university of groningen / faculty of spatial sciences

How to tackle flooding in Venice

What are the institutional and material causes of MOSE's failure?

Master course: Environmental and Infrastructure Planning

11/06/2018

Student

Nicola Belafatti

s3232425

n.belafatti@student.rug.nl

Supervisor

F.M.G. (Ferry) Van Kann

University of Groningen

Faculty of Spatial Sciences

Abstract

Literature extensively discusses the role of different elements such as corruption and stakeholder involvement as drivers of megaprojects' success and failure (among others: Flyvbjerg et al., 2002; Flyvbjerg 2011, 2014; Locatelli 2017; Pinto and Kharbanda 1996; Shenhar et al., 2002; Shore 2008; Tabish and Jha 2011; etc). Scholars analyse reasons and incentives leading to the undertaking of public projects. The main consensus is that insufficient stakeholder involvement, processes lacking transparency and missing institutional checks are factors hindering the appropriate fulfilment of initial expectations and the realization of the project resulting in cost and time overruns (Flyvbjerg et al., 2002; Flyvbjerg 2014). The thesis tests the existing theories by linking them to a specific case study: Venice's MOSE. The city of Venice and its lagoon have long been threatened by increasingly frequent floods, severely damaging the city's historical and cultural heritage and disrupting people's lives. The *acqua alta* phenomenon has considerably increased in scale and frequency throughout the last decade. The Italian government, in order to protect the lagoon and the city, launched in 2003 the construction of a mobile barrier called MOSE (*MOdulo Sperimentale Elettromeccanico,* Experimental Electromechanical Module) whose development had started back in the 1970s. The one-of-a-kind giant structure, known worldwide for its length and mass, has not yet been completed, though. The project's failure is traceable to several factors such as the outdate characteristics of the projects and the questionable technical-political management in which the project was to be implemented, characterized by high levels of corruption as shown by data acquired with interviews and supported by literature. Due to these reasons, Italian prosecutors have investigated more than 100 stakeholders involved in what has become the "MOSE's scandal". As a result, the government tasked a team of independent commissioners with finishing the long debated project. Sadly it is difficult to foresee a positive future for MOSE: maintenance costs are expected to be exorbitant and the very operational viability of the structure is uncertain. The case study example underlines the link between informal behaviours such as bribing and corruption, a weak stakeholder involvement, and the institutional/physical failure of the project. The study calls for a more inclusive, transparent and open approach, by referring to more suitable anti-corruption strategies for the management of Italian megaprojects.

Keywords: Resilience, Flood Control Strategies, Megaprojects, Corruption, Stakeholder Involvement, Transparent Institutional Processes, Environmental Protection, Venetian Lagoon.

Acknowledgement

While I am writing the final sentences of this thesis, I take the opportunity to thank all those who have helped me during this journey. This work has only been possible thanks to the University of Groningen and its staff that allowed me to study in the Environmental Infrastructure Planning Master's course for the academic year; its structures, services and facilities made my life as a student in Groningen considerably easier. I would like to thank my supervisor Ferry Van Kann for helping me in this learning process and for guiding me in the realization of the thesis. I am grateful to my parents who always encourage me to keep studying and working hard and to my brother and uncle who constantly motivate me. A special thank goes to the experts, journalists and professors who have been interviewed and who gave me extremely useful information. I would also like to thank my classmates and friends with whom I have spent entire days, weeks and months at the library, studying, reading, complaining, laughing and drinking tea together. Living in the Netherlands enriched me with more knowledge on Dutch culture, habits, food and traditions which I will always carry with me.

Table of contents

List of abbreviations

€	Euro
$	USA dollar
CVN	Consorzio Venezia Nuova
PM	Prime Minister
MOSE	Experimental Electromechanical Module
NGO	Non-Governmental Organization
GDP	Gross domestic product
GIACC	Global Infrastructure Anti-Corruption Centre
EU	European Union
WWF	*World Wildlife Fund*
CORILA	Consortium for Coordination of Research Activities concerning the Venice Lagoon System
REA	Rebalancing the Environment
TAR	Regional Administrative Court
VWB/VWA	Venice Water Board/Venice Water Authority
CIPE	Inter-ministerial Committee for Economic Programming
NETLIPSE	NETwork for the dissemination of knowledge on the management and organization of Large Infrastructure ProjectS in Europe
EIA	Environmental Impact Assessment
SIA	Social Impact Assessment

List of tables

List of figures

List of graphs

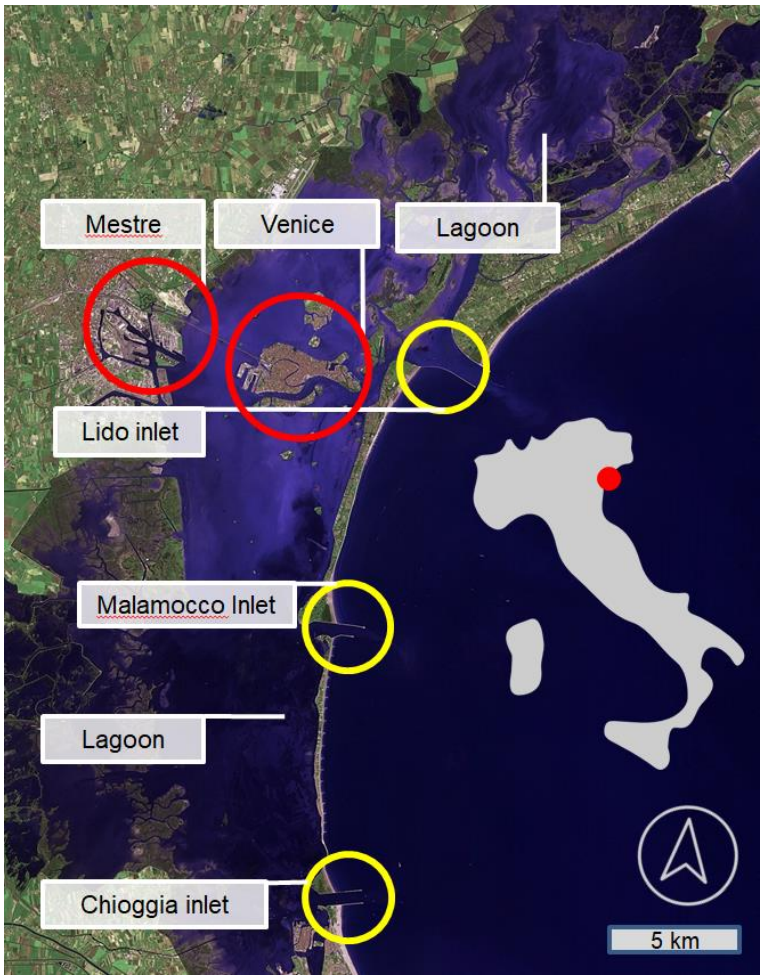


Figure 1: Geographical framework. Yellow circles: MOSE's sites (Malamocco, Lido and Chioggia inlets). Red circles: the two biggest cities in the lagoon: Venice and Mestre. The Venetian lagoon is the water reservoir kept between main land (west) and the strip of land at east (author, 2017; Venice municipality, 2017)

Chapter 1 - Introduction

Venice, founded in the 5th century and located in the north-east of Italy, is Veneto's regional capital city and a major tourism destination in the northern part of the country. Its strategic position has always helped ensuring the city upon the most powerful maritime republics of the country, and has allowed the Venetian republic to become one of the greatest naval forces of the Mediterranean Sea. The *Serenissima*[1] quickly became one of the richer republics in Italy thanks to flourishing trades with eastern empires. In spite of this, Venice's supremacy fell approximately at the end of the 18th century leaving behind an inestimable historical and cultural masterpiece on different islands, attracting millions of tourists from all over the world. For Venice's massive historical and artistic heritage, this peculiar environmental condition is both a blessing and a curse, as it constitutes Venice's main attraction but also a threat to the very existence of the city. The city is declining, houses and historical palaces are becoming empty, quickly replaced by tourism-oriented investments.

Physical threats are undermining Venice's stability as well, in fact, subsidence combined with the sea levels rising are slowly making the city vanish. Global warming, linked to ice melting and thermal expansion, is causing the inevitable rise of sea levels by almost 2 mm per year, level that will increase in the near future due to excessive emissions of greenhouse gases in the atmosphere (from 1870 to 2004 the level rose up to 195 mm, with an average of ~1.44 mm per year. Church et al., 2006). Venice, as many other cities around the world, lies at less than 1 meter above the sea level. This further exacerbates the vulnerability and fragility of the region's environment. The lagoon, UNESCO heritage site, is threatened by rising levels of pollutions mainly coming from the

[1] Republic of Venice (7th-18th century)

industrial areas of Marghera and Mestre[2] and by tributary rivers. The fast rising of the water tides impacting the cultural and architectural importance of the city, has encouraged politicians to develop flood risk management strategies. The situation of daily floods in the lagoon of Venice (*acqua alta*), requires a specific solution due to the need, on the one hand to preserve untouched the in-out fluxes of water, crucial for the lagoon's water exchange, and on the other hand to stop the water coming from the sea during the *acqua alta* season. The solution devised by the Italian government is the so-called "Modulo Sperimentale Elettromeccanico", (Experimental Electromechanical Module) or MOSE, a bulky structure made of moveable yellow gates. The decision-making phase, started in the 1970s, that ultimately led to its realization has been long and troubled.

Nowadays, the gate is not finished, it is having exorbitant realisation costs and have high maintaining costs (when and if is finished), moreover, the barrier has a negative environmental impact on the fragile lagoon's ecosystem. 20 years of political debates on whether MOSE is a suitable solution and on the causes of its time and cost overruns are crucial elements analysed in the thesis. The research aims at underlining the crucial elements of this process, by analysing the drivers of failure or success of public megaprojects, by studying in depth the Italian situation and how public projects are managed in the Italian republic. The majority of seaside cities, all over the world, are threatened by rising level of water and are investing considerable amounts of money in flood-control strategies and infrastructures (van der Brugge et al., 2005). What is now taking place in many states is characterized by the decision to embrace less physical/environmental impacting, more dynamic and reversible infrastructures capable of addressing flood issues in a more sustainable and efficient way (Liao, et al., 2013; Schoeman et al., 2014; Vis et al., 2003). This shift has not yet entirely occurred in Italy's water management discipline. The MOSE system, a semi-mobile structure is an attempt to keep the stability of the lagoon's ecosystem untouched, on the other hand it resulted in a severe environmental impact causing drastic modifications of the delicate maritime ecosystem. Causes of the malfunctioning of the gate barrier are to be addressed upon the reasons and choices behind the project which will be discusses through the chapters. This complicated project calls for advanced engineering plans, a well-structured project management phase, cutting-edge materials, a responsible and transparent involvement and selection of stakeholders, a great participation of local citizens, an excellent understanding of the environment's physical, ecological and maritime characteristics and a detailed maintenance plan inclusive of strategies for unforeseen events. This unfortunately, as analysed in the thesis, has not yet happened.

[2] The two cities, are connected to the inner city of Venice with the road bridge called *Ponte della Libertà*.

1.a - Structure of the thesis and timeline

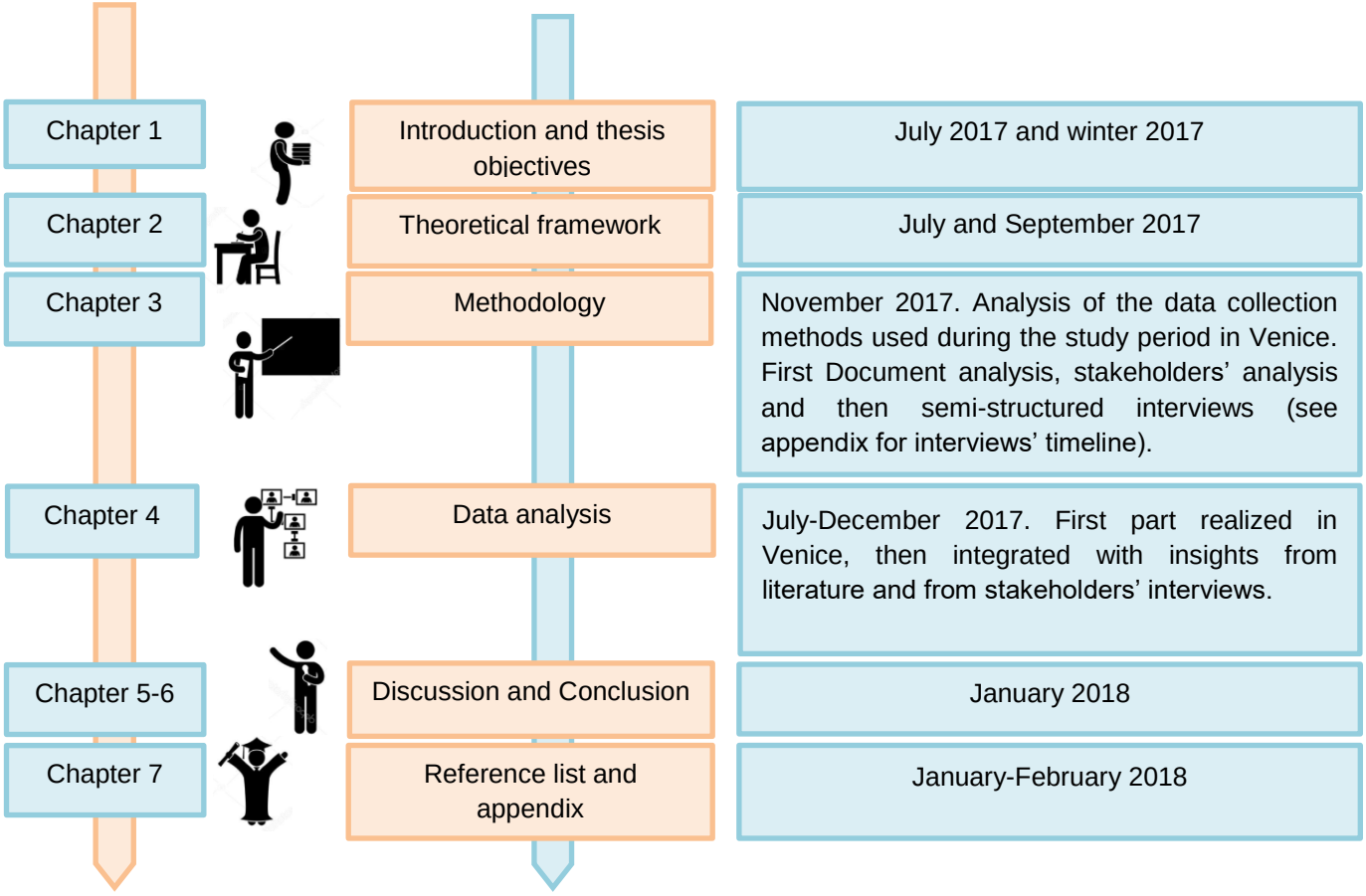


Table 1 Schematic representation of the thesis's structure (author, 2017)

The thesis is structured in five main chapters: after a brief introduction in chapter 1, the second chapter gives insight from literature regarding project management strategies, projects and megaprojects' characteristics, drivers of failure and success, the Italian institutional (and political) scenario, the role played by corruption, stakeholder inclusion and informal behaviours in megaproject failure/success. Chapter 3 is focused on analysing the data collection methods that have been used for data analysis. This refers to three main methods: document analysis, stakeholders' analysis and semi-structured interviews realized with key stakeholders. Chapter 4 is aimed at analysing the data acquired during the research period in Venice, illustrating firstly, the physical elements of Venice and its lagoon, the *acqua alta* phenomenon and secondly, the MOSE project, its processes leading to the actual situation and the relevant strategies undertook regarding Italy's most famous water management infrastructure. By doing so, the author compares data with insights from theory as well as interviews realised with experts in the field. Chapter 5 and tests theoretical insights with empirical knowledge and it addresses strategies and possible solutions presented in order to tackle corruption in Italy's megaprojects. The list of references and the appendix are listed in chapter 7 after the author's personal concluding reflections in chapter 6.

1.b - Research question and relevance of the study

The thesis aims to study the institutional and material causes that led to the failure of one of Italy's biggest flood protection infrastructures.

The main research question is: **How to tackle flooding in Venice? What are the institutional and material causes of MOSE's failure?**

Smaller research questions are therefore answered throughout the different chapters. "What are the drivers of megaprojects' failure and success?" is answered in chapter 2. "What are the physical and hydrodynamic characteristics of the Venetian lagoon?", "how and when does the *acqua alta* phenomenon occur?", "what are the trigging factors and what are the damages and inconveniences that it can cause?" are answered in the very first part of chapter 4. More MOSE-related sub questions are addressed in the second and last part of chapter 4 and they refer to: "what are MOSE"s structural elements that make the infrastructure work?", "what is the positive or negative impact of MOSE's design, realization and maintenance phases on today's stage?". Chapter 5 and 6 reflect on: "MOSE today and tomorrow, is there a possible preventive strategy for future Italian megaprojects?".

The thesis is relevant to both, theory and practice, in fact, it apply insights from theory to a specific case study; knowledge on megaprojects' management, useful for building an understanding on the characteristics of megaprojects and on the causes of their failure or success, is closely investigated in relation to the Venetian case study. The elements arising from the theoretical analysis on stakeholders' involvement and on management of complex megaprojects' decision making, realization, and maintaining phases are tested with the processes that finally led to the realisation of Venice's barrier. The author not only aims at studying the literature on megaprojects' drives of success and failure, but also at verifying whether the insights in chapter 2 are relevant and can also match with the practical case study analysed in chapter 4 or whether today's situation is the fruit of different processes. The author's goal is also to investigate whether the study can be applied to practical researches and whether it can be used to help future managerial strategies to prevent possible failures.

Chapter 2 - Theoretical framework

This chapter aims to shed some light on the main characteristics of mega projects ("mégas" from Greek which means: big, huge) and on the elements that make megaprojects extremely complex, due to their size, costs, stakeholders' involvement and different project-management requirements. According to Flyvbjerg (2014) "Megaprojects are large-scale, complex ventures that typically cost US $ 1 billion or more, take many years to develop and build, involve multiple public and private

stakeholders, are transformational, and impact millions of people". A further important differentiation is also made by Flyvbjerg who refers to megaprojects as projects with a budget of several billions of dollars whereas "major projects" and "projects" are measured, the former in hundreds of millions and the latter in millions (Flyvbjerg, 2014). Hirschman (1995) made an interesting differentiation referring to mega projects as "trait-making", because they can modify the structure of the society itself, and "normal" projects are "trait-taking" due to the fact that they are placed within existing structures that are not supposed to be modified (Hirschman, 1995). As a consequence megaprojects are not classified into specific water tight categories which means that, once the indicators described previously are fulfilled, a mega project could be pretty much anything, such as: an airport, a tunnel, urban regenerations, hospitals, cultural centres, dikes, wind farms, sustainable energy production sites, Olympics Parks, new high-speed transport networks etc. (Biesenthal, 2018). The size of the megaproject has changed and increased throughout the last century. The never-ending competition of whoever owns the biggest harbour or the highest skyscraper, the longest bridge or the newest space shuttle, has pushed way further the budget-limits of these projects (Flyvbjerg, 2014; Flyvbjerg, 2017).

But why are megaprojects, despite their sizes and costs, so attractive to investors?

Flyvbjerg analyses four reasons (Flyvbjerg's "Four Sublimes") that make decision-makers engage in these kinds of projects. The reasons are not mutually exclusive (a or b): the presence of one does not exclude the presence of the other (a + b).

Kinds of Sublime	Characteristics
Technological	The excitement engineers and technologists get in pushing the envelope for what is possible in "longest-tallest-fastest" types of projects.
Political	The pride politicians get from building monuments to themselves and for their causes, and from the visibility generated with the public and media.
Economic	The gratification businesses and trade unions get from making lots of money and creating jobs with megaprojects, including money made for contractors, workers in construction and transportation, consultants, bankers, investors, landowners, lawyers, and developers.
Aesthetic	The pleasure designers and people interested in design get from building something very large that is classed as iconic and beautiful, such as the Golden Gate Bridge.

Table 2: Flyvbjerg's "Four Sublimes" (Flyvbjerg, 2014).

It must be said that another *sublime* could be analysed by Flyvbjerg (2014). In his article he does not refer to the need of megaprojects in emergency situations which are sometimes the causes leading to the realization of these projects. The author of the thesis here claims that a *new* sublime

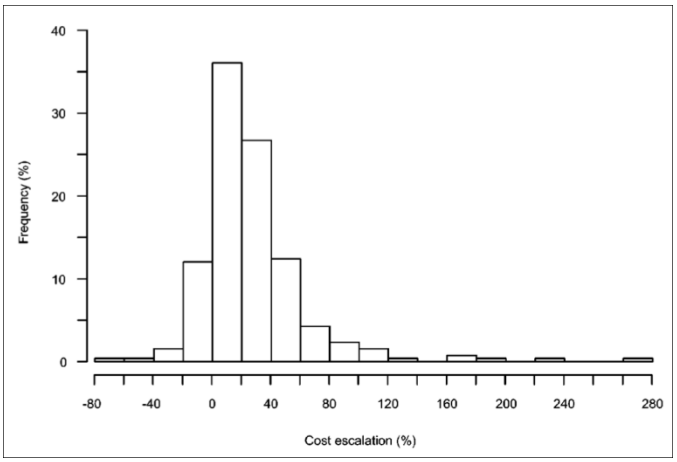
could be included in Flyvbjerg's analysis and it is closely related to the Venetian case study and to the urgency of a structure that would protect the lagoon. The motivation leading to the realization of this project goes beyond Flyvbjerg's four sublimes and it embraces a different typology of megaproject rather needed instead of wanted. Due to the variety in scope, size and typology of megaprojects, scholars have described them with different characteristics. One of the experts who made a suitable explanation of what megaprojects are is Flyvbjerg.

Flyvbjerg (2014) identifies 10 key characteristics of megaprojects. Megaprojects are therefore described as: 1) risky due to lengthy and complex planning process. 2) Projects that are led by managers and planners with little experience, who may also change throughout the process, can leave the project weak. 3) In these projects there might be a conflict of interests due to the involvement of different stakeholders (private and public). 4) The (apparent) uniqueness of the project is a bias that makes decision makers and project managers focusing on a non-standard strategy without learning from other projects. 5) There is often an over commitment at the early stage of the projects leaving weak alternatives. 6) Problems such as principal-agents and rent-seeking behaviours might occur due to the high level of capital invested. 7) The dynamist within these projects is high therefore the project goal or characteristics might change overtime. 8) Delivery is a high-risk activity, with overexposure to black swans' phenomena. 9) Project's complexity and unforeseen events are not the only causes for time and cost overruns. 10) Misinformation about costs, project and risk will lead to cost overruns and delays (Flyvbjerg, 2014). The ten points have been listed due to the relevance on the debate on megaprojects and because, as analysed below, they are a reflection of the Venetian case's dynamics. Flyvbjerg does not refer in detail to an important characteristic of megaprojects which, according to the author of this thesis, is a reflection of the dynamics studied in the Italian case study analysed in chapter 4 yet a crucial and often frequent factor undermining the realisation of the infrastructure. Megaprojects are, in specific situations, not desired by some of the stakeholders involved, due to the so called NIMBY phenomenon (Not-In-My-Backyard). This phenomenon, according to Dear (1992) refers to the "protectionist attitudes of and oppositional tactics adopted by community groups facing an unwelcome development in their neighbourhood." (Botetzagias et al., 2015; Dear, 1992). Example of projects heavily criticized by local stakeholders, beside the already mentioned MOSE barrier are the wind park project in the northern part of the Netherlands, or Keystone XL pipeline between Canada and the United States (Erickson et al. 2014).

2.a - Time and cost overruns in megaprojects

Literature describes how megaprojects can easily fall into unforeseen complications and difficulties due to the mentioned high level of complexity and high number of stakeholders involved, lack of information, either voluntarily or involuntarily, left out. Before digging deep into the drivers of megaprojects success or failure, it is worth mentioning the frequency of cost overruns. First of all, Flyvbjerg et al., (2003) questions whether initial forecasted costs and benefits of infrastructure projects match with the final costs or whether they are just too complicated and unpredictable to be foreseen. The answer, as will be analysed in chapter 4, is that they are hardly foreseen. This cannot be proved immediately, in fact, from the beginning of the design-phase to complete functionality of a project, the long period (5-15 years) could make cost/time estimations hard to be undertaken and likely to be misled (Flyvbjerg et al., 2003).

