the Board of Directors may authorize the Chief Executive Officer to subscribe;
- Determination of the maximum amount of subscriptions to loans or bank commitments that the Board of Directors may authorize the Chief Executive Officer to subscribe;
- Dissolution and liquidation.

The General Assembly is composed of the Members. Each Member is represented either by its legal representative or by a representative that it is obliged to designate as its substitute. Each associate has one vote per share held. The Chairman and the Chief Executive Officer attend the General Meeting without taking part in the vote insofar as they are not partners of the Company. The meeting is chaired by the President or, in his absence, by any person designated for this purpose by the Members. Any collective decision of the Members taken in a General Meeting is recorded in a report drawn up and signed by the Chairman(TELT,2023).

Annual reports ;

At the end of each financial year, the General Manager draws up the inventory and the annual accounts, and then draws up the management report, which are made available to the auditors and the works council, if any. They are made available to the auditors and to the works council if there is one, at least 15 (fifteen) days before the meeting of the General Meeting of Shareholders which decides on the accounts. A statement of sureties, endorsements and guarantees given by the Company and a statement of securities granted by the Company are attached to the balance sheet. All these documents are sent or communicated to the Members as mentioned above. They are drawn up each year, in the same form and using the same valuation methods, subject to changes in the regulatory context applicable to the company(TELT,2023).

History of governance and conflicts;

The development of the Lyon-Turin high-speed railway, known as LT, exhibits several key characteristics. Firstly, it involves a diverse range of stakeholders with different interests and approaches, who operate within an uncertain and conflict-prone environment.With the ratification of the Maastricht Treaty in 1992, the European Union (EU) introduced the Trans-European Transport Network (TEN-T) as a policy designed to facilitate the establishment and expansion of a comprehensive transportation network across Europe. The primary goal of this network was to address existing disparities, eliminate congestion points, and dismantle obstacles that impede the smooth flow of people and goods within EU member

states.One of the proposed infrastructure projects was a 270 km high-speed railway line connecting Lyon and Turin. This ambitious plan required the construction of a 57 km tunnel through the Alps, connecting the Susa Valley in Italy with Maurienne in France. Lyon Turin Ferroviaire, an international joint venture consisting of SNCF Réseau in France and Rete Ferroviaria Italiana (RFI) in Italy was tasked with overseeing the actual construction of the tunnel.These companies are subsidiaries of the two state-owned holding companies: Societe Nationale des Chemins de Fer Français (SNCF/France) and Ferrovie dello Stato (FS/Italy)(Esposito et al.,2021).

After nearly 30 years since its announcement, the high-speed train line remains unfinished, surpassing the original cost estimate of 12€ billion and reaching 26€ billion according to the French Court of Audit in 2012. The projected completion date has been continuously postponed, and the most recent estimate now suggests a completion in 2030. The primary cause of the substantial delays in this large-scale project can be attributed to construction interruptions resulting from opposition by civil society groups in the Susa Valley. Conversely, the construction process on the French side of the project has faced fewer conflicts, and citizen opposition has not caused any significant halts(Esposito et al.,2021).

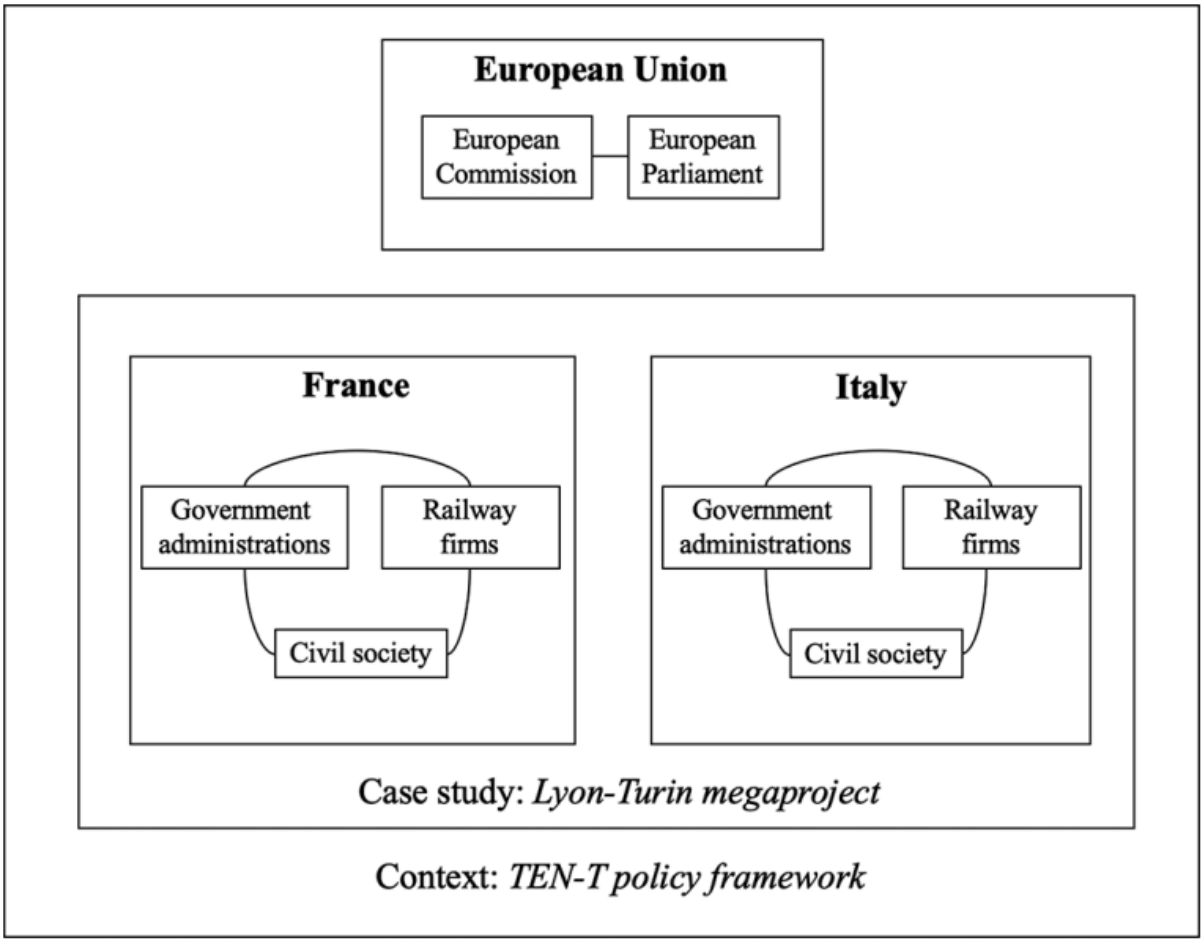

Figure 17 : Case study design of Lyon-Turin megaproject(Esposito et al.,2021)

The selection of this particular case becomes even more intriguing due to the fact that the Lyon-Turin high-speed railway project has been implemented in Italy and France, each operating under different participatory governance systems. In France, the project's governance is structured around a standard administrative procedure known as the Public Inquiry, which anticipates social conflict. This procedure requires the national railway company to engage in public consultations with local citizens and civil society organizations during the decision-making process of the project.In contrast, the participatory approach in Italy followed a path marked by social conflict. Initially, the plan involved a streamlined procedure that allowed the national government to approve the project and its associated works without any obligation to consult local citizens. However, this approval was met with concerns and opposition from various citizen groups in the Susa Valley near Turin, including environmental activists, local railway experts, and university professors. They organized a protest campaign known as NOTAV (No Treno ad Alta Velocità, No High-Speed Train).In response to this opposition in 2006, the Italian government established the Observatory for the Turin-Lyon Railway. The primary objective of the Observatory is to conduct public consultations with local opposition groups in order to proceed with the planned operations of the project(Esposito et al.,2021).

The European Union (EU) employs conventional legislation and quasi-market mechanisms to delineate construction responsibilities and timelines for the Lyon-Turin project in Italy and France.In 1994, the European Commission submitted a legislative proposal to the European Parliament and the Council of the EU, outlining the future blueprint for the trans-European transport network. Following administrative deliberation, it gained approval in 1996. The endorsed text included investment guidelines spanning a 15-year period, allocating €1.8 billion to EU member states for the realization of a series of infrastructure megaprojects, including the Lyon-Turin undertaking, regarded as the network's fundamental components.The legal provisions within the text established a system of issuing calls for proposals. As an EU policy officer explains, this system allowed the European Commission to break down the megaprojects into smaller sub-projects consisting of intermediate-level tasks, which were to be accomplished in several 1- to 5-year phases. The call for proposals defined a specific timeframe, including a deadline by which European firms were obliged to submit comprehensive documentation. Through this documentation, firms provided an elaborate account of deliverables and a detailed implementation schedule for the upcoming 1 to 5 years(Esposito et al.,2021).

The European Commission assessed the submitted documentation, determining whether the proposed actions aligned with the project's mid- and long-term objectives. If deemed consistent, selected firms became eligible for available funding. The funding allocation followed a two-step process. Firstly, the Commission invited the firms to sign a grant

agreement, earmarking the allocated funds. This agreement stipulated the objectives that beneficiaries were expected to accomplish within the funding period. Secondly, the Commission and the firms jointly devised a strategic action plan, specifying discrete tasks and their respective timelines. This action plan served as a means to monitor progress against the initially planned tasks and provided EU decision-makers with relevant information in case of deviations from the plan, as indicated by an interview with a policy officer from the European Parliament(Esposito et al.,2021).

The governments of Italy and France sign a number of international agreements to incorporate and regularize EU construction tasks and deadlines into the daily operations of their national public administrations and railroad companies. The governments of Italy and France sign many agreements establishing the building of Lyon-Turin throughout the 1990s. The employees of the French and Italian public administrations are required by treaty obligations to work with relevant national ministries as well as EU-level agencies. According to Article 1 of the Lyon-Turin Treaty from 1991, national governments are particularly required to work together on "the construction of the international Montmelian-Turin section of the high-speed rail link between Lyon and Turin."(Esposito et al.,2021).

An additional convention, the Lyon-Turin convention of 2001, Article 6b, instructs the national railroad companies to form an international joint venture to carry out "the conduct of the preliminary studies and of the geological reconnaissance tunneling work." End of 2001 brings the formation of the joint venture. The same year, Lyon-Turin is included in a list of crucial infrastructure projects that must be finished by 2013 under the Legge Obiettivo (also known as the "Target Law"), which is passed by the Italian Parliament. The law establishes a fast-track process for approving such infrastructure projects, directing administrative authorities to do so without having to engage local residents(Esposito et al.,2021).

EU's construction tasks and deadlines are facilitated by national public administrations and railway firms through various administrative procedures, some of which may involve civil society participation to a varying extent. In the 2000s, after issuing several calls for proposals, the EU executive agency and the joint venture firm enter into multiple grant agreements. These agreements allocate funds specifically for carrying out geological reconnaissance tunneling before 2014, when the actual excavation of the tunnel is scheduled to commence. However, before these agreements can be put into action, formal authorizations are needed according to national legal systems in order to initiate the work(Esposito et al.,2021).

In France the authorization for the project was obtained in 2003 through a standard administrative procedure known as Enquête Publique or Public Inquiry. This procedure required the national division of the joint venture to engage in public consultations with concerned local citizens and civil society organizations. Simultaneously, an independent administrative authority called the Commission d'Enquête Publique or Public Inquiry

Committee was established. The committee's role was to consult with citizens and civil society, gather their opinions about the project, and prepare a report for the government, indicating whether or not they recommended authorizing the project.During this consultation process, a citizen group from a small municipality expressed their opposition to potential environmental impacts associated with the project. They specifically raised concerns about pollution of local water sources and risks related to the storage and disposal of excavation material. As a result, a civil servant from France stated, "The opposition of Villarodin-Le Bourget compelled us to conduct a new public inquiry in this municipality. We had to clarify the environmental impacts of the project in this area. Subsequently, a new prefectural order was approved to complement and finalize the previously approved decree of public utility."In parallel, with the support of state-level and local administrations, the French division of the joint venture company disseminated informative brochures containing technical details about the local impact of the project. They also organized local information events to address the concerns and questions of residents. These efforts played a role in convincing local stakeholders of the merits of the project, leading to the completion of preliminary work in 2010(Esposito et al.,2021).

The Public Inquiry procedure can be characterized as a non-binding consultation process regarding the final governmental decision. Spanning a period of two months, the LT case consultation covered various aspects. These included discussions on the nature of the future railway line, specifically whether it should prioritize freight or passenger transportation (Coordinator of local opposition groups in France). Additionally, topics such as employment, noise, and water pollution were debated, with the assurance from railway company managers that they had plans in place to address these issues (Local politician interested in the project). However, according to interviewees, citizens had limited access to the necessary information required to adequately express their opinions and potentially influence decisions. This is exemplified by the statement of a municipal mayor who expressed dissatisfaction with the 2012 public inquiry process, stating that it felt rushed and lacked the comprehensive information needed. The available files at the town hall contained numbers and map updates, but they were difficult to comprehend. The mayor further characterized the consultation process as manipulative, following predetermined decision-making pathways (Mayor of a municipality concerned by the project)(Esposito,2023).

During the 2012 Public Inquiry, Daniel Ibanez became aware that the traffic data presented by the railway company's project managers were manipulated to convince local residents of the project's worthiness. He discovered that "the project promoters showed us graphs indicating increasing transport flows from France, Switzerland, and Austria to Italy, which supposedly justified the need for a new tunnel. However, when we analyzed the same data in detail, we found that while flows from Switzerland and Austria were indeed increasing, flows from France had significantly decreased since 1988" (Daniel Ibanez,spokesperson of lcoal opposition groups in France). Ibanez believed that distorting the data was a tactic

employed by public administration experts to provide technical justification for the project construction. Manipulating technical knowledge proved to be an effective strategy in garnering initial support from local residents. As the coordinator of a local opposition group explained, "the construction of the project would have resulted in a loss of the quality of life in our villages. People understood this from the beginning, but the project promoters assured the local population that they would protect them—and they used several comprehensive studies to support their claims—so we trusted them" (Coordinator of local opposition groups in France).

The participation of Ibanez in the 2012 Public Inquiry introduced new expertise to the opponents of the project, enabling them to effectively address the strategic misrepresentation of data by the project proponents. Ibanez's knowledge became a valuable resource for the opposition. According to his statement, "I made my analyses and reflections available through Alpinfo, a highly respected source for data on transportation in the Alpine region. It provides detailed information on transit transport between Switzerland, Austria, France, and Italy, both by road and rail" (Daniel Ibanez). By analyzing the individual traffic patterns between these countries and Italy, Ibanez was able to demonstrate a significant decrease in freight tonnage between France and Italy in the Northern Alps. Consequently, he was able to make valuable observations regarding the changes in tonnage over the past 15 to 20 years (Esposito,2023).

In contrast to France, Italy's Target Law ruled that it was not required by law to consult with the public or the civil society prior to approving Lyon-Turin. "The Target Law introduces a fast-lane authorization procedure," a civil official from Italy noted. The central government administrations control all crucial decision-making stages, including planning, localization, and environmental impact assessment (interview with a regional administration employee). Within this framework, the preparatory work was approved in 2003 by the Italian ministries seated in the CIPE (ComitatoInterministeriale per la Programmazione Economica, or Inter-ministerial Committee for Economic Planning) through a majority vote without the participation of the local voice.Several citizen groups in the Susa Valley (near Turin), including environmentalists, local railway experts, doctors, and university professors, expressed concern and opposed to CIPE license. Three main factors formed the basis of their opposition: (1) the new high-speed line's lack of utility given the decline in traffic between Italy and France; (2) public health worries regarding the presence of uranium and asbestos in the mountains to be bored; and (3) environmental worries due to the destruction of local ecosystems during the tunneling work.According to an interview with a public official of the Italian central State administration, these elements came from a number ofcounterstudies produced by opponents that were detailed "in a pamphlet reporting nearly one hundred argument points against the Turin-Lyon project." A member of the opposition claims, "We are able to do technical, medical, and even geological research. We have outfitted ourselves to evaluate all aspects of the project. Above all, wetook into accountall of the project

proponents' paperwork. Our arguments against the infrastructure project are based on these materials, according to a Presidio Europa protester in an interview (Esposito et al.,2021).

According to local experts, making a decision on the construction of such an expensive infrastructure based on traffic forecast models with unclear assumptions was not justifiable. They believed that the actual transportation situation should be assessed using existing historical data. In a pamphlet published by the NOTAV movement, which outlined 150 reasons against the Lyon-Turin high-speed line, it was stated that the project was an example of a wasteful megaproject because the traffic data since 2000 indicated a significant decrease in road and rail traffic between Italy and France (NOTAV movement, 2012). The historical data presented in the pamphlet revealed that rail freight traffic between the two countries had dropped from 10.1 million tons in 1998 to 3.7 million tons in 2012. In terms of environmental impact, proponents of the LT project argued that it would reduce pollution emissions by shifting a portion of freight and passenger traffic from highways to electrically powered rail lines. However, these proponents seemed to overlook the energy and environmental impact of the construction operations. The pamphlet highlighted that the construction would involve excavating 42.5 million cubic meters of material using large milling machines powered by electric motors, as well as breaking millions of cubic meters of rocks and mixing them with 15 million cubic meters of cement (NOTAV movement, 2012).

When the joint venture company delivers letters of expropriation to acquire local lands and establishes the construction site to begin work in 2004, the townspeople launch a protest movement known as NOTAV (No Treno ad Alta Velocita, tr. No High-Speed Train). The police respond by expelling the NOTAV protesters after they occupy the building site to block the work. After seeing pictures of this police operation in the media, 30,000 people gather outside the construction site and retake it with the same anti-government objectives in a few of days(Esposito et al.,2021).

In opposition to the Nazi and Fascist armies invading Italy during World War II, protesters sing Bella Ciao, an anti-fascist anthem in Italian.The joint venture company was viewed as an invader that was unjustly grabbing the local lands, and this was made very plain to the authorities. Therefore, it must be resisted and battled no matter what.NOTAV activists stated to the media, "We are willing to spend our holidays on this particular piece of land. We represent the forefront of the valley's resistance against the high-speed project. We are the guardians here, ensuring that no one dares to resume the work." (Newspaper article "Alta velocità stop ai carotaggi nel sito di Seghino. I residenti: a Natale staremo di vedetta, La Stampa, December 19th, 2005).

The upheaval caused by these events and the resolute stance of local opponents compel the government to accede to the demands of NOTAV. By the conclusion of 2005, the construction work is halted, and in 2006, public consultations are initiated involving

representatives from the government and the joint venture. These consultations persist for a period of six years. The central government set up the Observatory as an extraordinary participatory venue to deal with local protests against the high-speed railway(Esposito,2023).

The arrangement and composition of the Observatory mirrored the hierarchical structure imposed by the central government. By means of a decree issued by the Prime Minister, it was mandated that the Observatory be overseen by a government commissioner. The membership of the Observatory consisted of experts possessing technical expertise, appointed by relevant public administrations at both the central level (such as ministries of environment, infrastructure, interior, transport, and health) and local levels (including the Piedmont Region, Province of Turin, Municipality of Turin, and Susa Valley federation). Additionally, the Observatory included experts designated by the manager of the Italian railway company and the international joint venture. However, it should be noted that these experts were not impartial, as their role involved advocating for and advancing the interests of the parties they represented. As elucidated by a technical expert, the selection of an expert profile depended on the stance of the municipality: "Municipalities in support of the project may prioritize experts with expertise in economic and financial matters to emphasize the economic benefits generated by the project's construction. On the other hand, municipalities opposing the project would opt for profiles that highlight the environmental risks associated with it" (Interview with Technical expert representing the local administration of the Susa Valley in the Observatory(Esposito,2023).

