

# POLITECNICO DI TORINO

Master of Science in Engineering and Management

*Master of Science Thesis*



**The evaluation and the decision-making processes in Public  
investments: the Torino – Lione high-speed rail case**

**Supervisor:**

Prof. Luigi Benfratello

**Author:**

Andrea Escoffier

A.Y. 2018/2019



## **ACKNOWLEDGEMENTS**

First, I would like to thank my professor and thesis supervisor, Prof. Luigi Benfratello, always available whenever I have had indecisions or questions about my thesis work, and who has guided me in the right direction whenever he thought I needed him.

Thanks also to all the professors I met during my academic career, who taught me a lot and gave me experiences and knowledge useful for my future career and my life.

I would also like to thank my family for giving me constant support and encouragement during my years of study. Thank you for always believing in me.

A further thanks to all my friends with whom I was able to share moments inside and outside the Politecnico and those I met during my stay in Torino.

This result would not have been the same without you.

Thank you.

## **ABSTRACT**

While in the private sector there is a highly developed culture about the evaluation of an investment, due to the profit it should produce in the short and long term, for the public investments the situation is quite different.

In Italy, the culture on the evaluation of public investment assumed an important role only in the recent years. Even if the level of public investments is low with respect to the European Union, it can be noted that many projects are now under the analysis of groups of experts.

The following paper identifies the evolution of this culture and the ideas behind the public investment's decision. After a brief introduction on the concept of public investments, the first chapters examine the processes of evaluation and decision-making, in order to understand which could be the drivers of a good investment, and discuss their strengths and weaknesses with a specific focus on the cost-benefit analysis.

Then the attention shifts to the Torino-Lione high-speed rail case, with an overview on the project, and to the comparison between the 2012's and the 2019's cost-benefit analyses, inspecting the differences in the results.

# INDEX

<b>1. INTRODUCTION</b> .....	<b>1</b>
<b>2. INVESTMENTS</b> .....	<b>4</b>
2.1. The public investment .....	4
2.1.1. What is an investment .....	4
2.1.2. Private vs public investments.....	4
2.1.3. Contemporary situation.....	6
2.1.4. Italian contemporary situation .....	8
2.2. Support to public investment from EU to promote growth.....	11
2.3. Public investments in Italy.....	13
2.3.1. Italian regulation.....	14
2.3.2. Planning activities .....	15
2.4. Sustainability and growth of the country.....	18
2.4.1. Immaterial investments .....	20
2.4.2. Public expenditure for investments and infrastructures .....	22
2.4.3. Realization of works .....	24
2.4.4. Sustainability of the public debt .....	25
2.5. EU regulation .....	27
<b>3. EVALUATION PROCESS</b> .....	<b>29</b>
3.1. How to evaluate an investment .....	29
3.1.1. Evaluation techniques.....	30
3.1.2. The feasibility analysis .....	31
3.1.3. The convenience analysis .....	33
3.2. CBA: Cost-Benefit Analysis.....	35

