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Considering the social and economic implications of infrastructure megaprojects: theoretical contributions, practical challenges and managerial implications

1. Introduction

The United Nations, as part of their 2030 agenda, are promoting 17 Sustainable Development Goals (SDGs). Goal 9 encourages relevant actors in industry and beyond to ‘build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation’ (United Nations 2021). This point is further reinforced by the Green Deal of the European Commission (European Commission 2019), with its focus on several interconnected areas, like Sustainable Industry, to ‘ensure more sustainable, more environmentally-friendly production cycles’, Building and Renovating, ‘for a cleaner construction sector’, and Sustainable Mobility, ‘promoting more sustainable means of transport’. The Urban Infrastructure Initiative, led by the World Business Council for Sustainable Development, emphasizes the need for cities and businesses to work collaboratively to ‘navigate these (sustainability) challenges and turn a high-level vision into practical and implementable action plans’ (WBCSD, 2014).

In this scenario, it would be myopic not to focus on the challenges posed by megaprojects, such as those concerning infrastructure. Megaprojects have seen their biggest growth in history, and captured the attention of scholars and practitioners alike (Ma et al. 2019). Given their magnitude, the challenges they pose are of a different nature and, very often, scale to those of an individual organization, whether a company or a government. The intricate network of stakeholders involved greatly complicates the distribution of responsibilities and calls for a greater need for accountability. However, as the concept of Megaproject Social Responsibility (MSR) (Lin et al. 2017; Ma et al. 2017) suggests, attention must be paid broadly to the planning, monitoring and measurement of social, economic, and environmental impact of megaprojects. This systemic view of sustainability, which follows the different stages of development in an integrated way, is considered an essential condition for any social and environmental impact analysis. Megaprojects are no exceptions to this and should also follow this holistic view of sustainability. In light of this, recent studies focus on the interconnections among SDGs, affirming that it would not be wise to address one SDG without considering the potentially deep interactions with other goals (Griggs et al. 2017; Weitz et al. 2018; Nilsson 2017; Nilsson et al. 2018). As Weitz et al. (2018) argue, although governments may well have understood SDGs and their individual goals, a systemic view from practitioners is currently lacking. Therefore,

scholars criticize that often when SDGs are implemented within policies or projects, they are almost always considered individually and not with respect to the interactions between them. Also, the interconnections between SDGs are not always positive, which means that a progressive improvement in one of them could potentially imply a worsening in another (Nilsson et al. 2018). By contrast, we consider the interactions among SDGs as an essential planning element, echoing Scharlemann et al. (2020), who emphasize how those interactions are a prerequisite for any impact assessment of the sustainable development of an area.

It is important to highlight that, despite some national differences, in Europe the impacts of megaprojects are regulated through norms that apply to two specific contexts only, Environmental Impact Assessment and the Assessment on Health and Safety. By contrast, providing a full account of the socio-economic impacts is usually not required by law. Especially in the case of megaprojects run by private companies, the MSR concept calls for scrutiny that goes beyond simply abiding by regulations. As Littau et al. (2015) argue, understanding how to manage and minimize negative economic and social impacts is a proactive way for those who execute a megaproject to take on social responsibilities. A first step towards this could be joining the Global Compact initiative by the United Nations. Despite being far from unproblematic, as we will explain later, this should, at least in principle, bind a company to operate in more sustainable ways, by conforming to the ten guiding principles (United Nations Global Compact 2021). Given the popularity of the initiative, an increasing number of big players in the construction and engineering industry have indeed joined the Global Compact, but this should be seen as only a first step from Corporate Social Responsibility (CSR, therefore at organizational level) to an integrated, systemic MSR, (hence at project level) aimed at sustainable development. Although adherence to the Global Compact may represent a first step, it is certainly not sufficient to guarantee a concrete and effective commitment to the adoption of social responsibilities, which requires much more concrete management methods and tools.

Hence, the rationale for this chapter is to discuss how a comprehensive evaluation of the socio-economic impacts of a megaproject can be undertaken, based on a pilot project that the authors are involved in. The research takes advantage of the multidisciplinary background of the authors, rooted in sustainability accounting, critical organization studies and sociology of cultural and communicative processes, to build a framework for the assessment of socioeconomic impacts of megaprojects. The case analysed in this chapter is the Turin-Lyon Tunnel, a rail megaproject undertaken by the European Union as part of the trans-European transport network. The project, which has been discussed since the 1990s, has seen vehement

opposition (at least on the Italian side) by local communities, civil society organizations and even governments over the years.

The chapter is structured as follows: firstly, we define megaprojects and MSR and discuss how this concept relates to and differs from organizational CSR. Then we introduce the case study of the Turin-Lyon tunnel, followed by the research framework and methodological considerations of our research. We then present research findings, and the chapter ends with a discussion and some concluding remarks, including some takeaways for the society-level impacts of CSR.

2. Megaprojects and MSR

2.1. Defining megaprojects

In the last thirty years, megaprojects have enjoyed their ‘biggest boom in history’ (Ma et al. 2019). Conventionally, the word ‘megaproject’ is used to indicate big works that can be public, private, or resulting from private/public partnerships, usually with an international and/or transnational character, and a long-term perspective, which can last decades. Megaprojects are defined primarily in terms of major infrastructural endeavours, both fixed infrastructure and non-fixed complex technologies in sectors such as tunnels, aerospace and IT (van Fenema, Rietjens, and van Baalen 2016). Megaprojects are characterized, as Flyvbjerg (2014) points out, by four main aspects: technological, political, economic and aesthetic. Besides the Turin-Lyon tunnel, recent examples of megaprojects include the Genoa-Saint George Bridge (Italy), the Hong Kong–Zhuhai–Macau Bridge (China, Hong Kong, Macau) or the Western Europe–Western China International Transit Corridor (Kazakhstan). From an organizational point of view, megaprojects are complex, dynamic and in some cases temporary (think, for instance, of the World Expo, or the Olympics, which also require infrastructural efforts and management policies for the post-event stage). They also display ‘more ambiguous roles and boundaries, and more informal coordination activities between teams’ (Wang et al. 2017). Within the different definitions of megaprojects, there are nuances regarding the investment thresholds required, as well as the different phases of project management. Yi et al. (2015) argue that it would not be correct to assign to megaprojects an absolute cost threshold (usually \$1bln), but rather to use the megaproject cost-GDP ratio, stating that most megaprojects ratios are between 0.01% and 0.02% of the respective country’s GDP. During the different phases of development, megaprojects may affect the interests of several categories of stakeholders, among which there are: contractors, sub-contractors, investors, governments, local communities, but also supra-national organizations and regulatory bodies.