Within the Observatory, experts were primarily expected to express their preference for one railway route option over another. According to a technical expert, "Starting from March 2006, the previous project was abandoned, and we started from scratch. In all the meetings that took place, different route alternatives were discussed" (Technical expert). The Observatory served as a platform where the administrations had to convene and deliberate on the new high-speed line, considering all possible alternatives. They had to address questions such as whether to proceed with the project, and if so, how to proceed and which approach to take (Mayor of Susa Valley's municipality). Due to the decline in traffic between Italy and France, it was also important to consider the "zero option," which involved not undertaking the project at all (Mayor of Susa Valley's municipality). However, while the zero option was initially discussed during the early meetings of the Observatory, it was eventually excluded based on a cost-benefit analysis (Public officer of the Piedmont region). This shifted the focus of the debate from whether to build the new rail line to how to build it. As a result, the main point of contention became whether the new line should pass on the right or left side of the Dora River (Technical expert)(Esposito,2023).

The experts consulted within the Observatory provided their preferences regarding the railway project, but their input did not have any binding influence on the final governmental decision. The Observatory operated alongside the "political" table, with the latter providing

guidance on the infrastructure's development. According to an advisor of the Chairman of the Observatory, the political table consisted of representatives from national and subnational governments, as well as the railway companies overseeing the project. It served as the intermediary between the project promoters and the technical experts of the Observatory (Advisor of the Chairman of the Observatory). The technical work of the Observatory was constantly reported to the political table to ensure compatibility with the political macro-orientations. In reality, the Observatory had no impact on the decision-making process of the project, nor was it intended to have such influence (Advisor of the Chairman of the Observatory).

The ineffectiveness of the Observatory in project decision-making became evident in the late 2000s when local consultations progressed slowly, and reports from the European Commission highlighted implementation delays. The European Commission even contemplated the possibility of reallocating financial support from delayed projects to those performing well (European Commission, Final evaluation of the TEN-T Multi Annual Indicative Program, 2007: 36). Under the financial pressure exerted by the EU, the Chairman of the Observatory issued a document in 2008, known as the "Pracatinat Agreement," instructing the technical experts to cease debating the project's feasibility and focus on its implementation. However, many local experts opposed this directive, as they believed the LT project was technically unnecessary. They argued that the data did not support the construction of a new railway line, as there was no significant increase in traffic between Italy and France. Despite the opposition, the central government publicly threatened to expel local experts from the Observatory in 2010 if they did not endorse the project's implementation. The government insisted that the municipalities represented in the Observatory needed to be redefined and explicitly declare their commitment to participating in the infrastructure's realization, aligning with the European agenda (Italian government, press release, 8 January 2010).

The European Union regularly monitors the progress of the Lyon-Turin project and takes action by imposing financial penalties and conditions on both firms and public administrations in cases where construction tasks and deadlines are not met.

The European Commission employs various reporting tools to oversee and evaluate the timely completion of tasks outlined in the strategic action plan by firms. Firstly, the action status report is utilized to gather annual data on the number of tasks accomplished by firms, enabling the measurement and monitoring of their yearly performance on an individual basis. Secondly, mid-term reviews are conducted to assess the effective execution of planned mid-term tasks by firms receiving funding from the TEN-T program. This review process involves two key stages: a) the consolidation of annual data extracted from action status reports, followed by b) an examination for any deviations from the mid-term objectives specified in the strategic action plan. The outcome of the mid-term review determines the

classification of a firm's performance as effective, ineffective, or under-effective. Firms categorized as effective continue to receive funding, while under-effective or ineffective firms face partial or complete funding cancellation, respectively. One EU-level officer refers to this approach as the "use-it-or-lose-it rule" (Interview with a project manager from the European Commission's executive agency). However, before implementing this rule, the European Commission employs moral suasion, conducting regular meetings with national governments and stakeholders to discuss project implementation. These meetings are often chaired by the European Coordinator, who, due to their personality, charisma, and reputation, helps foster productive dialogues with governments and stakeholders, aiming to address implementation obstacles (Interview with a program manager from the European Commission's executive agency). Another EU-level officer emphasizes the political role of the European Coordinator, highlighting that although they possess no special powers, their reputation, personality, experience, and ability to engage with high-level national politics, particularly at the government level, can facilitate the implementation of projects. The European Coordinator effectively plays a political role by urging governments to take action, stating, "Look, it's really time now! Move on!" (Interview with a policy officer from the European Commission)(Esposito et al.,2021).

Several reports by the European Commission in the Lyon-Turin case point to implementation delays on the project's Italian side in 2007. According to the European Coordinator (2007: 6), they are concerned about "the delicate situation in the Susa Valley and its potential impact on the project timetable." One of the funded projects that is not performing well and is experiencing significant delays is Lyon-Turin, according to a 2007 report. The possibility of "redistributing support from projects that were delayed to those that were performing well" is thus envisaged (European Commission, 2007).

Local civil society strategically engages with the European Union's policing efforts and aims to impede and halt construction activities in order to disrupt the benefits associated with the Lyon-Turin project by provoking financial penalties linked to construction delays.In 2011, the Italian government issues a press statement indicating that if local activists wish to continue participating in public consultations, they must explicitly express their endorsement of the overall megaproject. However, representatives from the NOTAV movement decline to comply, terminate the consultations, and persist with their protest campaign.With the government's backing, the collaborative enterprise recommences construction operations. In response, the activists once again occupy the construction site with the intention of causing additional implementation delays that could prompt the European Commission to impose further financial reductions. One activist from the Presidio Europa group asserts, "There are numerous other projects across Europe that are progressing more effectively than Lyon-Turin. If Italy is incapable of utilizing these funds, they should be allocated to other projects in different member states. This aligns with the use-it-or-lose-it principle. They have already lost a significant amount of money in the past. We do not

require this funding. Let us allocate it entirely to someone else!" (Interview with an activist from the Presidio Europa group)(Espasito et al.,2021).

In response, the government enacts legislation ordering the Italian army to move out project occupants who disagree with it. The law permits the army to occupy the construction site to stop subsequent occupations that would endanger EU-level funding and postpone the execution of the megaproject. The company continues the preliminary work in 2011 and completes it in 2017 under the State's military protection(Espasito et al.,2021).

However, the protest movement goes on. As a result, the Ministry of Infrastructure and Transport decides to halt tunnel construction in 2018 and assigns a group of impartial specialists to conduct a cost-benefit study. The investigation's findings are made public in February 2019 and show a poor return on investment.The group of experts has experienced a division. Out of the six members, only five agreed to endorse the analysis. However, one member declined to sign and presented the ministry with an alternative analysis. (Press article "The costs outweigh the benefits by an amount ranging from 7 to 8 billion," La Stampa, February 13th, 2019).

The progress of the large-scale project in Italy has reached a stalemate. Consequently, the government defers the decision to the parliament, which subsequently passes a resolution affirming the strategic significance of the megaproject and committing the government to undertake all required measures to facilitate the swift construction of Turin-Lyon. (Press release from the public session No. 144 of the Italian Senate, August 7th, 2019). As of 2019, construction activities on both ends of the megaproject have not resumed(Espasito et al.,2021).

Table 4 : National configurations of participatory governance(Esposito,2023)

			France	Italy
Structure	Setting up of the participatory venue		Ordinary routinized administrative procedure	State-led extraordinary procedure to deal with the local opposition movement
	Representation and involvement		(a)"Independent" experts appointed by an administrative tribunal, (b) individual citizens, (c) civil society organizations, (d) national administrations, and (e) railway company	"Trusted" experts appointed by (a) national and local government administrations and (b) railway company
	Information flows		Opinions	Preferences
	Influence over decisions		Consultations with difficult Access to public information	Consultations under the political control of national authorities and the financial pressure of supra-national authorities
Agency	Dissemination of evidence	Proponents	Quantifed evidence disseminated through technical reports and public meetings with local actors	Quantifed evidence disseminated through promotional activities and no involvement of local actors
		Opponents	Intra-institutional contestation of quantifed evidence	Extra-institutional contestation of quantifed evidence
	Collection of information	Proponents	Strategic misrepresentation of transport fows through data aggregation	Strategic misrepresentation of transport fows through forecasting assumptions
		Opponents	Representing traffc fows through alternative descriptions of existing data	Representing traffc fows through historical data and juxtaposing them with economic and environmental data

2.2.2.2 BCA and feasibilty

Making choices regarding investments plays a crucial role in shaping a development strategy. Specifically, allocating resources towards infrastructure development is highly regarded as a valuable approach, as the presence of physical capital assets greatly impacts an economy's potential for growth. The effectiveness of infrastructure systems significantly affects the productivity of the overall economic system, influences business location choices, and directly impacts the lives of citizens. Consequently, they hold immense significance, particularly when considering medium- to long-term outcomes, and can also provide short-term benefits for countercyclical measures.More specifically, the evaluation of investment decisions pertaining to the implementation of transportation infrastructure projects assumes pivotal importance, as they serve as vital links connecting people, businesses, and resources. Additionally, these projects mirror and bolster the economic activities of households, individuals, and companies. Consequently, any alteration in the transportation system has far-reaching consequences on the economic development of the area, influencing aspects such as income levels, employment opportunities, and overall competitiveness. The relationship between infrastructure and growth is undeniably positive, although the strength of this correlation depends greatly on the strategic allocation of resources(Caruso et al.,2019).

The Bank of Italy has highlighted that Italy's infrastructure deficit compared to its main European counterparts is not primarily due to the level of public investment expenditure, which is on par with the average of other European countries in relation to GDP. Instead, the gap is primarily attributed to deficiencies in the selection, planning, and evaluation processes of infrastructure projects. In Italy, there exists an efficiency issue primarily stemming from design, regulatory challenges (particularly regarding coordination between different government levels, project placement, and selection of private contractors), and monitoring inadequacies. These shortcomings are especially significant considering the necessity to enhance public finances, which emphasizes the importance of systematically comparing the costs and benefits of alternative projects. Therefore, if Italy's challenge lies not only in the availability of resources but also in their effective utilization, it becomes evident that evaluation should play a crucial role in determining and directing resources towards optimal choices.During the process of decision-making, it is essential to conduct project appraisal to aid decision makers in selecting economically and socially rational choices that promote transparency. Cost-Benefit Analysis (CBA) is one of the tools employed by public decision makers to assess infrastructure projects. Nevertheless, the implementation of CBA and its ability to consider all the project's effects are subject to limitations. As a result, although CBA is necessary, it is not adequate on its own due to its inability to fully encompass the comprehensive impacts of a project(Caruso et al.,2019).

In general, transportation investments produce two distinct categories of benefits:

1. Direct benefits that are internal to the transportation system.
2. Secondary benefits, known as externalities, which extend to other sectors of society and the economy.

The primary impacts of transportation investments revolve around enhancing accessibility, ensuring traffic safety, and managing transportation-related costs, both internally and externally. However, environmental considerations are also taken into account and can hold significant importance in decision-making processes, particularly when they align with the priorities of the governing body(Caruso et al.,2019).

In Italy, the introduction of Law 196/2009 made it obligatory for the central government to conduct an ex ante assessment of public infrastructure projects. Subsequently, Legislative Decree 228/2011 established guidelines for the preparation of the Multi-year Planning Document, aiming to improve the efficiency of the planning system and enhance the effectiveness of public investments. This comprehensive process encompasses various stages, starting from analyzing infrastructure needs, conducting ex ante evaluations of projects, selecting investments, establishing monitoring criteria during implementation, and concluding with ex post evaluations. To carry out evaluation activities, independent entities called Public Investment Evaluation and Verification Boards were designated by the decree(Caruso et al.,2019).

Furthermore, a subsequent Prime Minister's Decree dated August 3, 2012 proposed a reference model for formulating sector-specific guidelines for both ex ante and ex post evaluations of investments, as well as outlining the structure of the Multi-year Planning Document. These guidelines outline objectives such as the adoption of standardized methods for calculating economic benefits for projects falling within the same sector or industry. The Cost-Benefit Analysis (CBA) is identified as the primary methodology for ex ante evaluations of projects, although in certain cases, it may be replaced by a "cost-effectiveness" analysis.The decree also outlines four distinct categories of infrastructure projects and specifies the minimum types of analysis required for each category. Specifically, for projects that involve the implementation of a service charge, the decree mandates conducting feasibility studies that encompass both economic analysis, involving the comparison of costs and benefits, and financial analysis, with a specific focus on financial plans. Furthermore, interventions with costs exceeding 10 million euros are required to undergo a dedicated risk analysis(Caruso et al.,2019).

The Lyon-Turin rail connection is not a recent undertaking; its evaluation began in the early 1990s as a component of a broader European infrastructure network.Since its inception, the

Lyon-Turin rail connection project has undergone multiple evaluations. The most recent assessment took place in 2019, conducted by the Italian government, which sparked intense debates regarding the evaluation methods and findings. Experts offered diverse opinions on what a Cost-Benefit Analysis (CBA) should or should not entail. In general, the analysis yielded a negative outcome for the proposed project, revealing a Net Present Value (NPV) of approximately minus 8 billion euros. Additionally, paradoxical effects were observed as part of the evaluation process.A noteworthy observation was made during the evaluation process: the more the Lyon-Turin tunnel would be utilized, particularly for freight transportation, the less beneficial it would be for society, as indicated by the OAFTL (2019) report. Furthermore, even if the tunnel construction incurred no costs, it would still yield a negative Net Present Value (NPV). These findings, combined with other factors, led to skepticism among many experts, the concerned public, and policy makers regarding the project evaluation(Massiani et al.,2022).

The evaluations of the Lyon-Turin project have been ongoing for more than three decades. The initial assessment took place in 1991 and involved the French and Italian rail operators (FS.SNCF, 1991). This assessment determined that the Chambéry-Turin section had an internal rate of return (IRR) of 7.5%. Over the years, several additional evaluations have been carried out, and it can be found below.

These paragraphs exclusively focus on studies that have produced a net present value (NPV). Specifically, Figure 18 and Figure 19 display the primary quantitative outcomes of different project assessments in terms of NPV for the entire corridor and the tunnel section (including certain connections to the existing rail network). The figures differentiate between the results provided by or on behalf of the project sponsor (represented by hollow histograms), such as the tunnel owner or potential train service operator, and those presented by third parties or governmental bodies. Despite variations in the scope of evaluation, as indicated by Table 5, a noteworthy observation from these figures is the significant divergence among the assessments. This disparity arises from multiple factors, such as the assessments covering different project sections. However, this is not the sole reason. It is also important to understand the reasons behind these divergent results and to discuss which, if any, of these findings can be considered convincing(Massiani et al.,2022).

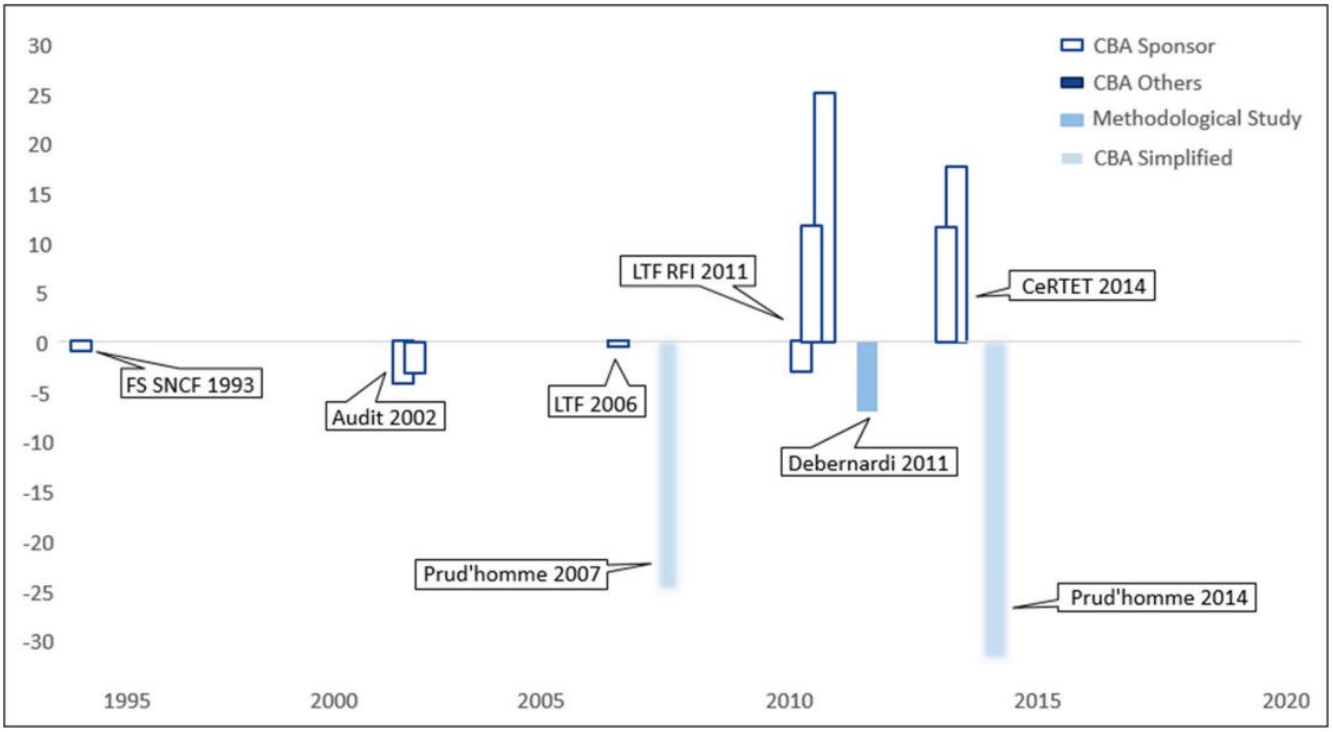

Figure 18 : Net Present Value for the whole Lyon-Turin corridor project (billion euro) (Massiani et al.,2022)

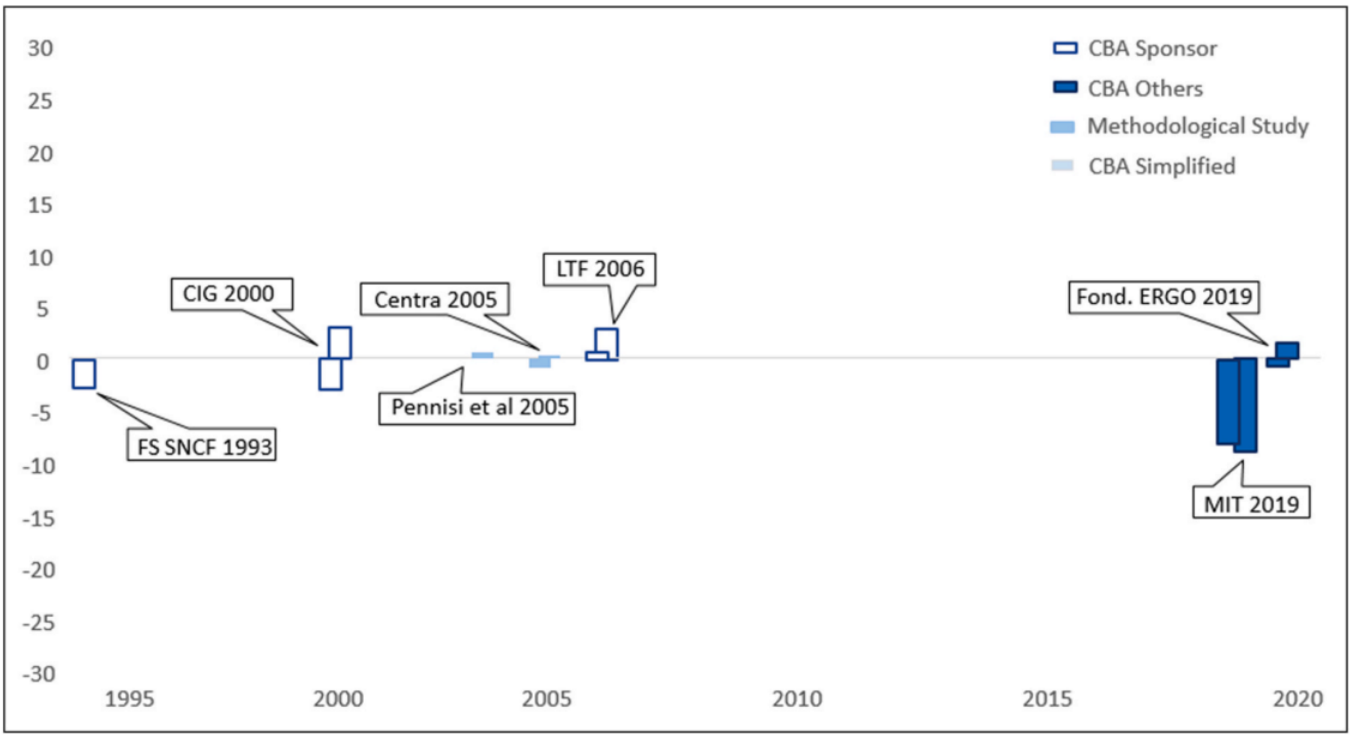

Figure 19 : Net Present Value for the base tunnel, and its connections (billion euro) (Massiani et al.,2022)

The perceived significant variation in outcomes can be partially attributed to the variations in how the evaluated project is defined. This pertains to:

Varied sections: The evaluation can pertain to different aspects of the Lyon-Turin rail project, such as the entire rail system, the international section, or specific groupings of sections. Adding to the complexity, the terminology used for different sections can be confusing. For example, the "international section" is distinct from the "trans-border tunnel."