The analysis carried out by Flyvbjerg et al., (2003) is focused on 258 transport megaproject case studies, with a varying budget from $ 1.5 million up to $ 8.5 billion, divided among 20 different nations around the globe in order to avoid data classification. The results, visible in graph 1, show that cost escalations happen in almost nine out of ten projects therefore the likelihood of cost



Graph 1: Cost escalation in transport infrastructure megaprojects. According to the scholar: "A cost development of zero for a project means that the forecasted costs for the project were correct and thus equalled actual costs. If errors in forecasting costs were small, the histogram would be narrowly concentrated around zero. If errors in overestimating costs were of the same size and frequency as errors in underestimating costs, the histogram would be symmetrically distributed around zero" (Flyvbjerg et al, 2003).

overruns is 86% and the likelihood of cost underwhelm is 14%, furthermore megaprojects' final costs are on average 28% higher than what has been foreseen during the design phase and the bias regarding the forecast of costs is caused by systematic underestimation (Flyvbjerg et al., 2003). As a result of this, the scholar states that errors in underestimating the costs are much more common and much larger than overestimating costs especially in railway projects compared to road projects, furthermore the cost performance is also not geographically influenced and it has not improved overtime therefore "no learning from past experiences seems to take place" (Flyvbjerg et al., 2003).

2.b - Drivers of megaprojects' success/failure

Megaprojects, if well managed, can increase economic growth in developing countries, as well as developed countries, whereas a failure can drag development back many years (Flyvbjerg, 2014; Mišić et al., 2015). Example of these megaprojects, created on the occasion of mega-events are, on the one hand, the 1994 Winter Olympic Games organised in Lillehammer (Norway) and Turin (2006) that improved the nations' image, or the 1992's Olympic Games in Barcelona (Spain) and in Sydney (2000) that boosted the local and national economy representing good examples of urban regeneration, and on the other hand, the catastrophic Athens's 2004 Summer Olympic Games (Guala, 2007). These kinds of projects are a substantive part of a country's gross domestic product in fact the annual spending for megaprojects worldwide is between $ 6 and $9 trillion (8% of global GDP). The size of the capital invested is so important that entire firms, investors or governments can fall in case of a project failure (Mišić et al., 2015).

A vague definition of the key elements of megaprojects can quickly lead to failure of the project, in fact, according to Mišić et al., (2015), 66% is the proportion of megaproject delivery failure and 50% regarding cost overruns. The success of a project is intrinsically linked with organizations' effectiveness and its success in the long run (Mišić et al., 2015). Although there is not a clear definition of the factors driving to either success of failure, according to the OECD and European Commission, the key analytical elements for evaluating the project success are efficiency, effectiveness, impact, relevance and sustainability (OECD, 2004). Scholars have been arguing whether these were the only criteria, therefore Shenhar (Shenhar et al., 2002) defined four more drivers for a successive implementation of the project, such as: "project efficiency for users, the impact on a client's network of infrastructure, the business success, preparing for the future or the learning possibilities, and goals communication" (Shenhar et al., 2002). In 2011, Tabish and Jha (2011), who mainly focused their research on Indian megaprojects, described four success factors: pre-project planning, clarity in scope, a fruitful and suitable partnering among projects participants, external monitoring control and acceptance of the embeddedness of rules and regulations (Tabish et al., 2011). The World Bank further added five more factors that are here reported: "monitoring, coordination, design, training and institutional environment". The focus is here placed on controlling and evaluating, although the focus on the pre-decision phase, where stakeholders should meet the ideas and be aware of their roles, is more important (Mišić et al. 2015). Also NETLIPSE (Network for the dissemination of knowledge on the management and organisation of large infrastructure projects in Europe) elaborated its successful drivers: "a clear vision and a strong political will; an independent and stable project delivery organization implemented at an early stage; a charismatic, highly professional project director; a sound financial setup from the start of the project based on realistic business case; adequate procedures for legal consents with fallback options; a

comprehensive and systematic stakeholder management with open communication; a stringent management process" (Hertogh et al., 2008; Mišić et al. 2015). Insights from different articles are here quoted due to the difficulty in addressing megaprojects' characteristics and due to the abundance of related literature (a summary of the literature on drivers of megaprojects' success can be found at the end of this chapter).

Academics do not only focus on factors of projects' success but also on drivers that cause their failure, as a matter of fact, Pinto and Kharbanda (1996) described 12 drivers (here only 7 drivers are listed based on the ones that trace the characteristics of the Venetian case study and that can be used to have a better understanding of the case. The criteria chosen for the selection are also based on the analysis of the drivers of the failure of the MOSE project) of public projects' failure that, to some extent, retrace the so called "iron triangle" described for the first time in 1969 by Martin Barnes to show the relationship between time, cost and quality to be managed in project delivery (OMEGA centre, 2013). The 7 points have been listed hereafter due to their significance.

1) "Ignore the project environment, context and stakeholders' behaviours".
   This refers to all those interested actors who have a stake in the projects and are directly or indirectly involved.
2) "Push new technologies into market too quickly". A new technology, due to the fact that it has never been used on the market before, is extremely appealing for designers but this rush could lead to inadequate, inappropriate and possibly disastrous results.
3) "Don't bother building in fallback options". Problems are certain to arise at some point throughout the process, the solution is to foreseen the degree of these issues and try the best to bring the project back on track by constantly asking "what if" questions that strengthen the number of alternatives.
4) "When problems occur, look at them in depth". It is not wise to focus only on most visible superficial problems without deeply analysing hidden causes of these problems and further eventual other complications.
5) "Don't bother conducting feasibility studies". All project managers should be investing time and energy on studying and creating ex-ante risk analysis, cost-time frame analysis, environmental analysis and stakeholder analysis in order to acquire all the information before starting the projects […]
6) "Never, never conduct post-failure reviews".
   What could a project that just failed, teach us? Certainty how to avoid the same mistakes. Learning from our previous errors is a core element of our society, even though this is a natural process, it is not easy to acquire.
7) "Allow political expediency and infighting to dictate crucial project decisions". Power relations play a neuralgic role especially in public megaprojects, but when the level of

power interferences exceed the controlled level, the politically-saturated environment becomes too hard to function successfully (Pinto et al,. 1996).

Chapter 4 and 5 analyse whether MOSE met these points and to what extent.

NETLIPSE evaluated six factors responsible for project failure: 1) A vague unpractical analysis of time and cost with no reserves for contingency; 2) late and unstable decision making processes among the involved stakeholders from the project managers to the delivery company; 3) recurring changes in key personnel; 4) manipulated and not efficient communications with relevant stakeholders; 5) weak contract management; 6) experiments with new technologies, which refers to what Pinto and Kharbanda (1996) described as the action of pushing new technologies into market too quickly.

Flyvbjerg (2011), who has deeply analysed the drivers of success/failure of megaprojects, focused his research on two main roots that can cause the failure of a megaproject, named: optimism bias and strategic misrepresentation (Flyvbjerg, 2011). The first one refers to unintentionally biased estimations of crucial factors such as time and cost, made by biased and subjective project managers who, instead of relying on existing and scientific cost-time benefit analysis, rely on distorted optimism. In this misleading representation costs are underestimated and benefits are overestimated which lead to promotion of activities that are difficult to achieve without cost overruns (Flyvbjerg, 2011). The latter, defined by Flyvbjerg (2011) as the intentional act of strategically overestimate the benefits and underestimate the costs with the scope of making the project look more feasible and gain consensus and funding. This behaviour occurs when the political interference is strong and the focus is only on explaining positive scenarios and avoiding the negative ones (Flyvbjerg, 2011). Some concerns might be taken out of the initial estimation in order to make the project look more appealing, cheaper, less critical/dangerous or less prone to failure. This strategy comes under the name of “salami tactics” and refers to the process of systematically adding project components and risks one “slice” at the time so that the final cost-estimation will be kept as low as possible (clear example of cost underestimation) (Flyvbjerg et al., 2002).

As observed by Flyvbjerg (2011), planning is intrinsically linked to power. Misrepresentation and optimistic bias are two representations of how decision makers can act with different levels of power. It is crucial for planners to understand how power relations work in order to organize the planning process (Forester, 1982). Planners, despite their lack of influence on society’s power structure, can improve the quality of the planning process by influencing citizens’ participation concerning community’s issues. Citizens’ trust and expectations are influenced by the planners’ actions too. Power, directly linked to the amount of knowledge, on the one hand, might allow opportunistic behaviours, but on the other hand, if not present, can cause dissatisfaction (Forester,

1982). According to the words of Francis Bacon, “knowledge is power”, in fact knowledge, key element in planning power games, is a crucial factor influencing misinformation which is often not an accidental problem but a systematic and institutionally structured problem to be tackled. There are several types of misinformation according to Forester (1982), such as: spontaneous and unplanned misinformation, that occurs as a consequence of a lack of communication or due to the use of technical terminology between the audience and the speaker. Another example is due to the speaker’s hierarchical position or the speaker’s economic-political role, allowing them to act in a more opportunistic way engaging in strategic dominance instead of emancipation. The difference between the two cases is a reflection of whether the misrepresentation is unwanted or strategically planned. An actual example of power relations is the Aalborg project which was believed to be a great opportunity for improving the city’s downtown that, unfortunately, was turned into social distortion and environment degradation due to power inequalities. Institutions, who were supposed to act in the “public interest” had been found embedded in unconventional exercises of power in order to achieve personal interests (Flyvbjerg, 1998). Moreover, by analysing the Aalborg case, Flyvbjerg (1998) identifies that power is linked and influences rationality in several ways.

But what are the explanations (lies or errors perhaps) for cost overruns?

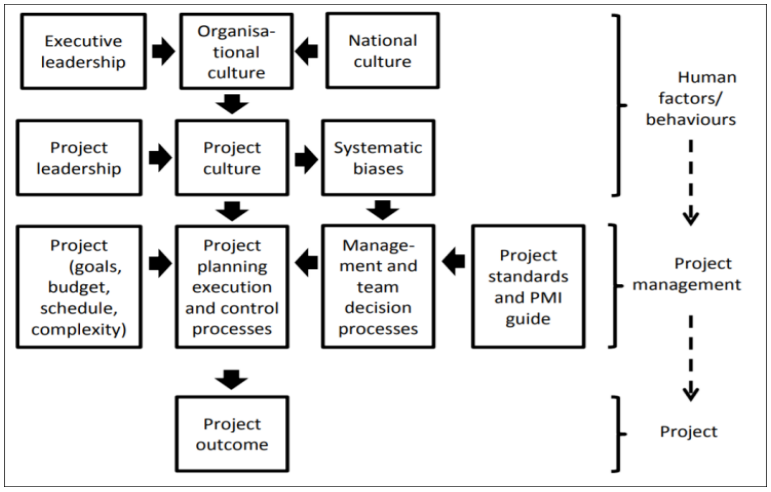
Flyvbjerg et al., (2002) grouped them into four categories named: technical, economic, psychological and political explanations. Technical explanations relate to “forecasting errors” such as imperfect techniques, inaccurate data, unwanted mistakes, incorrect prevision of future events by inexperienced personnel (Flyvbjerg et al., 2002). It should not be expected to obtain explanations of the failure of a project by analysing the technical forecasts which do not appear to illustrate the data (it is reasonably complicated to predict which combination of environmental/physical/structural problems will occur and lead to cost overruns, but we can still learn lessons from previous projects that failed).

Economic explanations are divided in two: the first explains in terms of economic self-interest and the second refers to the public interest. Concerning to self-interest, projects produce jobs and money for stakeholders and an accurate cost underestimation and benefit overestimation would therefore increase the probability for them to increase their profits. The latter describes the action taken by project promoters who voluntarily underestimate the initial costs to be given to public officials who then would be encouraged to reduce costs and therefore save taxpayers’ money (“noble lie”). Nevertheless, these explanations can cause, firstly, inefficient use of resources, secondly, the realization of a project that might end up being costlier and thirdly, the elimination of possible alternative solutions that might have been more suitable for that specific project (underestimation of costs does not save money but waste more public’s money). These reasons explain the data relating to high level and high likelihood to have costs overruns in megaprojects (Flyvbjerg et al., 2002).

Psychological Explanations are to be taken into consideration when tackling the "appraisal optimism" ("monumental complex") of some project managers, engineers or politicians who are too optimistic in predicting the outcomes of their project in the decision phase. Often the cost will be higher than the initially forecasted one (Flyvbjerg et al., 2002). Unfortunately, the incentives to optimistically underestimate costs is high and the legal penalties are rather low (Davidson and Hout, 1989). According to Flyvbjerg et al., (2002) appraisal optimism is not one of the main causes of cost underestimation.

Political Explanations take place when powerful politicians or project promoters intentionally mislead in order to get the project approved. Due to the difficulty in detecting whether that is the only cause of cost overruns and despite the fact that is quite widespread, not many papers have been written on it. This, alongside economic explanations, are therefore the two main causes of cost overruns (Flyvbjerg et al., 2002).

Shore (2008) also explains the main drivers and comes up with a model that analyses the three main drivers: human factors/behaviours, project management and project, that influence all the variables in a hierarchical order from human factors to the result of the project (Mišić et al. 2015).



Graph 2: Representation of the variables, such as influence of culture, leadership, project management and behavioural factors that influence power outcome (Shore, 2008).

The size of the initial investment differs from project to project ad from country to country, small sized countries have a lower GDP than big, developed countries, therefore the size of the budget will also vary. Mišić et al., (2015) suggested seven other points that could either hinder or facilitate the success of the project. They are: "development of project management, competence, experience in megaprojects management, cultural differences, corruption (a more detailed analysis of how corruption and other illicit behaviour have obstructed the development of MOSE is further analysed in chapter 4), political influence and stakeholder management" (Mišić et al., 2015) (a summary of the literature on drivers of megaprojects' success can be found at the end of this chapter).

2.c - Beyond the iron triangle

Large budgets, complicated decision making processes, economic and political interests involved, a continuous dynamism, possible conflicts between the different parties at the different levels are some of the characteristics of megaproject. Literature has paid relatively high attention on the so called “pathologies” of project failure/success, (time/cost overruns, public resistance, failure/delay in delivering the expected project) which are summarised by the term “iron triangle”. In this performance scheme, uncertainty appears to be something to be tackled as negatively impacting the project (causes of optimism bias and strategic misrepresentation). Unfortunately, the “iron triangle” does not allow a detailed analysis of policy and programme evaluation therefore it should adopt a more reflexive and learning-oriented evaluation approach always considering accountability as a tool for facilitating the evaluation approaches (Lehtonen, 2014). For most of the projects, time and cost are the main criteria for evaluation, but there could be other noteworthy factors, such as stakeholders’ involvement, satisfaction, safety and aesthetic factors.

In fact, according to Lehtonen (2014) the “iron triangle”, an important yet rather physical method used to study megaprojects performance, fails in addressing variation in rationalities and institutional structures also assuming that individuals are vicious opportunists only keen on achieving personal interests and optimizing their incomes (Lehtonen, 2014). Contrary to this fixed mentality, investigating stakeholders’ satisfaction allows us to testify whether a project has met the ex-ante objectives.

The relevance of this driver should not be underestimated given that a stakeholder, defined by the words of Zidane et al., (2015) as: “a person or an organization actively involved in the project or having an interest in or conflict of interest with the project execution or the project end result”, plays different important roles within the realisation of the project. The project success depends in part also on how stakeholders are successfully managed, by rationally selecting them, understanding their needs, personal expectation and potential contribution to the cause. De Roo (2015) defined a model that clearly explains how stakeholders, in situation of relative fuzziness, are selected based on their willingness to contribute, actual level of contribution and potential contribution to the project (de Roo, 2015). The satisfaction of stakeholders could be achieved through an attentive stakeholders’ management process (Olander & Landin, 2005) and by increasing the cohesion and trust among them. Olander & Landin (2005) also address how the decision-making process is influenced by actors’ behaviours and attitudes. Behaviours, such as competitive threat, cooperative or opposing nature and attributes, such as urgency, power and proximity, can shape decision-making processes (Zidane et al., 2015).

The design and maintaining processes are, most of the time, not linear and only rarely completely predictable, therefore changing in stakeholders’ expectations or positions might occur. This will

lead to an increased level of uncertainty and therefore begs for a more dynamic network management.

Stakeholders are to be divided into different categories in order to be analysed and managed in the most fruitful way. The fulfilment of this task has been made first by Mendelow in 1991 who suggested a matrix in which the different actors involved are “mapped” into their levels of interest and the power they have. The “power” refers to the ability of effecting the project and the “interest” indicates the desire to influence it (Martirosyan et al., 2013).

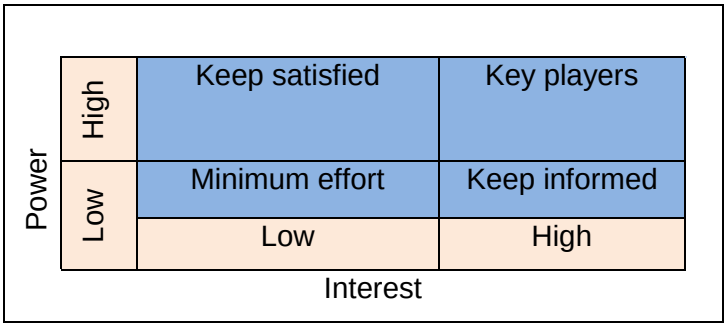


Table 3: Mendelow’s matrix; stakeholders’ power and interest (Martirosyan et al., 2013).

The matrix (table 3) shows how stakeholders could be: key actors if they are powerful and with high interests in the project; this type of stakeholders is likely to be influential and a promoter of change in planning strategies. Actors can have high interests but low power (this group of stakeholders has to be informed due to their willingness of participating but are unlikely to take a leadership role in the strategy). Actors who have high power but low interests are important because they can join the “first category” if adequately satisfied, in fact having them in favour of the proposed strategy would discourage them to use their power elsewhere. The last category includes those with low power and low interests, the so called “crowd”, unlikely to either show interest and to exercise their (low) power (Martirosyan et al., 2013, Mendelow, 1991). Having a deep stakeholder involvement is a crucial element particularly in big-size public projects. Taking into account interests of different communities and their specific actors help ensure that the corporation works for the benefit of the whole society (OECD, 2004). This table, as shown in chapter 4, helps understand the role played by the stakeholders included in the MOSE project.

This approach that leaves the impersonal “iron triangle” behind, leads to a better understanding of megaprojects and encourage project makes/managers, stakeholders and project evaluators to see them from a different perspective. This alternative point of view is more inclined on leaving behind the understanding of projects as closed and not dynamic entities, focusing on seeing megaprojects as dynamic, open, co-evolving systems in constant contact with the changing context via feedbacks, inputs on the evolution of their goals and objectives (Lehtonen, 2014). In order to achieve this new view, a fixed, traditional, vertical governance structure is not suitable anymore

and it calls for a more “day-to-day” practice of “real life” project-governing focused on coordinating the different actors involved (public-private) and across the different sectors and levels.

Having said that, a more appropriate definition of megaprojects (Benjamin and Greene, 2009) could be used: “megaprojects are networks of people and organizations that work more or less coherently and purposefully to address complex public problems” (Benjamin and Greene, 2009). A less vertical and structured scheme would inevitably lead to the blurriness of the defining boundaries of projects, making the issues more dynamic and prone to change. The previously feared complexity now seems to be an opportunity and not an obstacle to be solved, for this reason, it would encourage an horizontal coordination that uses uncertainties and conflicts in megaprojects as a tool for addressing the possibility of alternative solutions, by taking into account the key role played by the private sector (Biesenthal, 2018; Lehtonen, 2014). Nevertheless, a network system should be mapped in order to make it function better, for this reason, Lehtonen (2014) described four keys tasks for network mapping that are: “characterizing the network and defining its boundaries, defining the existing accountability structures, clarifying the goals and objectives of the network and finally, exploring the potential role of evaluation and the evaluator (Lehtonen, 2014). MOSE, as analysed in chapter 4, is a complex megaproject that requires horizontal coordination in order to successfully implement it.

2.d - Institutional failure, analysis of the role played by informal and formal institutions regarding public projects

Megaprojects, as seen in the previous paragraphs are critical and fragile open systems that need to be guided with integrated, transparent, dynamic management strategies. Iron triangle’s physical drivers are crucial for addressing the reasons behind the failure of these projects, however, the reasons and factors that can lead to success, but most luckily failure, are to be investigated also in the country’s cultural, historical, institutional, political, economic and social background in which every project lies.

Helmke & Levitsky (2004) give a clear overview of the relevant role played by both formal and informal institutions around the world and on how the dividing line, between them, could blur leading to improvement or deterioration of the formal sphere. They further define institutions as: “rules and procedures (both formal and informal) that structure social interaction by constricting and enabling actors’ behaviour” (Helmke & Levitsky, 2004). After this definition, a clarification needs to be made, in fact, if “formal institutions are created, enforced and communicated through channels widely accepted as official”, informal institutions “..are on the contrary characterized as socially shared rules, usually unwritten that are created, communicated and operated outside officially sanctioned channels” (not accepted by the law of an institutional entity, a country, a group of countries or international cooperation of counties) (Helmke & Levitsky, 2004).

Regarding the Italian case study investigated in this thesis, it is important to know how the deleterious interplay of informal institutions within the legal framework is responsible for the rise of opportunistic behaviours and the increase of level of corruption. This will be thoroughly addressed in chapter 4.

Scholars (Helmke & Levitsky, 2004; Leff, 1964) refer to the positive effect that informal institutions can have in relationship with formal ones. Helmke & Levitsky (2004), divided the (sometimes vague) term "Institution" in categories based on whether the official institution is effective and whether the desired outcomes of the two institutions are either convergent or divergent. This resulted in four typologies named as: *complementary, accommodating, competing* and *substitutive*. When the desired outcomes of the informal institution meet the same outcomes of the formal institution and the only inequality is on the different level of effectiveness of the legally accepted institutions the scholars refer to *complementary* and *substitutive* typology. In the former, the informal institutions, help and "complement" formal ones (outcome are similar and formal institutions still work), slightly different is the *substitutive* typology in which the informal institutions, sharing the same goals, help and work instead of inefficient formal institutions. These typologies are rather beneficial for the institutional setup of a country (Helmke & Levitsky, 2004).

Drivers of failure and inequalities (in the specific case, causes of inefficient project delivery) are visible in the remaining two typologies: *accommodating* and *competing*. Accommodating informal institutions are visible when the aimed outcomes are different from the formal institution regardless of the fact that the latter are efficient and able to achieve goals. These informal institutions are willing to initiate incentives for their actors to behave in ways that modify the results of formal rules. The situation changes in relation to *competing* informal institutions that, as suggested by their name, act in place of and in competition with (ineffective) formal institutions. Clear example of this are the creation of incompatible incentives that are in direct conflict with the formal rules. The authors describe these as legally unaccepted actions and informal behaviours such as clientelism, nepotism, patrimonialism, clan politics and corruption as the most well-known (Helmke & Levitsky, 2004) (the full theoretical chapter is summarized in a research design model placed at the end of the chapter. The left part is a representation of the theoretical part, whereas the right part, intentionally coloured in grey, is an analysis of the Italian case study, therefore it can be better understood after having read chapter 4).

2.d.i - Corruption and unlawful behaviours as causes of megaprojects' failure

Corruption plays a central role in megaprojects' failure and in today's MOSE's situation, which, in light of the sources analysed in chapter 4, appears to be deleterious. Corruption, "the abuse of entrusted power for private gain" (Transparency international), should be included as a factor

undermining project's quality, efficiency and reliability, at the same level of Flyvbjer's megaprojects' drivers of failure. The reasons for the lack of literature addressing the relationship between megaprojects' failure and corruption may be due to the fact that the interlink between elements mentioned above and the context of the project is not easy to analyse given the close embeddedness of one into the other and the prevalent dominance of public procurement framework (Locatelli et al., 2017). The context of corruption is associated to socio-economic systems which help to define an environment/context prone to corruption as: "corrupt project context" (an overlap of project context and corruption as a socially shared phenomenon) (Locatelli et al. 2017).