Gellert and Lynch (2003) point out that megaprojects could potentially displace resources, physical, human as well as natural resources, and these displacements could result in large-scale physical and social effects. Furthermore, megaprojects often carry a high degree of uncertainty and risk, which usually relate to both the costs involved and the expected social benefits (Fischhendler et al. 2015), many of which, as van de Graaf and Sovacool (2014) contend, are imposed on local communities and on society as a whole.

2.2. Megaproject Social Responsibility: key aspects

To summarize, several definitions agree that megaprojects are mostly related to the realization of complex and often controversial works, not only in terms of their environmental impact, which is a key challenge for sustainable development (Wang et al. 2017), but from a social, political and economic point of view too (Oliomogbe and Smith 2012; van Marrewijk et al. 2008; Flyvbjerg 2017, 2014).

This is not to neglect the benefits that megaprojects can give to modern societies in terms of economics (Flyvbjerg 2014), but to fully consider their impacts, defined as potentially ‘dramatic and permanent’ (Lin et al. 2017), on the project performance as a whole (He et al. 2019; Lin et al. 2018). The concept of MSR, defined by Zeng et al. (2015) as ‘the policies and practices of the stakeholders through the whole project life cycle that reflect responsibilities for the well-being of the wider society’, comes into play as an important approach to integrate several dimensions of social responsibilities into a holistic framework. For instance, one could think of themes such as corruption, land appropriation, supply chain issues, human rights issues, respect for the community, tracking of raw materials, etc. More specifically, the authors identify a specific dynamism at the different stages of the lifespan of an infrastructural megaproject: the dynamic evolution of social and environmental issues during the megaproject life cycle, including changes in primary participants over time (Ma et al. 2017); the changes in the heterogeneity of the stakeholders as bearers of needs manifested by the impacts; finally, the existence of networked interactions between partners and instances during time. As Lin et al. (2017) point out, social responsibility issues in the implementation of megaprojects have been analysed from several perspectives, such as organizational sustainability, project and stakeholder management, labour market, economic growth and regional health, financial and non-financial performance as well as catalysts for innovation, which can affect project performance directly and indirectly (He et al. 2019; Zeng et al. 2015). They argue, however, that MSR should adopt a more holistic perspective, which takes into account not only the main firms responsible for the projects but the multitude of stakeholders involved, more generally

focusing on the project's sustainability performance at both macro- and micro-level. Similarly, Ma et al. (2019) argue that MSR involves project, organizational and industrial concerns; they go on to build an integrated framework for the evaluation of the effects of MSR in the construction industry, which considers MSR, stakeholders and sustainability improvements.

2.3. The interplay between Megaproject Social Responsibility and Corporate Social Responsibility

The nexus between MSR and CSR poses several questions. As clarified above, when it comes to identifying social responsibilities in a megaproject, CSR – as organisation-level construct – needs to extend its boundaries to include partners, contractors and sub-contractors and also those responsible to design the necessary architectures, as well as those responsible for managing the infrastructure once realized. Consequently, there are multiple agency problems that could affect the allocation of social responsibility. Crucially, these problems concern the nature of the relationship between the political body, which started the new infrastructure project, and the firm, which oversees the project itself. For instance, a megaproject could be started by one government or through the joint initiative of multiple countries, which is different from a single company launching a megaproject (like Elon Musk's Space X and its space centre).

Furthermore, it can happen that private-public partnerships or special purpose entities (like in the case of business arrangements responsible for the execution of a project limited in time) oversee the management of the social responsibility linked to the entire project execution. The main difference is that usually a government (or governments) entrusts a company or a group of companies (profit-oriented) with the execution of a project or, as in the case that will be presented in this chapter, it can happen that a new hybrid organization is created whose shareholders are the member states and the European Union itself. In the latter case, those who implement and manage the project in its various phases are the promoters themselves. In this case, therefore, the main shareholders are also responsible for guaranteeing the common good of the project. In this case, it is possible (if often only imperfectly) to apply Scherer and Palazzo's (2011) model of political social responsibility, as the company in charge of leading a megaproject takes on agency for the project on behalf of the political body which has commissioned it (this could be a state or the European Commission, or a joint initiative between such parties). As a consequence, the realization of a project represents the concretization of a public policy which may have a geographical dimension that is wider than the territory where the project will be located. Seen from another perspective, the populations most affected by the

works may confuse the responsibilities of those who carry out a given mega-project with the political responsibilities of those who deliberated to carry it out. In this sense, there is a risk that those responsible for the execution of a project will – in the stakeholders' eyes – also become the political decision-makers, although they often have neither the cognitive skills nor the authority to do so (Esposito et al. 2021). In other words, companies working on megaprojects – rather the public decision-maker – may get called upon to integrate the management of various issues, the management of stakeholder concerns (which may include opponents and Not In My Backyard movements), the creation of public value and the achievement of social performance. In practice, the managers responsible for implementing these megaprojects would need to possess engineering and technical skills as well as political and social ones, which would require the acquisition of social responsibility management skills that go beyond regulatory compliance and include moral concerns (Esposito et al. 2021).

Therefore, acquiring the ability to account for one's responsibilities through the adoption of accountability systems becomes one of the ways for megaproject funders and/or managers to be able to report on the achievement of planned objectives. Although there are different types of accountability, especially towards different stakeholders, to date, most of the required accountability techniques are technocratic and regulatory. In addition to reporting mechanisms to funders, there are mechanisms for assessing environmental impacts that are strictly regulated. This consideration is valid for Europe generally as well as for Italy in particular, where the case presented here is based. However, there are also differences in accountability methods even within the same continent. For example, in France, the construction of strategic works is regulated by a specific law called *Demarche Gran Chantier*, which gives the prefect of a given area the power to control the reporting of the social, environmental and economic impacts generated during the construction of a major work. In Italy, such a law and accompanying measures do not exist. Furthermore, the legislation on identifying thresholds for environmental pollution or the production of climate-changing gas emissions is also different, although we are talking about neighbouring European states.