Diverse project configurations: Since 2012, there have been modifications to the alignment of the Italian access to the international tunnel. Furthermore, evaluations differ in their consideration of a single-tube tunnel or a double-tube infrastructure. In some cases, both options are examined within a single document, like the IGF & CGPC report from 2003.

Varying levels of detail: Studies vary in the extent of detail they incorporate. Some rely on accurate demand models, while others rely on rough estimations. In certain instances, the evaluations may employ slightly more than rudimentary calculations, often referred to as "back of the envelope" computations(Massiani et al.,2022).

Varied geographical perimeters: The analysis considers different geographic boundaries in terms of who is included. Some analyses focus on a single country, either France or Italy, while most encompass both countries or even the entirety of Europ(Massiani et al.,2022).

Divergent forecasts: The evaluations are based on different traffic forecasts, which is expected given the long timeframe involved, spanning over 28 years(Massiani et al.,2022).

Varying scientific status: Certain cost-benefit analyses (CBAs), such as the one conducted by Debernardi et al. in 2011, are methodological simulations. In these cases, the base-case Net Present Value (NPV) is assumed for methodological investigation rather than being directly asserted.

However, even when comparing studies that focus on the same sections of the Lyon-Turin infrastructure and have the same geographical scope (Italy, France, or Europe as a whole), significant differences emerge. This becomes evident when comparing, for example, Prud'homme's studies (2007, 2014) with Lyon-Turin Ferroviaire (LTF) studies in Figure 13. Prud'homme's studies indicate a negative Net Present Value (NPV) of -25 and -32 billion, while LTF (2006) and LTF (2011) present contrasting findings.

It is important to note that part of the variation in the latest studies may be attributed to their nature. Prud'homme's estimates, which rely on a simplified cost-benefit analysis (CBA), are somewhat more rudimentary, akin to "back of the envelope" calculations. Consequently, one might be inclined to disregard them in favor of more comprehensive results whenever they are available(Massiani et al.,2022).

In order to assess the credibility of project appraisals, it is crucial to acknowledge that each study under investigation has notable limitations, as outlined in the final column of the table below. It is important to consider that these limitations may arise from various factors, such as resource constraints or constraints related to confidentiality, which could have impacted the manner in which these studies were conducted. This recognition is necessary to ensure fairness towards the field of transport economics.

Table 5 : CBAs of the Lyon-Turin rail project (Massiani et al.,2022)

Year	Evaluation	Project Section	Main limitations
1991	FS SNCF feasibility study (FS SNCF, 1991)	Chambery-Turin	No NPV (only IRR). Does not include freight traffic externality. Very scant documentation.
1993	SNCF initial CBA (SNCF, 1993)	Lyon-Turin; Base tunnel	Very scant documentation
1998	Lyon–Montm´elian Transalpes CBA (SNCF, 1998)	LyonMontmelian	Very scant documentation
2000	Intergovernmental Commission (CIG, 2000)	Lyon-Turin	Reports evaluation results computed by the project sponsor. Mode choice calibrated on 50 interviews only. Report states these results are temporary.
2003	Audit to the French government (IGF & CGPC, 2003)	Base tunnel	Reports evaluation results computed by project sponsor. Very limited technical documentation.
2003*	LTF: Preliminary project evaluation (quoted in press conference april 2012 OAFTL, 2012, pp. 4,5; and Sutto, 2009)	Lyon-Turin	Not publicly available for scrutiny.
2003	Extended CBA using option value based on an assumed NPV (Pennisi & Scandizzo, 2003)	Base tunnel	CBA calculation is not documented. No allowance for risk of cost increase.
2005	Extended CBA using option value based on an assumed NPV	Base tunnel	CBA calculation is not documented. No allowance for risk of

	(Centra, 2005)		cost increase.
2006	Declaration d'Utilite Publique (LTF, 2006)	Lyon-Turin	CBA calculation is not documented. Risks of cost increases not properly considered.
2007*	LTF, Etude d'impact environmental (Quoted in Press conference OAFTL, 2012, pp. 4,5)	Lyon-Turin	Not publicly available for scrutiny.
2007	Simplified NPV calculation (Prud'homme, 2007)	Lyon-Turin	Simplified spreadsheet calculation.
2011	Lyon–Turin Ferroviaire 2011 CBA (LTF - RFI, 2011; OAFTL, 2011)	Lyon-Turin	No univocal description of calculation.Refers to unreasonable freight VoT values but other values are quoted in other sections. Road safety benefits and user surplus are sizeable but their calculation requires further investigation .
2011	CBA to assess flexibility in investment (Debernardi, Grimaldi, & Beria, 2011, based on OAFTL (2008 traffic forecasts)	Lyon Turin	Methodological paper. Does not claim to make an actual estimate of project's net benefit.
2014	Update of simplified NPV calculation (Prud'homme, 2014)	Lyon-Turin	Simplified spreadsheet calculation.
2014*	CERTeT update of official CBA (CERTeT, 2014). Quoted in TELT, 2015 and Foietta, 2015	Lyon-Turin	Not publicly available for scrutiny.
2019	Italian Ministry of Transport's CBA based on assumed updates of previous traffic forecast (MIT, 2019)	Base tunnel	No detailed transport model.
2019*	Italian Ministry of Transport's CBA: Italy only (unpublished)	Base tunnel	Not publicly available for scrutiny.

2019	Correction to the 2019 Italian Ministry of Transport's CBA (Trento & Spaziani, 2019, p. 14)	Base tunnel	Computationally incoherent.

The studies conducted in 1991 and 1993 can be characterized as highly preliminary in nature. The feasibility study conducted by Ferrovie dello Stato Italiane (FS) and Société Nationale des Chemins de Fer (SNCF) in 1991, for instance, mentions that the consideration of freight externality was not included. Unfortunately, there is limited documentation available for these studies, despite their significant influence in initially endorsing the project with an attractive 7.5% Internal Rate of Return (IRR) for the Chambery-Turin section (FS.SNCF, 1991). Similarly, the SNCF study conducted in 1993 lacks extensive methodological documentation.

The findings of the CIG (2000) study rely on initial inputs provided by the project sponsor. Moreover, they are derived from a behavioral model that has been calibrated using a very small dataset consisting of only 50 interviews. This limited sample size raises concerns about the reliability and robustness of the conclusions drawn from the study(CIG, 2000).

Similarly, the results of the French government audit conducted in 2003 are based on provisional findings prepared by the project sponsor. Furthermore, the available documentation for this audit is very scarce, providing minimal information and details for further analysis(Massiani et al.,2022).

The studies conducted by Pennisi and Scandizzo (2003), Centra (2005), and Debernardi et al. (2011) can be seen as valuable methodological contributions rather than comprehensive evaluations suitable for informing policy recommendations.It is noteworthy that none of these studies take into account the (asymmetric) risk of cost overrun, which is paradoxical given that their methodologies largely concentrate on risk assessment.Additionally, the studies by Pennisi and Scandizzo (2003) as well as Centra (2005) are academic papers that primarily focus on methodology. The authors argue in favor of the project and claim that their results are substantial. However, the level of detail provided in their computations is not sufficiently comprehensive for thorough scrutiny.

The studies conducted by Prud'homme (2007, 2014) can be considered as more than simple "back of the envelope" calculations, as they were carried out by a qualified researcher. However, they lack a comprehensive representation of supply and demand. For example, the computation of time-saving benefits assumes traffic and unit time savings per trip without considering factors like origin-destination patterns or path choices. While these calculations

can be valuable for specialist discussions or to inspire further research, they are not definitive evaluations that provide enough information for making policy decisions. Moreover, it is likely that these studies were not intended to serve as such comprehensive evaluations in the first place.

The findings of LTF (2006) are accessible through several public documents, including the "Dossier d'enquête publique préalable à la déclaration d'utilité publique" (LTF, 2006). However, these documents do not provide a comprehensive methodological documentation that is available for thorough examination.

LTF (2011) was documented extensively in a report (OAFTL, 2011), but the structure and format of the report make it challenging to conduct a thorough examination. Although it includes multiple appendices that contain exchanged memos during the evaluation process, it lacks a clear and unambiguous description of the calculations performed. Furthermore, the report presents certain parameter values, particularly a freight Value of Time of 19.5 or 24.8 €/t.hr (OAFTL, 2011, p. 28), which contradict widely accepted knowledge in transport economics (Massiani, 2005). Based on the available documentation, it is not possible to confirm if these flawed values were utilized in the analysis.There are also doubts raised regarding the significant magnitude of road safety benefits (roughly 8 billion euros) and the computation of users' benefits (OAFTL, 2011, p. 67). The largest benefits are attributed to freight users, amounting to nearly 30 billion euros. However, it seems that these benefits are calculated based on a change in operating costs (around 50 billion euros, including reduced toll payments) as well as time savings and reliability (approximately 7 billion euros). However, it is known that using a change in operating costs or Generalized Costs as a measure of users' benefits can be distorted, making the adoption of the Rule of Half or similar measures (Massiani & Maltese, 2019) more preferable.

The CERTeT (2014) study is not accessible to the public. Some of its results can be found in incomplete documentation, available in fragments through sources such as TELT (2015) and Foietta (2015).

The ERGO foundation, as stated by Trento and Spaziani (2019, p. 14), aims to address the alleged inconsistency in the MIT (2019) study. The foundation identifies an incoherent calculation in the study, where the tax impact is excluded from the project costs but not from the users' benefits, which goes against the principle of consistency.

In general, only a few of these studies have taken into account the possibility of cost overruns being more likely than cost underestimations. While sensitivity analyses have been conducted, they are not suitable for addressing this issue since only a small number of them adequately consider the expected value of cost deviations. This finding aligns with van Wee's (2007) conclusion regarding the evaluation of large-scale projects, stating that it is challenging to find a convincing evaluation for such projects.

By 2018, significant progress had been made in the construction of the Lyon-Turin project, including the excavation of auxiliary tunnels and a section of the main tunnel. However, there has been ongoing debate regarding the precise quantification of the completed works. Notably, opposition to the tunnel project remained strong, particularly among a portion of the Italian population. Against this backdrop, following a change in the national government in May 2018, the Ministry of Infrastructure and Transport requested a new evaluation of the Lyon-Turin project, along with several other projects. The subsequent sections of this discussion will examine the outcomes of this evaluation and the criticisms it has received, providing valuable insights into potential misunderstandings of Cost-Benefit Analysis (CBA)(Massiani et al.,2022).

2.2.2.2.1 The 2019 Lyon-Turin CBA

During the spring of 2018, a working group was assigned the task of reviewing several transportation projects in Italy. After completing an evaluation of the Genova-Milan High-Speed High-Capacity link, the focus of the group shifted to the Lyon-Turin project, specifically examining its initial phase, which involved the international tunnel and its connections to existing national railways. The Ministry for Transport and Infrastructures swiftly published the report in February 2019, merely six months after the working group was established. However, the release of the report sparked heated debates and controversies, drawing significant public attention to the Cost-Benefit Analysis (CBA) conducted for the Lyon-Turin project in the following weeks (refer to Figure 15)(Massiani et al.,2022).

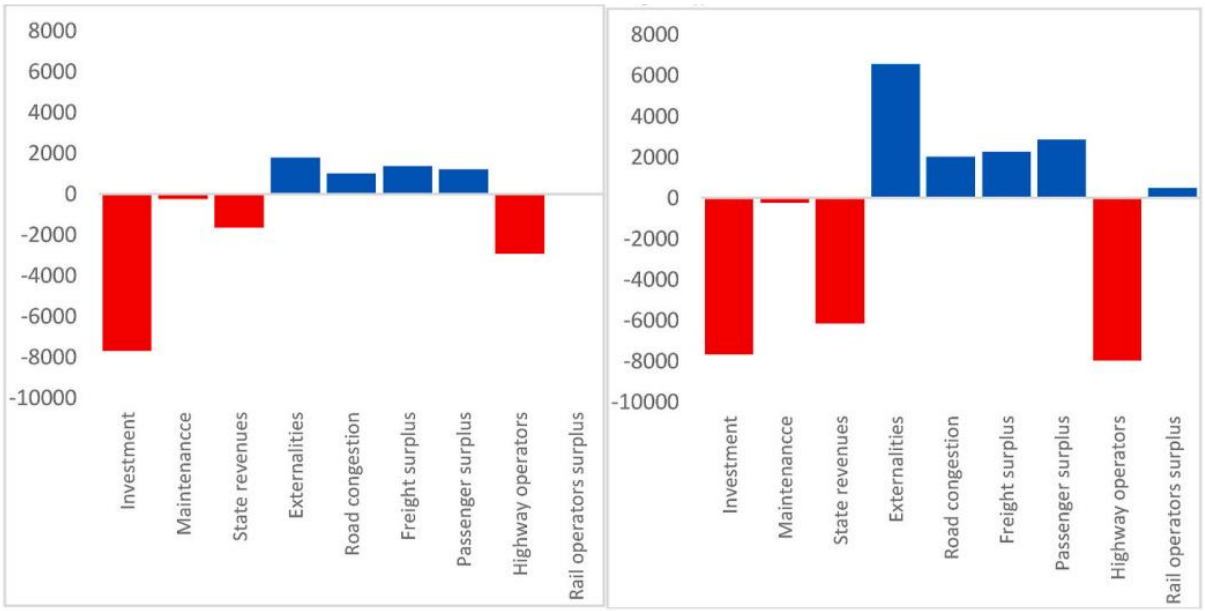

Figure 20 : Project Costs and Benefits (million euros). (Left table represents the "realistic" scenario while right table represents "high traffic" scenario)(MIT,2019)

The findings of the 2019 Cost-Benefit Analysis (CBA) report can be summarized as shown in Figure 3, which presents two traffic scenarios: a "high traffic" scenario, also referred to as the "Osservatorio" scenario, based on previous assessments presented by the Observatory of the Lyon-Turin Rail Corridor, and a "realistic" scenario that assumes a lower growth in demand and a reduced shift from road and air travel to rail, as outlined by the Ministry of Infrastructure and Transport (MIT, 2019).

Both traffic scenarios resulted in a negative Net Present Value (NPV). The substantial costs associated with fuel duties and the losses incurred by highway operators drew immediate attention. The "costs for the State" category encompassed the reduction in excise rights from fuel taxes, as fewer kilometers traveled by vehicles meant a decrease in fuel tax revenue for the government. While the project's benefits, including externalities, road congestion reduction, freight surplus, and passenger surplus, were significant, exceeding 1 billion euros each, they were not enough to offset the costs(Massiani et al.,2022).

Shortly after the report was released, numerous opinion leaders and economists expressed their disagreement with the calculations presented. The criticisms primarily centered around the following areas:

- Inclusion of taxation

The immediate and strong criticism from economists following the inclusion of taxation in NPV calculations sparked a debate. They argued that considering a decrease in fuel tax income as a cost is incongruous with the logic of conducting a Cost-Benefit Analysis (CBA). Many experts contested the inclusion of excise taxes, asserting that they should be disregarded as they merely involve transfers. This raised suspicions that the analysis was biased against the project(Massiani et al.,2022).

Some economists entertained the possibility that the category labeled "freight and passenger surplus" might encompass the benefits derived from lower taxation. Upon closer examination, it became apparent that the users' benefits were smaller than the reduction in taxation. Consequently, the net surplus after accounting for taxes would be negative, suggesting that users would suffer losses in other cost components despite the overall improvement in transportation services(Massiani et al.,2022).

Others pointed out that if there were distortions resulting from taxation on fuel (which is implicit in the CBA, given that the taxation exceeds the corresponding externalities), the evaluation of the project should also consider the advantages of reducing these distortions. They argued that reducing distortions would liberate more users from these inefficiencies(Massiani et al.,2022).

- Using the Rule of Half would underestimate the benefits

The assessment faced criticism regarding its application of the Rule of Half, a commonly used calculation method in transportation project evaluations. The main critique centered around its assumption of accounting for only half of the reduction in generalized costs and users' taxation resulting from the project. Some critics argued that this approach oversimplified the demand function by employing a linear approximation(Massiani et al.,2022).

- Alleged deviation from Italian or international guidelines

Other critiques revolved around compliance with national, European, or international guidelines. These criticisms highlighted the increasing emphasis on adhering to guidelines within the Italian regulatory context, where projects are subjected to scrutiny based on national or regional guidelines(Massiani et al.,2022).

Another set of criticisms focused on the lack of consideration for broader economic effects and employment. Terms such as wider economic effects, gravitational effects, general equilibrium, and local development were used to describe this criticism(Massiani et al.,2022).

The absence of a proper demand model in the cost-benefit analysis (CBA) was also criticized. Instead of utilizing a transport model, the CBA relied on assumed traffic scenarios derived from previous studies, raising concerns about the accuracy and reliability of the evaluation(Massiani et al.,2022).

Moreover, commentators identified paradoxes within the CBA that were considered thought-provoking. One paradox suggested that even if the tunnel infrastructure were provided for free, the project's net present value (NPV) would still be negative, which contradicted the expectation of economic benefits. Another paradox implied that it would be better not to operate the tunnel once built, as its use would reduce social welfare, particularly for freight, while passenger services could enhance social welfare. Additionally, it was observed that the higher the traffic in the tunnel, the worse the NPV—an outcome that seemed counterintuitive(Massiani et al.,2022).