The following part addresses the main features and consequences of corruption in megaprojects. In light of the findings analysed by Transparency International, and Aidt (2003).

1. Discretionary power: "public officials must have the power of design or administer regulations and policies in a discretionary manner" (Locatelli et al. 2017).
2. Economic rent: a strategic, opportunistic and fruitful manipulation of decisions made by decision-makers.
3. Weak institutions: the weaker the structure of government institutions, the higher the level of corruption.

Transparency International identifies two typologies of corruption: "petty corruption" (low scale corruption made by small or not very important stakeholders) and "grand corruption" (which interests higher and bigger stakeholders, at national or higher level such as governments or courts). MOSE's situation is the consequence of a mix of both, with prevalence of the latter and of a new sub-category called "political corruption". This refers to: "the manipulation of policies, institutions and procedural rules in the allocation of finances, or other resources, perpetrated by policy-makers." (Locatelli et al., 2017). Also the likelihood to engage in corruption is distributed in two categories based on the frequency of the action: sporadic corruption and systematic corruption (Locatelli et al., 2017).

The Global Infrastructure Anti-Corruption Centre (GIACC, 2008; 2017) identifies the main reasons for corruption and the way it manifests itself in two main domains. The first domain relates to the phase of the project where corruption arises: pre-qualification/tender phase, project execution phase and dispute resolution. Starting from pre-qualification and tender phase, the most important of which are:

1. Bribery: describes the act of handing out benefits to another person or incentives to act in a fraudulent way. The bribe could also be non-cash advantages such as insuring political influence, favours, low tenancy, free services or holidays.
2. Manipulating of pre-qualification.

3. Corruptly negotiated contract.
4. Inflation of resources and time requirement or submission of false quotation, etc.

In the second critical phase, the project execution:

1. Extortion is one of the most common way in which corruption can occur. It refers to the practice of gaining economic and non-economic valuables by the abuse of office or authority.
2. Fraud.
3. Abuse of power occurs when a public official behaves in ways not recognized by law or to their role and therefore it violates public trust.
4. Embezzlement, refers to the crime of secretly taking money that is in the actor's care or that belongs to an organization or business the actor works for.
5. Nepotism, when decisions taken are illegitimately in favour of relatives and conflict of interest which occurs when someone's private business/interests/actions are opposed and in conflict with his responsibilities for the public (Locatelli et al. 2017).

2008's GIACC report analyses further examples, spotted also in MOSE's situation, such as: fake invoicing, fake work certificates, hiding defects, set-off of fake rectification costs, refusal to issue a final certificate or overestimating the benefits, etc. (GIACC, 2008).

In order to solve issues arising from dispute after the realization of the project, GIACC (2008) suggests:

1. Corrupted officials may submit fake supporting documents, incorrect contract claims, supply fake expert evidences, bribe or blackmail the witnesses or lawyers, etc. (GIACC, 2008).

In light of what GIACC (2014) illustrates, corruption can be found and can be facilitated at three different levels: project level, national level and international level.

Factors at project level which facilitate corruption:

1. Lack of a functional anti-corruption system, in charge of limiting the dangerous effect of corruption, especially during the tender process. Having a transparent initial phase would avoid further jeopardizing disadvantages along the realisation process.
2. Having a well-structured defined contract among the involved parties is also a valuable tool to face corruption, in fact, contracts for megaprojects are likely to be complex, detailed and big, with companies sub-contracting parts of their tasks to other smaller actors who, in turn, may sub-contract to other actors. Every "step" in the contract can provide opportunities for bribery/corruption/opportunistic behaviours such as gaining payments, obtaining false certificates or misleadingly inflating of costs, etc.

The size of the initial contract is therefore shared among small sub-contractors, which might not be the same ones in all the phases of the realization of the projects, leading therefore to further confusion in detecting inappropriate behaviours. GIACC suggests, as a rule of thumb, that the bigger the size of the project and the more unique the project's characteristics, the easier and higher the chance to hide bribes. Moreover, megaprojects rely on constant and huge amount of construction materials, this may permit participants to inflate costs for high quality materials such as steel, concrete, plaster, glass and then use low quality ones instead, pocketing the difference or certifying works that have partially or never been realised (GIACC, 2014).

3. Having corrupted project managers or actors involved in the project is a symptom of a widely spread phenomenon that affects not only the project itself but also the national or international background.

Corrupted governments, regardless the level of development of the country, are one of the causes of corruption and failure of infrastructure projects (GIACC, 2014).

1. This may occur when ministers or public officials interfere with the normal process in order to obtain/facilitate/gain benefits to/from someone else. Behaviours like these are flourishing in countries without strict anti-corruption polities within the government (e.g. Italy). The willingness to tackle corruption is printed on almost every governments' agenda, but this will not be done unless the country decides to prioritise this decision at national level (GIACC, 2014) (further explanation in the concluding chapter). Appointed governmental bodies often struggle in identifying sources and intensity of corruption due to lack of knowledge (lack of awareness most of the time), the fear of "whistle-blowing" (the fear of being somehow involved in anti-corruption investigations) or the lack of adequate reporting structures. Further reasons that point to difficulties in addressing corruption in public sectors are the fact that these behaviours are widely spread across all layers of government and officials can undertake corrupting actions if they perceive a lack of benefits or incentives gained with their "normal" actions, lack of accountability/control or low financial retributions (GIACC, 2014).

Factors at international level which facilitate corruption.

1. Lack of inter-governmental co-operation: institutional check, either at local, national or international level are essential to transparently tackle corruption.

2. Lack of coordination among contractors, actors, businesses and professional associations could increase the risk of corruption (GIACC, 2014).

Graph 4: Schematic representation of different levels of corruption. Blue hexagons refer to corruption at project, national and international level, Orange hexagons refer to corruption at the different phases of the project (pre-qualification, execution and dispute resolution). Two grey arrows underline the embeddedness of the different project's phases into the different levels (author, 2017).

Corruption does not only hider project delivery but it also effects the productivity of the whole country. Locatelli et al., (2017) stresses the link between corruption and productivity by saying that on a 0-10 scale (where zero is very corrupted and ten is not corrupted) an increment of 1 point, reduces productivity by 2%. Corruption in one country discourages foreign investors from starting business there (Locatelli et al., 2017).

Literature (Locatelli et al., 2017) points at young stakeholders, independent, not so loyal to their job and generally less contented with their job as the ones more inclined towards corruption. In the MOSE case, as discussed later on, it is shown how this is only partially true, in fact, also highly satisfied, knowledgeable and experienced members of the Italian society have been accused of illegal activities.

To sum up, corruption is a plague upon both, developed and developing countries, and it affects infrastructure projects by increasing its costs and time delivery, reducing the quality and beneficial impacts on the community or society, it creates fertile ground for the rise of monopolies and market inequalities (Locatelli et al., 2017).

2.d.ii - Index of corruption in Italy compared to the rest of Europe

The existence of vast patronage networks and corruption practices in Italian policy-making processes has been analysed in detail since 1970s (Galt, 1974); the pervasiveness of connection between organized crime and politics has been proven and described in detail by abundant

historical research. A vast amount of academic research and judicial evidence about the involvement of mafia in economic activities has been produced throughout the 1980s and 1990s (Arlacchi, 1983; Lupo, 2004, 2007; for a view of officials who have been directly involved in the struggle against mafia, see Falcone and Padovani, 1991), thanks to the interest sparked by the open clash between the Italian State and the mafia organizations, which peaked in the 1980s-1990s with a series of political murders and massacres[3], and culminated in the so-called *"Maxiprocesso"* (a 1986-1992 large-scale trial of *Cosa Nostra* affiliates, with more than 400 people prosecuted) which exposed the depth of corruption practices in Southern Italian politics and economics (Giordano, 2011). Simultaneously, the so-called *"Mani Pulite[4] "* scandal in 1992 revealed the existence of very similar dynamics also in Northern and Central parts of Italy, and exposed the tight connection between political parties and criminal interest practices (Biondiani, 2017). Despite hopes that "*Mani Pulite*" and the "*Maxiprocesso*" could reduce the level of corruption in the country, such practices remained pervasive for all the 2000s and have once again become strong with the rise of new mafia organizations (Ciconte and Forgione, 2012), among them the Camorra clans deserve a special attention (Saviano, 2006, 2013) and, especially, 'Ndrangheta (Nicaso and Gratteri, 2010). With or without mafia involvement, corruption unfortunately remains pervasive in the country's politics.

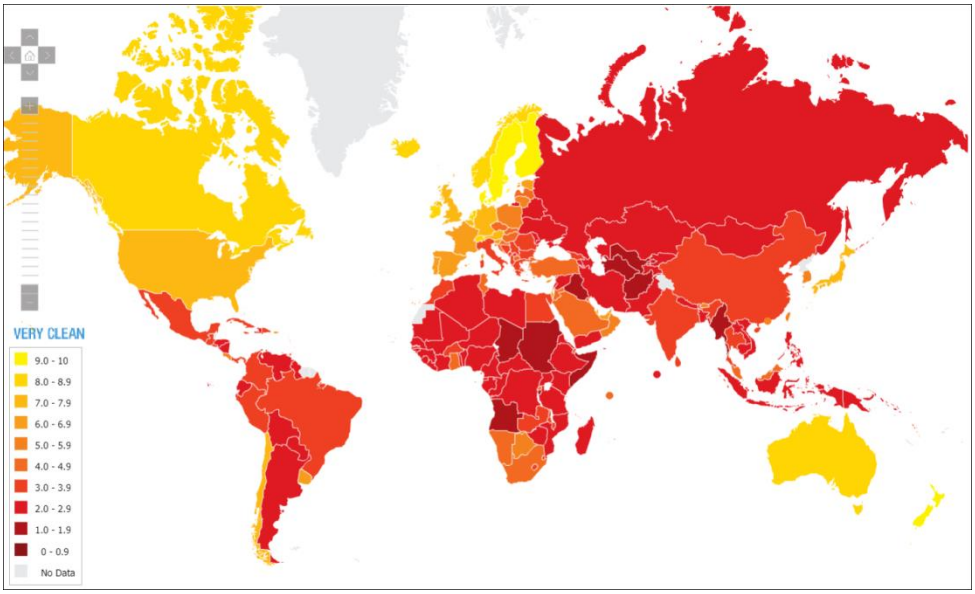
Transparency International's (2016) report on corruption perception places Italy in 60th position globally, one of the lowest in Europe, while arrests of prominent national politicians have shaken the country during the 2010s. Leaving aside the case of MOSE discussed below, or the many-reported trials against former Prime Minister Silvio Berlusconi[5], it is worth mentioning the 9 years jail term inflicted to the former president of Italy's richest region, Roberto Formigoni, whose political career ended when he was found guilty of running a vast-scale corruption business (Trinchella, 2017). A further and more detailed analysis of the rising levels of corruption in Italy is here described.

Transparency International annually draws the world's corruption perception Index per country. This index is on a 0–10 scale where countries scoring zero points are characterized by a public sector extremely corrupted whereas countries reaching higher points are relatively "cleaner" and less corrupted. Here the index is focused on European countries due to their similarities in context and characteristics and due to the fact that they are more comparable with the Italian case.

[3] Refers to a series of political murders that caused bloodshed for more than a decade through the whole country. Most striking is undoubtedly the Capaci bombing in 1992 that massacred the magistrate Giovanni Falcone, and the car-bomb explosion in Via D'Amelio, 1992, that killed Paolo Borsellino. The assassinations were Cosa Nostra's violent counterattack against *Maxiprocesso*'s main judges (Giordano, 2011)

[4] "the *Mani Pulite"* (clean hands) investigation is a large maxi-investigation that took place in Italy during the 90s".

[5] Silvio Berlusconi is an Italian politician and businessman. He was the longest-serving Prime Minister of the Republic of Italy staying in power from 1994 to 1995, from 2001 to 2006 and from 2008 to 2011. He was member of the Chamber of Deputies from 1994 to 2013, now being investigated and involved in many court trials due to his controversial political actions.

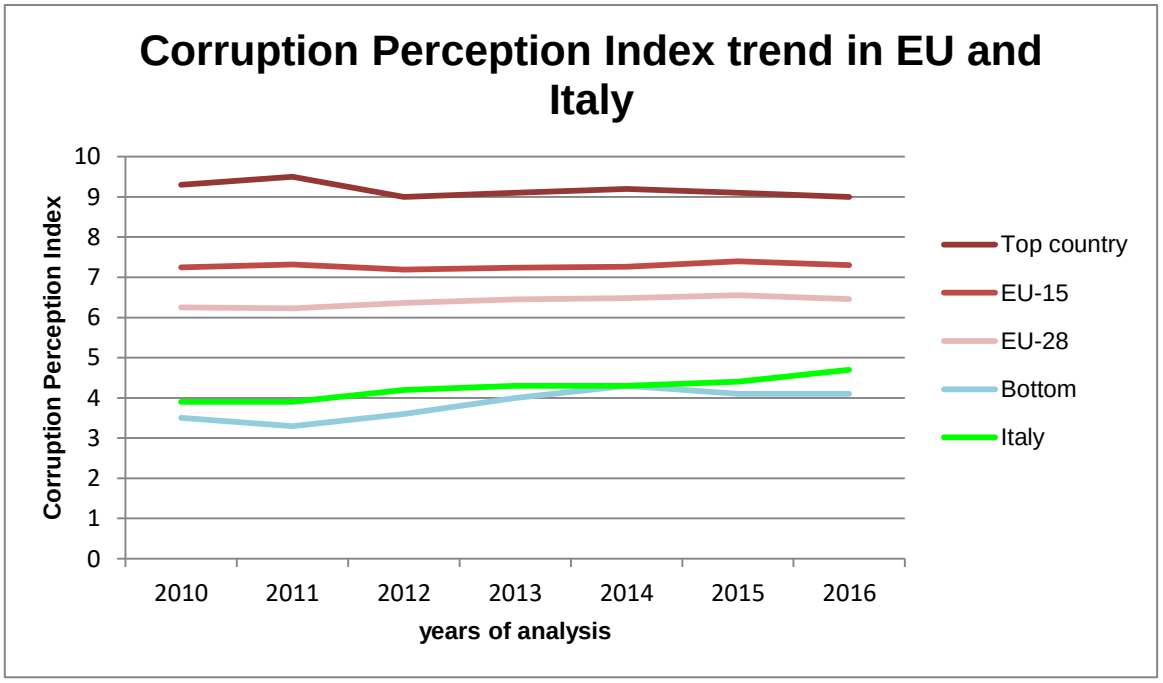


Graph 4: Visual representation of the Corruption Perception Index in 2010. The spectrum of colours illustrates the level of corruption (yellow=very clean, dark red=very corrupted) (Transparency International, 2010).

Year	Country	Rank	Score	"Best" European country	Rank	Score
2010	Italy	67	3.9	Denmark	1	9.3
2011	Italy	69	3.9	Denmark	1	9.4
2012	Italy	72	4.2	Denmark	1	9.0
2013	Italy	69	4.3	Denmark	1	9.1
2014	Italy	69	4.3	Denmark	1	9.2
2015	Italy	61	4.4	Denmark	1	9.1
2016	Italy	60	4.7	Denmark	1	9.0

Table 4: Ranking of Italy in the Corruption Perception Index from 2010 to 2016 (Transparency international 2010, 2011, 2012, 2013, 2014, 2015, 2016)

As stated by Transparency International's report (2010-2016) Italy is one of the most corrupted European countries, this has negatively affected most of Italian infrastructure projects (Locatelli et al., 2017; Transparency international, 2010-2016).



Graph 5: Graph showing the corruption perception index trend in EU countries and in particular Italy (author's elaboration of data from Transparency International, 2010-2017).

The graph shows the strong difference between the "top country", usually Denmark, EU-15 and EU-28 (EU-15: all the states that became part of the EU within 2004 and EU-28 includes all the actual members of EU) and Italy. The Italian index has not improved over the years, in fact, in 2014 Italy became the most corrupted country in EU and in the previous/subsequent years, it has often been close to the bottom of the ranking, usually occupied by either Greece, Bulgaria or Romania (see graph 5). In 2014 Italy ranked in the same position with Brazil or African countries such as Senegal or Swaziland and this is a symptom of country lacking anti-corruption policies, political/institutional checks and transparency in politics.

Italy has also not achieved excellent results regarding the global corruption barometer. This analysis, carried out by Transparency International (2013), shows the perceived level of corruption among citizens who participated to the survey, by asking three main questions.

The first one: "How has the level of corruption in Italy changed over the previous two years?" from this survey, only 4% said that the level has slowly decreased, 32% said that it has stayed the same, 19% claimed that it has increased and 45% said that the level has increased a lot.

Second question: "percentage of responders who felt that these institutions were corrupted in Italy". 89% of Italians felt that political parties were corrupted or extremely corrupted, 77% felt that parliament and legislature were corrupted, 45% perceived the media as corrupted, 47% is the percentage related to judiciary, 61% felt high level of corruption in public officials and civil servants and 52% claimed to see businesses as corrupted.

Third question is aimed at analysing whether the responder or someone in their household paid a bribe to the services described in question 2 in the last 12 months. 12% of the responders said to have paid a bribe to the judiciary in the last 12 months (Transiency International Index, 2013).

Sadly, in one of the most corrupted countries in Europe, the phenomenon of corruption is slowly becoming intrinsic in its society, understood and perceived as the norm instead of a disease to fight against. Italian journalist Roberto Gervaso says: *"La corruzione dilaga: i moralisti tripudiano e la gente se n'infischia.* ("corruption is dominant: moralists exult and people do not care anymore") (Gervaso, 1983), or Italian Nobel-winning playwright, theatre director Dario Fo (1987) came back on this and stresses the concept by saying: *"Ministri, gente di direzione, industriali, gente incriminata in tangenti, in furti, una schifezza; tanto che sui giornali fanno più presto a fare la lista dei ministri che quel giorno non hanno rubato"* ("ministers, public officials, industrialists, people guilty of corruption or fraud, this is garbage; in fact media would save more time by listing the ministers who have not stolen anything that day"). Fo, D. (1987). The theoretical framework is summarized in a research design model shown below, the theoretical part is analysed in the left side of the model, the right side of the model is to be understood after reading the case study analysis because if focuses on the MOSE case.

The author used a variety of sources, both Italian and international. Scholars, such as: Flyvbjerg (2014), Mišić et al. (2015), Locatelli et al. (2017) etc. have been used because their research gives useful insights and inputs regarding the successful management of megaprojects. These academics, among all Flyvbjerg, considered as an expert in megaprojects' management, are cited in most of the academic papers and therefore are to be considered as some of the most important experts on this topic. Studying these papers, not only gave the author knowledge but stimulated and increased his critical thinking, allowing him to analyse literature and compare it with his previously acquired knowledge. Literature on megaproject is not abundant, due to the difficulty in addressing projects that vary on size, location, type and purpose, therefore, it is complicated to generalize and draw a common understanding that embraces all the aspects of this complex topic.

Various publications of Flyvbjerg (2003 and 2014) all refer to megaprojects as risky, complex and prone to crisis, characterized by high level of capital and with different stakeholders involved. The definition is re-interpreted by Mišić et al. (2015), Locatelli et al. (2017) who embrace a rather more theoretical vision, pointing corruption as a main element of megaprojects failure. The definition is re-elaborated by Lehtonen (2014), who, after analysing the main "pathologies" of megaprojects, drives his analysis towards more socio-economic prospective embracing network-oriented and more dynamic evaluating strategies. The author of this paper agrees with both the definitions given first by Flyvbjerg (2003), who focused his study on a rather more economic/practical analysis of the elements leading to either success or failure of megaproject, but he strongly agrees with Lehtonen's vision, since the author thinks that megaprojects cannot be understood as fixed

elements but, on the contrary, as open systems, co-evolving with the context in which they are embedded. This view retraces the words of scholars such as De Roo (2015 and 2010), who elaborates on the link between context and systems.

Literature analyses the drivers of success or failure of megaprojects, in fact most of the scholars refer to similar elements either enhancing or undermining the stability of the project. As analysed in page. 11, Flyvbjerg (2014) explains that the causes of failure of megaprojects are divided in four categories: technical, political, economic and psychological explanations. Technical explanations, retracing mere material and technical drivers of megaproject failure are also included in Kharbanda et al. (1996)'s analysis that refers to pushing new technologies into market too quickly or blaming only the most visible problem when the final outcome is not satisfying. Analogous factors are also identified by NETLIPSE (Network for the dissemination of knowledge on the management and organisation of large infrastructure projects in Europe) who pinpoints reasons such as recurring changes in key personnel, experiments with new technologies as causes of megaprojects failure.

Not conducting feasibility studies before realizing the project is according to Kharbanda et al. (1996) another driver of failure, this idea is supported by NETLIPSE who refers to the risk of not having a concrete and practical analysis of time and cost with no reserves for contingency. Tabish et al. (2011) retrace this idea by describing how a suitable pre-project planning scheme could be considered as a key element in achieving a well-managed project. Feasible studies are crucial elements for a successfully delivered project, in fact, regarding the Venetian case study, a lack of detailed environment, time and cost analyses is to be addressed as one of the causes of the failure of MOSE (more information can be found in the research design model at the end of the chapter and in the concluding remarks in chapter 5 and 6. The model can be read being aware that only the left part refers to theory and the right part, coloured in grey, refers to the case study).

Flyvbjerg (2014), among his four reasons of failure, describes also political reasons. The concept of political interference is also analysed in Flyvbjerg (2011) and Kharbanda et al. (1996). The former refers to strategic misrepresentation and opportunistic bias and the latter, in accordance with the first one, refer to the danger of allowing political expediency and infighting to dictate crucial project decisions, over-managing project managers and their team and having a project run by weak leader. NETLIPSE agrees with the words of Fyvbjerg and Kharbanda et al.(1996) by saying that a clear vision and a strong political will is necessary for a suitable megaproject management.

The World Bank (2010) and Tabish et al. (2011) both indicate having external monitoring control as a very useful strategy for megaproject's success. The author of this thesis agrees with both the scholars and he analyses, in chapter 5 and 6, how monitoring systems could be fruitful elements in order to prevent projects from failing. A monitoring system is also identified as a valid strategy for preventing corruption and opportunistic behaviours in megaprojects.

Stakeholders involvement is a crucial factor for a stable and appropriate megaprojects' success, in fact, NETLIPSE (Hertogh et al., 2008) describes how having a comprehensive and systematic stakeholder management with open communication could be considered as a key driver of success, furthermore, Kharbanda et al. (1996) re-mark the concept by saying that ignoring the project environment, context and stakeholders' behaviours is an element undermining the stability and successful implementation of the megaproject. NETLIPSE concludes that a late and unstable decision making processes among the involved stakeholders from project managers to delivery companies and a manipulated and not efficient communications with relevant stakeholders are threats to megaprojects' successful delivery. The author agrees with Flyvbjerg et al. (2014) and he not only acknowledges Flyvbjerg's factors leading to the failure of megaprojects but he also agrees with the theory that economic and political explanations are the main reasons for the failure of the Venetian case study.

Only some of the drivers of megaprojects' success or failure have been taken into account by the author who selected them based on the relevance with the MOSE case; general elements such as World Bank's successful factors (monitoring, coordination, design, training and institutional environment) due to their general view could be a good representation of a considerable amount of projects. These scholars have been selected because they offer an excellent analysis of megaprojects' management and they enrich the case study analysis with useful insights.

The question that spontaneously arises after having analysed the papers is whether the factors driving to the failure or success of a megaproject are analogous even though the characteristic of the projects are different. Are the addressed elements of failure for big sized projects in countries with high GDP to some extent similar to the ones of small projects in small countries with a lower GDP? Often scholars such as Flyvbjerg et al. (2003) keep their analyses general without referring to the size or length of the projects. This, therefore, is an area that could be further developed in the analysis of megaprojects in fact, the author of this thesis, imagines that the length of the decision making and realization phase correlates with the performance of the project (the longer the realization phase the higher the chance to see cost overruns). The author is aware that having a general overview of megaprojects is not a negative element since in order to analyse the main characteristics and drivers of success/failure, academics have to focus on overarching theoretical elements, leaving more context based knowledge to case study analyses.