The presence of these regulatory disparities, in turn, generates increasing complexity in managing social responsibilities. Accountability systems can be a useful tool to combat this. Therefore, in the case of megaprojects, it is important to note that the adoption of proactive CSR strategies, such as the decision to monitor social and economic impacts, implies that the monitoring of environmental impacts is already required by law. Then, the presence or absence of specific regulations, or the presence of differences in regulation between different geographical areas, concerning the same project, can give powerful arguments to protest and

opposition movements (Tipaldo, 2011). Differing regulations can therefore lead to democratic and power imbalances (Esposito et al., 2020).

3. The Turin-Lyon railway line

The Turin-Lyon railway is a line designed for both goods and passengers, sitting at the centre of the Mediterranean Corridor of the Trans-European Transport Network (TEN-T). The total length of the line will be 270 km, with a 65 km cross-border section whose main feature is a 57.5 km long tunnel (12.5 km in Italy and 45 km in France) linking the stations of Saint-Jean-de-Maurienne (France) and Susa (Italy). Once completed, this tunnel, the Mont Cenis Base Tunnel, will be the longest railway tunnel in the world, just slightly longer than the Gotthard Base Tunnel. The company responsible for bringing this project to fruition, Tunnel Euralpin Lyon Turin (TELT), reports that the total cost of the cross-border section is € 8.6 bn, 40% of which is funded by the European Union, whereas the rest is divided between the French (25%) and Italian (35%) governments.

In Italy, high-speed rail (HSR) has been a hot topic since the early 1990s and the debate around it has often attracted a lot of attention among politicians and citizens alike, dividing those who believe it is a necessary step for the country's development and those who think it is a heavy cost that should be avoided. In the early 1990s, major industrial and political players of the North-West of Italy joined forces to be the catalysts for a new railway line that would connect Italy and France. Their argument was that a high-speed rail would be environmentally beneficial, if rail transport was to be preferred to other mass means of transportation, and that it would also have a positive socioeconomic impact on the region, increasing employment and reducing traffic congestion.

After a series of feasibility studies, the Italian and French governments signed an agreement in 2001 for the construction of the new railway line, and shortly after the binational company Lyon Turin Ferroviaire (LTF) was established as a 50-50 partnership between Rete Ferroviaria Italiana (RFI) and Réseau Ferré de France (RFF). In France, construction work started in 2002, while in Italy a series of compulsory purchases and the publication of LTF's preliminary projects to realize an exploratory tunnel in Venaus saw a big mobilization by the No TAV¹ movement, a spontaneous movement born in the 1990s against the proposed railway line. The No TAV movement is very heterogeneous and initially concentrated its efforts on the potential environmental, technical and economic impacts of the project (Armano et al., 2013). In

¹ TAV is the acronym for Treno Altà Velocità (High Speed Rail), because the speed the trains would reach would classify as high speed. They no longer do, because in 2008 EU regulation changed the parameters.

particular, the movement highlighted the negative trade-off between high costs, lack of advantages and the potential hazards connected to tunnel excavations, like asbestos release, increasing pollution and interception of water reservoirs (Marincioni and Appiotti, 2009; Fornero et al., 2005). However, the resistance soon became sociopolitical and cultural, a struggle for democracy and representation that found in the megaproject its *raison d'être*. Activists occupied the Venaus site in December 2005, clashing with the police who removed them from the area; yet, just a couple of days later, 30.000 people marched towards Venaus, invaded the site and effectively blocked the operations (Leonardi, 2013, p.34).

This first wave of resistance led to the creation of the Italian Technical Observatory in 2006, a multistakeholder body aimed at improving relationships among the different parties involved via accountability measures. The Observatory was itself an admission of guilt for past mistakes in terms of representation and communication. Other protests took place in the following years. The biggest protest took place in 2011 when, following the selection of a new site for the exploratory tunnel, Maddalena di Chiomonte, No TAV activists occupied the site for over a month. Eventually, the protesters were evicted by the police, but this action resulted in a permanent militarization and surveillance of the area, which has continued to the time of writing.

In 2015, LTF was replaced by TELT, again owned 50-50 by the Italian and French governments, albeit with some differences: the French government owns it via the Ministry of the Economy and Finance, and the Italian government via the Ferrovie dello Stato Italiane group. Having received extra funding from the EU, 2020 marked the beginning of a crucial phase of the project for TELT, with works currently underway to reach completion by 2032. In the last few years, TELT joined the United Nations Global Compact and, in addition, has engaged in social reporting based on the Global Reporting Initiative (GRI) to address stakeholder concerns. However, the climate surrounding the megaproject is still very tense, as demonstrated by a new wave of conflicts of 2021 surrounding several construction sites.

4. Research framework

The project of which this chapter is one part is, in its entirety, conceived as an example of Interventionist Research (Dumay 2010; Dumay and Baard, 2017; Baard and Dumay, 2020). This approach to research goes beyond the case study method, because it is meant to help organizations develop solutions to problems (Dumay and Baard 2017), sparking organizational change, instead of 'becoming a forum for the exercise of academic indulgence' (Fournier and Grey 2000). Baard and Dumay (2020) stress that for Interventionist Research to be effective,

academics should work closely with managers in organizations, mobilize theory for the implementation of solutions and analyse results in both theoretical and practical terms. If well executed, Interventionist Research can not only stimulate change but also realize emancipatory goals for its participants (Baard and Dumay 2020).