Comparison of Cost-Benefit analysis of 2011 and 2019 ;

Table 6 : Comparison of CBA of 2011 and 2019 (Pasquali,2019)

Discounted Values – Entire Project NPV	CBA 2019 Scenario 1	CBA 2019 Scenario 2	CBA 2011
Investment	-7,658	-7,658	-16,794
Maintenance	-222	-222	-4,275
Lower state revenue (excise duties on fuel)	-6,128	-1,619	-6,988
Lower motorway revenues (tolls)	-7,483	-2,869	-9,549
Total costs	-21,491	-12,368	-37,606
Surplus passengers and cargo	5,123	2,785	37,827
Externalities (environment,incident,congest.)	8,563	2,588	11,452
Total benefits	13,686	5,373	49,279
Benefits-costs balance	-7,805	-6,995	11,673

The values indicated are in current Euros on the date of the analyzes and express, as specified, the net present value: as known, this is the algebraic sum of the effects deriving from the realization of a project, each with its own sign, calculated over the entire period time of realization and use and having compared all the values to today by applying a discount rate(Pasquali,2019).

The table shows the components of benefits and costs. The costs are given by the investment and maintenance (about 21 €/billion for the 2011 analysis, developed before the so-called phasing and reduction of the total project investment costs from about 23 €/billion to 13 €/billion, after also reviewing the costs of the respective domestic routes), as well as the loss of excise tax revenue caused by the shift of freight traffic flows from road (whose fuel cost includes a significant proportion of excise taxes, which go directly to the Treasury) and the loss of revenue for highway concession companies due to the same modal shift. The issue of excise taxes will be returned to shortly: at the moment, it is noted that investment and maintenance costs are worth about €7.8 /billion for the 2019 analysis (which counts only completion costs and not also the about €1.3 /billion spent on the project so far) and that the sum of lost excise and lost toll revenues are worth €13.5 /billion and €4.5 /billion, respectively, depending on whether scenario 1 of the 2019 analysis is considered, or scenario 2, which is considered realistic by the drafters of the analysis; the sum of the negative effects for states and highway concessionaires in the 2011 analysis was about 16.5 €/bld(Pasquali,2019).

The benefits of the project have two components. The first is the sum of the so-called consumer's surplus and producer's surplus, i.e., the set of positive effects that directly benefit those who use or operate the new infrastructure. This is the reduction in the overall generalized cost resulting from the route and mode choices that passengers and freight will travel as a result of project implementation. The most important components of the generalized cost are reduced travel time, reduced trip costs, and increased reliability (defined as the percentage of trips that are completed without delays in the scheduled time)(Pasquali,2019).

The second component of benefits is externalities, which are the net positive effects that benefit the community-in this case undifferentiated and not only if it will use the new infrastructure-in turn consisting of lower climate-altering gas emissions (environment), fewer accidents (safety), and less congestion (travel reliability and comfort). As has been made clear, externalities are considered by states and not by individuals because they are effects that by definition do not result in a transfer of money, positive or negative, from those who cause the effect to those who benefit or harm from it. The 2011 analysis shows total economic benefits of 49 /billion (38 for internal market effects, thus consumer and producer surplus, and 11 of externalities), while the 2019 analysis results in 13.6 €/billion or 5.2 €/billion depending on whether one chooses the scenario considered by the drafters to be less or more realistic(Pasquali,2019).

In the 2019 analysis, in contrast to the 2011 analysis, the surplus accounts for 37% or 52% of the benefits depending on the scenario, while externalities the complementary to unity, thus 63% and 48%(Pasquali,2019).

In summary, the 2019 Cost Benefit Analysis flunks the project in several respects:

- limited to the scenario considered by the drafters to be realistic, the net internal market effects are strongly negative: the user surplus is worth €5.3/ billion against an investment and operating cost of €7.8/ billion, which is like saying that the cost reductions from switching from road to rail for freight and from air to rail for passengers do not balance the cost of implementing and operating the project
- again with reference to scenario 2, the positive externalities are worth slightly less than the surpluses, so the benefits to the environment, safety, and reliability also reach low values
- overall, summing up the positive effects and comparing them with the investment and management costs alone, there remains in the 2019 analysis, scenario 2, a negative imbalance of 2.5 €/billion; if we add to these the lower excise taxes and concessionaires' revenues, we arrive at about - 7 €/billion, which represents the summary of the net present value (NPV) of the Project

Difference between the 2011 and 2019 analyzes ;

Table 7 : Reconstruction, forecast and monetization of the project (Pasquali,2019)

State reconstruction to date	Forecast with a horizon of 20-30 years	Parameters to be adopted for the monetization of bills and their discounting
definition of the project area and the project corridor	prediction of the performance of rail and road in freight transport and rail and air in passenger transport	value of time expressed in €/hour for the main types of passengers (business, tourism, commuters and students) and value of time expressed in €/hour for types of goods
detection of passenger and freight traffic in the project corridor	prediction of construction or adaptation of infrastructures and connections in the three modalities and definition of the elements of the so-called "zero case" or "zero option" (forecast of the evolution of the offer in case the project is not carried out)	unit value expressed in €/kg per passenger-km and per ton-km of climate-altering gas emissions in the rail, road and air modes, to date and in the project time perspective
detection of the generalized costs of passengers and goods in air, rail and road modes	forecast of the gross product of the countries included in the project corridor, of the elasticity of freight and passenger transport with respect to the gross product for the countries involved and therefore forecast of total passengers and goods in the project area	unit value expressed in €/accident distinguished between deaths, accidents with personal injury and accidents without personal injury
survey of the infrastructures and connections available to date in the project corridor for passengers and goods in the three modes of transport	specific forecasts of passengers and freight in the project corridor and in the project proper	discount rate
	prediction of climate-altering gas emissions per passenger-km and per ton-km of the rail, road and air modes	residual value
	predictions of the accident coefficients per passenger-km and per tonne-km of the rail, road and air modes	duration of the project management phase (years of operation with positive net values considered)
	forecasts of the congestion coefficients per passenger-km and per tonne-km of the rail, road and air modes	

The first column reconstructs the current situation of the reference framework of the economic system which is expected to be affected by the possible realization of the project, focusing attention on the two elements of significant variation of the offer in the transport market at the basis of the project proponents: the road-rail choice for goods and air-rail choice for passengers (or rather, high-speed train versus low-cost plane).The second column defines the hypotheses according to which today's demand and supply of transport are projected over the time horizon of the project, 60 years, with a highly developed detail for the first 15-20 years.The third column makes it possible to obtain the synthetic reference meter of the project, the net present value, corresponding to the sum of the effects expressed in current euros for the various actors involved, deriving from the realization of the project, each with its own sign(Pasquali,2019).

Once the framework of supply and demand has been constructed to date, the introduction of the new infrastructure is simulated (characterized by given performance and data on costs and benefits associated with its use) and the redistributive effects of freight and passenger traffic are simulated, based on predictions of rational behavior by users (simplifying a bit, it can be said that the passenger or the logistician always chooses the option that saves time and cost). Once the movement matrix in the project area and the state of the infrastructures and services available have been reconstructed, having associated the relative service levels with these and the benefits and costs for those who use them, the model "assigns" the traffic to the new infrastructure based on the ability of the new element placed on the market to influence user choices. The assignment is carried out having as a time reference the date of completion of the new infrastructure and its entry into operation: it is in fact at that moment that the different users have the availability of a new option, characterized by different times and costs compared to what available in the situation without the project at the same time horizon (having therefore estimated the inertial scenario of evolution of supply and demand in the absence of the project).Naturally this is not an automatic result, as the model expresses an assignment of traffic to the new infrastructure according to how it has been calibrated. For example, it is the cost-benefit analysis editorial team that decides whether in ten years the transport of goods by rail will be more efficient than today (for example in terms of reliability, understood as the percentage of deliveries within the established time) and it is always the same team that evaluates to what extent road traffic will be in congestion conditions or what will be the prediction of users' adaptation to situations other than the current one. It is clear that a model is assumed to be correctly calibrated, but it is equally evident that while there is little room for uncertainty on the present(Pasquali,2019).

The different freight traffic forecasts ;

The 2019 cost-benefit analysis did not develop its own model and it is not clear whether the estimated traffic flows result from an assignment, therefore it is not possible to understand exactly the assumptions underlying the modal choice according to which the traffic forecast. The two scenarios envisage the first an increase in passenger and freight traffic of 2.5% per year for the entire duration of the project, while the second - the one considered more realistic by the authors of the analysis - an increase of 1.5%. Furthermore, the 2019 Analysis clarifies that for the traffic estimation one must start from the actual value of the last available year (mostly 2017) and highlights a difference between this value and the one estimated in 2011. The estimation works at the roughly like this: it starts from the base year and increases traffic at the chosen rate up to the expected date of opening to traffic of the new infrastructure; from this total traffic it calculates the part that will be attracted by the new connection (assignment), which results from the application of the model(Pasquali,2019).

The 2019 Cost Benefit Analysis did not develop its own model, and it is unclear whether the estimated traffic flows result from an allocation, so it is not possible to understand exactly the assumptions behind the modal choice under which the traffic forecast was set. The two scenarios predict the first one to increase passenger and freight traffic by 2.5 percent per year over the life of the project, while the second one - the one considered most realistic by the drafters of the analysis - increases by 1.5 percent. In addition, the 2019 Analysis makes it clear that for the traffic estimation one has to start from the actual value of the last available year (mostly 2017) and shows a gap between this value and the value estimated in 2011. The estimation works roughly like this: one starts from the base year and increases the traffic at the chosen rate until the date when the new infrastructure is expected to open to traffic; from this total traffic one calculates the part that will be attracted by the new link (allocation), which results from applying the model(Pasquali,2019).

The difference between the two analyses is clear: 2019 analysis starts from a lower actual figure than the one estimated at the time and applies a lower traffic growth rate than the 2011 analysis.Those conducting the analysis in 2019 are right to place a base figure that is correct as historical, but those who prepared the analysis at the time were based on actual traffic trends in the previous period and therefore their choices were reasonable at the time. Certainly, however, the revision of the analysis starting from today's actual value, put in place by the 2019 Analysis, is correct. That being said, it is appropriate to understand traffic flows using the following chart, constructed from data from Alpinfo, the periodic collection of flow surveys that is also the main and most trusted source of data on freight traffic in the Alps:

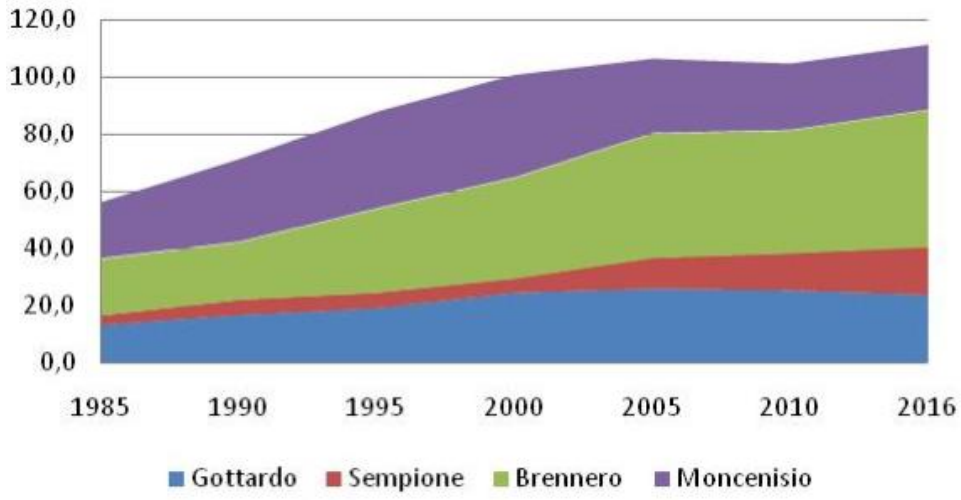

Figure 21 : Alpine total freight crossing (Million ton)(Pasquali,2019)

The 2011 Cost Benefit Analysis was developed starting from the 1985-2005 history, which as can be seen shows strong growth rates (2.0% annual growth for rail, 4.1% for road and 3.2% for the sum of the two). Between 2005 and 2010, due to the two economic crises Europe went through, traffic grows much less (0.6% rail, -0.1% road and 0.2% the sum of the two). In the latest period, however (2010-2016), traffic is growing again (1.4% rail, 0.8% road and 1.0% total)(Pasquali,2019).

Another interesting phenomenon can also be noted: while until 2000 the freight mode across the Alps by road drives traffic growth, since 2000 the trend reverses: in the last three five-year periods (2000-2005, 2005-2010 and 2010-2016, the latest year available), rail freight grows significantly more than road freight(Pasquali,2019).

This analysis suggests several considerations. It is true that traffic has not grown by 2.5 percent per year, and thus the 2011 analyses, although justified by observing the development of the previous 20 years, were overestimates of actual traffic. It is also true, however, that freight traffic in the Alps has been growing again since 2010 and that the rail mode is already gaining ground over road competition, thanks to the coming on stream of the Swiss rail projects, as also evidenced by the graph below (same period and perimeter, but only rail traffic):

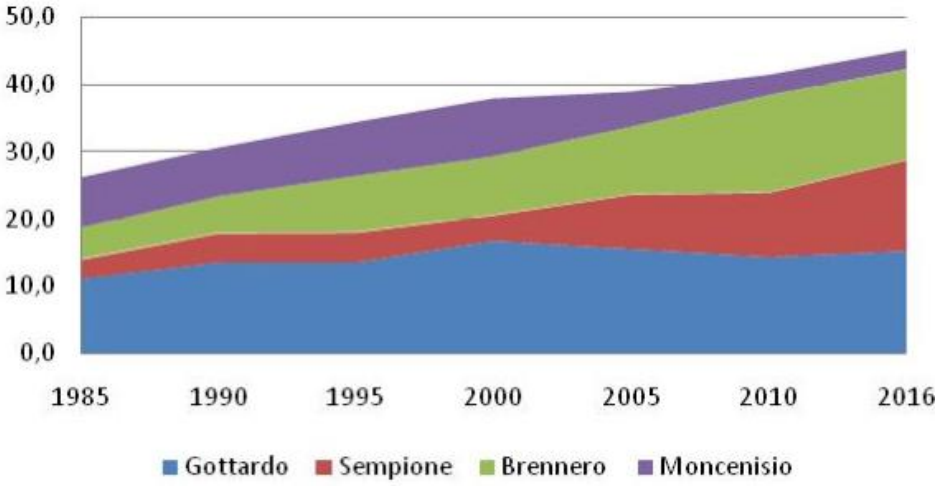

Figure 22 : Alpine rail freight crossing (Million ton) (Pasquali,2019)

The two graphs also make it possible to visualize the significance of the project corridor (referred to as "Moncenisio" in the graphs and resulting for total traffic from the sum of the freight from the Frejus and Mont Blanc freeway crossings and the Frejus railroad crossing). As can be seen from the first graph, unlike the Swiss and Austrian crossings, the total traffic volume in the French Alpine crossing has seen its share decrease and not increase, remaining over the years at around 20 mln tons/year, but it still represents an important value compared to the entire Alpine arc, 20 percent in 2016(Pasquali,2019).

The performance of road and rail to 2030 in the two analyses ;

There is another factor that divides the two analyses, which is equally important in assessing the traffic attracted by the new project in 2030, the year in which the new base tunnel is expected to open: the performance of road and rail from 2019 until that date. In calibrating the traffic model, the 2011 study predicted a gradual improvement in rail freight service (which seems to have occurred, if the total modal share over the Alps has increased over the last 10 to 15 years) and a gradual deterioration in the service rendered by roads and highways. Consistent with this, the study assumed increasing levels of congestion on roads and thus a worsening of the level of service and ultimately an increase in the generalized cost(Pasquali,2019).

On this issue, the 2019 study takes a diametrically opposite position. It is described that the two highway crossings have a very high residual capacity (especially after the decision to also use for ordinary traffic the Frejus tunnel tube initially planned for emergency use only), that congestion situations on the road network are very rare, and that the traffic present on the corridor can be handled without problems by the existing infrastructure. Current travel times are also simulated with a Google application (thus based on real traffic data) and the conclusion is reached that this risk does not exist. Thus, it is implicitly assumed that the

service rendered by road freight transport is also able to maintain complete efficiency in the future(Pasquali,2019).

The externalities of road and rail ;

This point also divides the two studies in terms of externalities. While the assessments of the reliability of road and rail transport affect the modal choice that is determined in the market and thus the generalized costs and ultimately the consumer surplus, the analysis in terms of externalities in the comparison between the two competing modes of transport (road-rail for freight and road-air for passengers) concerns climate-changing gas emissions, accident rates and congestion(Pasquali,2019).

The position of the 2019 study-which, moreover, fully reflects that long advocated vigorously by expert team coordinator Marco Ponti-is that the technology for making motor vehicles, with particular reference to heavy-duty vehicles, is evolving rapidly, and this process allows for significant reductions in unit emissions. The adoption of Euro 5, Euro 6 and the others to follow are accompanied by a strong decrease in emissions of climate-changing gases, and for this the study provides evidence on NOx and PM10. With respect to CO2, the main among these factors in relation to global warming, the following is expressed in the study (p. 69, bold original text):

‘’With regard to CO2 emissions in particular, given that modal shift policies can have very limited impacts in terms of changing the shares of demand met by road and rail transport respectively, ambitious reduction targets can only be achieved-as has been the case in past decades for local pollutants-only through vehicle technological innovation and the consequent reduction in unit emissions; this necessary condition would automatically lead to a sharp reduction in the "environmental competitive advantage" of the rail mode of transport and, therefore, the benefit of shifting from road to rail.’’

Ultimately, the position of the 2019 study is that reasonably achievable changes in the modal split are limited and that the only factor that can affect the reduction of mobility-related emissions is technological innovation in road vehicles. Again, since these are policy considerations based on a forward-looking reading of the present and future, those reading can make their own assessment.In addition to expressing skepticism about the modal shift from road to rail for long-distance freight, the 2019 study assesses that the 2011 analysis suffers from a methodological error in calculating the modal diversion benefit. The criticism had already been made, and the Observatory's Notebook on Cost Benefit Analysis reported the critical views of a member of the working group on the analysis formed within the Observatory(Quaderno 08,2011). A decrease in the price of rail transport results in two effects: a) with respect to those who were already using this mode, there is a benefit with full effect in that less is spent on a service that had already been chosen; b) some of those who

were using the road mode will switch to the rail mode, generating the modal shift that is one of the assumptions and motivations of the project.

The 2011 study counts both the first and second cost reductions with full effect, while the 2019 study believes the so-called "half rule" should be applied to the lower cost benefits for those who switch from road to rail, and therefore divides that value by two, significantly reducing the modal shift benefits.The issue is controversial, and the guidelines of international organizations themselves, as well as the literature on the subject, express non-univocal positions; more precisely, the rule of one-half is universally applied in the literature for a portion of the consumer surplus, but the treatment of the benefits in terms of the lower generalized cost resulting from shifting from one mode of transportation to another is not unambiguous, and therefore it does not seem agreeable to treat a methodology applied in various international contexts as error.In a project that posits modal shift (road-to-rail and air-to-rail for freight and passengers, respectively) as a major objective, the implications are significant, and the methodological choice in favor of one or the other position shifts the net present value of the project by several billion euros(Pasquali,2019).