The idea that general theory is not enough to define megaprojects is confirmed by Mišić et al. (2015) who refer to how megaprojects should be defined based on the size of the country and its GDP. Mišić's perspective gives a great contribution on understanding the different aspects of megaprojects, in fact, as mentioned by the author of this thesis, and as analysed by Mišić et al. (2015), megaproject should always be studied in their contexts, by understanding the political influences, cultural differences that every aspect in which the country is embedded.

Experts such as Flyvbjerg et al. 2003, focus their research on rather general aspects, therefore they do not specify whether the projects is for the majority public, private or co-managed by private and public partnerships and they do not focus on whether the different management strategies can influence the final outcome. It would be interesting to see how the different characteristics of megaprojects could, on the one hand, be elements leading to contrasting outcomes, and on the other hand, result in similar successful management.

Figure 2: Research design model answers the research question in two ways. Material and institutional causes of the failure of MP and MOSE are underlined with two different colours (green for material and blue for institutional). The left part of the graph is focused on the theoretical aspects therefore it is an explanation of chapter 2. The right part, voluntarily coloured in grey, refers to the Italian case study and should be better understood after reading chapter 4 (Author, 2018).

Chapter 3 - Methodology

This chapter examines the data collection methods used in this thesis. The aim of this manuscript, after building an understanding on water management strategies and flooding phenomena in Veneto's capital city, is to study how political influences, opportunistic behaviours, miscommunication among actors and lack of participation could, firstly, influence megaprojects and, secondly, have influenced the final result of one of Italy's most important flood-control infrastructures. This is done by linking theoretical framework with empirical knowledge obtained in the field. Beside the institutional framework, the aim is also to increase awareness on one of the most pressing issues of our time: global warming and the consequence of sea levels rising which is slowly yet inexorably tackling Venice's stability and safety.

This chapter analyses the methods used to answer the research questions: **"How to tackle flooding in Venice. What are the material and institutional causes of MOSE's failure?"**. In order to do so, the researcher needed first of all to acquire knowledge on mega public projects' characteristics and on reasons and drivers of megaprojects' successes and failures. This will then be applied to the Venetian case study by analysing firstly the hydrodynamic characteristics of the Venetian lagoon, understanding the *acqua alta* phenomenon, its triggering factors and, secondly, analysing MOSE's structural elements and institutional/political background. Knowledge will be tested also with the use of semi-structured interviews which provide great insights from experts working in the field.

3.a Case study and qualitative analysis

Theoretical analyses are crucial for a thorough understanding of practice, but regarding the MOSE case, the researcher considers case study analysis to be more suitable. The author decided to use qualitative analysis of the case study instead of quantitative analysis because it allows a detailed study of the characteristics, key elements, relevant information of the case study and it allows to gain specific insights. Statistical method differs principally due to the high number of cases analysed, focusing more on numerical variables instead of in-depth study (breadth instead of depth) (O'Leary, 2004; Verweij et al,. 2013). Case study analysis is used in this thesis because it allows to address issues that are, mainly, relevant for the Venetian case. A case study is here defined as "an in-depth, multifaceted investigation, using qualitative research methods, of a single social phenomenon. The case study is conducted in great detail and often relies on the use of several data sources." (Orum et al., 1991; pp: 2). The author decided not to undertake multiple case studies analysis because the knowledge acquired from the cases would have been more suitable for a comparative research or a statistic-based analysis; he therefore thinks that a single case study would provide him with more detailed and thorough knowledge regarding the MOSE

case. It must be said that the researcher does not exclude the possibility to learn from other megaprojects or to draw lessons from the MOSE case in order to improve future public projects, in fact, Venice's movable barrier is, notwithstanding its size and cost, only one of the many megaprojects in Italy. Multiple case studies would have allowed the author to study several other megaprojects but he thinks that a case-study approach suits better this type of research given that the focus is on a single case and statistical research is not extremely relevant for the topic. Learning from a meaningful case study is therefore always a good strategy (Flyvbjerg, 2006).

3.b Stakeholders analysis

Stakeholders analysis is aimed at understanding the relevant actors involved in the Venetian case study. It first addresses the relevant stakeholders both private and public, involuntarily interested by the daily tidal flooding events and secondly it identifies the relevant stakeholders involved in the MOSE case. According to Zidane et al., (2015) a stakeholder is "a person or an organization actively involved in the project or having an interest in or conflict of interest with the project execution or the project end result", (Rolstadås, 2008; Zidane et al., 2015), which makes, detecting all the stakeholders, not an easy task. It is important to investigate the role of every actor given their uniqueness of interests and their peculiar characteristics in regard to this specific flood management infrastructure. Starting from the Venetian citizens who have always been dealing with *acqua alta,* forced to secure the doors of their houses, shops or public buildings with handmade sand sacks or movable metal barriers; the numerous tourists, who, during the floods, have to walk on wooden piers which are located along the most frequented routes or public officials in charge of managing the public transport system in highly stressed situation. Living in the inner city of Venice, in the period between 2011 and 2015, gave the author more context-based knowledge and personal opinions on the level of resilience of the city and on how it responds to the floods. It allowed him to acquire insights on the processes that led to the realization of the flood protection infrastructure. Stakeholders analysed in this document are also environmental NGOs such as the Italian section of WWF, CORILA and Italia Nostra. More MOSE-related actors are the Venetian Water Board or CVN (Consorzio Venezia Nuova) composed by four big enterprises: *Italstrade, Grandi Lavori Fincosit, Società italiana per Condotte d'Acqua e Mazzi Impresa Generale di Costruzioni*, and more recently joined by: *Consorzio Veneto Cooperativo, Impregilo, Italstrade, Mantovani group* etc. (MOSE official website). The political, administrative and economic actors interested in the decision making and realisation processes at both local and national level, such as CVN's members or *Comitatone*'s actors, are in detailed scrutinized in chapter 4. Stakeholders' analysis took place in August and November 2017.

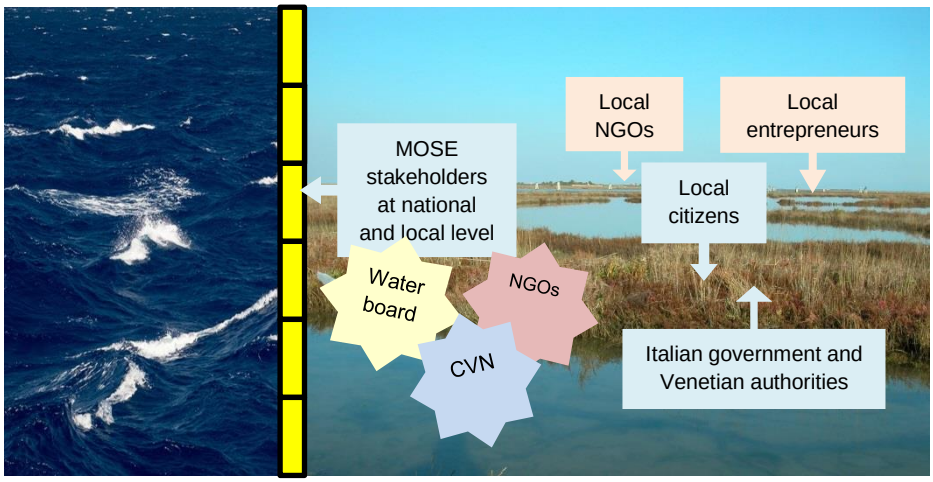


Figure 3: Stakeholder conceptual model (author, 2017)

3.c Documents analysis

The term "document" does not only refer to paper but it comprises different sources such as photographs, paintings, works of art, movies (O'Leary, 2004). The documents that have been analysed during the process are of various types. In chapter 2, academic and scientific articles have made the majority of the literature due to the fact that words of scholars such as De Roo, Helmke, Levitsky, Locatelli, Flyvbjerg, Pinto and Shenhar etc. are easier to be found in academic papers. Flyvbjerg is the role figure regarding megaprojects' management, he has been cited over 30.000 times on web search engines (Google Scholar, 2018)[6]. Being aware that Flyvbjerg is an expert that needs to be mentioned and analysed, the author of this thesis not only focused on his work but he thoroughly analysed other scholars and he critically compared them with each other in order to gain more knowledge. NETLIPSE is also used in this dissertation, it helped to obtain broader insights form different perspectives given the structure of this network of organizations aimed at exchanging knowledge and strategies in megaprojects' management. Regarding the data analysis of Venice's environment, books about the history of Venice, academic articles about the physical and geological characteristics of the lagoon, local newspapers and tables showing the frequency and intensity of floods have been investigated. For the author, being in Venice during part of the research period (July-September, 2017), allowed him to use the city's archive and local libraries, giving him the opportunity to find data that are not always findable online. Concerning the MOSE-project, the author used technical reports made by MOSE's engineers and project description documents traceable at Venice's city hall's archive. This part has been enriched with detailed knowledge from experts on MOSE's project and its background. The concluding part on chapter 4, related to the institutional failure of the context and today's infrastructure's stage has been written with the help of legal acts, local and national newspapers articles, interviews and

[6] Google Scholar website: Bent Flyvbjerg. (2018 https://scholar.google.com/citations?user=79htA7gAAAAJ&hl=it&oi=sra)

books. Analysing documents before starting the interviews or the stakeholders' analysis appears to be a suitable strategy because it allows the researcher to acquire more knowledge on the topic and to have a better understanding of the issue. If the interviews had been realized beforehand the results might not have been the same because the researcher might not have had the same information. Regarding the methods used for the document analysis, the researcher selected all the relevant documents, at libraries, archives and University's specialised research websites. Once the documents had been selected, a first analysis was made. The author skimmed through the pages in order to check whether the document was relevant in order to answer the research question. The relevant documents had therefore been selected according to a structured procedure. In order to find useful information, they have been firstly divided into categories based on the topic and insights, secondly, the most relevant parts had been read and summarized in order to make a comparison with other articles easier and possible. Especially regarding the theoretical part, given the considerable amount of literature, only the very useful articles have been extensively read so that the researcher could focus on documents addressing similar and crucial issues, making a comparison between scholars' papers more reasonable. The empirical data analysis was realized in accordance with the theoretical part and therefore the two chapters, realised from July until September 2017 and from November 2017 until January 2018, are linked with each other.

3.d Semi-structured interviews

Interviewing is much more complex than asking questions (O'Leary, 2004). Interviews with relevant stakeholders and experts on flood risk management and infrastructure projects help confirm or reject the insight from theory and support the data analysis by verifying or falsifying specific processes. The different options, such as, structured interviews, semi-structured interviews or unstructured interviews allow the researcher to undertake various analytical paths based on the type of formulated questions. Semi-structured interviews allowed the interviewees to be more flexible and to answer the questions in a rather more discursive way (O'Leary, 2004). The selected interviewees are knowledgeable experts, academic professors, engineers, economists, journalists who are involved or interested in the MOSE-case. The interviews are not anonymous, written in Italian, translated into English and partially included in the chapters. The author is aware that non anonymous interviews could be bias due to the fact that the names of the interviewees and their interviews are published. This was not the case given that the experts, who have been interviewed, have a notorious strong position and opinion regarding the MOSE project. A brief description of the interviewees and their roles can be found at the end of this paragraph and a more detailed description with the questions asked during the interviews can be found in the appendix. Some of the 7 interviews have been made *in loco* and some via Skype, email or phone call. The different

strategies, undertaken during the research, involve varying characteristics, actions and behaviours. Face to face interviews are more time consuming considering that the interviewer used to live in the Netherlands during the thesis's research period and most of the stakeholders are located in Venice, nevertheless, face to face interviews enable, thanks to a friendlier and direct environment, to engage in a real open discourse. Similar is the situation concerning phone or Skype interviews that, on the one hand, allow a "virtual" face-to-face discussion, but on the other hand, forces the interviewees to have a mobile device or a computer in which the communication can take place. Email interviews are also a valid element because the interviewee can think and gain all the required knowledge before starting to answer the questions. The last kind was therefore used the most in this thesis. The researcher initially wanted to interview a much higher number of experts, but he stopped after 7 interviews because each on the interviewees gave extremely relevant information, they had matching views regarding the project, the resulted opinions and answers were, to some extent, similar. The author wanted to interview actors personally involved in the MOSE project who were favourable to the realization of the structure but unfortunately, due to their unavailability or unwillingness to make the interview, he focused on actors with opposing views regarding the benefit of the project. This is due to the fact that the thesis analyses the causes leading to the institutional and material failure of the barrier, not the reasons behind its successful implementation. In order to avoid useless repetitions, the number of interviews has been kept to 7.

Interviewees names	Role of the interviewees	When was the interview made	Type of interview
Fersuoch, L.	President of Italia Nostra	February 2018	E-mail interview
Filesi, L	Professor University of Venice	September 2017	E-mail interview
Patassini, D	Italian engineer and dean of the Faculty of Urban Planning	January 2018	Skype interview
Martini, G. A	Journalist	August 2017 and December 2017	Face-to-face and phone interview
Ciacci, L	Professor	January 2018	E-mail interview
Cusinato, A	Economist	August 2017	E-mail interview
Boato, S	Expert on tide and water management	January 2018	E-mail interview

Table 5: Interviewees details. (author, 2017)

Chapter 4 - Analysis of the research data.

In this chapter the author analyses the data which were firstly collected among different sources (newspaper articles, books, papers acquired during the research period in Venice, tide charts, different types of interviews with stakeholders etc.), secondly accurately selected based in their

relevance with the Venetian case study and then studied; not all data have been used because some of them did not add useful information to answer the research question. Data analysis is a crucial part of the thesis because it enables the researcher to verify or deny arguments presented in the theoretical part or acquired during the interviews. It also provides explanations for different theories, hypothesis and it is useful in order to provide answers, draw concluding remarks and prepare the ground for further discussions.

The author, before analysing the data, selected different sources, and verified that every information was confirmed by another source (data triangulation). This was especially the case when the political/institutional background of the project was analysed, in fact due to the newness of the events and a lack of information on this topic, the concluding part of the chapter includes hypothesis which are compared with other sources in order to make them as accurate and precise as possible. The data give answer to the research question because it would be difficult to find a suitable answer with only theoretical knowledge, moreover data give real, contest based and tested information through analytical representation therefore data analysis is one of the only possible ways to answer the research question. This chapter is divided in two main parts: the first one analyses the environment of the Venetian lagoon. An introductive part gives a brief overview of the geographical characteristics, before diving (sub-chapter **4.b** and **4.c**) in two of the biggest threats undermining the stability of the city. The second part focuses on the MOSE project. Sub-chapter **4.d** describes the characteristics of the MOSE, **4.e** aims at showing how MOSE should function according to project managers, **4.f** and **4.g** study the limitations of the project and its institutional and material failure. The chapter ends with a brief analysis of the "final cost" of the project and the role that corruption plays in this case study.

4.a - Introduction of Venice's scenario

Venice, a city which is as beautiful as it is fragile, rises above the homonym lagoon. The lagoon, an UNESCO heritage site since 1987, is one of the biggest sea water reservoirs in the Mediterranean Sea, with a surface of 550 square km (Zanetti et al., 2016). This complex environment consists of 8% of dry land, 12% of canals or *barene* (typical flood-prone environment of the lagoon of Venice), and shallow water for the remaining 80%. It is connected to the Adriatic Sea by 3 inlets (*Bocche di Porto* in Italian): Lido, Malamocco and Chioggia that allow ships to sail through and water to flow (Salzano, 2016).

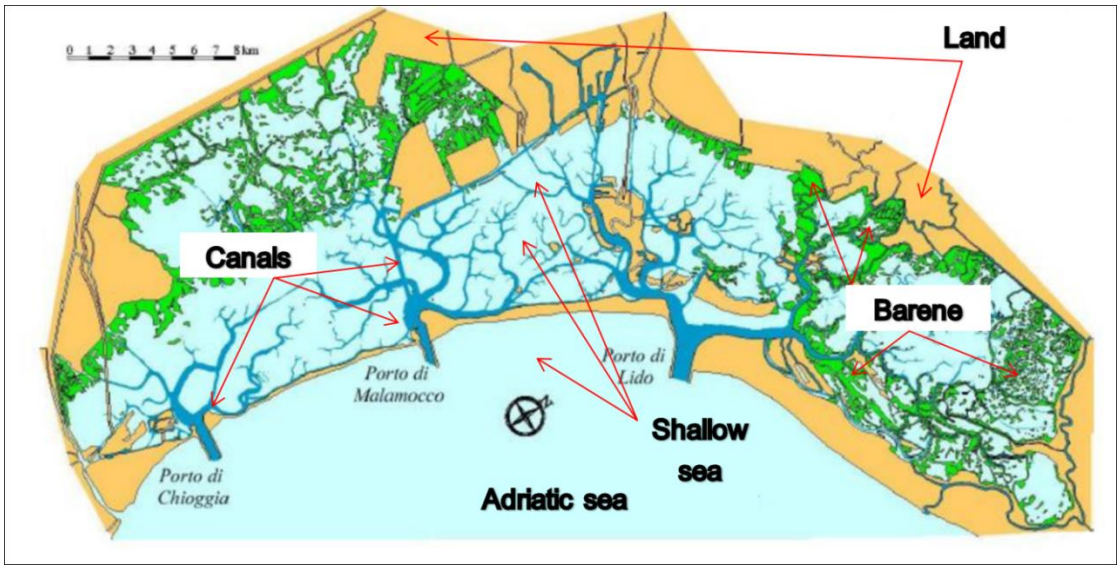


Figure 4 Visual representation of the lagoon of Venice (CORILA website, 2017).

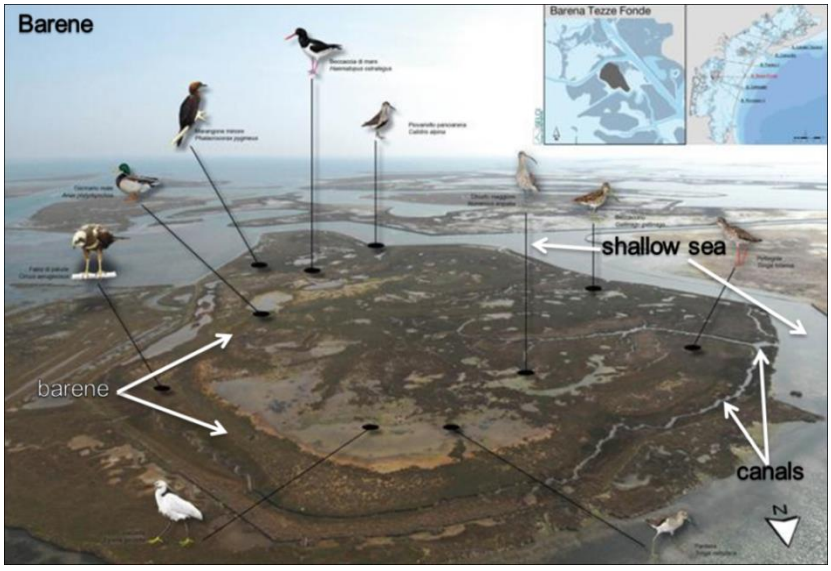


Figure 5: Venetian lagoon's local flora and fauna (Corriere Veneto, 2016).

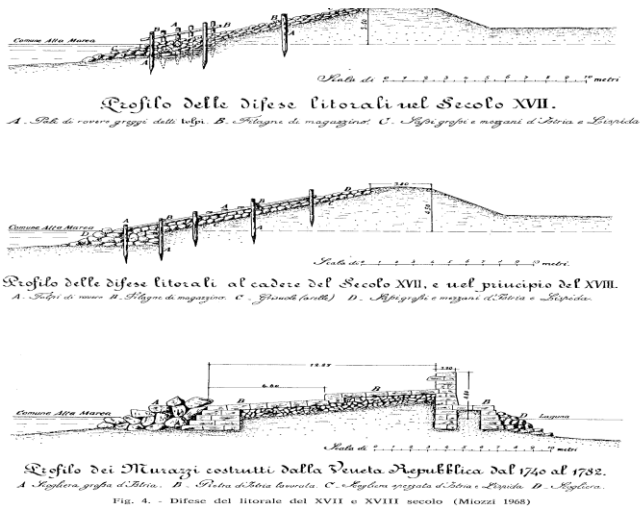


Fig. 4. - Difese del litorale del XVII e XVIII secolo (Miozzi 1968)

The flow of the water, through the complex web of canals and shallow *barene* plays an extremely important role for the maintenance of the fragile marine ecosystem. On the one hand, *barene*, are semi-submerged areas that are being flooded twice a day by the daily tide and therefore are useful for lessening the wave-motion on the coasts (figure 4, 5 and 6). By keeping sediments, on the other hand, every single canal is a natural "riverbed" that facilitates the flow of sea water along the whole network of ramifications starting from the three inlets facilitating an efficient water exchange (Beretta, 2015). This fragile ecosystem of partially open stagnant water would not be as it is today if the local population did not make, throughout the centuries, important maintenance interventions in order to preserve its peculiar

Figure 6 Examples of costal physical defences used throughout the previous centuries (Colombo, 1972). **Figure 7:** Barene's environment protection installations October 2011 (MOSE official website, 2017).

characteristics. The most important action was the deviation of the main rivers that would have naturally flown into the lagoon in order to reduce the amount of sediments and debris that would have caused the vanishing of the water reservoir (McClennen et al., 1998).

Today the lagoon still stands thanks to important physical barrages and flood protection infrastructures that had been built throughout the decades in order to protect it against storm surges and to preserve Venice's important fleet, useful for establishing and maintaining the political and economic supremacy of the sea during the *Serenissima*'s republic (Salzano, 2016).

4.b - The sinking city

In 1885, during the first dig made at the basement of Saint Mark's Basilica's bell tower (showing that the initial steps of the tower used to be five instead of the only two visible today) the local population became aware of this problematic issue. Further digs made in *Riva degli Schiavoni* and in *Sottoportego S. Silvestro* showed that the original floor of Venice has already sunk for 80-85 cm (Housley et al., 2004). The annual sinking of the urban area is approximately 1.1 mm which means more than 10 cm every century (Venice water board's hydrographic office, 1983). Data shows that the speed of sinking has actually been increasing during the last years. In 60 years Venice has sunk 1.7 cm, Lido more than 2 cm and during the 10 year period between 1931 and 1941 Saint Mark's neighbourhood has sunk 3 cm (Colombo, 1972). If this scenario is not alarming enough, global warming is constantly undermining the city's physical stability, in fact data tells us that during the decade 1931-1941 the sea level rose up to 4.9 cm (Colombo, 1972).

Why is Venice sinking?

The causes are many, beside the sea level rise and subsidence of the ground, as previously stated, physical infrastructure interventions need to be added to the list. An example of this is the deviation of the natural course of the rivers responsible for the reduction of pluvial supply of sediments that counterbalances both the excessive growth of the urban areas and the constant

extraction of fresh water from the ground in order to fulfil the population and industry's needs (Favero et al., 1988; Leonardi, 1960).

A short analysis of the causes is described below:

Sea level rise

The level of sea water has always been significantly fluctuating, due to the consequence of the equilibrium between icy and liquid masses, called "eustacy". This is primarily the result of debatable human activities which caused the temperature to rise and an increase in the speed of the ice-melting process (Leonardi, 1960). The ice-melting process and the resulting water level rise undermine the safety of most of the sea-side locations and could have catastrophic effects on the ecological and socio-economic stability of many countries.

Subsidence

The causes of subsidence are visible in three ways, firstly, amongst the gradual compacting of the pluvial sediment that is a central layer in the lagoon, secondly through the oscillation of the level of the liquid mass of water underground, and thirdly through tectonic phenomena. Manmade actions are also responsible, for example the extraction of water from the ground and the deviation of rivers with the purpose of avoiding the accumulation of debris carried by the rivers (Gatto et al., 1981).