In this chapter, we report on one specific aspect of the overall research project, the development of indicators for a *protocol* to monitor the socio-economic impacts of the Turin-Lyon megaproject. The evolution of European legislation on EIA (Environmental Impact Assessment) procedures² has led to the development of a substantial amount of technical-scientific monitoring, compared to an exclusive focus on environmental issues in the past. However, we still lack an equally systematic tool for the evaluation of the social impact of these projects on the resident populations and local economies, as the monitoring of these impacts is not regulated equally across Europe. In the specific Italian case, the monitoring of impacts on societies and economies is a topic covered by law, but there is neither a common practice nor a shared standard to apply such measurement in an evidence-based way. This gap in regulation and professional practice has led companies in charge of executing megaprojects to present an incomparable and often superficial analysis. For this reason, our multi-disciplinary group of researchers, which includes accounting scholars, organizational sociologists, sociologists of communication and organizational ethnographers, came together to develop a set of indicators (qualitative and quantitative) that constitutes a *protocol* to monitor the socio-economic impacts of the Turin-Lyon megaproject during the entire length of the works, including, if possible, historical comparison of the past ten years of works. The protocol is, therefore, just the first step of a structured set of interventions within the organization; however, it serves as the stepping-stone for the ongoing critical exploration of the phenomenon.

Regarding the geographical parameters, the entire area qualifying as Val di Susa is defined as the area for the investigation, made up of 39 municipalities. Due to the absence of common practice and standards in social and economic impact evaluations in Italy, our research has focused just on the Italian side. In France, the Demarche Grand Chantier already regulates the management of social and economic impacts as well as their reporting.

Our findings include the outcomes of the literature and documentary review in terms of areas of impact to be considered, which also became the basis for structuring and defining the macro-areas of our protocol of megaproject impact assessment. Therefore, the research can be divided into two specific but complementary sections, namely:

² Recently updated by Directive 2011/92/EU. At the time of writing, this was not yet adopted by Italy, where prior legislation, Legislative Decree no. 152/2006, still applies.

- Socio-economic section. The indicators for this part take into account the potential areas of impact that the megaproject can have on the territory and on the main internal and external stakeholders. The macro-areas of this part are: health and safety at work and for the population; relational capital with the territory; governance of sustainability; economic effects on the territory; population mobility and the promotion of the territory with its cultural and identity capital. These indicators have been elaborated after an extensive review of megaproject management literature, an analysis of different types of reports of megaprojects and construction companies involved as well as by benchmarking other recent and comparable megaprojects.
- The socio-communicative section, which arises from a review of sociological literature. It digs further into the social fabric of the territory affected by the megaproject to monitor civic attitudes and culture, information sources and needs, social representations of the phenomenon as well as the values the actors associated with the megaproject. These variables aim to capture the possible transformation of the image that different groups of stakeholders hold of the megaproject over time.

The proposed indicators, although presented within two specific sections, have many common points and must, by their nature, be read together. For example, a change in the perception of the quality of life of citizens residing in the area can be analysed through socio-communicative information as well as through socio-economic indicators. Therefore, the results should be read jointly, with the aim of strengthening the decision-making process, i.e., the choice of actions to compensate, the choice of actions to avoid and the changes to be implemented.

As part of the wider interventionist aims of the research, the team will oversee the application of the framework for the remaining years of this project lifespan, especially in light of potential new societal issues, according to the evolution of stakeholder concerns etc. In fact, one of the principles adopted by the researchers has been to involve stakeholders in making suggestions regarding the selection of specific indicators and data. Principles adopted in choosing the indicators include: replicability, verifiability and easy retrieval of data. Striving for a systematic identification of the social and economic implications of the megaproject analysed, the researchers aimed to safeguard as much as possible the precision of information on the vast area, providing data for each of the 39 municipalities involved.

5. Methodology: towards a systematic account of impact indicators

Reporting the impacts of a megaproject is different from reporting the impacts of a company (Epstein and Buhovac 2014), and for this reason, the identification of possible indicators has involved two phases:

1. Phase 1: Review of scientific literature on the monitoring of economic and social impacts related to megaprojects and the concept of MSR.
2. Phase 2: Benchmark analysis of megaprojects and their socio-economic and socio-communicative impacts.

5.1. Phase 1: Review of scientific literature

Examining literature on megaprojects, the theme of monitoring socioeconomic impacts has, until now, been primarily discussed by engineering and project management scholars. Our scoping review (Arksey and O'Malley 2005) makes it clear that there has been a growing trend in the literature in this area since 2017. The academic articles were selected according to a criterion of relevance to the topic of social and economic impact of megaprojects; they were then divided into five non-exclusive macro-areas that allowed a more immediate identification and classification of possible KPIs. The articles were searched through the Scopus and ISI Web of Knowledge databases. The total number of relevant articles analysed is 44. Figure 1 shows the articles' distribution by theme.

[INSERT FIGURE 1 HERE]

The methodology this chapter followed for the analysis of the literature was based on an initial understanding of the issues addressed in the various articles, so that it was possible for each paper covering megaprojects to link the typology of infrastructure, the geographical context and the KPIs identified. Subsequently, potential indicators capable of measuring the performance and socio-economic impacts of a megaproject were identified, where we focussed on an integrated stakeholder-based strategy. Here, the aim was to develop indicators capable of representing multiple actors and multiple values, focusing on the main issues that each category of stakeholders has put forward during decades of debate.

The vast majority of publications were found in the International Journal of Project Management (15), followed by Project Management Journal (4) and the International Journal of Information Systems and Project Management (3). As detailed by Figure 2, attention to this

topic has led to a recent increase in publications, starting from 2017. In general, it can be argued that most publications fall within typical project management topics, while there is an almost complete lack of CSR, sustainability, or sustainability accounting themes.

[INSERT FIGURE 2 HERE]

5.2. Phase 2: Benchmark analysis

In the next phase, we undertook a benchmark analysis of megaprojects and their assessment of economic and social impacts at several levels. Although finding similar megaprojects with a binational governance, management and other characteristics was not easy, we chose a sample of megaprojects at European and international level with a degree of similarity to the case analysed. In particular, we used studies produced under the European COST Megaproject (Brookes, Locatelli, and Mikic 2015), which features a series of benchmarks on megaprojects from which common traits can be inferred. For our case, we analysed 11 megaprojects geographically distributed mainly across Europe, with others being in North America as well as Central and East Asia, and one in Australia. The megaprojects have been selected as they share some basic characteristics of the TELT project: having a binational nature, relating to the railway sector and having a strong impact on the natural environment. The typology of projects analysed gives preference to rail transport; other infrastructure projects, such as highways, roads and bridges, subways and major highway projects were also considered, but only when they have a similar scale to the TELT project, or they operate in a binational context. Table 1 summarizes the main characteristics of the megaprojects benchmarked.