The issue of excise taxes ;

The other issue that falls among the discrepancies in assessment and thus among the issues that the comparison between the 2011 Cost Benefit Analysis and the 2019 Cost Benefit Analysis leaves open, which is also related to the central issue of freight diversion from road to rail, is that of the treatment of excise taxes. As is well known, the cost of fuel is burdened by a significant percentage of taxation-45 percent of the final price is excise taxes and 18 percent VAT-with a total impact on the price per liter delivered of 63 percent. The shift of freight traffic from road to rail, generated by the generalized cost reduction in the second mode, results in the important effect of a decrease in revenue for the Treasury. From the overall perspective of the total number of stakeholders, the transporter goes, for example, from a cost of 100 (road mode) to a cost of 90 (rail mode) and 10 represents his surplus, which is counted among the benefits of the project to the extent of 10 or to the extent of 5 depending on the position taken on the above issue of applying the half rule. Regardless of how the benefit is counted, overall the carrier saves 10 and transfers the cost incurred to the rail operator in the form of the price of the transportation service(Pasquali,2019).

In the comparison of the two modes, fuel costs, which incorporate excise taxes and VAT, are minus, and highway toll costs are minus, highway obviously being more prevalent than road in medium- and long-distance traffic: from this it follows that a significant modal shift results in a significant decrease in excise taxes and revenue for concessionaires. While the reduction in revenue for highway concessionaires is presented as the consequence of a market choice favoring a new infrastructure (the new rail line) over the existing one (the highway and the historic railroad), which causes the consequences to fall on the operator who suffers the loss,

the lower tax revenue triggers a more complex effect in that the states concerned see their revenues decrease, and this could lead to negative effects on the economic system, for example, lower public spending on welfare or an increase in public debt(Pasquali,2019).

Here again, the doctrine is divided in its various positions: right to consider the effect on excise taxes and VAT because it is a part of the net present value generated by the project (with a negative sign for some and a positive sign for others), wrong to consider it because-as has been noted by numerous commentators-implementing projects that aim at modal rebalancing to the detriment of the road necessarily lead to negative effects through the mechanism of lower revenue for the Treasury(Pasquali,2019).

The different assessments of accident risk ;

It remains to be said, in comparing the two cost-benefit analyses, of one last element of methodological disagreement, related to externality component. It has been clarified above that there are three effects of community interest not addressed within the market: environmental, congestion reduction, and safety effects. Disagreement on the first two in the 2011 and 2019 analyses has been made clear, and even for safety the views are quite different. Although it is widely agreed that the accident rate of rail transport is much lower than that of road transport (while in the train-to-air comparison this gap is smaller), there is disagreement on the magnitude of modal shift benefits in favor of rail.In the 2019 analysis, some ongoing trends are mentioned, such as the aforementioned improvement in the quality of HGVs and the decrease in serious accidents and fatalities on the road, and for this, the specific accident rates used in the 2011 analysis, which were considered too penalizing for road, are challenged. In addition to this, a specific criticism is introduced of the project proponents' assessment of the historic rail line in terms of accident hazard: given that no accidents have occurred on the Frejus rail line or in the historic tunnel in a wide time span, the risk of this occurring is considered remote, and thus the benefit resulting from less dangerous transit in the new tunnel that would be built appears modest. As should be clear by now, each of these criticisms leads to a reduction in the benefits estimated by the 2011 study and contributes to the construction of the strongly negative balance(Pasquali,2019).

The cost-benefit analysis carried out in 2019 by the expert team coordinated by Marco Ponti on behalf of the Ministry of Infrastructure and Transport rejects the project outright. The storytelling, to use a current term is, broadly speaking, as follows:

- traffic on the project corridor is stagnant.
- traffic forecasts made at the time and verified at the current date show a significant overestimate for freight and a correct value for passengers.
- the shift in freight flows generated by the project from road to rail is modest.
- the direct economic benefits of this modal rebalancing are small.

- a project-generated shift for passengers between air to rail is expected and a benefit for users, although the magnitude is not significant.
- reductions in climate-altering gas emissions are limited.
- reductions in accidents are negligible.
- congestion reductions will not occur because there is currently and prospectively no congestion on roadways.
- the loss of excise taxes is significant.
- the road freight mode is low-polluting, congestion-free, and increasingly efficient in prospect, which makes the benefits of modal shift modest and such that they do not offset the investment expenditure and loss of excise taxes and revenue for highway concessionaires.

Opposed to this position is that of the promoters and the 2011 analysis:

- traffic on the Modane-Frejus corridor is stagnant, but still substantial, and the interchange in volume and value between Italy and France is significant and 50% transits (partly improperly) through the Ventimiglia pass.
- the forecasts made at the time have been revised and the growth rate of 1.5% per year for freight and passengers seems a fair approximation of the medium and long term.
- the current corridor suffers from the service deficits of the line and the historic tunnel: where the rail line is efficient, rail freight traffic increases, and this trend is generalized across the Alps. Also by passenger, the time reduction on the planned arc leads to an increase in the share of rail transport in the North Italy-France relationship.
- the benefits of the new modal split are significant and roughly such as to offset the investment cost (revised downward in recent years).
- the project achieves positive and substantial environmental, safety and congestion externalities.
- the new railway line Turin Lyon completes in the Alpine arc the achievements of the process of modernization of railway lines and tunnels of the 19th century allowing rail transport to be more efficient and more competitive, without regulatory constraints or penalizations, compared to road mode for freight and air mode for passengers.

NLTL Index of Evaluation of Project Costs ;

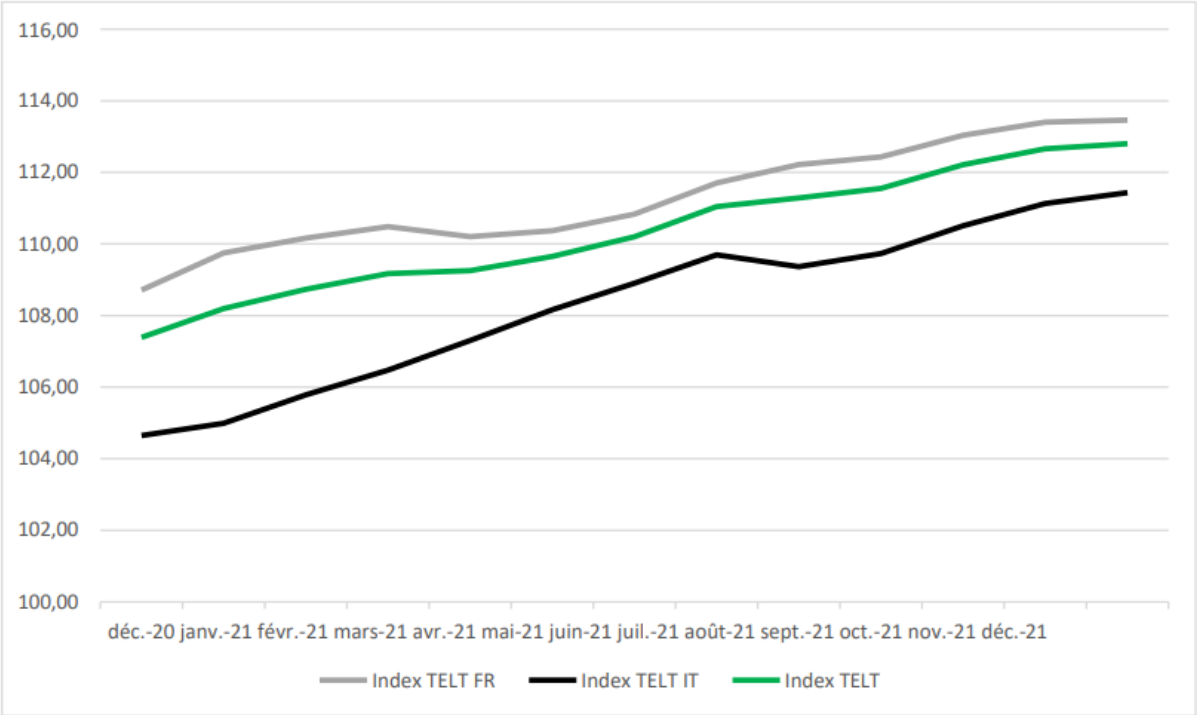

Figure 23 : NLTL index (Rapport Financier TELT,2021)

Above are the evolutions of the NLTL index and its components, between December 2020 and December 2021 :

The evolution of the NLTL index confirms the trend. observed in recent months, with the sharply noticeable increase in the overall production costs associated with the works sector. This increase has been steady throughout the year, rising 5.4 points from December 2020 to December 2021. This represents an annual rate of 5.0 percent, the most high ever recorded since January 2012(Rapport Financier TELT,2021).

The evolutionof the Indicator NLTL depends on the evolutions of its 4 component sub-indicators(Rapport Financier TELT,2021):

• Civil Engineering:

- Underground work (IND1) = a reconstructed Index is used, as specified in the Additional Protocol, based on a set of detailed elementary indicators (see in Table 1)

- External surface works (IND2) = a reconstructed Index is used, as indicated in the Additional Protocol, based on a set of detailed elementary indicators (see in Table 1 below)

• Facilities (IND2) = Same index used for surface work

• Land acquisitions and accompanying measures = Index of Prices at the Consumption excluding tobacco (CPI excluding tobacco)

• Project management = Engineering index, which corresponds to the "Index mensuel du coût horaire du travail révisé - activités spécialisées, scientifiques et techniques" for INSEE, "Labor cost in enterprises with at least 500 employees - professional, scientific and technical activities" for ISTAT, and "Labor cost index - specialized, scientific and technical activities" for EUROSTAT.

The graph below represent the monthly evolution of the NLTL index since January 2012.

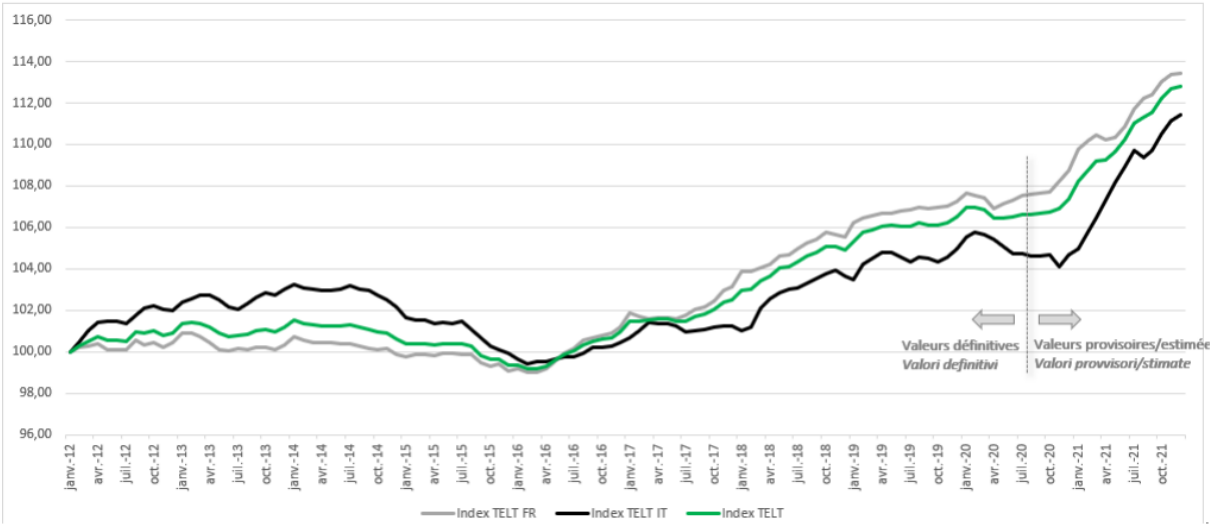

Figure 24 : Graph of the monthly evaluation of the NLTL index (green curve) since January 2012(Rapport Financier TELT,2021)

2.2.2.3 Stakeholder engagement

The Lyon-Turin railway is a high-speed rail project aimed at connecting the cities of Lyon, France, and Turin, Italy, through the construction of a new 270-kilometer railway line. This project, which is estimated to cost €26 billion, is part of the Trans-European Transport Network (TEN-T) and aims to enhance cross-border connectivity, reduce travel time, and lower the environmental impact caused by freight transport. For such a massive project, engaging stakeholders and maintaining a strong relationship with them is crucial for its success. In this section, we will explore the various efforts made to involve stakeholders in the Lyon-Turin railway project and analyze areas where improvement can be made.

The general stakeholder engagement should follow the procedure mentioned from previous section, Lyon-Turin High speed railway is no exception. During this section, 2 articles have been analyzed alone with the interview from project members to provide a basic idea about

the stakeholder engagement process of Lyon-Turin High Speed Rail project and the progress they already achieved.

In order to engage with stakeholder, the first step is always to identify who is stakeholder in this project. Basically, stakeholders are anyone who has any kind of interest in the project. It is them who decide if a project is a success or a failure.

Stakeholder engagement is a critical aspect of large infrastructure projects like the Lyon-Turin HSR. Such projects often involve multiple actors with diverse interests, ranging from government agencies and private sector companies to local communities and environmental organizations. Effectively engaging these stakeholders throughout the planning, construction, and operational phases can help to ensure that the project is developed in a way that addresses their needs and concerns, minimizes negative impacts, and maximizes overall benefits. Moreover, successful stakeholder engagement can foster trust and collaboration, reduce conflicts, and improve the long-term sustainability and acceptance of the project.

The purpose of this section is to analyze the key stakeholders involved in the Lyon-Turin HSR project, understand their roles, interests, and influence, meanwhile the engagement strategy will also be analyzed. By doing so, this paper aims to provide valuable insights and recommendations for the project team, policymakers, and other relevant actors to ensure the successful stakeholder engagement process and ultimately contribute to the successful implementation of the Lyon-Turin HSR project.

Stakeholder identification

According to the definition of the stakeholder, A stakeholder can be defined as any individual, group, or organization that has an interest in, is affected by, or can influence a specific project, policy, or decision. Stakeholders can be internal or external to an organization and can include a wide range of actors, such as employees, customers, suppliers, government agencies, non-governmental organizations, local communities, and investors, among others. (Freeman, R. E. (1984))

Because the vast amount of stakeholders for a megaproject like Lyon-Turin railway, it is impossible to list every single individual, group or organization of them. So according to;

1. Government Authorities

• European Union (EU): The EU is a major stakeholder in this project, as it aims to improve the overall transportation network within the region, promote economic integration, and reduce carbon emissions by encouraging a shift from road to rail transport.

• French Government: The French government seeks to improve transport connections with Italy, boost economic growth in the surrounding regions, and meet its climate targets by supporting sustainable transport solutions.

• Italian Government: Similar to the French government, the Italian government aims to enhance transport links with France, stimulate economic growth in the concerned regions, and promote environmentally friendly transportation alternatives.

2. Transportation Companies

• Railway Operators: Railway operators, such as SNCF (France) and Trenitalia (Italy), will benefit from the improved connectivity, reduced travel times, and increased capacity provided by the HSR, which may result in higher passenger and freight volumes.

• Freight Companies: The HSR will allow for the faster and more efficient transportation of goods between France and Italy, benefiting freight companies and their customers.

3. Local and Regional Authorities

• Auvergne-Rhône-Alpes Region (France): This region includes Lyon and the surrounding areas that will be impacted by the HSR. The local authorities aim to capitalize on the project's potential economic benefits and support sustainable development.

• Piedmont Region (Italy): The Piedmont Region, which includes Turin, is similarly interested in the project's economic and sustainable development potential.

4. Local Communities

• Residents: People living near the proposed HSR route may experience both positive and negative impacts. On one hand, improved transportation infrastructure could lead to economic growth and job opportunities. On the other hand, construction and operation of the HSR may cause disruptions, noise pollution, and other environmental concerns.

•Businesses: Local businesses, particularly those in the tourism and hospitality sectors, may benefit from increased visitors due to improved accessibility.

5.Environmental Groups and NGOs

• Environmental Organizations: Groups advocating for environmental protection and sustainable development may have a vested interest in the HSR project. While the HSR has the potential to reduce carbon emissions by shifting traffic from road to rail, it may also impact natural habitats and ecosystems during construction.

• Non-Governmental Organizations (NGOs): NGOs focused on transportation, sustainable development, and social issues may be interested in the project's potential impacts on local communities, infrastructure development, and environmental conservation.

Stakeholder engagement for Government Authorities

Among allstakeholders, government authorities are one of the most important stakeholders for this project. And it is a crucial process for government authorities to ensure that policies, programs, and projects are developed and implemented in a way that is responsive to the needs and concerns of the community. By engaging with stakeholders in a meaningful way, government authorities can build trust, improve decision-making, and achieve better outcomes for all stakeholders involved. One of the most important things for stakeholder engagement is to ensure the stakeholder fully aware why this project is necessary and what they will lose if the project is stopped. The article “le ragioni ed i numeri della torino lione il decalogo di un’opera “indispensabile” e “conveniente” provided some great insight about why this project is necessary for government authorities.

The Turin-Lyon line is essential for the economy of the country and europe: the data of economic exchange and traffic flows show its necessity

Official data from the Institute of Foreign Trade (ICE), European Union (DGMOVE), and Federal Office of Transport of Switzerland (UFT) show that economic trade and goods flows between Italy and Western Europe are extremely large, greater than those passing through Switzerland.

Overall, economic exchange with Western European countries amounts to 205 billion euros, with a 21 billion euro trade surplus. Trade with EU countries accounts for 41% of total exchange (35% with all of Europe). France is Italy's second largest trading partner, Spain is third, and the UK is fourth.

In 2017, 44.1 million tons of goods were transported by land: 93% by road through the crossings at Ventimiglia, Fréjus, and Mont Blanc, accounting for over 3.5 million heavy vehicles. The remaining 7% goes by rail, not due to lack of demand but because there is no longer a rail system that meets market needs. For this reason, rail transport on the old Fréjus line has lost 70% of volumes transported in the past 20 years and continues to decline. In contrast, 38.9 million tons of goods pass through Swiss crossings to Northern Europe, of which 70% go by rail and 30% by road (around 950,000 heavy goods vehicles)—14% less than passes through French crossings.

The data clearly show that trade and economic flows between Italy and Western Europe warrant modern transport infrastructure. The discrepancy in the share of rail transport used in the Swiss crossings compared to the French crossings demonstrate that the technical limitations of the historic Fréjus infrastructure, rather than lack of demand, are responsible

for the modal imbalance, which weighs heavily on the economy, the environment, and quality of life along the route. Constructing a new, larger tunnel would allow a modal rebalancing by shifting freight onto rail, with significant economic and environmental benefits(le ragioni ed i numeri della torino lione,2019).

The decision to do the work is a recent choice made on the basis of recent analyses and studies

The development and subsequent work to upgrade the Turin-Lyon Rail Axis to European standards has been a thirty-year journey, involving numerous agreements, comparisons, analyses, discussions, studies, and in-depth examinations. This process has been continually reconsidered, re-evaluated, reviewed, and updated.

In 2015 and then in 2018, the new project was entirely revamped and approved by CIPE. The commencement of the final work was contingent upon the formalization of European co-financing (Grant Agreement 2015) and the completion of the Italy-France Agreements 2015 and 2016, as stipulated in the Italy-France Agreement 2012. The EU-INEA conducted assessments of the project's economic viability in 2014 and 2015 before providing funding.

Italy fully implemented the Agreements, with Parliamentary Ratification in Law no. 1/2017, which concerns the "Ratification and execution of the agreement between the Government of the Italian Republic and the Government of the French Republic for the start of final works on the cross-border section of the new Turin-Lyon railway line, done in Paris on February 24, 2015 and the Additional Protocol, with Annex, done in Venice on March 8, 2016, with annexed contract adopted in Turin on June 7, 2016". This law was published in the Official Gazette no. 9 on January 12, 2017. The final decision by the Italian and French Parliaments and the European Union is thus a "recent fact" preceded by an extensive and in-depth national and international study and evaluation process, which was updated and verified by the EU-INEA almost yearly.