The Venetian motto: *Grande laguna fa buon porto* (a big lagoon makes an harbour efficient) has not been of great use for subsidence prevention.

Last but not least, urban expansion (Mestre, and other seaside cities are experiencing increasing fluxes of migration from the countryside) and excessive land use for both agricultural and industrial purposes (this is referred to the areas of Marghera and Mestre, main industrial centres of Venice) have increased the necessity of fresh water from groundwater reservoirs. The deprivation of water is causing the impoverishment and sinking of the subsoil (Carbognin et al., 1984).

Insights from the interview with Professor Cusinato: *"…tra le maggiori cause dell'aggravarsi del fenomeno dell'acqua alta ci sono la subsidenza (-1/-2 mm/anno) e l'eustatismo a cause delle estrazioni di gas e acqua dal sottosuolo, aspetto da non sottovalutare. Si dovrebbe intervenire innanzitutto per rallentare questi fenomeni nella zona industriale a Marghera. Il blocco delle estrazioni di gas e acqua dal sottosuolo è stato un intervento mirato in questo senso; sul livello del mare, come sappiamo, occorre intervenire a livello globale"* ("…subsidence, -1/-2 mm/year, and eustasy are among the main causes of the *acqua alta* phenomenon, due to the excessive extractions of gas and water from underwater reservoirs, this is an aspect to take into consideration. Interventions should be aimed at reducing these activities especially near the cost

and near the industrial area of Marghera, even if, in order to tackle sea-level rise, a global approach should be established. Cusinato, 2018)

Figure 8: *Acqua alta.* Venice, St. Mark's neighbourhood. On the right: December 2008. Tide level: +156 cm. on the left **(figure 9),** St. Mark's square, 2016. Bottom pic **(figure 10)**: Giudecca's neighbourhood (MOSE official website, 2017).

4.c - The *acqua alta* phenomenon

According to researchers, subsidence and eustasy induce sea level rise and today we can observe that Venice is 25 cm shorter than how it used to be 100 years ago (Carbognin et al., 2004). Due to its orographic characteristic, Venice has always been exposed to floods, ranking from low intensity events to extremely intense disasters such as the catastrophic flood in November 1966, which submerged the city under a tide of +194 cm (Venice city hall, 2017). This unfortunately is by no means an isolated example, in fact, the water rose up to +166 cm in 1976, up to +158 cm in 1986, +156 cm in 2000, +145 cm in 2009, +144 cm in 2010 and during winter 2012 the water entered the city's buildings at an alarming height of +150 cm (Venice city hall, 2017).

What is important to know is that between November 1966 and November 2010, *acqua alta* events struck 191 times whereas from 1926 to 1965 Venice's citizens experienced it "only" 21 times (Cordella et al., 2011). Data shows the frightening increment of frequency and entity of these events in the very recent history of the region (Venice city hall, 2017).

How is the frequency of the *acqua alta* phenomena calculated?

The term *acqua alta* refers to a sea tide that goes +80 cm above the ZMPS: *Zero Mareografico di Punta Sabbioni* (tide gage zero of Punta Sabbioni) which is the average fixed level of tide established in 1897 in Punta Sabbioni, location where the measuring station is located (Fersuoch, 2015; Venice city hall, 2017). In 1942 the "zero-level" of the national altitude scheme was fixed referring to the average of the Genoa sea, exactly +23 cm higher than Punta Sabbioni's detection station, but due to further complications that might have occurred in adapting the two different measuring systems, Venice's water board decided to keep the former that would give constant data easily comparable (Piazzoli et al., 1999). With this in mind, it can be said that when the media refers to a tide of +110 cm it does not mean that the city is submerged by more than 1 meter of water, but that the ZMPS's measuring level has been passed by +110 cm. In other words: a +80 cm tide affects only 0,1% of the surface of the city (mostly Saint Mark's area, which is the lowest one); with a +110 cm tide, though, 14% of the surface will be under water. (+130 cm=46% of the city, +150 cm = 70%, +190 cm = 90%) (Venice city hall, 2017). It must be added that often *acqua alta* covers only the canal banks making the edge of the sidewalks invisible to those who walk or drive/sail, causing serious problems. This should not be underestimated because even if the percentage (e.g. <80 cm) is low, it does not mean that the flood will affect only a restricted zone, but instead, it will submerge several areas around the city, determining problems to the public transport network and normal everyday-life. The increased level of water often compromises ferries and boats' courses under the innumerable bridges that link the intricate network of canals, *"calli e campi"* (streets and squares in Venetian), and undermine both the reliability of public and goods transport on which the city relies on. At this point, it is appropriate to question why the phenomenon of *acqua alta* strikes only during winter-autumn-spring and in specific periods of the day, notwithstanding the rising level of the sea and the sinking process of the city. *Acqua alta* is the result of astronomical, meteorological and oceanographic events such as the Moon's attraction on big masses of water, the Sirocco wind that blows the water towards the lagoon, the longitudinal oscillations of the Adriatic, precipitations and a relatively shallow sea in the lagoon. These conditions combined cause the exacerbation of this phenomenon especially during autumn, winter and early spring (Fersuoch, 2015; Piazzoli et al., 1999; Pirazzoli, 2002).

The city has developed few resilience strategies throughout the decades (Venice city hall, 2017).

- There is a danger alarm that sounds 1 hour before the rise of the tide and alerts citizens in case of exceptionally high tides.
- Venice's city hall offers a free SMS service that sends alert text messages with informations about the coming tide (approximate time and height of the waves) (there is also an e-mail service that performs the same function).
- On local newspapers weather forecast and tide levels forecast are reported daily.

- Venice's *commune* (municipality's) website, Facebook page and Twitter account post daily news regarding the forthcoming tide levels.
- Venice's *comune* provides ground floor buildings with iron/wood manual barriers to be applied in front of doors and windows in order to prevent water from entering structures.
- Emergency phone numbers in case of necessity are always available
- Screens placed in busy locations (central station, Burano island, Rialto bridge) with colour-based visual alert code warn passers-by.
- Temporary wooden elevated walkways.
- Webcam service.

4.d - The MOSE project

The sequence of events just described above encouraged Venice's public administrations to propose a "competition of ideas" aimed at taming the *acqua alta* problem and at preserving Venice's historical and artistic heritage from flooding events (Comerlati et al., 2004). In 1973, six projects were made but none of them resulted suitable to address the issue. The following year saw the establishment of a focus group (composed of academics, scientists and experts), aimed at re-analysing the projects made in 1973. The group, in 1981, came up with a project believed to be a suitable, feasible strategy called *Progettone* (Fersuoch, 2015). In order to finalise the project, all the decisions concerning the design and realization phase were given to a new established authority called: *CVN - Consorzio Venezia Nuova* (Consortium New Venice) in accordance with the law 798/84 (Fersuoch, 2015). Right after its establishment, CVN and VWA (Venice Water Authority) *(Magistrato delle Acque)* submitted the REA project (Rebalancing the Environment) that called for rather physical solutions to the problem: gigantic mobile hollow gates to be put at the entrance of every inlet (Malamocco, Chioggia and Lido) in order to finally save Venice from the floods. Between 1988 and 1992 the experimentation phase took place, both in protected artificial pools and on-site. In 1984, thanks to three special laws made in order to ensure the safety of Venice, a new institutional body called *Comitatone*[7] (chaired by the Prime Minister and all the actors involved in the safeguard of Venice's lagoon) was established (Fersouch, 2015). This law stated that the project for the safeguarding of Venice needed to be "experimental, gradual and removable" due to the fragile ecosystem in which it was going to be built. MOSE, despite winning the completion against other projects, will lack of all these three aspects. The preliminary draft of the project was drawn in 1989 and the environmental impact assessment has been carried out in 1992. The final version, submitted in 2002, was lacking two important elements: the final detailed

[7] Translated from Italian into English would be "big committee"

cost assessment and an exact realisation scheme (Venice city hall. 2005). (regarding the project's requirements see the interview made with Prof. Boato, S. in chapter 5).

The 3rd of April 2003, the realisation of MOSE: *MOdulo Sperimentale Elettromeccanico* (Experimental Electromechanical Module) officially began both with a delay of almost 10 years, without including the opinion of the Venetian citizens or the local administrative stakeholders' (Di Tella et al., 2017). Literature extensively analyses the important role of stakeholders' involvement in most of the public projects, this allows project managers to take into account several opinions, different points of view or alternatives that can be incorporated into the project during the design phase. A top-down approach on megaprojects management is most likely not to give the appropriate tools these complicated projects often require. In the case of MOSE, the lack of participation of local citizens in the debate about the *acqua alta* problem will be the beginning of a long series of demonstrations culminating with today's non acceptance of the project by the public opinion. Perhaps a more appropriate collaborative approach, would have provided Venice with a better solution (Timeline in *Appendix part 3* for further information).

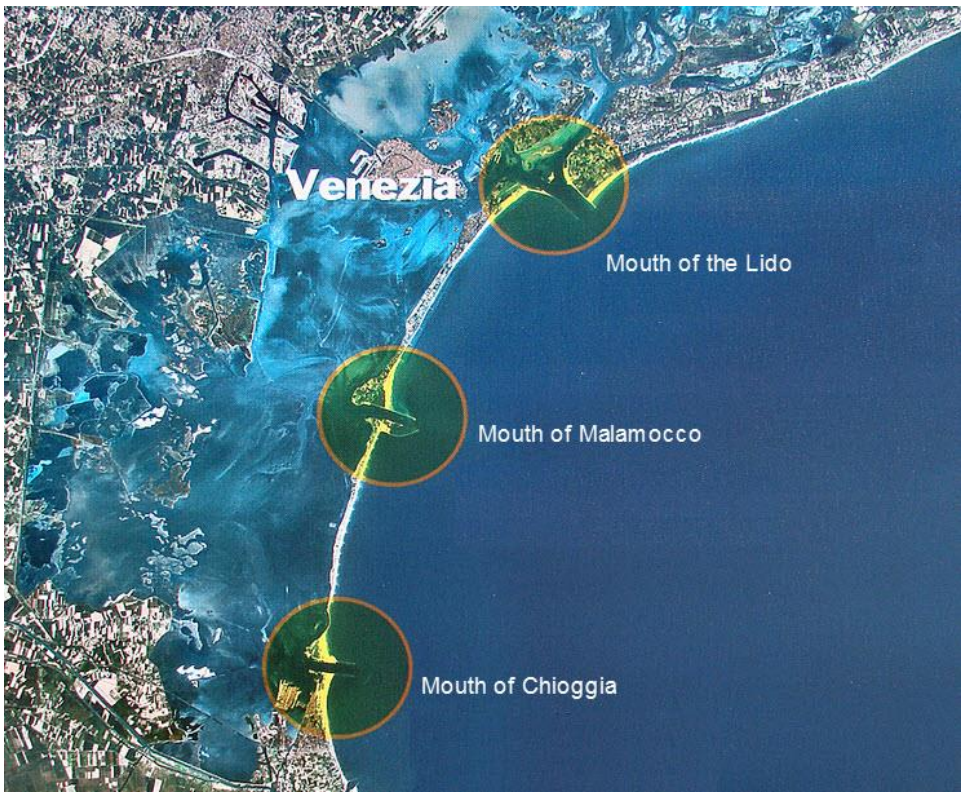


Figure 11 View of Venice and the three "mouths" (inlets). From south to north: Chioggia, Malamocco and Lido (MOSE official website, 2017).

4.e - How MOSE should function according to the project

MOSE consists of a series of mobile hollow gates, installed at every inlet of the lagoon. 18 gates are placed in the mouth of Chioggia, 19 in Malamocco and 41 in Lido where, due to the excessive

length, the gates are divided in 2 blocks with an artificial ship built in order to facilitate the realization of the infrastructure. The total length of all the gates is 1600 meters (Di Tella et al., 2017). Every hollow gate is a big steel "box" of 20 meters wide, between 18-30 meters long, depending on the location, and between 3,6 and 5 meters thick (see picture 12). These boxes are connected to a 30 meters fixed concrete-base lying at the bottom of the sea, through a series of 25 tons hinges (each) (MOSE's official website, 2017). The hinges are the most important structural element of MOSE's system yet the most fragile as they allow the gates to raise and lower, accordingly (Di Tella et al., 2017; MOSE's official website).

With calm sea and when the tide is low the gates lie down in their concrete bases (the grey part under the yellow gates in picture 12). During rising tides, within 30 minutes, the "boxes" are emptied of the water kept inside and are filled up with air causing the elevation of the steel structure, just like a dike. This will be enough to protect the city for tide-waves up to 3 meters for the next 100 years (see pictures 13 and 16) (Di Tella et al., 2017). When the tide reftracts, within 15 minutes, the MOSE's machine goes back to its initial position and "disappears" under the surface.

In order to provide a safe and uninterrupted maritime transport and navigation during the *acqua alta* season, ships, ferries and private boats can still pass through specific locks located beside the floating dikes.

The biggest lock, at Malamocco's inlet, is specially designed for cruise and container ships, two smaller locks are located in Chioggia to allow the important local fishing fleet to sail in the Adriatic Sea and the fourth one is at Lido (see pictures 14 and 17) (La Nuova Venezia, 2013; MOSE's official website, 2017).

Figure 12 MOSE's gate. (MOSE official website, 2017) **Figure 13** Gates in action. On the left side of the picture, the calm water of the lagoon of Venice, on the right side, the open sea. This picture shows how the gates work once they have reached their designed position (https://www.mosevenezia.eu/, 2017).

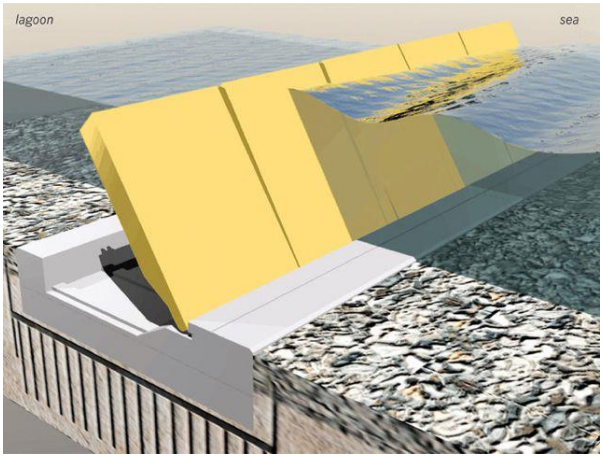


Figure 14: MOSE Construction site, Malamocco. December 2016 . (MOSE official website, 2017)

Figure 15: Malamocco's lock specially designed for big ships. Size: 380 meters long 50 meters wide (MOSE official website, 2017)

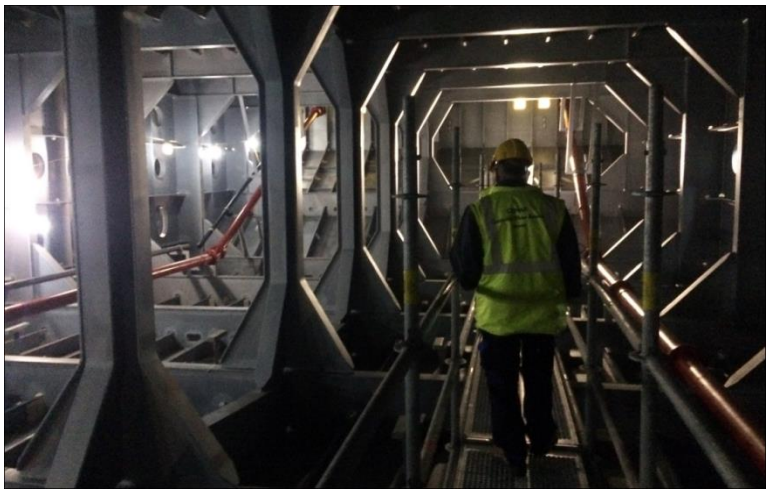


Figure 16: Inside the MOSE. January 2017. (MOSE official website, 2017)

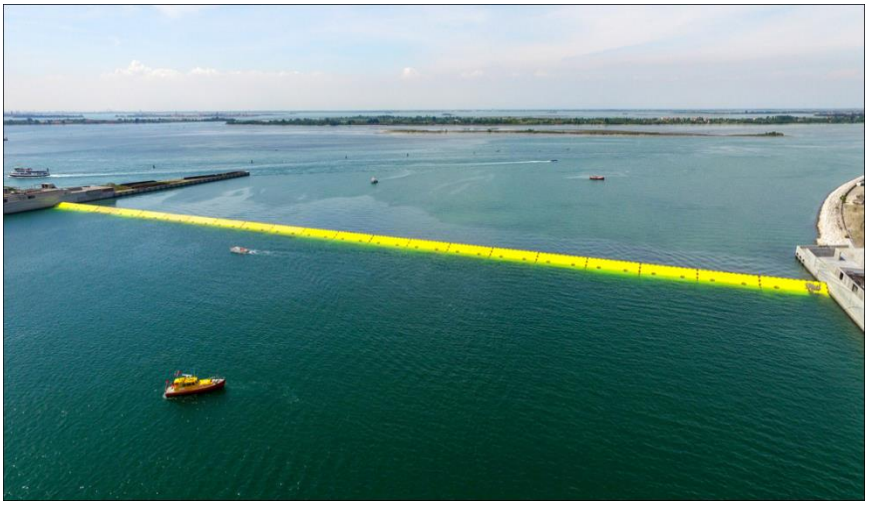


Figure 17: Lido's inlet, Treporti canal. Barriers test in May 2016 (MOSE official website, 2017).

4.f - Limitation of the projects

The MOSE project, as soon as it was presented, did not satisfy local stakeholders and citizens' expectations that, on contrary, immediately started to doubt about the efficiency of the project and tried to demonstrate that alternative solutions might have been more sustainable, feasible and cost saving (Pirazzoli, 2002). Nowadays, Venice's population, given that the city is still being flooded, does not accept MOSE and shows strong disagreement against it. This is due to the fact that the core of the decisions has been imposed by higher authority, without a clear link with the history of the city, the population's needs and habits, notwithstanding any rule regarding the use of public resources and about public project management. MOSE is day by day showing its inefficiency, and overly high costs (Venice city hall, 2005).

This should not come as a surprise given that back in 2005, Massimo Cacciari, the mayor of Venice at that time, opened a call for tenders aimed at offering Venice's future a more suitable

alternative. The hypothesized solutions were shown to the public during open debates and meetings throughout the past years. Examples of these projects, both more economically and environmentally convenient, include:

4.f.i - Alternatives to the project

Gravity sluice gates

At the beginning of 2000, FIAT *Impregilo*, a large business, part of the consortium for the realization of MOSE, commissioned to three experts in off-shore engineering (Di Tella, V., Vielmo, P. and Sebastiani, G.) a detailed analysis of the MOSE project and, eventually, an alternative project. Their idea was a cheaper and more efficient alternative to MOSE's old physical structure which works with heavy and sizable gates attached to concrete base with multiple hinges. The gates raise in the same direction of the sea current. The gravity sluice gate structure works the other way around; it would use the current to facilitate the raise of the gates since they would be built facing the flow of the water coming off-shore. This would consume less energy and it would save precious time (Di Tella, 2005). The gates would only need to be emptied 50 cubic meters and the current would keep them in position, whereas, in the actual MOSE's hollow gates, the water that needs to be pumped out for each gate is approximately 2000 cubic meters. Also the constant need of hydraulic pressure in the system consumes lots of energy (declared cost: € 400/753 million) (Di Tella, 2005; Di Tella et al., 2017; Venice city hall. 2005).

ARCA project (Removable System Against *Acqua Alta*)

The most interesting feature about this project is that it does not include heavy concrete-steel-made physical structures like MOSE, literally devastating for the fragile environment. ARCA proposes a layer of geonet (a particular material specifically designed for draining liquids) which can be used as a response to the increasing levels of the sea. This is anchored to smaller and removable self-sinking hulls which make the infrastructure more dynamic, more adapting to the different circumstances, less impacting on the environment and, more importantly, less costly than the MOSE (approximately € 450 million) (Venice city hall. 2005). This would enable further implementation of the system given its flexibility and mobility (Ieno, 2005).

Further projects are here mentioned: DOGE dike: *Dighe Omeodinamiche a Gestione Evoluta* (Self Regulating Barrage With Evolved Management) (declared cost: € 300 million) (Tamburrino, 2004; Venice city hall. 2017), Eko-NorConsult-TEC's *Barriere Emerse a Riposo con Bracci a Traliccio* (Above Surface Barriers With Hinged Arms) (Already in use in Rotterdam) (De Simone, 2004), Tec-Norconsult's - *Dighe in Gomma Per Venezia* (Rubber Barrages For Venice), *Navi-Porta* (ship-gates - movable barrages for the physical safeguarding of Venice) (declared cost: € 900 million) (Pellegrinotti, 1998) or *Venezia Portualità E Riequilibrio Lagunare VE-PERLA* (Venice Port System

and Re-Equilibrium of the Lagoon) (declared cost: € 1200 million) (De Piccoli, 2002) (Timeline in *Appendix part 3* for further information).

4.g - The institutional and material failure of MOSE

The realisation process undertook totally abnormal decision making channels notwithstanding the ethical conception of public resources and public-fund management, ignoring warnings coming from specially established commissions, bypassing the correct and transparent assignment of contracts and building roles. MOSE is a perfect example of the critical situation that is afflicting Italy's public administration, torn apart by corruption and extremely slow bureaucracy. What the media and the rest of the world perceive is a weak and fragile country.

A short description of the MOSE phenomenon.

Following the disastrous floods in 1966 the Italian national government passed three special laws that set the issue of Venice as a "national priority" (Fersuoch, 2015). From the laws*: "the Republic guaranties the safeguard of the environmental, historical and artistic heritage of the city of Venice and its lagoon, it preserves its equilibrium, it protects it from air and water pollution and it guaranties its socioeconomic vitality"* (Lo Storto, 2015). Only in 1975 the competent ministers published an international public bid in order to select the best project for the safety of the city and its sea. None of the ideas was selected due to their incapacity to address this difficult issue. In 1980 the bid and all the projects moved under the jurisdiction of a national expert pool which tried to come up with a solution to the issue. In 1981 the so called "*Progettone*" (big project), a feasibility study was therefore developed (Lo Storto, 2015).

An important event was the decision made by the ministry of public works in 1984 to give full authority regarding the design-phase, project realisation and management of the whole MOSE system to a new established consortium called *CVN*. The monopolistic strategy appears to be the main obstacle to a linear and transparent realisation of MOSE (Venice city hall. 2005). Operating in full freedom, without being controlled or forced to undertake public tenders, notwithstanding Italian current regulations and advice coming from European legal frameworks concerning free market competition and ethical public contract-assignment conferred CVN considerable authority (Venice city hall. 2005).

After the establishment of CVN and after the total neglect of the 1995 law which was intended to prevent mono-actor contract concessions, environmental groups started to complain in order to increase the awareness among other European countries.

In 1998 as a follow-up of a study conference about the problems of monopolistic consequences of unidirectional concessions in public bids, the environmental groups appealed to the European Court which, in 2001, commenced infringement proceedings against the Italian government for violation of the Community Directives in matter of bids and free competition.

As a result of this, the EU court forced the Italian government to make use of at least 53% of transparent public bid and regular procedures. This would be fair and normal in any other circumstance, but, back then, MOSE's construction phase had already begun and most of the task had already been given, not surprisingly, to companies working for CVN. The EU warning signal was therefore ignored and did not change anything (Fersuoch, 2015). A second infringement proceeding was established in 2010 by the EU court but this time as a consequence of the violation of the European directives regarding the analysis of the environmental impact[8]. Also this time, it did not interfere with CVN's plans and the project proceeded undisturbed (Fersuoch, 2015). MOSE's tormented storyline goes on until 1989, when CVN presented the first tide-control guideline project which was refused by the national committee. This board used to be formed by the Ministry of Public Works, the Ministry of Cultural Heritage, Marine and Environment Protection, the Ministry of Ecology and the major national administrative stakeholder (Lo Storto, 2015).

Figure 18: Lido's inlet. Evolution of the environment from 2004 (picture on the left) to 2014 (picture on the right)(MOSE official website, 2017)

Nevertheless, in 1990, during the new Andreotti's cabinet[9], this decision was re-thought and in 1992 CVN was asked to come up with a master plan.