Once the sample was established, the documentation produced at an institutional level by the companies responsible for these projects were retrieved from their websites and analysed. The purpose of this analysis was to identify indicators that could reflect a commitment to the territory in the economic and social spheres, as well as the socio-communicative impacts of the project on communities (like social media coverage or sentiment analysis). Finally, we used a report by the Global Commission on the Economy and Climate (NCE, 2016), a series of reports drawn up by the Observatory for the Turin-Lyon railway link, together with two reports on the state of health of the Alpine socio-economic environment edited by local research centres.

By applying Lazarsfeld's scheme (Boudon and Lazarsfeld 1965), we arrived at a protocol that has been structured as follows: *macro-areas*, *areas*, (eventually) *sub-areas*, *indicators* of

quantitative/qualitative nature. Furthermore, we have linked each indicator with applicable SDGs and principles of the United Nations Global Compact.

Table 1. The megaprojects benchmarked for our the analysis

Construction Company	Client/Infrastructure	Beginning	End	State	Location	Infrastructure type
PERGENOVA: Consorzio Salini Impregilo e Fincantieri	Special Commissioner for the rebuilding of Polcevera viaduct/Ponte "Per Genova"	2019	2020	Italy	Genova	Highways, roads, and bridges
Salini Impregilo and Lane Construction Corporation	Texas Central/Texas High Speed Rail	2020	2026	USA, Texas	Dallas and Houston	Railway transportation
BBT SE	Brenner Base Tunnel	2007	2028	Austria and Italy	From Innsbruck to Fortezza	Railway connection tunnel
China Railway & Autodesk	Wuhan-Shiyan High-Speed Railway Line	2015	2019	China	From Wuhan to Shiyan	Railway transportation
AlpTransit Gotthard and Generale Costruzioni Ferroviarie	Monte Ceneri Base Tunnel New Rail Link through the Alps (NRLA)	2006	2020	Switzerland	Canton Ticino	Railway connection tunnel
Salini Impregilo and CMT	Metroselskabet/Cityringen	2013	2019	Denmark	Copenhagen	Subway
Salini Impregilo	Transport for New South Wales/Sydney Metro Northwest	2008	2019	Australia	Sydney	Subway
L&T Metro Rail Limited	Hyderabad Metro Rail Network	2017	N/A	India	Hyderabad	Subway
Advance Work Coordination Group of HZMB	Hong Kong-Zhuhai-Macau Government Liaison Office / Hong Kong-Zhuhai-Macau Bridge	2009	2018	China, Hong Kong, Macau	Arup China Highway Planning and Design Institute	Bridge over the sea and galleries
Salini Costruttori S.P.A. (Italia)/ JV Akkord, OKAN (Azerbaijan/Turchia); Impresa S.p.A (Italia); Todini Costruzioni Generali S.p.A., (Italia), "Cengiz Insaat Sanayii Ve Ticaret A.s." (Turchia); KCC Engineering and Construction; Akmola Kurylys Material LPP, Kazaskhtan, Azerkorpu, K-Dorstroi, KCC E&C/Zhambylzholkurylys, Kazakhdorstoi LLP, (Kazaskhtan)	Southwest Roads Project: Western Europe-Western China International Transit Corridor	2009	2015 (2021 for the final project)	Kazakhstan	Aktobe, Kyzylorda, Zhambyl and Almaty	Refurbishment and upgrade of rural and interurban roads
Ghella and Acciona	Bane NOR/Follo Line	2015	2021	Norway	Oslo and Ski	High speed railway line

6. Findings

The literature review included 44 scientific articles relating to megaproject management and another 9 sociological articles specifically on megaprojects and conflict, while the benchmark analysis covered 11 megaprojects, the sustainability reports of 21 major companies participating in these projects and 7 relevant UN Global Compact reports. The analysis of the institutional documentation of the actors involved in the realisation of megaprojects highlighted that, in general, there is a tendency to develop compensatory actions through the promotion of high social impact projects co-created with the community (e.g. the refurbishment of a local museum). The literature also highlights the importance of context when assessing the impacts of megaprojects and stresses that indicators must consider specific local factors.

The main impact areas and corresponding indicators that emerged during the documentary research are detailed in Table 2 below.

Table 2. List of the main impact area emerging from literature review and documentary research

ECONOMIC IMPACTS	ENVIRONMENTAL IMPACTS	SOCIAL IMPACTS ON LOCAL COMMUNITIES	HEALTH AND SAFETY
Indirect contribution to the local economy through expenditure by workers and families located in the area	Circular use, reuse of abandoned areas within local communities during works, to be returned to the community afterwards	Agreements with food bank for surpluses recovery in the canteens of larger sites	Environmental, health, safety and human rights audits of suppliers
Creation of jobs for local workers	Noise mitigation through replacement of windows in houses most prone to noise pollution, especially for poor people	Adoption of recruitment policies in support of gender equality, also among business partners on the construction sites	Workplace accidents, fatalities and near misses
Creation of an innovation ecosystem around the sites, start-ups and spin-offs, collaboration with universities and polytechnics	Circular use of the extracted material to produce shotcrete	Update of the state of the art on the project website, with webcams on the construction sites	Worker accidents on the way to work
Improvement of the quality of local infrastructure	Establishment of an environmental education observatory	On-site health care for non-resident staff, to avoid overloading local health facilities	Promotion of a health and safety culture at work sites (training)
Improvement of local economies in connection with different regions		Involvement of unemployed local human capital	Analysis of traffic and the impact of the work on traffic in neighbouring communities
Sourcing food from local retailers		Preventative actions to reduce citizens' inconveniences and to improve the safety around the construction sites during the transportation of materials, such as construction of parking lots	

	(following the transfer of workers on site)
Economic stability of the territories in the post-operation phase	Collaboration with training institutions in the area, to recruit local people as trainees
Support for business creation and entrepreneurship	Construction of kindergarten facilities as a result of the creation of a long-term construction site, which will then be donated to the municipality
Direct support for the local economy through the involvement of local companies	Creation of business information points for citizens
	Reduction of traffic congestion
	Provision of pre-employment training courses through local training institutions (e.g. welders, carpenters, pipefitters)
	Open-door events and site visits
	Events to publicize the work to local residents, for the co-creation of co-designed social measures
	Interventions to support children in marginal communities
	Creation of internal academy-style training courses
	Instances of dialogue and debate with the local community
	Total number of beneficiaries of implemented social impact projects
	Number of workdays lost due to sabotage or protest events by the citizenry
	Social impact projects co-created with the community
	Corporate volunteering projects in the community
	Recruitment of staff from vulnerable groups, such as refugees
	Availability of all documents on the corporate website
	Reassignment and retraining of temporary workers hired in the operational phase
	Restoration of archaeological sites following the discovery of any finds
	Respect for different ethnicities, cultures, religions, and beliefs in the workplace
	Development of public policies

Building on this, and including the inputs provided by the academic literature on megaprojects, we came up with a taxonomy of macro-areas, areas and specific indicators of impact assessment. A detailed overview of its structure is given in Figure 3.