The planning of interventions aligns with the infrastructure planning tools adopted by the Italian State, which include the DEF 2018 (Infrastructures), the MIT - RFI Program Contract, the MIT - FS - TELT Program Contract, and the CIPE funding and project approval resolution.(le ragioni ed i numeri della torino lione,2019).

The Turin-Lyon is a missing ring of the TEN-T network essential for Europe

In 2013, the European Union redefined the central rail network through two regulations (1315 and 1316), organizing it into nine corridors and redesigning the Ten-T network. The Connecting Europe Facility (CEF) financing plan was also approved by the European Parliament. The Mont Cenis Tunnel is a crucial part of the Mediterranean Corridor and ranks as the third largest project among 270 projects. Due to its significance, the European Union granted substantial co-financing within the CEF program for 2015-2019 (41%). Without this

contribution, the final Agreement between Italy and France would not have been ratified, and the final work would not have commenced.

For the European Union, the current Turin-Lyon line is more than just a bottleneck; it is a missing link in the EUROPEAN NETWORKS (Mediterranean Corridor). It holds increasing transnational strategic importance that extends beyond the bi-national dimension of Italy and France, encompassing other Eastern European countries (Austria, Slovenia, Hungary, Czech Republic, Slovakia) and Western countries (Spain and Portugal)(le ragioni ed i numeri della torino lione,2019).

The work internationally financed, with 41% European Union subsidy

The total cost for the Turin-Lyon cross-border section, including safety enhancements and the improvement of adjacent lines in Italy and France, is set at 8.6 billion euros (in 2016 values). The costs for the transalpine base tunnel alone, which spans 55 km (with 45 km on the Italian side and 10 km on the French side), amount to 8 billion euros.

Out of these 8 billion euros, 41% (3.3 billion) is financed by the European Union through the CEF Transport Fund, while the remaining 59% (4.7 billion) is jointly funded by Italy and France. As per the international agreements since 2012, costs are shared equally between the two countries.

Given the total investment of 8.6 billion euros and the economic benefits generated, the benefit-cost ratio is positive for each country individually as well as jointly. Due to this positive ratio, the project has received international financing from the European Union of 1.5 billion euros and, through the Grant Agreement 2015, an additional co-financing contribution of 2.3 billion euros within the CEF program for 2015-2019. The total European funding amounts to 3.3 billion euros, which represents 41% of the costs(le ragioni ed i numeri della torino lione,2019).

Coordination between the State, local authorities, project owner-developer, professional organizations, and financing partners in the Major Construction Project Approach

In the Major Construction Project Approach, the coordination between the State, local authorities, project owner-developer, professional organizations, and financing partners has been crucial for the successful implementation of the Lyon-Turin project. This innovative mechanism brings together all the key stakeholders to collaboratively work towards achieving common goals, such as supporting the territorial development, creating employment opportunities, and enhancing the economic transformation. By pooling their skills, resources, and expertise, these stakeholders have been able to develop tailored strategies and initiatives that cater to the evolving needs of the territory and its residents. This cohesive and dynamic collaboration has ensured a swift response to challenges and has allowed the stakeholders to adapt to changing circumstances, such as economic downturns

or health crises. The success of the Major Construction Project Approach can be attributed to the continuous coordination and communication among the involved parties, fostering a sense of shared responsibility and commitment to the project's objectives.(Xavier et al,. 2021)

Support for the Maurienne Territory Contract with a €40.7 million investment program for 2016-2020, including €3 million from the territorial support fund

The Maurienne Territory Contract, backed by a €40.7 million investment program for 2016-2020, signifies the commitment of various stakeholders to support the economic and social development of the territory. Out of this investment, €3 million comes from the territorial support fund, demonstrating the shared responsibility of the different partners involved. The support for the Maurienne Territory Contract has enabled the implementation of numerous initiatives aimed at improving the living environment, promoting employment and training opportunities, and encouraging ecological transition in the region.

The financial contributions from various stakeholders, including the State, local authorities, project owner-developer, professional organizations, and financing partners, have been instrumental in driving lasting, positive change in the Maurienne territory. By allocating resources effectively, these stakeholders ensure that a wide range of projects receive the necessary support. These projects range from enhancing local facilities and supporting the energy transition to rehabilitating town centers and promoting intermodality in transportation.

Through this concerted effort, the partners have successfully engaged in the collaborative process, fostering a sense of unity and purpose in their pursuit of the shared objectives outlined in the Maurienne Territory Contract. Their continued support demonstrates the value of investing in the region's long-term development and the importance of working together to maximize the positive impact of the Lyon-Turin project on the local communities(Xavier et al,. 2021).

Stakeholder engagement for Transportation Companies

The Turin-Lyon is not a high speed line but a new generation tunnel for freight and local transport

The new Turin-Lyon railway link is not designed as a high-speed line; instead, it primarily focuses on freight transport and daily mobility connections in the territories along the route through regional trains. The new infrastructure complies with international technical standards for interoperable freight transport (maximum inclination, minimum radius of curvature, platforms, etc.) and guarantees maximum operating safety and efficiency. The new route will accommodate freight trains up to 1,500 meters long, with the potential to double in length for unit trains. The new link is conceived as a new generation tunnel: it

features two distinct single-track tunnels for freight transport and a third tunnel for regional transport and emergency management.

The tunnel's dimensions and the route's low gradient (maximum 12.5‰) allow all types of freight trains currently operating on European TEN-T network corridors (lengths up to 1,500 m, weight up to 20 t per axle with double traction) to pass without restrictions or interference with passenger traffic. The maximum operating speed will be 100 km/h for freight trains and 160 km/h for passenger trains. Although technically possible, very high-speed passenger trains are not currently planned for the tunnel, as dedicated infrastructure would be required that the countries and the EU do not consider necessary or a priority compared to the project's primary objective: freight transport. The served passenger traffic will consist of regional connections and travel for tourism and cultural purposes.

The Turin-Lyon link seamlessly integrates with the railway line layout as a junction, enabling transit freight traffic to Rome and beyond, as well as towards Northern Italy and Germany, and passenger traffic towards Turin, Milan, and beyond via Bussoleno. The countries considered and discarded the idea of a junction bypassing Turin for a hypothetical direct high-speed freight branch between France and Novara, as it would not serve the territories and logistic and transport needs along the axis. The link modernizes a historic route by adapting it to sustainable freight transport requirements and serves the daily regional connections of the territories it crosses. It is not a high-speed passenger line running parallel to existing efficient motorway routes(Osservatorio per L'asse Ferroviario Torino Lione,2019).

Promotion of intermodality and improved access to stations through the redevelopment of station surroundings, such as Saint-Jean-de-Maurienne's new multimodal transport hub (PEM)

The stakeholders involved in the Lyon-Turin project are dedicated to promoting intermodality and improving access to stations through initiatives like the redevelopment of station surroundings. A prime example of this is the new multimodal transport hub (PEM) at Saint-Jean-de-Maurienne, which has been designed to facilitate seamless connections between various modes of transportation and enhance the overall mobility experience for travelers.

The Saint-Jean-de-Maurienne PEM serves as a central transportation hub, integrating trains, buses, bicycles, and pedestrian pathways to offer users a convenient and efficient means of travel. This comprehensive approach to transportation planning not only improves access to the station but also encourages the use of sustainable and eco-friendly mobility options, ultimately contributing to a reduction in greenhouse gas emissions.

The redevelopment of station surroundings, such as the PEM at Saint-Jean-de-Maurienne, also creates opportunities for urban revitalization in the area. By enhancing the aesthetics

and functionality of the station environment, the stakeholders aim to create a more inviting space for residents and visitors, boosting local businesses and tourism in the process.

This focus on intermodality and the improvement of station access reflects the holistic approach taken by the stakeholders in the Lyon-Turin project. By incorporating sustainable development principles and prioritizing the needs of users, the project aims to create a modern, efficient, and environmentally responsible transportation infrastructure that benefits the entire region(Xavier et al,. 2021).

Other stakeholder engagement for transportation companies also including:

• Job development and training to promote local employment as close as possible to the construction site

• Support for the local and regional economic fabric to allow local and regional companies access to construction sites and facilitate the reception of external companies in the territory

• Accommodation for construction site employees by helping in particular with the rehabilitation and mobilization of vacant public and private housing

• Welcoming employees to the territory aims to solve problems of housing search, transport, welcoming the family until the spouse's employment and discovering the activities of the territory.

• A single welcome desk will liaise with Major Construction Project referents designated by companies

• Mobilizing the local and regional economic fabric: a platform to support the economic fabric led by Auvergne-Rhône-Alpes-Entreprise is set up by the DGC to help companies succeed.

• Participating in the support project for Maurienne to anchor construction sites in the territory.

• A guide has been published to explain in a few pages what the Lyon-Turin Major Construction Project Approach is, and the tools made available to companies to successfully integrate construction sites entrusted to them into the territory.

Stakeholder engagement for Local and Regional Authorities

The Turin-Lyon ensures greater territorial connectivity between Italy and France

The Turin-Lyon cross-border rail link's primary goal is not only to connect the centers of the involved regions but also to enable the connection of railway networks between Italy and

France, Southern France and Northern Italy, and consequently the multimodal platforms present.

The project's layout involves the continuation and modernization of the railway between Turin, Mont Cenis, and Lyon, rather than constructing a new high-speed line. The railway axis extends beyond Turin and Lyon, connecting to the railway networks of both countries and their ports. This ensures widespread connectivity, including through the future Mediterranean Corridor that will link Algeciras in Spain to Budapest. The new base tunnel also improves accessibility to Alpine valleys, expanding their transport and tourism options, as evidenced by the experiences of other cross-border tunnels.

The enhancement of freight rail transport facilitated by the Turin-Lyon link leads to the immediate integration of transport and logistical chains between Italy and France and beyond. This integration is highly sought after by economic operators in both countries. The multimodal platforms connected to the axis (Orbassano and Aiton in Italy, Grenay, Longeray, Aiton in France) also benefit from this development. An infrastructural link with such significant impacts on territorial cohesion and competitiveness cannot be merely considered as a "not very useful" passenger railway line. Instead, it acquires the strategic value of an enabler for sustainable mobility and a green economy(le ragioni ed i numeri della torino lione,2019).

Collaboration with elected officials in the territory and the public promoter to prioritize the development of existing private and public housing for construction site employees

The collaboration between elected officials in the Maurienne territory, the public promoter, and other stakeholders has been pivotal in addressing the housing needs of construction site employees working on the Lyon-Turin project. Recognizing the importance of providing adequate accommodation for the workforce, the partners have come together to prioritize the development of both existing private and public housing in the region.

This collaborative approach has enabled the stakeholders to efficiently pool their resources and knowledge, ensuring that the housing needs of the employees are met effectively. By engaging with local authorities and elected officials, the public promoter has been able to gain insights into the region's existing housing stock, identify suitable properties, and work together to develop tailored solutions for the workforce.

One such initiative is the establishment of the Habitat House, which supports private landlords in providing accommodation for construction site employees. Additionally, the partners have focused on the rehabilitation of the public housing stock of OPAC de Savoie, benefiting not only the employees but also the current residents of the region.

Through open communication and a shared commitment to addressing the housing needs of the construction site employees, the collaboration between elected officials, public promoter,

and other stakeholders has been successful in providing adequate and comfortable living spaces for the workforce. This, in turn, contributes to the overall success and smooth execution of the Lyon-Turin project(Xavier et al,. 2021).

Partnership with Savoy Departmental Fire and Rescue Service (SDIS 73) for the tunnel skills center project in Modane

The partnership between stakeholders involved in the Lyon-Turin project and the Savoy Departmental Fire and Rescue Service (SDIS 73) demonstrates the commitment to enhancing the region's skillset and addressing the technical challenges associated with the construction of the tunnel. This collaboration has led to the establishment of a tunnel skills center project in Modane, which serves as a hub for training, innovation, and knowledge sharing in the field of tunnel construction and safety.

By joining forces with SDIS 73, the stakeholders have been able to leverage the expertise of the departmental fire and rescue service in emergency response and tunnel safety. This partnership has enabled the creation of specialized training programs tailored to the specific needs of the Lyon-Turin project, ensuring that the workforce is well-equipped to handle the unique challenges associated with tunnel construction.

Moreover, the tunnel skills center in Modane serves as a platform for fostering innovation and promoting research and development in the field of tunnel construction. The collaboration with SDIS 73 allows the center to stay up-to-date with the latest advancements in safety measures and techniques, ensuring that the Lyon-Turin project benefits from cutting-edge knowledge.

This partnership exemplifies the value of engaging with local organizations and authorities in order to capitalize on their expertise and resources. Through the tunnel skills center project in Modane, the stakeholders have been able to hone in on the skills and knowledge required for the successful execution of the Lyon-Turin project, while also contributing to the long-term development of the region's technical capabilities.(Xavier et al,. 2021)

Town center rehabilitation operations and redevelopment of station surroundings to improve the living environment and revitalize the valley town centers

The stakeholders involved in the Lyon-Turin project have made concerted efforts to improve the living environment in the Maurienne valley by undertaking town center rehabilitation operations and redeveloping the surroundings of train stations. These initiatives aim to revitalize the valley town centers and create a more inviting atmosphere for both residents and visitors.

The town center rehabilitation operations focus on renovating public spaces, upgrading infrastructure, and preserving the historical and cultural heritage of the towns. By working

closely with local authorities and the community, the stakeholders have been able to identify the areas in need of improvement and develop tailored solutions that enhance the overall aesthetics and functionality of the town centers.

The redevelopment of station surroundings is another crucial aspect of this revitalization effort. By creating new multimodal transport hubs, such as the one in Saint-Jean-de-Maurienne, the stakeholders aim to improve access to public transportation, promote intermodality, and encourage sustainable mobility solutions. These hubs integrate various modes of transportation, such as trains, buses, and bicycles, making it more convenient for people to move around the region.

These initiatives not only contribute to a better quality of life for the residents of the Maurienne valley but also boost local businesses and tourism by making the town centers more attractive and accessible. By focusing on the living environment and the revitalization of valley town centers, the stakeholders demonstrate their commitment to the sustainable development of the region and the long-term success of the Lyon-Turin project(Xavier et al,. 2021).

Support for the energy transition with environmentally friendly energy projects, such as the Saint-Julien-Montdenis wood-fired boiler

The stakeholders involved in the Lyon-Turin project recognize the importance of supporting the energy transition in the region and are committed to implementing environmentally friendly energy projects. One such example is the Saint-Julien-Montdenis wood-fired boiler, which demonstrates the project's commitment to promoting sustainable and renewable energy sources.

The Saint-Julien-Montdenis wood-fired boiler is a local initiative that harnesses the potential of biomass energy, using wood chips sourced from nearby forests as fuel. This eco-friendly energy project not only reduces the dependency on fossil fuels but also contributes to the local circular economy by utilizing locally sourced materials and creating job opportunities in the forestry and wood processing sectors.

By backing initiatives like the wood-fired boiler, the stakeholders contribute to the reduction of greenhouse gas emissions and the promotion of clean energy solutions. These projects align with the region's broader energy transition goals, such as the Positive Energy Territory (TEPOS) approach and the thermal renovation of public buildings.

Through their support for energy transition initiatives, the stakeholders involved in the Lyon-Turin project showcase their commitment to sustainable development and environmental responsibility. This approach ensures that the project not only delivers improved transportation infrastructure but also leaves a lasting positive impact on the

region's ecological footprint, benefiting both current and future generations(Xavier et al,. 2021).

stakeholder engagement actions regarding to Local and Regional Authorities:

• The Lyon-Turin Major Construction Project Approach is led by the prefect of Savoy for the State, in partnership with the Auvergne Rhône-Alpes Region and the Savoy Department. The Maurienne Area Union (SPM) and TELT, the Franco-Italian public operator in charge of building the structure, are closely involved.

• Local elected officials and stakeholders in the territory are involved and coordinated through the Maurienne Lyon-Turin Committee.

• The Maurienne Territory Contract (CTM), the territorial component of the State-Regional Plan Contract (CPER) 2015-2020, was signed by the State, the Auvergne Rhône-Alpes Region, the Savoy Department and the Maurienne Area Union, in the presence of TELT and the main elected officials of the territory.

• The development and implementation of the Maurienne Territory Contract are the result of a close partnership between the partners of the Major Construction Project Approach and local authorities.

• When signing, the CTM recommends 20 actions to support the construction site and 11 actions to support the territory for a total amount of €40.7 million to be shared between the signatories of the contract and the project leaders.

• To help municipalities that need it develop their projects, and possibly assist them in the design phase, public engineering is made available under the DGC, according to special provisions depending on the size of the municipality.

• Many town center rehabilitation operations are underway or have been conducted between 2017 and 2019 in several municipalities.

• Several station surroundings are being redeveloped or planned in different municipalities.

Stakeholder engagement for Local Communities

the oldest tunnel of the 19th century (Fréjus) and the most critical alpine crossing section are unusable for modern goods transport

The Fréjus Tunnel, built in the 19th century, and the critical Alpine crossing section it is part of can no longer be used for modern freight transport.

As stipulated in the treaty between Italy and France that went into effect on March 1, 2017, infrastructure that has reached the end of its useful life must be replaced. The historic Fréjus

Tunnel crossing, which is obsolete and inefficient, must be replaced with a modern base tunnel that meets current European standards, as has been done with other Alpine tunnels.

A new infrastructure is needed to replace the 88-km Bussoleno-Saint Jean de Maurienne section, which includes the Fréjus Tunnel and 40 km of newer tunnels. In addition to not meeting current international tunnel safety standards, the crossing's technical and morphological characteristics do not allow the passage of modern, competitive freight trains that are longer (>750 m) and heavier (2,000 tons), as required by the market.

Restrictions put in place by Italian and French railway safety authorities have effectively saturated the line. As a result, there is no remaining capacity for freight transport. Rail operators have already abandoned the line, which has lost 70% of traffic over the past 20 years. Going forward, the old crossing section can only be used for local and tourist passenger transport. To achieve the significant modal shift that Italy has agreed to, it is necessary to build a new base tunnel. Without replacing the infrastructure, there will no longer be a railway connection with France and Western Europe that can be used for freight transport. All freight traffic will have to go by highway, as is already happening.(LE RAGIONI ED I NUMERI DELLA TORINO LIONE,2019)

The work creates business and employment opportunities across multiple sectors

and preliminary studies, impacts numerous economic sectors over several years (medium and long term). The direct, indirect, and induced effects on employment and the business community of a country are always significant. Various studies conducted with the contractor's cost model (Master Plan, 2017 Update), using standard multiplier models (INR and NIBS), estimate the total impact of the cross-border section works between 2017 and 2029 as follows:

38,000 total employees (including 10,500 direct employees)

7.2 billion euros in induced total revenues distributed over 10 years (including direct expenses of 4.2 billion euros)

Additional national income for the economies of Italy and France of around 7.1 billion euros.

The impact of spin-offs on tourism development and transport and logistics efficiency gains is also significant. The reduced general transport costs and the increased accessibility of alpine valleys positively affect the tourism economy. Transport and logistics operators benefit from the improved infrastructure. The project requires the use of high-tech goods and services, resulting in positive effects on manufacturing businesses and knowledge centers of excellence. Examples include granite extraction sites and quarries, river basin rehabilitation, tunnel safety systems, and information technologies applied to rail transport.

Greenfield foreign investments in the areas involved are also expected due to enhanced accessibility and territorial connectivity. The presence of qualified human resources is promoted through the construction of the infrastructure and the scientific spin-offs that follow in the operational management phase(le ragioni ed i numeri della torino lione,2019).