Ironically, during the same year, the second law for the safety of Venice and its lagoon was established. The law, in accordance with the first one, was aimed at forcing to take into account the morphological characteristics and the constant environmental degradation of the lagoon.

[8] This also refers, for example, to the debatable choice of building the concrete and steel artificial island in the middle of Lido's inlet. 6 billion cubic meters of stone materials and more than 700.000 tons of concrete have been used to build the bases of the islands where today three electric power plans stand. The impacting artificial island, due to technical reasons, is located in front of Bacàn's shoal and it irreversibly damages the lagoon's characteristic environment (Fersuoch, 2015) (see picture 18).

[9] Giulio Andeotti's 6th cabinet was the 47th government of the Italian Republic and it lasted from the 22nd of July 1989 to the 12th of April 1991.

In spite of this, the national government approved 1992 CVN's project which was lacking a detailed analysis of the environmental impact of the infrastructure, the maintaining problems, moreover there was no sign of a geological survey, nor an assessment of the risk that methane gas infiltration into the gates could create (Lo Storto, 2015). Most importantly, the survey did not minimally address the "misalignment" of the different gates which, with a 10 cm distance between each gate, does not create a solid barrier against the waves and let considerable amount of water pass between the spaces created by the autonomous moving structures.

Doubts arose and, as a result of this, the government asked for a more detailed and specific plan which was never made. Therefore, the abnormal steps that the project was taking encouraged worried and concerned local stakeholders to ask the municipality to draw a real environmental impact assessment. Finally, in December 1998, the national committee expressed a first real negative opinion regarding the MOSE case based on two aspects. First: the projects does not fulfil any criterion of reversibility, removability and graduality that the law requires, second: the project does not include any element for the protection of the equilibrium of the lagoon and it would heavily impact the marine ecosystem (Gatti, 2016; Lo Storto, 2015; Venice city hall. 2005). After this definitive stop, imposed by the higher national authority, the MOSE project seemed to be coming to an end. But this was not the case.

In 2000, the regional authority of Veneto and its president Giancarlo Galan, member of CVN appealed to the regional administrative court and successfully gained the annulment of the administrative order that earlier stopped MOSE (Fersuoch, 2015). Galan has been one of the most corrupted political figures involved in the so-called MOSE's scandal. He was the President of Veneto region from 1995 to 2010, Minister of Agriculture and successively Minister of Cultural Heritage during Berlusconi's forth cabinet. As it will be discussed below, he has also been inspected and then arrested for corruption, extortion, money laundering and bribery. Only many years later the magistracy discovered that the judges who made the decision in favour of Galan had been bribed by CVN.

The Veneto regional administrative court's decision had been severely criticized by media, by the former mayor of Venice: Massimo Cacciari and by the national Court of Auditors who claimed that the enormous structure of MOSE could never and in any circumstance gain a positive environmental impact assessment due to the impact that it would have on the marine ecosystem, universally recognized as extremely fragile and endangered (Pirazzoli, 2002; Venice city hall. 2005).

With the positive verdict given by the regional administrative court of Veneto, the MOSE's corrupted machine could go on without further interruptions. *Comitatone* in 1999 and Amato's

second cabinet[10] in 2001 asked for a further assessment of the environmental risk of the lagoon and especially of the three inlets and requested that danger and prevision of the increasing sea levels needed to be taken into account given Venice's vulnerability and proximity to the rising water.

CVN responded in 2002 with a vague draft project that was not analysed and judged by the Ministry of Public Works but instead by the VWA (Venice Water Authority) who has always been supportive of CVN's policies. Not surprisingly they obtained a positive result (Lo Storto, 2015). VWA will be subsequently charged with corruption and bribery by the Italian Law Court as mentioned in chapter 4.h.

The final decision was made by Berlusconi's cabinet and the *Comitatone* (chaired by Berlusconi) who officially started the realization of MOSE, supported also by the favourable opinion of Berlusconi's political party's member: Paolo Costa[11] (Pirazzoli, 2002).

In order to proceed with the realization of the project, 11 project's key points had been ignored (Lo Storto, 2015). It did not take long before WWF, Italia Nostra[12] and other environmental organizations appealed to the Regional Administrative Court (T.A.R.) which refused the act (Lo Storto, 2015). The same year Galan, the president of Veneto Region, under pressures from CVN, called for a special meeting of the Committee of Safeguarding whose opinion is very important for the realisation of MOSE. He, for the first time during his cabinet, chaired the meeting and claimed that all the decisions regarding the realization of the project were approved by the national government, asked those present to vote in favour of a deliberation that would prevent this committee from further investigations and controls. The Ministry of Environment, strongly against this decision, appealed to the Government asking that the financial funds, for the project, needed to be gained by the Ministry of Education, Universities and Research instead of CVN and VWA. Unfortunately, positive actions have not yet been taken (Fersuoch, 2015).

After a few months, Cacciari became mayor of the city for the second time and announced the already mentioned public tender for collecting more sustainable and feasible future alternatives for Venice (Venice city hall. 2005). None of the members of CVN or VWB were present that day.

These alternative projects gave local stakeholders, even if only for a short time, the illusion that something could have changed and that MOSE's future could have been redirected towards a more transparent and honest path.

[10] Amato's second cabinet was the 56th cabinet of the Italian Republic and stayed in power for slightly more than one year: from the 25th April 2000 to the 11th of June 2001.
[11] Major of Venice in office from April 2000 to April 2005.
[12] Italia Nostra is a national NGO aimed at protecting the natural and cultural heritage of the county

This was not the case considering that when the committee was evaluating and analysing all the projects, the government already approved that nothing, that could negatively influence the process of MOSE or force it to a modification, had emerged from the meeting.

The public demonstrations and the opinions of local media were useless in front of a deeply embedded network of informal institutions, frauds, extortions and criminality that brought the MOSE practically untouched to these days and helped to shed some light on the real and shattered political and administrative national framework (Venice city hall. 2005). (Timeline in *Appendix part 3* for further information).

4.h - MOSE and corruption. What is the "final" cost?

After more than 10 years of debates, many articles, books and reports written about the MOSE barrier, the question that arises is: what is the "final" cost of the MOSE case? How much will MOSE weigh on the Italian population by the end of its construction? Even before seeing the end of this tunnel, big cost-overruns have emerged only for regular maintenance therefore this section casts some light on a very controversial chapter of Italy's most recent history. The initial cost estimation was set at € 1.5 billion, which skyrocketed by 2009 to more than € 3.1 billion according to the Court of Auditors. It is interesting yet frustrating to know that, when Berlusconi's Cabinet allowed the realization of the project in 2003, a real cost analysis had not been made and the MOSE had been approved without having a detailed estimation of its real cost. A factor that increased the costs was the government's decision to switch CVN's payment scheme from a safer step-by-step payment strategy to a rather riskier lump-sum scheme (Fersuoch, 2015).

The costs inevitably rose to € 4.2 billion and, in a few years, to € 5.4 billion. According to Court of Justice's investigations, the network of consultations and engineering services during the design phase was literally an economic bottomless abyss that dragged down significant amounts of financial resources. This was nothing else than the result of the monopolistic strategy adopted by CVN which was legally allowed to appoint whoever was more convenient for whatever the reason with full control of financial resources and without any institutional-legal check (the Italian term *mangia-mangia,* which means a situation in which each member thinks only about himself and is keen only on gaining personal incomes despite public needs/interests*,* perfectly explains this situation) (Corbetta, 2014).

The same situation was encountered when it came to evaluate the maintenance costs of the entire project which were initially set at € 9 million every year but rapidly peaked to an annual amount of € 60 million. Data show that during its construction period, CIPE (Inter-ministerial Committee for Economic Programming) financed first, € 380 million in 2006, then € 243 million in 2007,

successively € 400 million in 2008, then € 800 million and finally € 230 million during 2010 (Lo Storto, 2015). This was due to the fact that, while the MOSE was being built, new evaluations regarding its unsuitableness, its obsolete nature, inabity to meet the speed of global worming's physical transformations, came up.

Up to today, it is difficult to calculate the exact cost of the infrastructure. According to Corbetta (2014) e Turato (2017) the cost is more than € 5.6 billion (€ 2 billion more than the forecasted prevision in 2010), without calculating the annual "extra" costs of maintenance and management of the barrier. The cost is rapidly increasing year by year in order to repair and adjust the inefficient structure allowing justifiable media speculations on what the final cost will be (Turato, 2017).

The 4th of June 2014 Venice finally "woke up" from the so-called MOSE-nightmare and its huge waste of public money, thanks to 35 arrest warrants issued against politicians, experts and consultants involved in the scandal. Further investigations brought the number up to more than 100 (Il Fatto Quotidiano, 2014; Lo Storto, 2015). Several politicians, regardless of their political orientation, have been bribed and corrupted, bringing to the surface Italy's problematic institutional framework. The mechanisms used, described in the theoretical framework in chapter 2, are rather common in Italy's history. One of the most common method was: fees/parcels for non-existent advice and technical consultations paid with exorbitant sums or transfers of money to off-shore bank accounts in order to finance political campaigns or to please politicians' tantrums and favours (La Repubblica, 2014; Lo Storto, 2015). As this might not be exhaustive, the following part gives a short report of the profits gained by the main actors involved in the MOSE-scandal. The cascading effects of MOSE's corruption scheme are too extensive to be described here, therefore only the most important participants are named.

The President of the Veneto Region, Giancarlo Galan, sentenced to 2 years and 6 months of house arrest for receiving a salary by CVN of more than € 1 million per year for corrupting members of the Regional Council, € 900.000 euro for corrupting the Environmental Assessment Commission and further € 900.000 for bribing the Supervisory Commission (Corbetta, 2014; La Repubblica, 2014; Le Monde, 2017). Marco Milanese, political advisor of the Ministry of Economy and Finance, earned € 500.000 for influencing politicians' opinions concerning the funding for MOSE. Renato Chisso, member of the egional council of the Veneto Region, has been annually paid € 250.000 from the beginning of the 90s until 2015 for granting clean-bills to any decision made by CVN (La Repubblica, 2014). Altero Matteoli, former Minister of Infrastructure and Transport from 2008 until 2011 and former Minister of the Environment from 2001 until 2006 has been sentenced to 4 years imprisonment and a fine of € 9.5 million (Pietrobelli, 2017). Member of the business community and local entrepreneurs are not exempted from illegal behaviours, in fact Piergiorgio Baita, coordinator of the system of injustice and corruption, has been arrested and accused of hiding € 27 million in off-shore accounts in order to pay himself and his numerous

mazzette (bribes) (Corbetta, 2014). Also members of the army took advantage of MOSE such as: General Commander of the Guardia di Finanza, Emilio Spaziante received large sums of money for "adjusting" fiscal audits made by his own police force, Vittorio Giuseppone, Magistrate at the Court of Auditors, who was annually paid € 400.000 from 2000 to 2008 or Patrizio Cuccioletta, former president of Venice Water Board, who cashed millions for supporting CVN's decisions (La Repubblica, 2014). The list of names is too long to be described in a single document but these names give a clear example of what has been named at "global corruption", referring to its embeddedness at every level of the society, affecting both members of parliament, judges, magistrates, mayors, police officials/chiefs, journalists and gravely undermining the credibility of an entire nation. Venice's Public Prosecutor Carlo Nordio during an interview defined the MOSE-scandal as: *"Peggio di una tangentopoli"*[13] ("worse than Tangentopoli"). According to Baita, also involved in MOSE's scandal, more than € 1 billion has been used by judges in order to start and create the informal institutional network that provided CVN with a solid base and not less than € 25 million used for bribing (Corbetta, 2014; La Repubblica, 2014). It is worth noting that detailed cost-benefit analysis, the environmental and social impact assessment (EIA and SIA) (main tools for firstly evaluating the project before its implementation as described in chapter 2, Mišić et al., 2015) have not been realised or even excluded in the MOSE's design phase in order to acquire more credibility and bypass legal controls. The MOSE case study is a suitable reflection of drivers of megaproject's failure described in chapter 2 by, among them: Flyvbjerg et al., (2002); Flyvbjerg (2014); Kharbanda and Pinto (1996) (Timeline in *Appendix part 3* for further information).

[13] *Tangentopoli* (a play on words meaning: "tangent-opoli" (bribe-town) was first used in Milano in 1992 as a synonym of corruption, used to define corrupted public bodies, institutions, political parties, geographical areas etc. the term does refer to single corruptive actions but it is more suitable for describing entire systems of corruption between political parties, private businessmen, public officials, mafia members etc.
The term *tangentopoli* has been largely used during the *Mani Pulite* (clean hands) investigation, a large maxi-investigation that took place in Italy during the 90s and shed some light on a vast corrupted network of politicians and businessmen (Treccani dictionary, 2017).

5 – Conclusion and discussion

This chapter is divided in two main parts, the first one gives concluding remarks and elaborates on MOSE's current situation, elaborating on the physical and structural malfunctions of the project, linking them to the theory and to the drivers leading to this situation. The second part stresses the importance of three important topics such as: having a well-defined megaproject's coherence, stakeholders' involvement and time-cost analysis and on how these factors are crucial in megaprojects' management, referring them to the case study's situation. The link between this part and the previous chapters is clear and realized by analysing the research design model.

As many underwater infrastructures, the submerged concrete big "boxes" are damaged by corrosion, mould and by Mediterranean mussels (action surprisingly unexpected by the project managers) and some gates do not rise properly due to technical malfunctions (Giovanni, 2017). The gates, that have not been assembled and placed yet, are quickly rusting, despite the special rust-proof paint, due to the salinity of the air (Gatti, 2016). Recent structural analyses show that in order to conclude the project, MOSE will need more than € 700 million and more than € 105 million every year only for the maintenance process; where this money will be found is, up to this day, unknown (La Repubblica, 2017).

Figure 19 and 20: public demonstrations against MOSE in 2013 organized by the *NoMose* group (VeneziaToday, 2016).

The most paradoxical aspect of the project is that, in spite of the outrageous amount of money used for it, the 78-gate raising dike will only stop tides from +110 cm up to 3 meters, but it will be completely ineffective for medium and medium-high tides from +80 cm to +110 cm which are the most frequent ones (Ammerman et al., 1999; Comerlati et al., 2004; Ponti, 2014).

It must be said that CVN also came up with an innovative € 2 billion pilot project including an enormous "sheath-membrane" that would have wrapped up Saint Mark's square (only the square;

what would then happen to the rest of the city?). Looking at the debatable job done by this committee, Italian citizens should be happy that this idea did not reach agreement. Now the municipality is proposing rubber and steel “corks” to be used for blocking the water coming from underneath the soil of the square and the municipality is planning on raising cement-based screeds all along the edges of the square for a total cost of € 2 million.

Public Works Superintendent’s report underlines that MOSE is in danger of structural failures due to electro-chemical corrosion this because of the different typology and quality of steel that had been used during the test. In fact, it should be said that during the experimental phases and for the demonstration, top-quality materials were used and the hinges (most important elements of the structure) were produced by an Italian company specialized in special underwater sleets. However, during the construction phase, the hinges were commissioned to a different foreign company, which was not able to guarantee the same quality (Vitucci, 2017). Today, between 60% and 90% of the 156 hinges (weighting 25 tons each), the contract for which was given to Mantovani Group[14] without an open and transparent tender, for the sum of € 250 million are at high risk of malfunctioning and failure. Three years were enough for corroding the underwater hinges at Treporti location (Gatti, 2016). During the technical test at Chioggia inlet, more than half of the hollow gates did not rise or did not re-position themselves into their concrete bases due to debris obstructing the normal function. One of those, actually exploded and caused a breakdown of the compressed-air system that is supposed to empty the hollow gates (Gatti, 2016; Vitucci, 2015). This should not be a problem because a € 52 million special maintenance boat has been built only for removing and transporting the gates to the construction site. The only negative note is that this boat collapsed after having tried to raise the first gate that got stuck (Vitucci, 2017). The CNR - National Research Council, certified that MOSE has already caused alarming levels of water pollution and high levels of seabed erosion (Venice city hall. 2005).

[14] Italian company specialized in large-scale engineering projects.

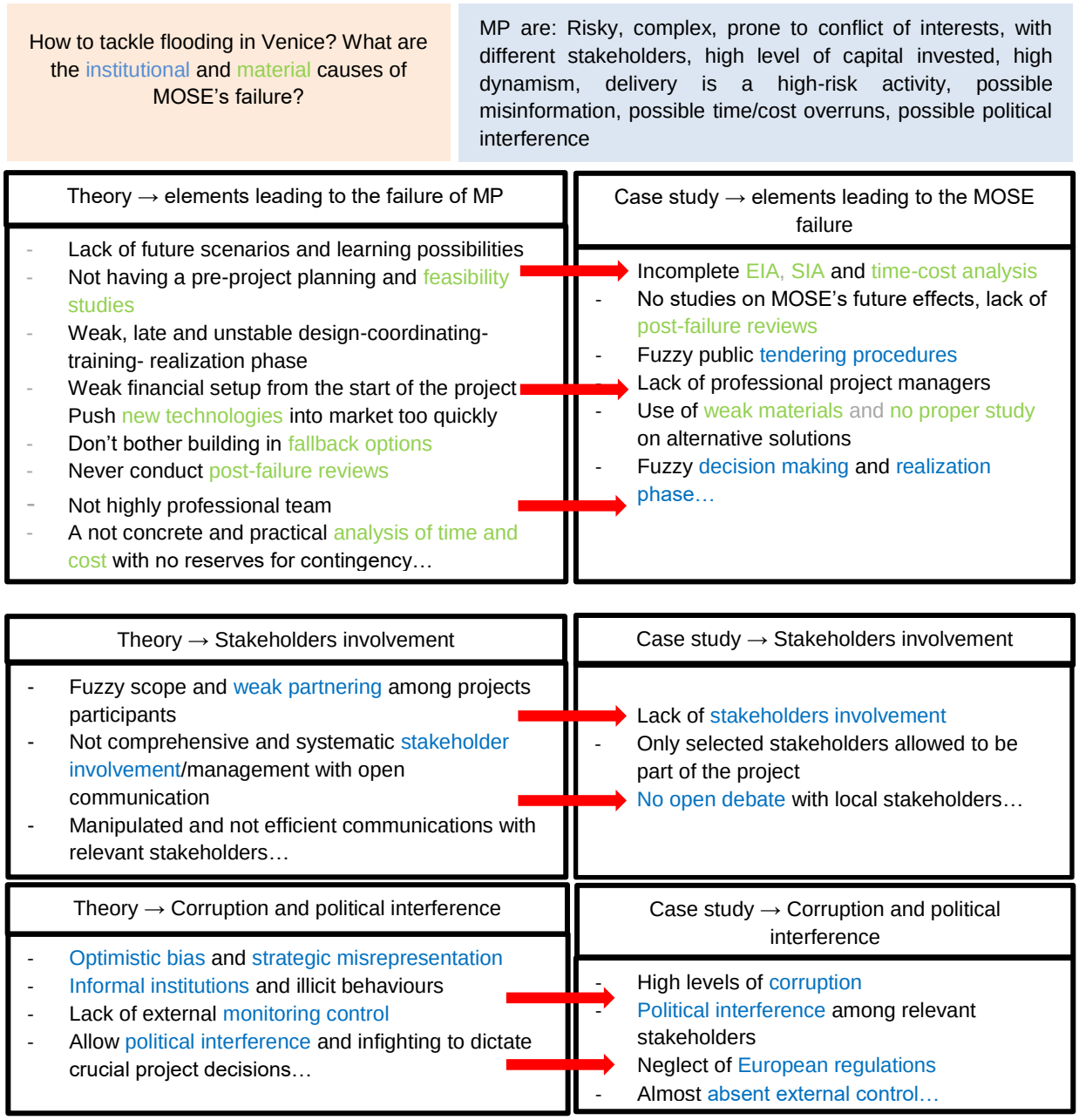


Figure 21: Research design model analysed in chapter 2 and chapter 4. Left part of the model addresses theoretical drivers of failure, right part of the model is focused on case study elements. The red arrows are used to underline the link between theory and practice. Blue words refer to the institutional causes of failure of MP and MOSE whereas the green ones refer to the material causes (Author, 2018).

In order to answer the research question: "How to tackle flooding in Venice. What are the institutional and material causes of MOSE's failure?" it can be said that, referring to the drivers of megaprojects' success or failure, outlined in chapter 2.b and 2.c, MOSE project has only partially met the theoretical drivers of success. In fact, drivers of failure are predominant: there has never been a clear detailed vision of the project before and during both the design and implementation phase, the political will has been influenced by informal behaviours and by the operation of

informal institutions, not controlled by the Italian government who unwisely relied on experimental ways of managing public megaprojects (see the research design model). As described above the delivery organization in charge of designing, delivering and maintaining the project is also addressed as one of the main causes of the failure of the infrastructure project. MOSE lacked a highly professional project director, legal checks and most importantly, a comprehensive stakeholder involvement (see the research design model). The MOSE scandal has not only ridiculed a country in front of the entire world but also reduced the already low trust of Italian citizens in national institutions (Timeline in appendix part 3 for further information).

To sum up the MOSE case study, sadly, represents a suitable example of erroneous project management, the elements analysed throughout the chapters and especially in the theoretical part, can be used in order to study the causes of failure of one of Italy's biggest water management infrastructures and can also be used in order to increase the awareness of megaprojects' characteristics and possible issues leading to an incorrect implementation. As analysed in the research design model, and after having thoroughly analysed the data collected on the field, the link between theory and practice is evident, in fact, many of the drivers mentioned by the authors find a direct link with the case study. For example MOSE was characterized by fuzzy tendering strategies, untested technologies and weak materials used for the barrier which refer to the problem introduced by Kharbanda et al. (1996) of pushing new technologies into the market too quickly and without having them tested first. Not having a proper feasible study (as happened for MOSE) is also mentioned as one of the causes of the failure of megaprojects.

The list continues and it refers, for example, to the benefit of having time-cost analyses which lacked during the realization of the Venetian barrier; elaborating post failure reviews, which have not been realized yet; having fallback options, which have never been established due to optimistic bias; establishing a stable design-coordination-realization phase, which lacked important elements such as feasibility studies; drawing a clear scheme for stakeholders' involvement, which has been fuzzy and incomplete since the beginning of the design phase, not having political interference and illicit behaviours, which were, unfortunately, extensively present in MOSE's political and institutional background. After having analysed the data it is clear why the project did not work and why the expected results have not yet been produced. The reasons leading to the failure of MOSE trace back to the beginning of the design phase and are deeply embedded in various aspects of the management process: vague monitoring control regimes, a fuzzy decision making process, unclear and corrupted political and institutional background led to the realization of a project that according to many experts was not needed, becoming therefore an *escamotage* for private investors to gain profit (Boato, 2018).

Megaprojects' benefits for a country's economy and wealth are undoubtedly present as soon as the project's utility is actually justified. The actual problem concerning megaprojects is how to locate them in a reality that takes into account all the externalities originating from the projects.

The project's environmental impact and social impact are some of the main elements to be taken into account and are crucial in order to evaluate whether economic considerations of the project and environmental/social protection priorities are adequately balanced. Numerous megaprojects have turned out to be driven only by economic purposes, undermining, damaging or simply transforming the environment in which they are erected or negatively impacting local communities (Fallico et al. 1991).

Literature stresses the idea that, for a megaproject to be considered efficient, it should be both economically, environmentally and socially sustainable. After studying megaprojects' design, realization and maintaining phases, literature review (chapter 2) and insights from semi-structured interviews, three points have been underlined as crucial in order to have an improved megaproject management strategy. The points analysed below are: megaprojects' coherence, stakeholders' involvement and time-cost analysis (these points are an implementation of some of the points in the research design model analysed above).

1. Megaproject's coherence. This refers to the level of coherence between the project's characteristics and the social/economic/environmental impact assessment (EIA/SIA). There are several types of regulations regarding EIA, both at national level and international level that should be undertaken in order to increase the feasibility of the project. Examples of these are: *Natura 2000*, European protected zones and restrictions, Marine Protected Areas, Special Protection Areas, Special Areas of Conservation etc. (European Commission official website, 2017). Each of these elements, legally binding or not, establishes rules aimed at safeguarding the environment and at preventing it from harmful uses.