[INSERT FIGURE 3 HERE]

Ten macro-areas are included in the Protocol:

1. *Health and safety in the workplace and for the local population* includes indicators on measures to ensure the health and safety of workers employed in a megaproject, including suppliers, but also of the local population affected by construction sites in the local territory. Here the concept of health is extended to also include the psychological health of workers.
2. *Relational capital with the territory* includes a broad overview of (1) the relations that the main political and operational actors behind the megaproject establish with the territory and the local population (dialogue with the population, local institutions and actions aimed at the development of the human capital of the local territory), and (2) of local trends concerning, for example socio-demographic indicators on levels of education and wealth of the population, local emergency systems and vulnerabilities.
3. *Governance of sustainability* focuses on how the megaproject's main actors manage sustainability. In addition to the company's sustainability strategy, important issues to be considered are construction site certifications, communication of work progress and the analysis of stakeholder communication. In our case, this includes also anti-mafia regulations for any company working on the megaproject (this is not an exclusively Italian concern, rather engineering and construction companies from all parts of the world must all abide to such regulations).
4. *Economic impact on the territory* is the broadest indicator. It analyses both site-centric and territory-centric views of the trends in the local economy. The extensive analysis also includes assessments of the impact of the project (including the potential impact of the presence of construction sites within the local territory) on real estate prices, tourism and technological innovation. When considering the Turin-Lyon megaproject, we cannot avoid taking into account its bi-nationality as a fundamental characteristic, not

only of TELT, but also of a valley that lies on the border between Italy and France, where tourism fuels the economy due to winter sports.

5. *Impact on population mobility.* Mobility is a key issue, and it can severely be affected by construction works, both in terms of daily practicality (usability of roads, lack of parking, traffic congestion) and in terms of sustainable mobility and connections with neighbouring territories.
6. *Promotion of the territory and its cultural and identity capital.* In light of a need to reduce the risk for a megaproject to negatively impact on the cultural identity of a specific territory, the identity and values of the geographical area in which it is placed need to be considered. Here we identify the cultural and landscape places of interest, capture actions to preserve and promote them and estimate the risks of potential negative impacts that the megaproject might have. In the case of the Turin-Lyon railway and TELT, this also means respecting its binational culture, which is the foundation for a European and pro-European culture.
7. *Civic culture* contains a variable mix of standardized questions addressing the level of attitudes with respect to a series of actions, behaviours, situations of civic culture (like trust in institution, respect/disrespect for civic values in cases of political agitation, clientelism, attitudes to joining political and other democratic organizations, etc.). This analysis helps us to determine the civic values of a population, to understand the predisposition that it might have or not have to accepting a megaproject in its territory.
8. *Information sources* relates to the awareness that people have of a megaproject, in terms of the degree of widespread knowledge of certain aspects relating to its presence in a given territory. These indicators depend on a multiplicity of factors, like media usage/consumption, opinion leaders, political orientations, etc.
9. *Social representations* refer to the analysis of social media content in relation to the megaproject, including not only personal media but also institutional accounts and press communication.
10. *Values associated with the work* includes the reconstruction of people's opinions about the megaproject, the risks associated with it, as well as attributions of possible blame or responsibility and the identification of those responsible. In our case, this macro-area assumes critical relevance, given the long-standing, widespread resistance that the Turin-Lyon railway has encountered over the years over a lack of a democratic deliberative process at the beginning of the project. This can certainly be extended to other megaprojects that suffer from a top-down decision-making approach that excludes

a variety of stakeholders. As mentioned above, European and national-level regulations on environmental impacts are comparably strict and extensive, whereas the analysis of social and economic impacts of megaprojects is not so widespread, not even in professional practice. Given differences in national regulations here, our protocol has been developed with the intention of filling the existing gap specifically on the Italian side.

7. Discussion

Accompanying the development of a megaproject with an impact detection plan that is all-encompassing, continuous as well as open to stakeholders is fundamental to the project's ability to monitor and respond to a risk of negative impacts. One challenge here is that CSR tools, such as the Global Compact, or even sustainability reporting tools usually have an organizational focus; they do not have a focus on the entire project, nor on the changes brought about by its implementation. Upon closer examination, we also realize that companies that enter the Global Compact network are not necessarily committed to sustainable practices. As Orzes et al (2018) point out, the act of joining the Global Compact is a political one, born out of internal and external pressures to improve their reputation and performance. On top of that, the authors stress that the entry requirements for the UNGC are not very high, and companies can join without actually fully implementing practices and processes set out in the ten principles. Moreover, if the adoption of monitoring of social and economic impact assumes a binding characteristic by law, it means that if negative impacts occur, the company responsible for the construction is called upon to respond with prevention, replacement or compensative actions. From the point of view of social responsibility, the difference is huge. It means that without a protocol for monitoring these components, it is legally impossible to hold the company responsible for social and economic impacts (except for requirements that are already covered by law).