The work is currently active and the tunnel has already started

After final design activities concluded with the signing of the contract for the performance of works (Construction Management) in August 2015, preparatory works began in January 2017. The excavation of the Exploratory Gallery (4 km), located at Bussoleno, started in February 2017. This gallery will cross the entire mountainous section affected by the base tunnel, allowing for detailed knowledge and management of geological risks before excavating the tunnel tubes. The core extraction cores of the Bergen-Chiomonte segment (tunnel entrance) began at the end of 2017. The Enlarged Restricted Area for the work was identified and summarized in the ConferenzaUnificata of February 2018.

Excavation is currently underway at approximately twenty construction sites, employing around 700 workers, of which over 90% reside in the provinces of Turin and Savona. All work is conducted in full compliance with regulations on occupational health and safety, the environment, and landscape.

The excavation of the first alpine tunnel (Chiomonte-Saint Martin la Porte, bore 1) began in 2021, and the tunnel is expected to enter service in 2029 according to the timeline established in international agreements. The work is fully operational despite legal delays due to appeals to the Council of State and the Tar Piedmont, which were rejected by judgment in December 2018. Some appeals are still pending but are not causing any delay to the work, as they relate to expropriation proceedings and environmental compensation already defined in the international agreements and underway(le ragioni ed i numeri della torino lione,2019).

Attendance at events, such as Mondial des Métiers in Lyon and Foire de Savoie in Chambéry, to promote awareness about Lyon-Turin trades for potential candidates and young people seeking training

The stakeholders involved in the Lyon-Turin project recognize the importance of engaging with potential candidates and young people seeking training opportunities in the construction sector. To this end, they actively participate in events like the Mondial des Métiers in Lyon and the Foire de Savoie in Chambéry, where they showcase the diverse range of trades and professions associated with the project and promote awareness among potential future employees.

By attending events like these, the stakeholders can directly connect with young people, job seekers, and those looking to change careers. They provide valuable information on the various trades and professions required for the successful execution of the Lyon-Turin

project, such as tunneling and construction, engineering, environmental management, and more.

These events also offer an opportunity for the stakeholders to present the training and apprenticeship programs available for the Lyon-Turin project. By informing young people about the skills needed and the pathways to acquiring them, they help bridge the gap between the demand for qualified workers and the supply of trained professionals.

Moreover, by promoting the Lyon-Turin project at such events, the stakeholders contribute to raising the overall visibility of the construction sector and creating a positive image of the industry among the younger generation. This outreach not only benefits the project by attracting talented individuals but also ensures the long-term growth and development of the construction sector in the region. In essence, the stakeholders' presence at events like the Mondial des Métiers and the Foire de Savoie plays a vital role in inspiring and preparing the workforce of the future.(Xavier et al,. 2021)

Establishment of the "My Job Lyon Turin" (MELT) platform to facilitate employment and training opportunities for locals

The "My Job Lyon Turin" (MELT) platform was established by stakeholders involved in the Lyon-Turin project as a dedicated online resource to facilitate employment and training opportunities for locals. This platform demonstrates the commitment of the project partners to promoting inclusive and sustainable growth in the region by engaging the local workforce and offering them a chance to be a part of this major infrastructure development.

The MELT platform serves as a central hub where job seekers, training providers, and employers can connect and exchange information. It lists available job openings, apprenticeships, and training programs related to the Lyon-Turin project, making it easier for locals to find opportunities that match their skills and aspirations.

By offering a user-friendly and accessible platform, MELT helps streamline the job search process, allowing candidates to create personalized profiles, upload their resumes, and apply for relevant positions with just a few clicks. This efficient approach not only benefits job seekers but also enables employers to identify suitable candidates more effectively.

In addition to connecting job seekers and employers, the MELT platform also plays an essential role in raising awareness about the diverse range of professions and trades associated with the Lyon-Turin project. By showcasing the multitude of opportunities available, the platform encourages locals to develop their skills and contribute to the region's economic development.

The establishment of the "My Job Lyon Turin" platform is a testament to the project's dedication to fostering local employment and training opportunities, ensuring that the

benefits of this large-scale infrastructure development are shared and enjoyed by the communities it serves(Xavier et al,. 2021).

Creation of the Habitat House to support private landlords in providing accommodation for construction site employees

The creation of the Habitat House is a tangible example of how the stakeholders involved in the Lyon-Turin project have taken proactive steps to address the housing needs of construction site employees. By establishing the Habitat House, they have demonstrated their commitment to ensuring that the workforce has access to comfortable and adequate accommodation during the project's duration.

The Habitat House serves as a support center for private landlords who wish to rent their properties to construction site employees. By offering guidance and assistance, the Habitat House helps landlords navigate the rental process, ensuring that they meet the required standards and provide suitable living spaces for the employees. This support includes advice on legal and administrative matters, as well as recommendations on how to make the accommodation more appealing and comfortable for the workers.

In addition to assisting landlords, the Habitat House also plays an essential role in connecting construction site employees with suitable housing options. By maintaining a database of available properties, the center can efficiently match workers with accommodations that meet their needs and preferences. This streamlined approach not only benefits the employees but also ensures that landlords have a reliable source of tenants for their properties.

The Habitat House contributes to fostering a sense of community and collaboration between the local population and the construction site employees. By providing support for private landlords and facilitating access to housing for the workforce, the Habitat House plays a vital role in ensuring that the Lyon-Turin project runs smoothly and is embraced by the local community(Xavier et al,. 2021).

Rehabilitation of the public housing stock of OPAC de Savoie to benefit construction site employees and current residents

The rehabilitation of the public housing stock managed by OPAC de Savoie is yet another example of how the stakeholders involved in the Lyon-Turin project are committed to enhancing the living conditions for both construction site employees and current residents. By partnering with OPAC de Savoie, the project stakeholders aim to improve the quality of public housing and create a more comfortable and inviting living environment for all.

The rehabilitation process entails the renovation and modernization of existing public housing units, ensuring that they meet the latest energy efficiency standards, offer improved

amenities, and provide a comfortable living space for the occupants. By focusing on aspects such as insulation, heating systems, and accessibility, the stakeholders can significantly enhance the quality of life for both construction site employees and current residents.

This initiative not only benefits the workforce by providing them with suitable accommodation, but it also contributes to the long-term improvement of the public housing stock in the region. By investing in the renovation of these properties, the stakeholders are helping to create a lasting positive impact on the local community and the overall living conditions in the region.

The rehabilitation of OPAC de Savoie's public housing stock demonstrates the holistic approach taken by the stakeholders involved in the Lyon-Turin project. By prioritizing the well-being of the workforce and the local community, they ensure that the project contributes to the sustainable development of the region and leaves a lasting legacy that extends beyond the completion of the infrastructure.

Improvement of local facilities, such as the renovation of the Joseph Gavarini stadium in Saint-Jean-de-Maurienne and the establishment of a new home for childminders in Villarodin-Bourget

The Lyon-Turin project stakeholders are committed to improving the overall quality of life in the region, which extends beyond transportation infrastructure development. This commitment is evident in their support for the enhancement of local facilities, such as the renovation of the Joseph Gavarini stadium in Saint-Jean-de-Maurienne and the establishment of a new home for childminders in Villarodin-Bourget.

The renovation of the Joseph Gavarini stadium in Saint-Jean-de-Maurienne is an excellent example of how the stakeholders are investing in the local community by upgrading sports facilities. This project involves modernizing the stadium, improving its infrastructure, and ensuring it meets current safety and accessibility standards. By upgrading the stadium, the stakeholders are not only providing better facilities for athletes and spectators but also fostering a sense of pride and community engagement among local residents.

Similarly, the establishment of a new home for childminders in Villarodin-Bourget demonstrates the stakeholders' dedication to supporting families and improving the availability of childcare services in the region. This new facility will provide a comfortable and welcoming environment for childminders and the children they care for, offering a valuable resource for working parents in the community.

These initiatives to improve local facilities contribute to the overall well-being of the residents in the region and help create a more vibrant and attractive living environment. By investing in the improvement of local facilities, the stakeholders involved in the Lyon-Turin

project are ensuring that the project's positive impact extends beyond transportation and infrastructure, benefiting the communities it serves in various ways(Xavier et al,. 2021).

Meanwhile, other possible engagement are also applied for this project:

• The Maurienne Area Union (SPM) and TELT, the Franco-Italian public operator in charge of building the structure, are closely involved in the Major Construction Project Approach.

• The partners aim to support the smooth running of the construction sites and to be a lever for development for the territory.

• The approach involves local elected officials and stakeholders in the territory and coordinates actions to support the territory through the Maurienne Lyon-Turin Committee.

• The Maurienne Territory Contract (CTM) aims to strengthen the territorial integration of the infrastructure and support the emergence of structuring projects for the valley.

• Projects that can benefit from the dynamics of the Major Construction Project to improve the attractiveness and living environment of Maurienne are supported.

• Actions focus on training and employment, economic diversification, improving quality of life through facilities and services, energy transition and mobility.

• A territorial support and support fund (FAST) of €32 million was allocated for the duration of the construction sites to fund projects.

• Projects are labeled that are the most structuring, related to Lyon-Turin or concerning small municipalities impacted by the construction sites.

• Specific reclassification actions are implemented for employees to allow them rapid re-employment in the valley.

• The Major Construction Project Observatory regularly measures the effects of the construction site on the territory and shares results with stakeholders.

• The tunnel skills center project in Modane aims to provide qualified training for underground construction or intervention in confined environments.

Stakeholder engagement for Environmental Groups and NGOs

The Turin-Lyon rail line serves the ecological transition of the transport system

The infrastructure's purpose is not to transport "high-speed goods," but rather to shift the transit of goods from road to rail. It aims to make numerous long and heavy freight trains more economical and competitive due to lower energy costs. The new line consumes 1/3 of the energy per unit transported compared to the old one, making rail transport more convenient than road transport.

At cruising speed, the base tunnel will accommodate 162 freight trains per day, allowing for the transportation of at least 30 million tonnes per year. This amount surpasses the rail traffic at Switzerland's borders today, where 70% of transportation (27 million tonnes) is already carried by rail.

The current imbalance of road transport (93% of the total) at French crossings is the worst in the Alps and results in pollution, congestion, and accidents not only at crossings but also throughout the motorway network.

Shifting freight transport from road to rail (30% by 2030 and 50% by 2050) offers significant economic and environmental benefits. A train produces 1/9 of the CO2 and particulate matter per unit of weight transported compared to road transport. The new line will enable a 40% reduction in transport costs compared to road transport, eliminate three million tonnes of CO2 per year, and significantly reduce congestion and accidents on the motorway network. The cumulative carbon balance is highly positive and advantageous compared to the alternative "do nothing" scenario.

Sustainable mobility and green economy policies prioritize modal transfer. An ecological transition of the transport system is not credible without first enabling efficient rail infrastructure.

However, there is no mention of direct engagement with environmental groups or NGOs to develop and implement the approach. The focus seems to be more on sustainable actions and projects that benefit the local communities. More involvement of environmental organizations could potentially strengthen the environmental dimension of the approach (Osservatorio per L'asse Ferroviario Torino Lione,2019).

Support for the energy transition through projects like the Haute-Maurienne-Vanoise community of municipalities' wood chip shed expansion, thermal renovation of public buildings, and the Positive Energy Territory (TEPOS) approach

Supporting the energy transition and promoting sustainable development in the region is an integral part of the Lyon-Turin project stakeholders' commitment to making a positive impact on local communities. By investing in initiatives such as the Haute-Maurienne-

Vanoise community of municipalities' wood chip shed expansion, thermal renovation of public buildings, and the Positive Energy Territory (TEPOS) approach, they demonstrate their dedication to fostering a greener and more environmentally responsible future.

Wood chip shed expansion: The expansion of the wood chip shed in the Haute-Maurienne-Vanoise community of municipalities is an essential initiative to increase the use of biomass as a renewable energy source. By facilitating the storage and processing of locally-sourced wood chips, the project helps reduce dependence on fossil fuels and lowers greenhouse gas emissions. This commitment to sustainable energy not only benefits the environment but also supports the local economy by creating demand for wood chips and related services.

Thermal renovation of public buildings: By supporting the thermal renovation of public buildings, the Lyon-Turin project stakeholders contribute to enhancing energy efficiency and reducing the carbon footprint of these facilities. By improving insulation, upgrading heating systems, and incorporating energy-efficient technologies, these renovations lead to decreased energy consumption and lower greenhouse gas emissions. This initiative also results in long-term cost savings for the community, as lower energy consumption translates to reduced utility bills.

Positive Energy Territory (TEPOS) approach: Embracing the TEPOS approach signifies a comprehensive commitment to achieving energy self-sufficiency and reducing greenhouse gas emissions at the local level. The Lyon-Turin stakeholders' support of this approach encourages local communities to adopt sustainable practices in energy conservation, renewable energy production, and eco-friendly transportation options. By fostering a culture of sustainability, the TEPOS approach contributes to long-term resilience in the face of climate change and environmental challenges.

In conclusion, the support provided by the Lyon-Turin project stakeholders for these energy transition initiatives showcases their dedication to creating a more sustainable and environmentally responsible future for local communities. By investing in green energy projects and eco-friendly practices, they help ensure that the Lyon-Turin project's benefits extend beyond transportation infrastructure, positively impacting the overall well-being of the region and its residents(Xavier et al,. 2021).

Development of the cycling sector, with a 160 km cycle route connecting the V62 cycle route in Combe de Savoie and EuroVelo 8 in Italy

The development of the cycling sector is a key component of the Lyon-Turin project's commitment to promoting sustainable transportation and improving the quality of life for local communities. One notable initiative in this regard is the creation of a 160 km cycle route that connects the V62 cycle route in Combe de Savoie, France, with the EuroVelo 8 route in

Italy. This new cycling infrastructure not only encourages greener modes of transportation but also supports local tourism, recreation, and healthy living.

The 160 km cycle route provides a safe, dedicated, and scenic path for cyclists of all skill levels to traverse the region. By connecting the V62 cycle route in Combe de Savoie with the EuroVelo 8 route in Italy, the new cycling infrastructure helps to bridge the gap between the two countries and promotes cross-border cycling tourism. This, in turn, fosters cultural exchange, cooperation, and a greater appreciation for the unique landscapes and heritage sites found in the region.

Additionally, the new cycle route encourages residents to adopt healthier and more sustainable transportation habits. By providing a safe and convenient alternative to car travel, the route makes it easier for local communities to embrace cycling as a viable means of transportation for both commuting and leisure purposes.

Moreover, the development of the cycling sector has broader economic benefits for the region. The new cycle route is likely to attract tourists and cycling enthusiasts, which can boost the local economy through increased spending on accommodations, restaurants, and other services. The growth of the cycling sector also creates new opportunities for businesses and entrepreneurs to cater to the needs of cyclists, such as bike rentals, repair shops, and tour operators.

In summary, the development of the 160 km cycle route connecting the V62 cycle route in Combe de Savoie and EuroVelo 8 in Italy is a testament to the Lyon-Turin project stakeholders' commitment to promoting sustainable transportation and enhancing the well-being of local communities. By investing in the cycling sector, they contribute to a greener, healthier, and more connected region, where the benefits of the project are not limited to transportation infrastructure but extend to the quality of life, environment, and economy as well(Xavier et al,. 2021).

Other stakeholder engagement action regarding Environmental Groups and NGOs:

• Actions to support the local area focus on energy transition, promoting the local and regional economic framework, R&D, revitalizing town centers and approaches to railway stations, and cycle paths.

• An axis of the approach is to act in favor of sustainable development and help accelerate the energy transition in order to make Maurienne a positive energy territory.

• The new Saint-Julien-Montdenis wood-fired boiler, the expansion of the wood chip shed of the Haute-Maurienne-Vanoise community of municipalities and the thermal renovation of several public buildings are examples of operations supporting the energy transition.

• Operational studies have been launched to design a 160 km cycle route along the valley bottom to strengthen the attractiveness of the territory for cycling.

• The environmental impacts of the construction sites are monitored through the Major Construction Project Observatory.

• In order to maximize its effects, the Major Construction Project Approach must continue to adapt to developments in the project and strengthen in the coming years around new levers to support the ecological transition and the transformation of sectors of activity.

• Innovation can also be at the heart of future actions to build a sustainable dynamic on the territory beyond the commissioning of infrastructure, which is the ultimate objective.

2.2.3 Interviews

The first interview conducted with Lorenzo Brino who is the dupity director of the railway division in TELT. He was formerly the director of engineering for 20 years from 2002 to 2022. The second interview conducted with Viviana Corigliano who is in charge of institutional relations since 2008 in TELT.

2.2.3.1 Governance

As Mr. Brino provided an overview of the project, he explained that it originated in the early 1990s with a summit held in France and Italy. The two states agreed to initiate feasibility studies for the Turin-Lyon link, which consists of three sections. The French section is managed by the national railway company, the Italian section is overseen by the national railway administration, and the border section is jointly managed by both countries.

Initially, there was no dedicated company for the project. Instead, a working group was formed between the two national railway associations to conduct the feasibility studies. However, in 1994, the two states decided to establish a special purpose vehicle named AlpeTunnel. This entity was jointly owned by the two national companies and the states, with representatives from the main ministries forming an intergovernmental commission. The feasibility study phase continued until 2001, when the states signed a treaty to create a new special company called Lyon Turin Ferroviaire (LTF). LTF was responsible for the studies, ministry procedures, and certain investigation works. It operated from 2001 to 2015. When LTF was established, it initially comprised a small group of individuals who had experience in railway administration. However, they recognized the need to recruit employees from the private sector. Mr. Brino, for example, joined LTF as the technical director due to his expertise as a tunnel designer in a prominent international company. With his knowledge and experience, Mr. Brino played a crucial role in managing the design phase of the project.

During the design phase, both countries conducted studies, but the approval processes were conducted separately in France and Italy.The design phase of the project is highly intricate,

primarily due to the differing approval regulations between the two states involved. In France, only the preliminary design needed to be completed, while in Italy, both the preliminary and final designs had to be submitted. This discrepancy represents the most significant difference.

Moving on to the approval procedures, in France, a "Public Inquiry" was conducted. During this process, the design was made public, allowing individuals, cities, and associations to provide comments. An inquiring commissioner oversaw the proceedings, addressing questions, comments, and criticisms while making recommendations for approval with certain conditions.

In Italy, the approval process was more complex. At that time, an "Objective Law" allowed for the recognition of public utility based solely on the preliminary design. However, due to difficulties encountered with the public, the Italian government decided to finalize the design and incorporate it into the approval procedure. In this case, there was no public inquiry, but a "service conference" was organized, inviting all stakeholders to provide their advice and input.

Due to these variations and the challenges involved, the declaration of public utility in France was made in 2007, five years after the start of the design phase. In Italy, this declaration occurred in 2015, following an intermediate adjustment of the alignment to find a location for the line that caused fewer issues with the local terrain. Thus, it is evident that the parallel approval procedures took significantly longer in one country compared to the other, with an eight-year difference between the two cases.By 2015, the design and investigations were nearly completed, with approximately 20 kilometers of tunnel, intermediate heads, and exploratory tunnels already constructed. At this point, the states decided to transform LTF into a new company called TELT.In the company charter in LTF French decided president and design director and Italy decided the general director and construction manager.In the new company French still decides president and juridic directory, Italy decides general director as the same power of CEO and finance director.This positions are blocked ,president will be forever French and the general director will be forever Italy. The personnel remained the same, but the shareholders now consisted of the Italian national railway company and the French Ministry of Economy. In 2015, the construction phase commenced, and the work is currently ongoing on the base tunnel.According to Mr. Brino, the board of TELT is characterized by a perfect equal distribution of power. It consists of high-level managers who oversee the project. However, there are two notable distinctions within the TELT board. Firstly, the European Union member serves as an observer, and secondly, representatives from the Savoy region and Piedmont region are also present but do not possess voting rights. Hence, there are three external observers in total. Considering that the European Union is the primary financial contributor to the project, its presence as an observer is expected. The inclusion of two representatives from the territorial regions aims to maintain a strong

connection with the stakeholders, as this relationship began with the establishment of the observatory.In response to the question about what would happen if there were any change requests from the observatory, Mr. Brino explains that the technical observatory is responsible for managing both the Italian section and the cross-border section of the project. In the Italian section, the design has not yet been approved. Therefore, the observatory engages in direct discussions regarding the national line. As a result, any proposed changes are still feasible for the national line.