   SIA aims at analysing both planned and unplanned social consequences of actions and projects and it refers to the evaluation of impacts on humans, local communities and socio-cultural surroundings (heritage, aesthetic, health/gender and demographic impacts etc.) (Becker, 2001). Environmental, economic and social impact assessments are intrinsically linked therefore they should always be equally met. If the results of the assessments are negative the project must not be established or it should change in order to fulfil the requirements.

   This is what has not happened regarding the MOSE project. The design phase and realization phase, due to a weak institutional guide, lacked analyses of the structure's impacts on the lagoon and on the population. For example: the concrete base of the gates

is causing damages to the seabed, gates are stopping the water-flow, the structure impacts particularly fragile shallow inlets and the population, not properly involved, is not satisfied.

Insights from the interview with Professor Patassini, D.: *"…gli impatti del Mose sono soltanto in parte prevedibili e gli studi fatti finora insufficienti. Occorrerebbero simulazioni molto raffinate su come il Mose influisce sulla idrodinamica e sulla biodiversità in relazione a diversi scenari d'uso della laguna".* ("…MOSE's environmental impacts are only partially predictable and feasibility studies are not enough. More detailed and specific analyses on how MOSE affects the hydrodynamics and biodiversity of the lagoon has not yet been completed". Patassini, 2018)

Insights from the interview with Boato, S.: "*C'è un inquinamento grave sopra i limiti di legge degli anodi di zinco per evitare il deterioramento che entra nella vita dei pesci e della vegetazione acquatica entrando nel ciclo alimentare. C'è un enorme impatto ambientale e anche paesaggistico (alle bocche di porto) degli impianti. C'è rischio di rottura delle paratoie per risonanza e molti altri rischi minori che in piccola parte hanno già cominciato ad avvenire. Ci sono già cedimenti differenziati dei cassoni di fondazione, cedimenti che potranno nel tempo rendere il sistema ingestibile. L'avevo preannunciato in una delle mie relazioni di critica scientifica alla Commissione di Salvaguardia nel 2003".* ("As I had already foreseen during the barrier's design phase when I was writing a report on MOSE in 2003, MOSE is causing severe damages to seaweed and fish due to the high levels of zinc anodes entering their food chains. There is also a huge environmental and visual impact due to submerged and emerged pats of the barriers. Moreover the yellow gates, hinges and underwater tunnels are at high risk of malfunctioning and breakage, furthermore, the concrete-base structure is at high risk of failure and it would cause future malfunctioning of the entire barrier". Boato, 2018)

The project should have alternative options to be taken into account in case of failure or in case unforeseen events undermine the original path. A "backup plan" or several realization strategies, included in the main project would not be synonyms of weak project design abilities but a valid tool for the project designers. Moreover, the project should be the result of a linear, honest and transparent process, aimed at analysing the real need for a megaproject. At this point questions such as: "Is this project practicable?", "what would the infrastructure's final impact and benefit be?", "are there more sustainable alternatives?", "would the economic benefits overtake the environmental ones?" should be asked. MOSE's realization process shows almost inexistent interest in alternatives to the projects that have been shown to the population at the beginning of the last decade (the link between theory and practice is underlined in the research model as well) It is not known whether the alternative projects could have been a better solution but more time and thoughts should have been given in order to decide upon such an important decision. "Reversibility,

graduality and transformability", the three initial conditions appointed as necessary in the project requirements, were not met by MOSE. (Boato, 2018).

Insights from the interview with Boato, S.: *"…per tutto il 2006 sono state ulteriormente valutate otto alternative progettuali dal un gruppo di lavoro del Comune di Venezia e da un altro gruppo del Ministero dell'Ambiente (da me coordinato). Il Mose è risultato il progetto peggiore. Per il Ministero dell'Ambiente la relazione ufficiale (presentata da me a Palazzo Chigi su incarico del Ministro) ha giudicato migliore il progetto ARCA (Apparecchiature Removibili semestralmente) del costo di 1/20° del Mose e in seconda ipotesi le Paratoie a Gravità (costo 1/10) . Progetti ambedue "sperimentali, graduali e removibili" (come chiesto dalla legge speciale del 1984). Questi progetti erano già stati presentati nel 2003 in un convegno pubblico all'IUAV (da me promosso assieme). Neppure il governo Prodi ha voluto cambiare il progetto approvato dal precedente governo Berlusconi, progetto che pur non era ancora in attuazione.*" ("…throughout the whole 2006, eight alternative projects have been evaluated by the municipality of Venice and the by Ministry of Environment's special group (under my coordination). MOSE, among them, resulted the worst project. According to the Ministry of Environment's report, which I personally handed in at Palazzo Chigi[15] on behalf of the Minister of Environment himself, the ARCA project (twenty times cheaper than MOSE) and the Gravity Sluice Gates[16] (ten times cheaper than MOSE) were considered to be more suitable and better alternatives. Both projects are "experimental, gradual and removable" (as asked by project requirements and 1984's special law). These projects had already been presented in 2003 during a public meeting at IUAV University of Venice which I organized. Interesting is that not *even*[17] Prodi's cabinet[18] was willing to change the project that had been approved by Berlusconi's cabinet although at that time it had not started yet." Boato, 2018).

2. Stakeholders' involvement. Stakeholders, as addressed in chapter 2, are a crucial element in order to tip the balance towards successfully implemented infrastructure projects. Lack of stakeholders' participation could result in a rather top down approach, not shared and supported by national, international or most likely, local actors who are at the end, the ones bearing the infrastructure's consequences or negative externalities.

   The so called MOSE's scandal refers also to the almost absent local stakeholders' participation. Actors have been chosen carefully with the purpose of achieving personal interests but Venice's habitants could not, or only partially, participate to the debate about their own city (Fersuoch, 2015)

[15] The official residence of Italy's Prime Minister.
[16] These two projects are described in chapter 4.
[17] Given the political differences between the two political parties (Berlusconi's right-wing party and Prodi's left-wing party), a different decision, taken by the newly-elected prime minister, was expected.
[18] Prodi's cabinet succeeded to Berlusconi's one in 2006.

Insights from the interview with Filesi, L.: *"…il comune era contrario alla realizzazione dell'opera, la regione se ne è lavata le mani e le scelte sono state prese da un ente troppo distante da questa particolarissima realtà per cui i Veneziani non sono stati interpellati."* ("…Venice's *comune* (municipality) has always been opposed to the realization of MOSE and therefore, important decisions were taken far away from this particular and fragile city. This resulted in a lack of involvement of local stakeholders". Filesi, 2018).

3. Time and cost analysis. The iron triangle tells us how to reduce the evaluation mechanisms of large infrastructure projects to the so-called: megaproject pathologies, merely summarized by the ability of project makers to deliver the infrastructure in time and within an agreed and reasonable budget. As known, "time is money" therefore a detailed and well-balanced time evaluation strategy is the basic yet most important element for a successfully implemented project. Actors should agree upon initial foreseen expectations touching both time and money evaluations, the analyses should be as precise as possible, taking into account hypothetical unforeseen events that are very likely to happen during the long megaproject's realization phase. This should not be biased by opportunistic behaviours or strategically misrepresented in order to gain support and consensus (Flyvbjerg, 2011). Transparency is therefore one of the most important elements in this difficult task.
   Examples of what went wrong in MOSE's case are: unreal time previsions, political approvals even before having a real concrete cost analysis, opportunistic behaviours at the hand of corrupted project managers and entrepreneurs, bribing, political power inequalities leading to monopolistic-type structures, the use of different quality of materials (the quality of the infrastructure's material is significantly lower than the one used during the indoor tests, in order to skim off money) and violation of European legal requirements with regard to transparent and open public tender are surely reasons for the failure of the barrier.

Such a difficult and vast project begs for an inclusive, coordinated and horizontal approach capable of managing different elements within the same strategy. Regarding MOSE, a far more *supra-partes* approach would be more suitable. The researcher in this last paragraph, discusses possible solutions to this problem and to possible future scenarios concerning megaprojects.

Literature stresses the importance of institutional control mechanisms in preventing and detecting corruption, such as anti-corruption laws, prosecution bodies and anti-corruption authorities in order to tackle the issue at national level. This, for example, could be applied in Italy by establishing a national body, not politically appointed but established by the High Council of the Judiciary and working in close relationship with ANAC[19]. The new body, with stronger power and authority, would be assigned supervision, control and coordination tasks, specially concerning public projects. With a working and efficient monitoring body, the considerable amount of money spent in this project

[19] Italian National Anti-Corruption Authority

would not have been uncontrollably manipulated by a single organization (CVN) but, instead, it would have been monitored and better controlled by anti-corruption authorities. The new institutional body, with legally binding powers, would be composed of honest and transparent experts, and it would also be focused on making sure that national and European regulations concerning for example environment protection, free and open tender, would be respected. This, according to general insight from literature on the benefits of anti-corruption measures (GIACC, 2017; Spector, 2016), would have ensured a more linear and transparent process, avoiding monopolistic situations (Interview with Fersuoch; 2018). Incentives should also be given to those who report situation of corruption, facilitating the difficult role played by whistle-blowers and ensuring them protection. This would also increase faith and trust towards national institutions.

Examples of monitoring parties could be found in the Norwegian institutional framework (Klakegg et al. 2016). After realizing that time and cost overruns in megaproject were becoming more recurring, the Norwegian Ministry of Finance introduced in 2000 a strict mandatory regime aimed at studying the important documents, undertake analyses and study data and methods regarding megaprojects financed by the state. The so-called “third party” is composed of private experts and has legally binding powers given that every project has to pass the “third party’s” institutional check. Every result is published in order to increase transparency and to discourage negative behaviours. Norway lists at the top ten of the most liveable countries, with high levels of education, gender equality, transparency, quality of life and income per capita. This means that, in comparison to less developed countries, institutional monitoring parties are relatively easier to be established and maintained. (Norway is here taken as a positive example, moreover the researcher is aware of the fact that also Norway shows levels of corruption, even though lower compared to other countries) (Transparency International, 2016).

The context plays a relevant role in this issue in fact, according to Transparency International, (Transparency International Report, 2016), if Norway ensures its citizens with relatively good quality standards, Italy on the other hand, hobbles behind with a weaker economic situation, higher levels of corruption, underemployment, unsteady monitoring regimes and political processes lacking transparency (European Commission 2014; Lisciandra et al., 2017; Pelloni et al., 2015). Transferring policies from a country to another country is surely not an easy task, as a matter of fact, elements constraining the transferability are always present (Evans, 2009). Countries are always different, in many aspects, therefore policies, in order to be applied, have to take into account the context’s characteristics and relevant aspects which can hinder or facilitate the transferability (Dolowitz & Marsh 1996; Rose 1992). Moreover, based on these characteristics and on the likelihood of transfer, different types of policy transfer are included in the planner’s toolbox such as copying, emulation, hybridization and inspiration (Evans, 2009). The author claims that lessons can be drawn from the MOSE case study, in order to learn from a failing megaproject and

in order to avoid the same mistakes, lessons can be drawn but it is important to be aware of the differences between the different projects and the different characteristics. Knowing the size and typology of the project is also a crucial element in order to be able to compare it with similar ones.

A monitoring anti-corruption third party in Italy should therefore be legally binding, accepted by government and law, should have a formal and valid institutional background that would support every decision of this body. It must be said that in some deep-rooted corrupted countries, this phenomenon cannot be tackled without a comprehensive approach aiming at enhancing prevention and control mechanisms throughout the public administration, at central and local levels (European Commission, 2014). Which is connected to the fact that Italian internal controls across the country (particularly at local level) are weak and uncoordinated (Pelloni et al., 2015). There is a need to reinforce such controls and integrate them with strict prevention policies in order to deliver suitable results against corruption (European Commission, 2014). In order to do this, Italy should improve its political system by making anti-corruption regulations stronger; checks, balances and controls more efficient; more severe sentences and punishments (Di Cristina, 2013). Someone might argue that repressive measures alone are not sufficient for tackling and fighting corruption in an effective manner. However the European Commission suggests that: “the ability of a judicial system to impose dissuasive criminal sanctions plays a major deterrent role and is a clear sign that corruption is not tolerated” (European Commission, 2014, p: 15; Corloni, 2017). This process would, most likely, be long and complex, but it would then create the institutional background in which further anti-corruption measures, specially related to megaproject management, could be implemented (Merloni, 2015).

6- Personal concluding reflections and link to planning practice

According to theory, public megaprojects’ outcomes are a reflection of different and diverse management strategies and guidelines. Theory notes down several points to be addressed as key elements for successfully implemented megaprojects. Some of them are: a balanced distribution of power among stakeholders, lack of monopolistic regimes, the possibility of engaging in transparent and open discourses and decision making strategies, clear and well formulated agenda and goals, a detailed time and cost analysis, a prevision of the project’s future or the learning possibilities, external control/functional monitoring systems, fruitful partnership among participants, a trained and highly professional director/staff, a clear vision/strong political will, a well-analysed and reduced environmental impact and a thorough analysis of the context.

Elements leading to megaprojects’ failure, on the other hand, are: ignoring the project environment, context and stakeholders’ behaviours, lack of alternative projects, allowing negative political interference, pushing new technologies into the market too quickly, lack of feasibility studies, weak

contract management, not concrete time and cost analyses, opportunistic bias, strategic misrepresentation and corruption which are elements in line with the factors analysed in the theoretical part (Flyvbjerg et al., 2002; Flyvbjerg, 2014; Shenhar et al., 2002; Shore, 2008; Tabish and Jha, 2011).

After realizing the interviews with relevant stakeholders and after extensively analysing the Venetian case's data and literature, the author claims that in practice, the reasons behind the institutional and material failure of the MOSE barrier are to be found amongst the aspects mentioned above. MOSE's not transparent decision making process and fuzzy project/realisation phase are the result of a monopolistic environment created by some of the actors who were then found corrupted. This led to delays during the realization phase, cost overruns, the rise of doubts among citizens and authorities and material/physical malfunctions of the structure causing impacts on the environment and negative acceptance of the population. In light of the above, the Italian case is a suitable reflection of the elements suggested regarding the drivers of megaprojects' success or failure. Through the realization of the thesis, the theoretical framework matched with practical issues therefore the author claims that the MOSE case study is a suitable learning platform in order to develop an understanding of the theoretical framework and compare it with practical issues. The study shows a suitable link with the planning practice because it gives clear insights on what are the relevant issues regarding the Venetian flood barrier infrastructure and on how these can be applied to future projects in order to obtain more appropriate managerial strategies. The thesis can be used to increase awareness of the possible negative externalities of megaprojects and it can be used in order to prevent or limit negatively impacting behaviours leading to time and cost overruns.

The theoretical part additionally explores aspects that could be, even further, included in megaprojects' management: the author of the thesis analyses how Flyvbjerg's initial four sublimes could be revised by including a firth sublime that goes beyond technological, economic, political and aesthetic reasons for megaprojects realization. This new sublime embraces the need for megaprojects in situation of emergency, such as the risk of flooding. It is worth analysing this new "*emergency sublime"* because it increase awareness on the real need of megaprojects in life-threatening situations and because it highlights a different category of projects, often not (or should not be) driven by aesthetical, political or economic characteristics.

The NIMBY phenomenon, analysed at the beginning of chapter 2 is an aspect to be taken into account when megaprojects are planned, it can not only hinder the realization of the project but it can raise dissatisfaction among citizens. Having favourable, well-informed and properly included stakeholders is a crucial element that must be adopted in planning.

Having contrasting stakeholders' opinion included in megaproject's realization process, characterized by different elements and unforeseen events that might cause cost and time overruns underline, even more, the dynamic nature of these projects. De Roo (2010) elaborates on the link between complexity and systems, underlining how increasing levels of fuzziness, not linearity and turbulence in contexts can make closed systems change and become open systems. This could be interpreted as a reflection of megaprojects that have to be adaptive to the context in which they are embedded.

In this thesis, therefore, the theory is linked with the empirical evidence but some aspects are still uncertain and not entirely applicable. General knowledge on megaproject management and megaprojects' drivers of success and failure are theoretical guidelines which refer to generic topics. Despite the general applicability of these elements, only some of them can actually be used in specific situations, leading us to assume that the context should always be taken into account. This refers to possible solutions given by scholars regarding failing or failed megaprojects, in fact not every policy can be transplanted into specific realities, such as, for example, the need for a stricter monitoring authority in deeply corrupted countries like Italy, as emerged by data analysis in chapter 4, literature review in chapter 2 and the researcher's personal knowledge. This begs for specific, tailor made and context-based approaches that can be generally drawn by theory but must be locally established and implemented.

Generalizing is a useful tool in order to obtain information on specific case study that could be applied to other case studies. It must be said that for generalizing the researcher must be aware of the typology of research and therefore decide whether to use qualitative or quantitative data. The typology of the data and the population determine the sampling process. it might be difficult to generalize based on a single case study but according to Flyvbjerg (2006) one can generalize from a single case, therefore, the single-case study can contribute to scientific development. Important to know is that generalization from a single case study depends on the case one is speaking of and how it is chosen (Flyvbjerg, 2006).

Having a well-defined research question and an elaborated answer allowed the researcher to focus his study on specific topics and to ignore other ones; the author was only partially expecting the results obtained and he was surprised to learn more about megaprojects and their characteristics. Literature review, data analysis and stakeholders' interviews enriched his personal knowledge and allowed him to find a suitable answer to the research question.

Ex-post personal reflections are important in order to test whether the structure and the thesis's realization processes are suitable in order to obtained the best outcomes. During the drafting of the thesis, the researcher used a well-structured scheme which turned out to be a suitable working frame for this manuscript. A rather classic method, with theoretical analysis first and successively

data collection and stakeholder analysis, gave the researcher a structured strategy. It would be interesting to see if the results would have been the same, had a different strategy been used. Perhaps interviewing the stakeholders beforehand would have provided the researcher with more context based knowledge and would have guided him in finding more specific theory, nevertheless, he is satisfied with the final results and on how the thesis has been written. The author enjoyed writing this paper because it allowed him to focus on a very important topic, centre of the national debate and relevant subject for the author's background and personal interests. Writing this thesis allowed him to gain more knowledge in the field and to test it with his existing insights, moreover, he wishes to continue studying this interesting topic and he hopes that his work will help national or international experts study and better understand Italian and international megaprojects.

7 - List of references

- Aidt, T.S. (2003). Economic analysis of corruption: a survey. Economic Journal. n 113, pp: 632-652.
- Ammerman, A. J., C. E. McClennen, M. De Min, and R. A. Housley. (1999). Sea-level change and the archaeology of early Venice. Antiquity 73:303–312.
- Arlacchi, P., (1983) *La Mafia Imprenditrice. L'etica mafiosa e lo spirito del capitalismo,* Bologna.
- Becker, H. A. (2001) Social impact assessment. European Journal of Operational Research Volume 128, Issue 2, Pages 311-321;
- Benjamin, L.M. and Greene, J.C. (2009) From program to network: the evaluator's role in today's public problem-solving environment. American Journal of Evaluation 30(3): 296–309.
- Biesenthal, C., Clegg, S., Mahalingam, A. and Sankaran, S. (2018) Applying institutional theories to managing megaprojects. International Journal of Project Management. Volume 36, Issue 1, pp: 43-54.
- Biondiani, P., (2017). 25 anni di Mani pulite, i 10 verbali che hanno cambiato l'Italia, *l'Espresso,* Feb. 16 2017, available from: http://espresso.repubblica.it/attualita/2017/02/15/news/mani-pulite-i-10-verbali-che-hanno-cambiato-l-italia-le-confessioni-nelle-carte-originali-1.295481.
- Botetzagias I., Malesios, C., Kolokotroni, A., & Moysiadis Y. (2015) The role of NIMBY in opposing the siting of wind farms: evidence from Greece, Journal of Environmental Planning and Management, 58:2, 229-251
- Carbognin, L., Gatto, P., Mozzi, G., Gambolati, G. and Ricceri, G.(1984), Case history no.9.3 Venice, Italy, in Guide book to Studies of Land Subsidence Due to Ground-Water Withdrawal, pp. 161 – 174.
- Carbognin, L., P. Teatini, and L. Tosi (2004), Eustacy and land subsidencein the Venice Lagoon at the beginning of the new millennium.
- Centro Previsioni e Segnalazioni Maree - Distribuzione annuale delle alte maree >= +110 cm, comune.venezia.it. Available at: https://www.comune.venezia.it/it/content/centro-previsioni-e-segnalazioni-maree [Accessed 25 Nov 2017].
- Centro Previsioni e Segnalazioni Maree - Distribuzione mensile delle alte maree >= +110 cm, comune.venezia.it. Available at: https://www.comune.venezia.it/it/content/centro-previsioni-e-segnalazioni-maree [Accessed 26 Nov 2017].
- Church, J.A and White, N. J. (2006) A 20th century acceleration in global sea-level rise. Geophys. Res. Lett., vol 33, issue 1.
- Ciconte, E., Forgione, F., Sales, I., (2012) *Atlante delle Mafie, vol. I,* Soveria Mannelli, Rubbettino.
- Colombo, P. (1972) Problemi relativi alla difesa della città di Venezia.
- Comerlati, A., Ferronato, M., Gambolati, G., Putti, M. and Teatini, P. (2004) Saving Venice by seawater. Journal of geophysical research, vol. 109, pp: 1-14.
- Corbetta, D. (2014). Il caso MOSE. E il fallimento della normativa anti corruzione. Paginauno. n 39.

- Cordella, M., Zampato, L., Pastore, F. Tomasin, A., Canestrelli, P. and Ferla, M. (2011) le Tavole Annuali di Marea per Venezia: “atti dell’istituto di scienze, lettere e arti, Classe di scienze fisiche, matematiche e naturali.. book CLXIX, p: 44-59.
- Corloni, E. (2017) Italian Anti-Corruption and Transparency Policies Trends and Tools in Combating Administrative Corruption.
- Davidson, F. P. & Huot, J.C. (1989). Management trends for major projects. Project Appraisal, 4(3), 133–142.
- De Roo, G. (2015) A model for consulting actors: Desired, actual and potential contributions to planning. pp: 111-122.
- De Roo, G. (2010) A Planners Encounter with Complexity. Chapter 2: Being or Becoming? That is the Question! Confronting Complexity with Contemporary Planning Theory.
- De Simone, F. (2004) Dighe di gomma per Venezia. pp: 327-331.
- Di Cristina, F. (2013). I piani per la prevenzione della corruzione. In Mattarella, B.G., & Pelissero, M. (eds.). *La legge anticorruzione*. Turin: Giappichelli, 91-111.
- Di Tella, V. (2005) La paratia a Gravità - una soluzione vantaggiosa e flessibile per la realizzazione delle opere mobili a scomparsa di difesa di Venezia dalle acque alte. pp: 5-94.
- Di Tella, V., Sebastiani, G. and Vielmo, P. (2017) Il Mose salverà Venezia? Un'analisi tecnica dugli aspetti critici e sulle alternative.
- Dolowitz, D & Marsh, D. (1996) Who Learns What from Whom: a Review of the Policy Transfer Literature. Political Studies, 342-357.
- Erickson, P and Lazarus, M. (2014) Impact of the Keystone XL pipeline on global oil markets and greenhouse gas emissions. Nature Climate Change volume 4, pages 778–781
- European Commission website (2017) [online] Available at: http://ec.europa.eu/environment/nature/natura2000/index_en.htm [Accessed: 30-Dec-2017].
- European Commission (2014) *EU Anti-Corruption Report*. COM(2014) 38 final. Brussels: European Commission. Pp: 1-41.
- Evans, M. (2009) Policy transfer in critical perspective, Policy Studies, 30:3, 243-268.
- Falcone, G., Padovani, M., (1991) *Cose di Cosa Nostra,* Milano, Rizzoli.
- Fallico, C., Frega, G and Macchione, F. (1991) Impatto ambientale di Grandi Opere d'Ingegneria Civile. Ecologia, vol 3.
- Fersuoch, L. (2015) A bocca chiusa: Sipario sul Mose (Occhi aperti su Venezia Vol. 38).
- Flyvbjerg, B. (1998) Rationality in Power: Democracy in Practice. pp, 225-36; 272-5;
- Flyvbjerg, B. (2006) Five Misunderstandings About Case-Study Research. Qualitative Inquiry Volume 12 Number 2, pp 219-245.
- Flyvbjerg, B. (2011). Over budget, over time, over and over again: Managing major projects. In: The Oxford handbook of project management. Oxford, UK: Oxford University Press., pp. 321-344.
- Flyvbjerg, B. (2014) What You Should Know About Megaprojects and Why: An Overview. Project Management Journal. Saïd Business School, Oxford University, Oxford, United Kingdom, pp: 6-20.
- Flyvbjerg, B. (2017) The Oxford Handbook of Megaproject Management.
- Flyvbjerg, B. Skamris Holm, M. K. and Buhl, S. (2002) Underestimating Cost in Public Works Projects: Error or Lie? Journal of American Planning Association , 68:3, 297-295.