The voluntary adoption of this tool is the factual expression of a self-established intention to fill a regulatory gap with good management practice that can be replicated at different levels. Our study aims to develop a best-practice tool for all major national and international projects, to be adapted to the different socio-ecological contexts of reference. A large project developed in the Alpine environment will have different peculiarities regarding its socio-ecological settings compared to another one built by the sea. It is therefore necessary to stimulate the development of a policy that can clearly recognize the validity of a holistic and widely applicable impact assessment model, as a reference for the development of new infrastructures. Specifically, in the case presented, the opposition movements see the impacts of the Turin-Lyon

project as a real battlefield; it is therefore appropriate, especially in the future, that those who will be called upon to develop megaprojects should be equipped with skills that go beyond the technocratic sphere. Such skills should also be of a political and institutional nature, to move towards a democratic representation of requests and concerns from a broad range of stakeholders.

8. Conclusions

In this chapter, we highlighted the need for implementing a socio-economic impact measurement strategy for an infrastructure megaproject. With regard to social accounting, Gray (2001) sees some limitations in its ability to deal with systemic and large-scale problems, sometimes connected to a limited inclusion of stakeholder views or a lack of democracy. In fact, in the case presented here, we capitalized on Gray's critique and tried to devise a framework that could, in future, be applicable in other megaprojects too.

In this paper, we looked at the construction of a railway megaproject that includes the excavation of a world-record 57 km-long tunnel, connecting the two European member states Italy and France, as a reference to develop a more general discussion on the social and economic impact evaluation of megaprojects. The project presented in this paper, the High-Speed railway from Turin to Lyon has been one of the most contested projects in Europe, especially by local communities, due to its purported heavy impact on the environment and the local economy. In project management research, the measurement of environmental impact is a highly regulated field; consequently, it is one of the most researched aspects of project management worldwide. By contrast, social and economic impacts are usually less investigated by practitioners, because of the complexity of the intricate nets of variables that compose a social environment, with its history, its populations, its wealth, its social inclusion and all the economic settings characterising the ecosystem of a project.

In the context of Turin-Lyon, due to political instability of the Italian government, and due to a particularly turbulent decade for the development of the work, which led to the creation and dissolution of several companies, no social impact assessment project was implemented before 2020. Another reason for this state of affairs is the project's binational nature, where the project governance is undertaken jointly by the Italian state, the French state and the European Union.

Contrary to what happened on the Italian side, on the French side the development of the works has instead been supported by the Demarche Gran Chantier, which can be described as a long multi-stakeholder discussion table for any issue and decision to be taken with a social,

environmental and economic impact. Unfortunately, on the Italian side, there has never been such a strong political and legislative initiative, so it was only in 2020 that this impact assessment project actually started.

The innovative scope of the project described here is therefore to be found in the design of an experimental impact assessment tool that seeks, indicator by indicator, to create dialogue with local stakeholders that should be included in the assessment process in order to arrive at a socially inclusive and collaborative view. Although at the time of writing this chapter there was still a strong fringe movement opposing the project, making it impossible to say that the project currently enjoys complete social acceptance, a number of considerations can be made.

Firstly, this experimental project was designed to have a strong core of indicators, based on themes, which can be applied in any type of megaproject, as well as a series of indicators, which must be contextualised to the environment of reference, in this case the Susa Valley and the Alpine environment. Moreover, in the case investigated here, the governance of the project is binational, where none of the member states participates in the construction through profit-oriented companies, but through hybrid public enterprises. This aspect is crucial, since large international works for a public client almost always have a private contractor, so there is (almost always) an agency problem. In the case presented here, whoever carries out the project will also manage the railway line, so they will have to anticipate any management issues that are likely to happen in the future, as they will also be responsible for its future operation. This is not the case when the executor is an infrastructure company.

Secondly, in this case study, the TELT company is also a signatory of the UN Global Compact so, at least in principle it must respect the principle of multi-stakeholder inclusion, something that for years was not understood neither by the Italian government, nor by the previous companies in charge (which were later transformed into TELT). Adopting a multi-stakeholder perspective in this concrete case also means accepting, incentivizing and managing dialogue with opponents, and including all stakeholders upstream in the monitoring plan without prioritisation or exclusion. Therefore, this chapter provides an overview of the design phase of the monitoring protocol, as the first key moment in the process.

This initial version of the impact assessment tool may therefore have its a limitation, as we are at the beginning of the construction process of a project that will only be completed in a decade. It will certainly be necessary to update certain areas and indicators as the themes change and as the population itself changes. To do this, we believe it is appropriate to rely on structured literature reviews (Massaro, Dumay, and Guthrie 2016; Dumay et al. 2016) over time and then include new perspectives in the experimental protocol.

9. Takeaways for the society level impacts of CSR

Concluding this chapter, we arrive at three main takeaways. First, the definition of Megaproject Social Responsibility (MSR) requires a transcendence of the organisational boundaries on which most CSR theories are based, to include a (systemic) project vision, which encompasses not only the focal organisation but also the network of internal and external partners and stakeholders. Second, the political decision on the implementation of a megaproject cannot fail to take account of a democratic-participatory decision-making process with local stakeholders. If this is lacking, then almost all decisions and actions in terms of social responsibility will always be subject to potential risks or potential and actual conflicts. In other words, key actors may not engage in proactive measures, but merely in political responses to past actions and omissions. To conclude, it is essential for the assessment of the impacts of an infrastructure megaproject that politicians and government move towards the adoption of an increasingly eco-systemic and integrated perspective of impact analysis that perceives people, places and the natural environment as an interconnected system of relationships. Consequently, social and political actors who are responsible for construction decisions should also adopt the same eco-systemic view.

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Figure 1 - Main topics related to MSR. Source: Author's own development.