However, for the section managed by Mr. Brino's team, all decisions have already been made, reaching a compromise based on the alignment's characteristics. The alignment and structure have already received approval and are not subject to further discussion. Therefore, if there are any requests from the territory, they would not affect the alignment or structure, as these aspects have been finalized. The budget for building the global route is divided in three sections and French and Italy directly finance their section without European contribution. Because all the European contribution was dedicated to the cross-border section with finance by the two States.

Around 1500 people are involved in the project as contractors and engineers, with an additional 200 individuals working directly for TELT. Half of the TELT team operates from the French Office, while the other half works from the Italian Office.TELT is the only binational company managing binational project with a unique organization for Mr.Brino.

As per Ms. Viviana, the agreements regarding governance have been established to determine how the company is managed. The governance structure ensures that certain roles within the company are assigned by the respective governments. Specifically, the President and the Juridic Director are appointed by the French government, while the General Director and the Financial Director are named by the Italian government.Additionally, all other directors and human resources are selected and employed in the same manner as in any regular company. In terms of financing, the project is publicly promoted on both sides, with 35% of the project's finances contributed by France, 25% by Italy, and the remaining portion funded by the European Union. It is noteworthy that this mega project is one among various transportation projects forming the Trans-European Network, which aims to enhance transport infrastructure at a European level.The overall objective is to align with European policies and meet sustainability standards, reflecting the focus on green initiatives and sustainability in the European market until 2030.

2.2.3.2 BCA and feasibility

According to Mr. Brino, the cost-benefit analysis of the project was conducted as a socio-economic analysis. These analyses consistently yielded positive results and were scrutinized by the European Union, as the project needed to demonstrate its positive socio-economic impact to gain EU approval. Additionally, the analysis was performed with the involvement of stakeholders, who actively participated rather than remaining passive.

In 2019, the analysis took on a political dimension, as the government at that time was opposed to the project. Their aim was to use the analysis to argue that the project was not economically viable. However, this attempt ultimately proved unsuccessful. It is worth noting that in many cases, the professionals responsible for conducting the analysis had a clear bias against the project. Consequently, the predetermined outcome of the analysis could be inferred.

According to Ms.Viviana there were seven cost-benefit analysis in total and all of them were official.They were with government or with European Union. As she adding '' It is peculiar that the government claims the project's cost benefits are the only decisive factor, considering that the mega project falls within the purview of the European Union, which has approved it. This creates an unusual situation. The information presented in the mainstream media may have played a significant role in shaping public perception. In Italy, there is a belief that the government's statements align with the truth, but at an international level, there exists a contrasting and divergent perception.''

2.2.3.3 Stakeholder engagement

According to the interview with Viviana and Brino, several stakehodler engagement approaches has been conducted.

Initial Lack of Consultation and Local Opposition

viviana: "the first step was a very bad step in a strategy that in transport project management we can say decide announce the do that strategy that is our best strategy for project management but this is what happened in our case "

In the 1990s and 2000s, when the project was first launched, there was minimal consultation with local stakeholders. This led to resistance from local communities who believed the project would have negative environmental, economic, and social consequences. Viviana described this initial approach as a poor strategy in transport project management, which involved deciding, announcing, and then implementing the project.

Establishment of the Observatory Body in 2006

After conflicts between protesters and the police took place in 2006, the Italian government established an observatory body, similar to the participation process implemented in France. This body aimed to address the concerns of local communities and offer compensation. As a result, opposition from local mayors who were open to negotiations was reduced.

Compensation for Local Communities

The compensation provided to local communities focused on projects associated with mobility and transport, support for worker accommodations, and restructuring funds. Viviana mentioned that the region had to support the arrival of workers and facilitate the restructuring process.

Continued Ideological Opposition and Social Media Presence

Despite the decrease in local opposition, a broader ideological movement against the project persisted. This movement utilized social media to amplify its voice but ultimately could not halt the project due to international treaties and agreements.

Benefit-Cost Analyses

viviana: "We had another seven cost benefit analysit, seven." Since 2006, multiple benefit-cost analyses have been carried out to economically justify the project. However, only the 2019 analysis is publicly available in Italy. Viviana mentioned that there have been a total of seven cost-benefit analyses conducted.

The interview with Lorenzo Brino emphasized key stakeholder engagement approaches in the project, starting with joint feasibility studies conducted by France and Italy in the 1990s, setting a foundation for collaboration. Following opposition, the Technical Observatory body was established in 2006, involving representatives from both countries' municipalities, provinces, and regions who participated in regular weekly meetings over 3-6 years to discuss project aspects, including potential alignment changes, ultimately identifying a new alignment that addressed concerns. Lorenzo Brino also discussed engaging with stakeholders through these meetings for 5 years to discuss alignment, work sites, impacts, and mitigation measures. Open service conferences were held, enabling citizens to express their concerns and criticisms, while internal benefits, such as new international railway stations, were provided to directly benefit local communities. Furthermore, regional representatives from Piedmont and Savoy served as observers on the TELT board, ensuring an ongoing connection with local stakeholders and building on earlier consultations.

3. Conclusion

In this thesis, we analyzed the complexities, governance, cost-benefit analysis, and stakeholder engagement associated with megaprojects. Our findings provide valuable insights into the various aspects of these large-scale, complex endeavors and offer practical recommendations for their successful implementation We found that understanding the inherent complexity of megaprojects is crucial for effective management and decision-making. This involves acknowledging the multiple dimensions of the project, such as technical, organizational, and socio-political aspects, and addressing the associated challenges

In conclusion, our findings offer valuable lessons learned and recommendations for managing megaprojects more effectively. By understanding project complexity, enhancing governance structures, conducting comprehensive cost-benefit analyses, and engaging stakeholders systematically, the likelihood of successful megaproject implementation can be significantly increased. These insights not only contribute to the current body of knowledge on megaprojects but also provide a solid foundation for future research and potential generalizations in the field.

The Turin-Lyon high-speed railway line project, also known as the TAV (Treno Alta Velocità), is an ambitious infrastructure project aimed at connecting the cities of Turin in Italy and Lyon in France through a high-speed rail line. The project has faced significant opposition from various groups, particularly environmentalists and local communities. Critics argue that the project would cause irreparable damage to the sensitive Alpine ecosystem and disrupt the lives of people living in the affected areas. They also question the economic viability of the project, citing cost overruns and the availability of alternative transportation options. This researchconducted a comprehensive analysis of governance, cost-benefit analysis, feasibility and stakeholder engagement.

Project governance differs between the two countries, with France following a standard administrative procedure called the Public Inquiry, which involves public consultations and addresses social conflict. In Italy, The target law (Legge Obiettivo) allowed the central government to approve projects without public consultation. Italy later established the Observatory for the Turin-Lyon Railway in response to opposition, conducting public consultations to proceed with the project.The Observatory was composed of representatives from various Italian Ministries, local authorities, and the French-Italian intergovernmental Commission for NLTL. Mario Virano was appointed as the President of the Osservatory by the Italian Prime Minister, Silvio Berlusconi. The Observatory had ambitious ambitions, but many obstacles prevented it from achieving these goals easily. Opposition groups in the Susa Valley raised concerns about the project's utility, public health risks, and environmental impact.A public inquiry in France presented manipulated traffic data to convince local residents of the importance of the project. However, opponents like Daniel Ibanez exposed

the distortion and provided valuable expertise to counter the proponents' claims. In Italy, opposition groups highlighted the decrease in traffic between Italy and France, questioned the project's environmental impact, and criticized the lack of justification for such an expensive infrastructure project.The construction process involved expropriation of lands and the establishment of construction sites, leading to protests by the NOTAV movement. The movement emphasized the negative environmental impact of construction activities and opposed high-speed rail projects.

The Lyon-Turin rail connection project in Italy has undergone multiple cost-benefit analysis over the years, resulting in divergent findings. Different evaluations consider varying project sections, configurations, levels of detail, geographic perimeters, and traffic forecasts. Some studies are more comprehensive, while others rely on simplified calculations. As a result, there is significant variation in the Net Present Value (NPV) outcomes of these evaluations.

The Ministry for Transport and Infrastructures published the last CBA in February 2019. The analyse resulted in a negative Net Present Value (NPV). The release of the report sparked heated debates and controversies, drawing significant public attention to the Cost-Benefit Analysis (CBA) conducted for the Lyon-Turin project.

Key stakeholders involved in the Lyon-Turin HSR project contain government authorities (European Union, French and Italian governments), transportation companies (SNCF, Trenitalia), local and regional authorities (Auvergne-Rhône-Alpes Region, Piedmont Region), local communities (residents and businesses), and environmental groups and NGOs. Analyzing their roles, interests and influence helps develop effective engagement strategies and provides insights and recommendations for successful stakeholder engagement in project implementation.

The methodology section of the research study provides a detailed description of the overall research approach, including literature review, document review, and interviews. The aim of the literature review is to gain a comprehensive overview of existing research and knowledge related to project management in the context of large-scale infrastructure projects like the Lyon Turin railway project. The literature review aims to provide background knowledge, identify research gaps, summarize existing knowledge, evaluate project management methodologies, determine key success factors, and suggest areas of improvement. The purpose of document review is to gather data from existing documents that are relevant to the research questions or objectives.The purpose of the interviews are to provide a comprehensive and in-depth analysis of the data to answer the research questions or objectives. Interviews provided rich and complex data that cannot be obtained through other research methods such as surveys or document analysis.

The conflict surrounding the Legge Obiettivo law and the Turin-Lyon high-speed railway project in Italy has led to important tensions between local communities, authorities, and the

government. The Legge Obiettivo, approved in 2001, the purpose was to accelerate the completion of strategic public works projects across the country. However, it limited the ability of municipal authorities to voice opposition and restricted the Environmental Impact Assessment (EIA) procedure.In 2003, the Turin-Lyon railway project was included in the Legge Obiettivo, leading to further controversy. Local communities, particularly in the Susa Valley, raised concerns about the project's value, expense, and environmental impact. The No TAV movement emerged, opposing the construction of the railway and engaging in acts of resistance and protests.

The Italian government, led by Prime Minister Silvio Berlusconi, has pushed the project tenaciously.The conflict surrounding the Legge Obiettivo and the Turin-Lyon railway project represents a complex interplay between national development interests, environmental concerns, and local community resistance. The restrictions imposed by the Legge Obiettivo and the limited involvement of local authorities in decision-making processes sparked frustration and opposition.

The No TAV movement and other local communities raised valid concerns about the project's economic viability, environmental impact, and the potential disruption to their way of life. This dispute highlights the importance of a comprehensive decision-making process, effective mediation, and consideration of the concerns of all parties involved. Despite attempts at mediation and changes in project proposals, the conflicts persisted, and the project faced delays and financial consequences, including the potential loss of European funding. The construction site became militarized due to violent clashes, and the controversy led to the withdrawal of representative institutions from the mediation process.

In order to prevent the exclusion of local governments from the decision-making process, the Comunità Montana filed an appeal against the Legge Obiettivo with the Regione Lazio's TAR (Regional Administrative Court). However, the French government began to have concerns about the value, expense, and environmental impact of this work. As a result, the Alpetunnel project came under further scrutiny. Regione Piemonte, Provincia, and the Municipality of Turin started exploring for additional alternatives in an effort to reach a new compromise.In an argument that swiftly grew and resulted in the militarization of the valley, the No TAV movement carried out a number of acts of resistance in the winter of 2005 in defense of the construction sites.The march on December 8th, when 30.000 people occupied and reclaimed the locations, was particularly significant. The sites were transformed into garrisons for coordinating resistance forces and places of social solidarity and community. The demonstration persuaded the Italian government to change course and cancel its plans for Venaus.

The 2019 CBA report presented two traffic scenarios: a "high traffic" scenario and a "realistic" scenario. Both scenarios concluded in a negative Net Present Value (NPV), primarily due to

substantial costs associated with fuel duties and losses incurred by highway operators. While the project's benefits, including externalities, road congestion reduction, freight surplus, and passenger surplus, were important, they were not enough to offset the costs.Criticism of the CBA results focused on the inclusion of taxation, particularly the decrease in fuel tax income as a cost. Economists discussed that excise taxes should be disregarded as they involve transfers. Some economists suggested that the category labeled "freight and passenger surplus" might include the benefits derived from lower taxation, but the net surplus after accounting for taxes was negative, indicating losses for users in other cost components.The application of the Rule of Half in the assessment obtained criticism for underestimating the benefits. Critics discussed that this approach oversimplified the demand function and employed a linear approximation.Thus,the 2019 Cost-Benefit Analysis of the Lyon-Turin project faced criticism for its approach to taxation, use of the Rule of Half, compliance with guidelines, consideration of broader economic effects, absence of a proper demand model, and paradoxical outcomes. The analysis showed a negative NPV, indicating that the project's benefits did not outweigh the costs.

The main focus of the CBA is primarily on assessing the local impacts, but when it comes to transportation infrastructure projects, especially large and expensive ones, they also have effects at the regional level. CBA is primarily a tool for analyzing microeconomic aspects, so large projects that are expected to bring about transformational and macroeconomic changes are not well suited for CBA. The majority of CBAs tend to underestimate the broader economic benefits because they assume a constant land usage. Moreover, accounting for the effects of agglomeration and the subsequent increase in production proves challenging for many CBAs.

There is a need to expand the CBA model to incorporate external effects, such as environmental implications, into the assessment. While most extensions have focused on addressing negative effects, there is growing interest in identifying potential positive externalities, specially related to employment and economic growth. However, caution is needed to avoid double counting benefits, such as adding employment benefits to time savings. The impact on labor markets is evident in urban settings, but less so in interurban scenarios like high-speed train links. An expanded CBA model should also consider the distribution of costs and benefits, including over different time periods and societal groupings. The issue of equity and democratic outcomes in CBA decision-making is also discussed, as increased complexity may exclude certain groups. Travel time savings, although significant, are often not fully reflected in GDP, but they contribute to increased productivity and cost savings. CBA-DK, an evolution of transitional CBA, includes quantitative risk analysis using Monte Carlo simulations and provides a set of plausible results while accounting for uncertainties in predictive models and input factors.

Tunnel Euralpin Lyon Turin S.A.S. (TELT) is a French company governed by French law, with its registered office in Le Bourget du Lac, France, and its administrative office in Turin, Italy.The shares are owned equally by two shareholders.Ferrovie dello Stato SpA (Italian State Railways) and the French State each own a share. These two shareholders jointly control TELT.TELT was established under the agreement of 30 January 2012 between France and Italy for the construction and management of the new Turin-Lyon railway line. The governance structure of TELT includes a Board of Directors composed of ten members, including the Chairman and the Chief Executive Officer. The Chairman and juridic directory is appointed by the French State, and the Chief Executive Officer and finance director is appointed by the Italian StateThe Board of Directors is in charge of approving financial accounts, management reports, budgets, contracts, agreements, and the compensation of the Chairman and Chief Executive Officer. It also decides on the company's general and strategic policies. In summary, TELT is jointly controlled by the French and Italian States through their equal shareholding. The company operates based on subsidies from these states and the European Union. The Board of Directors, led by the Chairman and the Chief Executive Officer, oversees the company's operations, and the President and the General Manager have key roles in the decision-making process.The project involves a variety range of stakeholders with different interests and approaches, fostering collaboration and incorporating multiple perspectives.The governments of Italy and France sign international agreements to regularize EU construction tasks and deadlines, ensuring collaboration and cooperation between national public administrations and railway companies.The EU employs grant agreements and strategic action plans to allocate funds and monitor progress, ensuring accountability and adherence to project objectives and timelines.Overall, this governance framework serves as an excellent example of a collaborative governance model that includes the European Union, Italy, and France.The governance structure demonstrates attempts to incorporate stakeholder input, transparency, accountability, and consideration of environmental and health impacts.

In the context of the Turin-Lyon high-speed railway line project, the creation of a "Osservatorio" (Observatory) with the participation of all local communities has emerged as a best practice for governance and stakeholder engagement. The purpose of the Osservatorio is to facilitate dialogue, exchange information, address concerns, and promote shared decision-making among all stakeholders involved in the Turin-Lyon high-speed railway line project. By involving local communities, the Osservatorio recognizes the importance of engaging those directly affected by the project and gives them a voice in shaping its development.

The Osservatorio also plays a crucial role in monitoring and evaluating the project's progress. It assesses the implementation of mitigation measures, analyzes the environmental and social impacts, and ensures compliance with relevant regulations and commitments. Through regular meetings and consultations, the Osservatorio keeps stakeholders informed

about project milestones, timelines, and any adjustments made based on feedback received.In general, the creation of an Osservatorio for the project to build a high-speed train link between Turin and Lyon encourages good governance, increases stakeholder participation, and encourages a participatory approach to decision-making. All local communities are included, which recognizes their concerns, appreciates their opinions, and provides a forum for constructive discussion, resulting in more informed and long-lasting project outcomes.

In terms of governance, our research highlights the importance of enhancing both formal structures and informal methods to mitigate significant risks and ensure societal benefits. Effective governance involves identifying crucial project aspects and decisions through stakeholder engagement, determining the ultimate funding provider, and defining the authority to act on behalf of the client. Collaboration between the steering group and project manager is essential for efficient project governance, which in turn, increases the likelihood of project success

Our investigation into cost-benefit analysis underscores the need for a comprehensive assessment of the costs and benefits of a project, accounting for environmental, societal, and economic factors. We recommend adopting a broader cost-benefit analysis model that incorporates external effects, both negative and positive, and addresses equity concerns in assessments. This approach would lead to more informed decision-making and better alignment with strategic goals

Regarding stakeholder engagement, our research emphasizes the importance of a systematic approach to identify, engage, and prioritize stakeholders to ensure their interests are considered throughout the project lifecycle. We found that combining stakeholder management approaches, focusing on both compliance with project needs and value creation for stakeholders, can lead to increased transparency, fairness, and trust, ultimately contributing to project success.

To better clarify the reason why the French and Italian situation have been so different in terms of stakeholder engagement, a broader interview plan could be developed.To obtain information from multiple stakeholders, such as government representatives, project developers, local residents, environmental organizations, and other important participants, an interview strategy might be created. Their opinions on stakeholder involvement, as well as their experiences, worries, and recommendations for change, should be explored throughout the interviews. To gather quantifiable data and comments on stakeholder engagement techniques, surveys can also be sent to a wider group of stakeholders.

Comparative analysis of comparable case studies from across the globe and in Europe (such as the Gotthard Base Tunnel) could also be used to better understand what factors should be considered when creating these kinds of megaprojects. Comparing similar global

megaprojects, such the Gotthard Base Tunnel in Switzerland or other high-speed rail initiatives in Europe. Understanding the elements that contributed to effective stakeholder involvement, the difficulties encountered, and the lessons learned should be the main goals of this analysis. The Turin-Lyon project can benefit from understanding the best practices and relevant indicators that can be learned from these case studies.

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