- Flyvbjerg, B. Skamris Holm, M. K. and Buhl, S. (2003). How common and how large are cost overruns in transport infrastructure projects? Transport Reviews, Vol.23, No. 1, pp: 71-88.
- Fo, D. (1987), Theatre play: “Morte accidentale di un anarchico”, Crystal Theatre, Milan.
- Forester, J. (1982) Planning in the Face of Power, Journal of the American Planning Association, 48:1, 67-80.
- Galt, A. H., (1974) “Rethinking Patron-Client Relationships: the Real System and the Official System in Southern Italy”, *Anthropological Quarterly,* 47: 2, pp. 182-202.
- Gatti, F. (2016). Venezia, sta affondando pure il Mose. L'Espresso, [Online]. Available at: http://espresso.repubblica.it/inchieste/2016/11/11/news/venezia-sta-affondando-pure-il-mose-1.288116 [Accessed 17 November 2017].
- Gatto, P. and Carbognin, L. (1981), The Lagoon of Venice: natural environmental trend and man-induced modification. Hydrological Sciences Bulletin, 26:4, pp: 379-391
- Gervaso, R (1983) Il grillo parlante.
- GIACC (2017), Corruption Information Why corruption occurs, [available at:] http://www.giaccentre.org/why_corruption_occurs.phd [last access: 28-11-2017].
- GIACC. (2008), Examples of corruption in infrastructure, (available at:) http://www.giaccentre.org/documents/GIACC.CORRUPTIONEXAMPLES.pdf [last access: 27-11-2017].
- Giordano, A., (2011) Il maxiprocesso venticinque anni dopo - Memoriale del presidente, Bonanno Editore.
- Giovanni, R. (2017) Venezia e il suo MoSe, storia di un fallimento. eddyburg. [Online] Available at: http://www.eddyburg.it/2017/10/venezia-e-il-suo-mose-storia-di-un.html [Accessed 15 No. 2017].
- Guala, C. (2007) Mega Eventi. Modelli e storie di rigenerazione urbana, pp: 55-73;
- Helmke, G. & Levitsky, S. (2004) Informal Institution and Comparative politics: A Research Agenda. Perspectives on Politics, Vol. 2, N 4, pp: 725-740.
- Hertogh, M., Baker, B., Staal-Ong, P.L. and Westerveld, E. (2008) Managing Large Infrastructure projects, AT Osborne BV, The Netherlands.
- Hirschman, A. O. (1995). Development projects observed, second edition with a new preface (Washington, DC: Brookings Institution).
- Housley, R. A., A. J. Ammerman, and C. E. McClennen. 2004. That sinking feeling: wetland investigations of the origins of Venice. Journal of Wetland Archaeology 4:139–153.
- Ieno, A. (2005) ARCA-2005, apparecchiature removibili contro l’acqua alta. per la chiusura parziale o totale delle bocche di porto della laguna di Venezia con caratteristiche di gradualità, sperimentabilità, reversibilità e stagionabilità. pp: 215-310.
- Il Fatto Quotidiano (2014) Inchiesta Mose, 35 arresti: Giorgio Orsoni ai domiciliari. Chiesto il carcere per Galan. [Online]. Available at: https://www.ilfattoquotidiano.it/2014/06/04/tangenti-mose-35-arresti-in-carcere-anche-sindaco-di-venezia/1012200/ [Accessed 1 De. 2017].
- ISPRA (2017) Istituto Superiore per la Protezione e la Ricerca Ambientale [available at] http://www.venezia.isprambiente.it/ [Accessed on: 18 No. 2017].
- Kharbanda O. P., and Pinto, J. K. (1996) How to Fail in Project Management (Without Really Trying). Business Orizon, pp: 45-53.
- Klakegg, O, J., Williams, T. and Shiferaw, A. T. (2016) Taming the ‘trolls’: Major public projects in the making.

- La Nuova Venezia (2013) «Mose, chi paga le eventuali modifiche alle paratoie?» [Online] Available at: http://nuovavenezia.gelocal.it/venezia/cronaca/2013/08/15/news/mose-chi-paga-le-eventuali-modifiche-alle-paratoie-1.7587239 [Accessed 20 No. 2017].
- La Repubblica (2014) "Mose, inchiesta sugli appalti: arrestato il sindaco di Venezia. Chiesta custodia cautelare per Galan" [online] Available at: http://www.repubblica.it/cronaca/2014/06/04/news/mose_35_arresti_per_tangenti_anche_il_sindaco_di_venezia-88004605/?ref=HREA-1#gallery-slider=880076277 [Accessed on: 1 De. 2017].
- La Repubblica (2017) Mose, assolto ex sindaco Orsoni: "Buttata per aria una città". Condannato ex ministro Matteoli [Online] Available at: http://www.repubblica.it/cronaca/2017/09/14/news/mose_condanna_ex_ministro_matteoli_assolto_orsoni-175502148/?ref=search [Accessed 1 De. 2017].
- Le Monde (2017) A Venise, MOSE, le chantier maudit [online] Available at: http://www.lemonde.fr/ [Accessed: 2 Jan. 2018].
- Leff, N.H., (1964). Economic development through bureaucratic corruption. Am. Behav. Sci. 8, pp: 8–14.
- Lehtonen, M. (2014) Evaluating megaprojects: From the "iron triangle" to network mapping. Vol. 20, pp: 279-295.
- Leonardi, P (1969) Cause geologiche del graduale sprofondamento di Venezia e della sua laguna.
- Liao, K-H. (2013) From flood control to flood adaptation: a case study on the Lower Green River Valley and the City of Kent in King County, Washington. Nat Hazards (2014) 71:723–750;
- Lisciandra, M. and Millemaci, E. (2017) The economic effect of corruption in Italy: a regional panel analysis. Regional Studies. Vol 51, Issue 9.
- Lo Storto, C. (2015) The MOSE project. megaproject Case Study. slide presentation.
- Locatelli, G., Mariani, G., Sainati, T. and Greco, M. (2017) Corruption in public projects and megaprojects: there is an elephant in the room! International journal of project management, n.35, pp: 252-268.
- Lupo, S., (2004) *Storia della Mafia,* Roma, Donzelli.
- Lupo, S., (2007) *Che cos'è la Mafia. Sciascia e Andreotti, l'antimafia e la politica,* Roma, Donzelli.
- Martirosyan , E. G. & Vashakmadze T. T. (2013) SUN Cube: A New Stakeholder Management System for the Post-Merger Integration Process. Zagreb International Review of Economics & Business, Vol. 17, No. 1, pp. 1-13.
- Mendelow, A. (1991). Stakeholder mapping. Proceedings of the 2nd International Conference on Information Systems, Cambridge.
- Merloni, F. (2015). Le misure amministrative di contrasto alla corruzione. *Ragiusan*, No. 369-370, 9-16.
- Michael Dear (1992): Understanding and Overcoming the NIMBY Syndrome, Journal of the American Planning Association, 58:3, 288-300
- Mišić, S. and Radujkovic, M. (2015) Critical drivers of megaprojects success and failure. Procedia Engineering 122, pp: 71-80.
- NETLIPSE (2017) Netlipse – Networking and Knowledge – publications [online] Available at: http://netlipse.eu/ [Accessed 28 Jan. 2018].
- Nicaso, A., Gratteri, N., (2010) *La Malapianta,* Milano, Mondadori.
- O'Leary, Z. (2004) The Essential Guide to doing research.

- OECD (2004) OECD Principles of Corporate Governance.
- Olander S & Landin A. (2005)Evaluation of stakeholder influence in the implementation of construction projects. International Journal of Project Management, 23, 321-328.
- OMEGA Centre (2013) Mega Transport Project: "Beyond the Iron Triangle". Process in Planning 86, pp: 1-43.
- Orum, A. M., Sjoberg, G. and Feagin, J. R. (1991) A Casa For The Case Study, pp: 1-15.
- Pellegrinotti, A. (1998) NAVI-PORTA: sbarramenti mobili per le bocche di porto della laguna di Venezia. pp: 333-350.
- Pelloni, G. and Savioli, M. (2015) Why Is Italy Doing So Badly? LCERPA Working Paper No. 2015-7. pp: 1-20.
- Piazzoli, P. A. and A. Tomasin. 1999. L'evoluzione recente delle cause meteorologiche dell' acqua alta. Atti classe di scienzefisiche, matematiche e naturali 157 2:317–344.
- Pietrobelli, G, (2017). Galan torna libero dopo due anni e mezzo: “In 15 anni di presidenza mai un’azione in cambio di qualcosa”. Il Fatto Quotidiano, [Online]. Available at: https://www.ilfattoquotidiano.it/2017/01/06/galan-torna-libero-dopo-due-anni-e-mezzo-in-15-anni-di-presidenza-mai-unazione-in-cambio-di-qualcosa/3299465/ [Accessed 1 De. 2017].
- Pietrobelli, G. (2017) “Mose, l’ex ministro Matteoli condannato a 4 anni per corruzione. Prescritto e in parte assolto l’ex sindaco Orsoni”. Il Fatto Quotidiano, [Online]. Available at: https://www.ilfattoquotidiano.it/2017/09/14/mose-lex-ministro-matteoli-condannato-4-anni-per-corruzione-assolto-e-parte-prescritto-lex-sindaco-orsoni/3857031/ [Accessed 1 De. 2017].
- Pirazzoli, P. A. (2002), Did the Italian government approve an obsolete project to save Venice?, Eos, Vol. 83, No. 20, pp: 217 – 223.
- Pirazzoli, P.A., (2012) Will the Mose project be able to defend Venice against the predicted sea-level rise?, comunicazione allo SMARTeST International conference - Implementing Flood resilience.
- Ponti, M. (2014) Mose, perchè è un opera inutile per Venezia. Il Fatto Quotidiano [Online] Available at: https://www.ilfattoquotidiano.it/2014/06/05/mose-perche-e-unopera-inutile-per-venezia/1014802/ [Accessed 17 No. 2017].
- Rolstadås, A. (2008) Applied Project Management. How to Organize, Plan and Control Projects. Tapir Academic Press, pp: 27.
- Rose, R. (1992) Comparing Forms of Comparative Analysis. Political Studies XXXIX, 446-462.
- Salzano, E. (2016) La Laguna di Venezia: Il governo di un sistema complesso (Occhi aperti su Venezia, Vol. 5).
- Saviano, R. (2006) *Gomorra*.
- Saviano, R., (2013) *Zero Zero Zero*.
- Schoeman, J., Allan, C., & Finlayson C. M. (2014) A new paradigm for water? A comparative review of integrated, adaptive and ecosystem-based water management in the Anthropocene, International Journal of Water Resources Development, 30:3, 377-390;
- Shenhar, A. J. et al. (2002) Project success: A multidimensional Strategic Concept, 34. Pp: 699-725.
- Shore, B., (2008). Systematic Biases and Culture in Project Failures. Project Management Journal, 39(4), pp. 5-16.
- Spector, B.I. (2016) The benefits of anti-corruption programming: implications for low to lower middle income countries; Crime, Law and Social Change, vol: 65, pp 423-442;

- Tabish, S. and Jha S. K. (2011) Identification and Evaluation of success factors for public construction projects. Construction Management and Economics, 29. Pp: 809-83.
- Tamburrino, A. (2004) DOGE - Dighe Omeodinamiche a Gestione Evolutiva - project. pp: 101-176.
- Transparency International (2010), *Corruption Perception Index, [online]* available from: https://www.transparency.org/cpi2010/results [accessed: 28 No. 2017].
- Transparency International (2011), *Corruption Perception Index, [online]* available from: https://www.transparency.org/cpi2011/results [accessed: 28 No. 2017].
- Transparency International (2012), *Corruption Perception Index, [online]* available from: https://www.transparency.org/cpi2012/results [accessed: 29 No. 2017].
- Transparency International (2013), *Corruption Perception Index, [online]* available from: https://www.transparency.org/cpi2013/results [accessed: 29 No. 2017].
- Transparency International (2014), *Corruption Perception Index, [online]* available from: https://www.transparency.org/cpi2014 [accessed: 29 No. 2017].
- Transparency International (2015), *Corruption Perception Index, [online]* available from: https://www.transparency.org/cpi2015 [accessed: 29 No. 2017].
- Transparency International (2016), *Corruption Perception Index, [online]* available from: https://www.transparency.org/news/feature/corruption_perceptions_index_2016 [accessed: 29 No. 2017].
- Trinchella, G. (2017), Roberto Formigoni condannato, i giudici: “Nessuna attenuante: è spregiudicato. Corrotto con almeno 6 milioni di euro”, *Il Fatto Quotidiano,* https://www.ilfattoquotidiano.it/2017/06/20/roberto-formigoni-condannato-giudici-nessuna-attenuante-e-spregiudicato-corrotto-con-almeno-6-milioni/3672672/ [accessed: 29 No. 2017].
- Turato, G. (2017) Mose, un disastro continuo da 8 miliardi. L'Espresso [Online] Available at: http://espresso.repubblica.it/attualita/2017/04/13/news/la-diga-cede-1.299572 [Accessed: 2 De. 2017].
- V. Di Tella, G. Sebastiani, P. Vielmo, Se il Mose finisce in fondo al mare è un errore, non un’opera reversibile, «la Nuova Venezia», 24 gen.
- van der Brugge, R., Rotmans, J. & Loorbach, D. (2005) The transition in Dutch water management. Reg Environ Change 5, pp: 164–17;
- Venice city hall (2005) Working Group: to propose ways for organising a public comparison of alternatives to the Mo.S.E System. pp: 1-48.
- Venice city hall (2017) Annual tide variation. [online] Available at: https://www.comune.venezia.it/it/content/distribuzione-decennale-delle-alte-maree-110-cm [Accessed on: 26 No. 2017].
- Venice city hall (2017) Available at: http://www.comune.venezia.it/it/content/la-cronaca-dell-aqua-granda [Accessed on: 30 No. 2017].
- Venice city hall (2017) Centro Previsioni e Segnalazioni Maree - Parametri meteomarini e loro statistiche [online] comune.venezia.it. Available at: http://dati.venezia.it/ [Accessed 25 Nov 2017].
- Venice city hall (2017) tide forecasting centre and sea alert [online] Available at: http://www.comune.venezia.it/it/content/centro-previsioni-e-segnalazioni-maree [Accessed on: 26 No. 2017].
- Venice water board’s hydrographic office (1983), Il Comune Marino a Venezia, ricerche e ipotesi sulle sue variazioni altimetriche e sui fenomeni naturali che le determinano.

- Verweij, S., Klijn, E-H., Edelenbos, J. & van Buuren, A. 2013 What makes governance networks work? A fuzzy set qualitative comparative analysis of 14 Dutch spatial planning projects. Public Administration. 91, 4, p. 1035-1055.
- Vis, M., Klijn, F., De Bruijn K.M. & Van Buuren, M. (2003) Resilience strategies for flood risk management in the Netherlands, International Journal of River Basin Management, 1:1, 33-40;
- Vitucci, A. (2015) Mose, scoppia un cassone in cement. La Nuova Venezia [Online] Available at: http://nuovavenezia.gelocal.it/venezia/cronaca/2015/08/31/news/mose-scoppia-un-cassone-in-cemento-1.12014929#gallery-slider=undefined [Accessed 16 No. 2017].
- Vitucci, A. (2017) Muffe e degrado paratoie del Mose già bloccate. La Nuova Venezia [Online] Available at: nuovavenezia.gelocal.it/venezia/cronaca/2017/09/07/news/muffe-e-degrado-paratoie-bloccate-1.15820814 [Accessed 17 No. 2017].
- Vitucci, Mose, il Cnr avanza dubbi. “Con l’aumento dei mari potrebbe non bastare”, «la Nuova Venezia», 12 mag. 2012.
- Wang, G., He, Q., Meng, X., Locatelli, G., Yu, T. and Yan, X. (2017) Exploring the impact of megaproject environmental responsibility on organizational citizenship behaviours for the environment: A social identity perspective. International Journal of Project Management. Volume 35, Issue 7, October 2017, Pages 1402-1414.
- World Bank (2010) The Little Green Data Book,The World Bank,Washington, D.C.
- Zanetti, M., Marcolin, C., Bonometto, L. & Niccolucci. V. (2007) La laguna di Venezia. Ambiente, naturalità, uomo. pp 109-184.
- Zidane, Y J-T., Johansen, A., Ekambaram, A., Hald, L. C. (2015) When Stakeholders Shape Successes or Bring Failures – A Case Study of an Algerian Megaproject. Procedia Computer Science 64 pp: 844 – 851.

Appendix - Part 1

Questions in the interviews

Due to the thesis's limited word count, only the most relevant parts of the interviews are included, more precisely in chapter 3 and 4.

Question 1: Does the *acqua alta* phenomenon have negative impacts on the city's infrastructures, local citizens, tourists and commuters? If yes please explain how.

Has the city of Venice developed sufficient resilient strategies throughout the years? Are these strategies enough?

Question 2: Do you consider MOSE as a valid solution against Venice's *acqua alta* problem? Please elaborate in either negative or affirmative answer.

Question 3: In your opinion, should the city of Venice and the national government have approved a different typology of infrastructure project, such as the less costly and less environmentally impacting alternative projects proposed at the beginning of 2000s?

Question 4: Are you worried about MOSE"s environmental impact? If yes please describe what worries you the most and why.

Question 5: Given this huge project, lacking functionality, with a high level of corruption, high level of capital investments and uncertain results also during the realization phase, do you think it would have been better to finish the barrier or stop the MOSE project halfway and develop alternative solutions?

Question 6: As an Italian citizen, do you find this public expenditure for a single city justifiable? Would you establish a national/international authority in order to control and coordinate important national public projects?

Part 2 - Interviewees

Fersuoch L.: president of Italia Nostra (Italian environmental NGO), journalists and author of several articles and books about the safeguard of Venice, the Venetian lagoon and MOSE, among other: *A bocca chiusa: Sipario sul Mose* (2015). (interview made in February 2018)

Filesi, L.: professor of ecology, urban and environment protection at the university IUAV of Venice. Author of many academic articles on sustainable development and environment protection, among other: analysis of biogeographical value of the vegetation of the North-Adriatic sandy coastal (2007). (interview made in September 2017)

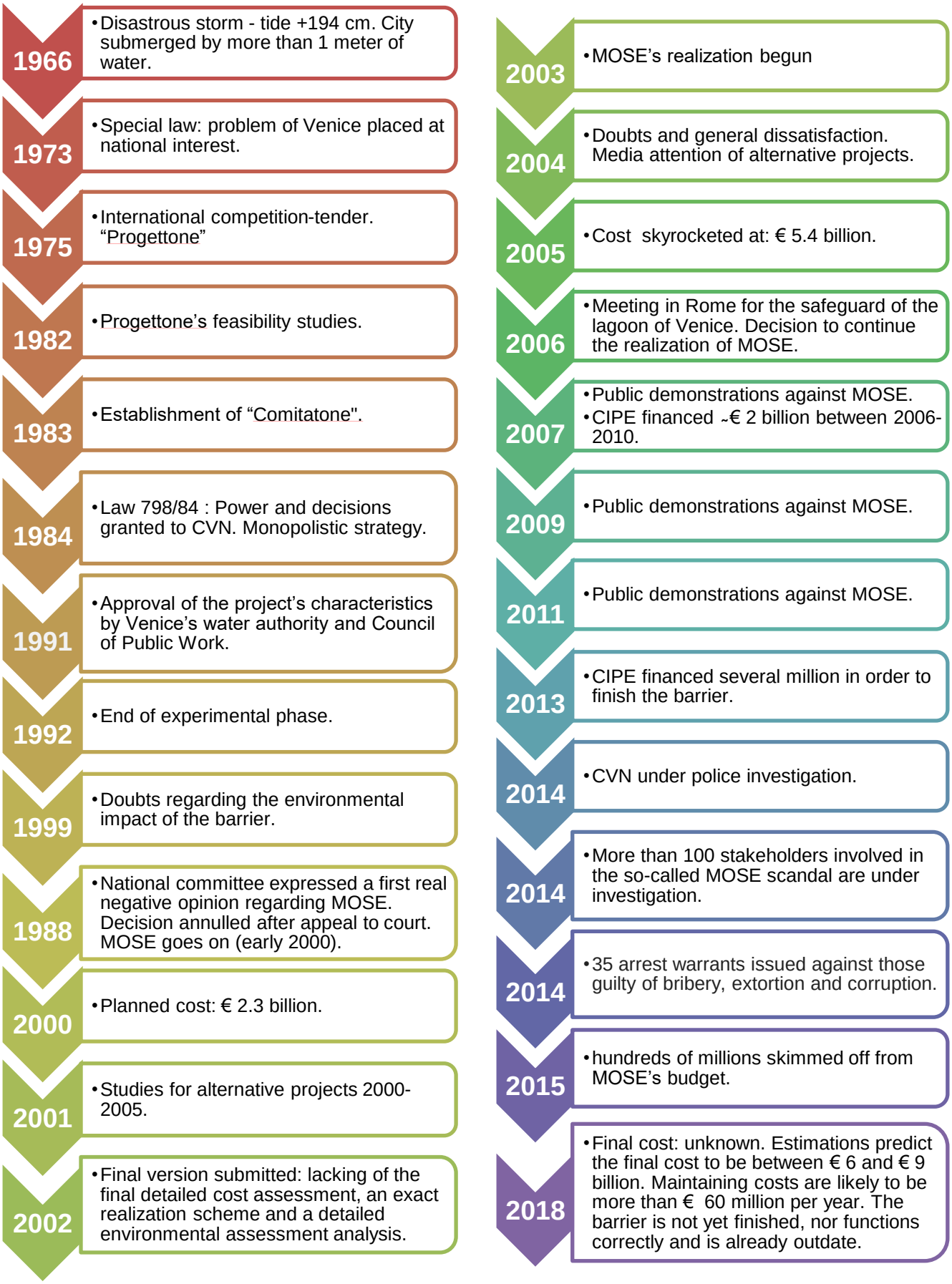
Patassini, D.: Italian engineer and dean of the Faculty of Urban Planning from 2004 to 2010. He was President of the Italian Evaluation Society (Associazione Italiana di Valutazione) for public policies. He is also very interested in the MOSE‟s case and in the lagoon of Venice. (interview made in January 2018)

Martini, G. A.: Italian journalist and researcher on issues related to the Venetian case study. He collaborated with the French newspaper Le Monde for the realization of the article: A Venise, MOSE, le chantier maudit. (interview made in August 2017 and December 2017)

Ciacci, L.: Italian professor of planning theories at the university of Venice. He helped journalists and researchers write article on the MOSE scandal and he collaborated with experts during the realization of alternative projects for the Venetian lagoon. (interview made in January 2018)

Boato, S.: expert on tide and water management. He collaborated with the Ministry of Environment during the realization of flood management measures for Venice’s lagoon and with journalists during the drafting of articles aimed at increasing the awareness of people about the MOSE‟s case. (interview made in January 2018)

Cusinato, A.: Italian economist, expert in urban development in north east Italy, urban and regional economic. (interview made in August 2017)



Appendix part 3: MOSE’s timeline. (author, 2018).