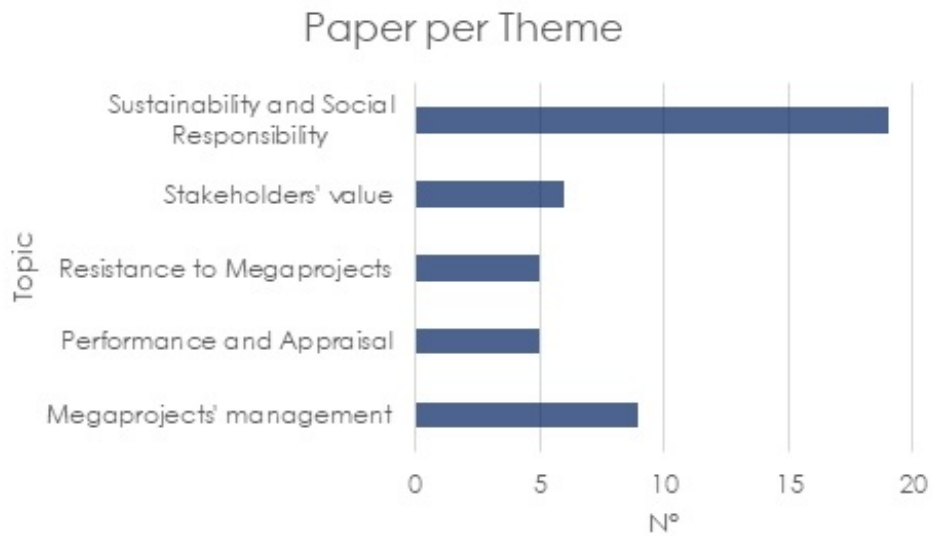


Figure 2 - Number of paper related to MSR per year of publication. Source: Author's own development.

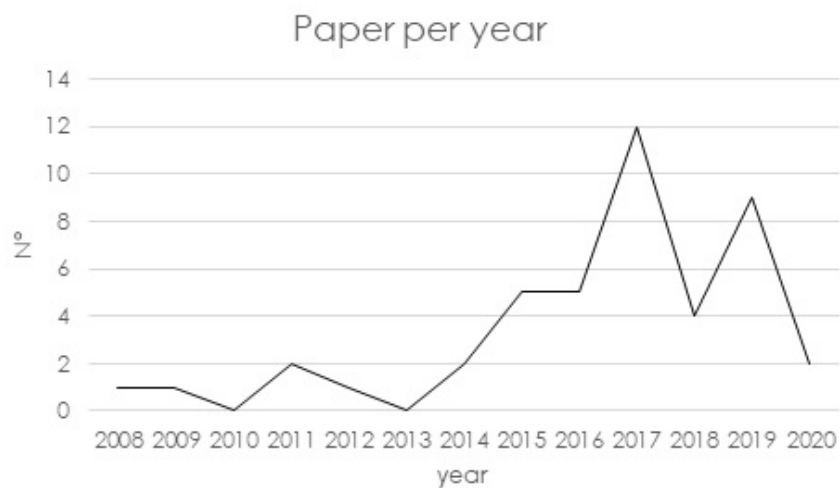
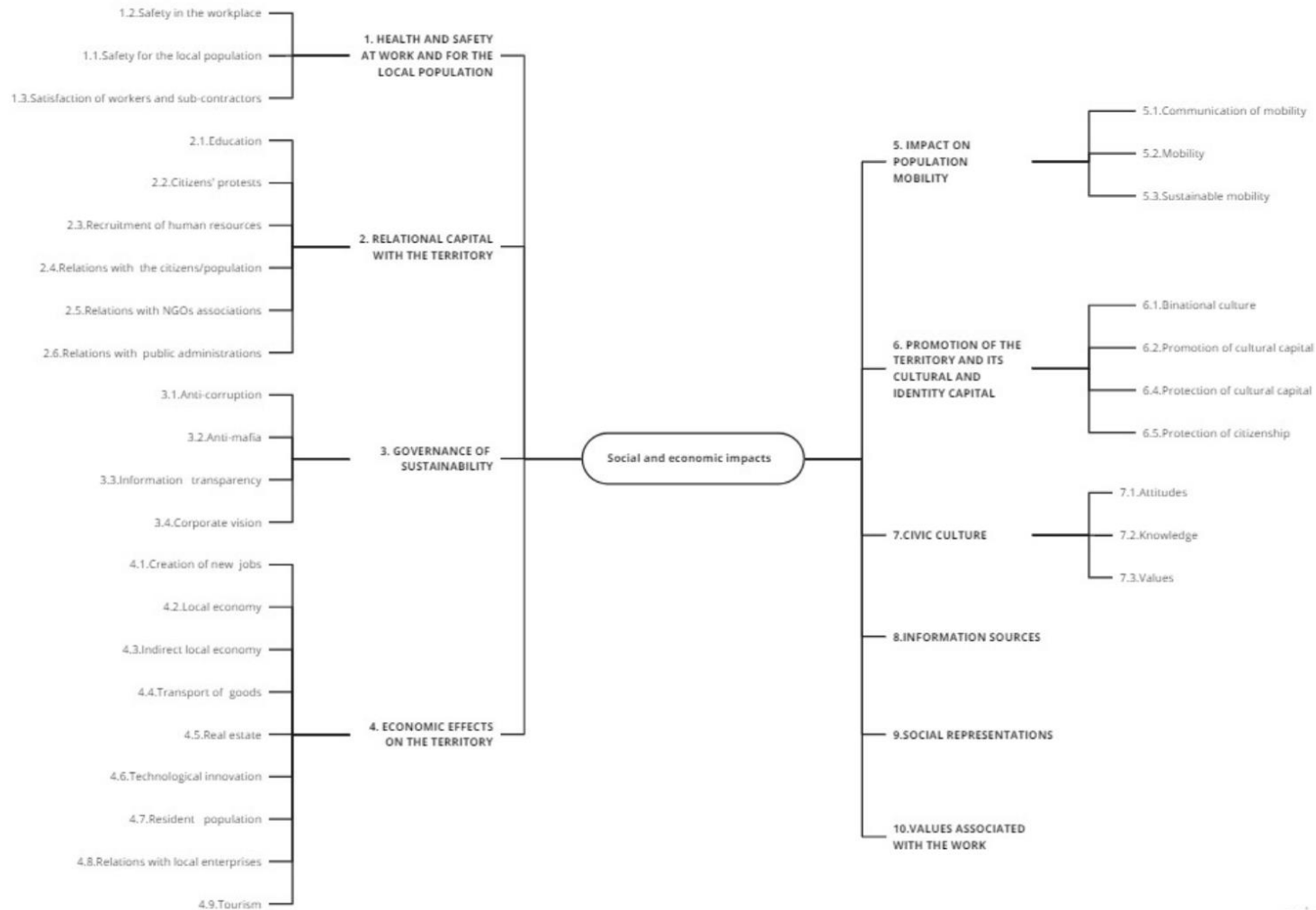


Figure 3 – Structure of the Protocol. Source: Author’s own development.



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