3.2.1.	<i>Financial analysis</i> .....	36
3.2.1.1.	<i>Net Present Value (NPV)</i> .....	39
3.2.1.2.	<i>Internal Rate of Return (IRR)</i> .....	39
3.2.1.3.	<i>Ranking techniques</i> .....	40
3.2.2.	<i>Social-economic analysis</i> .....	41
3.2.2.1.	<i>Externalities</i> .....	42
3.2.3.	<i>Sensitivity and risk analyses</i> .....	44
3.2.4.	<i>The use of the CBA</i> .....	45
3.2.5.	<i>Limits of the analysis and the EU directives</i> .....	47
3.2.6.	<i>Advantages of the CBA</i> .....	49
3.2.7.	<i>Mitigation and compensation</i> .....	49
3.2.8.	<i>Summary of the CBA's use</i> .....	51
<b>3.3.</b>	<b>Added Value analysis – an alternative to CBA</b> .....	<b>52</b>
<b>3.4.</b>	<b>Conclusion on the evaluation process</b> .....	<b>53</b>
<b>4.</b>	<b><i>DECISION-MAKING PROCESS</i></b> .....	<b>54</b>
4.1.	<i>Five steps of decision-making process</i> .....	57
<b>5.</b>	<b><i>NLTL: NUOVA LINEA TORINO LIONE – AN EXAMPLE OF PUBLIC INVESTMENT</i></b> .....	<b>60</b>
<b>5.1.</b>	<b>NLTL project</b> .....	<b>60</b>
5.1.1.	<i>Susa Valley: the affected area</i> .....	60
5.1.1.1.	<i>Contemporary economic situation identification</i> .....	61
5.1.2.	<i>Project overview</i> .....	63
5.1.2.1.	<i>What does it regard</i> .....	63
5.1.2.2.	<i>What has been done and what is missing</i> .....	66
5.1.3.	<i>Integration of the project in the European Community</i> .....	67
5.1.4.	<i>Expectations of the current project</i> .....	70
<b>5.2.</b>	<b>The CBA of the NLTL</b> .....	<b>72</b>

5.2.1.	<i>The analysis of 2012</i> .....	74
5.2.1.1.	<i>Pollution</i> .....	76
5.2.2.	<i>The analysis of 2019</i> .....	78
5.2.3.	<i>The results</i> .....	81
5.2.4.	<i>Compensations</i> .....	82
5.2.5.	<i>Conclusion on the comparison</i> .....	83
<b>6.</b>	<b><i>CONCLUSION</i></b> .....	<b>84</b>
<b>7.</b>	<b><i>ABBREVIATIONS AND ACRONYMS</i></b> .....	<b>85</b>
<b>8.</b>	<b><i>BIBLIOGRAPHY</i></b> .....	<b>87</b>

# ***1. INTRODUCTION***

In the ten years before the 2008's economic crisis, the ratio of public investment expenditure to GDP in Italy was about twice as high as in Germany. No virtuous effects on Italy's growth compared to Germany followed, suggesting that the quality of investment is a crucial issue.

The economic crisis has certainly contributed to a reduction in public and private investment in infrastructure. This is especially true for Italy which, compared to other countries in the Euro zone, has suffered a contraction in the percentage of investment in relation to the GDP.

In this complex framework, there are also factors that undoubtedly discourage investment in this sector: delays in payments, the gap between funds allocated and resources actually spent, and the very long time taken to complete the works.

In Italy, we have been observing for years the debate on the role of economic analysis and evaluation of public investment, so that various currents of thought have been created, in turn with relevant topics of discussion on which tools and methods can be applied. Over time, models and theories have also been formulated and working groups have been created focusing, in various ways, on activities related to programming, planning and design, but always with the optimization of choices related to the scarcity of resources of public spending as their central pivot.

In terms of analysis, the following pages focus on the importance and essential role of the analytical component of investment, in a context where public spending is constrained by the restrictions imposed by participation in the economic and monetary union and by budgetary constraints, and it is therefore necessary to evaluate all the components of the investment in order to be able to weigh the final decision.

The culture of evaluation in support of public decisions has begun to spread more widely in Italy since the 1970s with the institutions of the Regions with ordinary statutes, when the need to use economic calculation tools for a rational and efficient use of the financial resources available mainly for development purposes began to arise. Moreover, the need

for these tools could be placed in the broader context of the planning and budgeting systems that were then introduced for the first time at the regulatory level, starting with the Regions. This culture of evaluation, however, did not spread in a continuous and systematic way in the public apparatus, until the end of the Nineties, when a phase of relaunching began. This phase led to a continuous and systematic use of techniques and methodologies, not necessarily only of an economic nature, to support the decisions of the public operator in the various fields of institutional intervention.

For this trend reversal to be consolidated, appropriate support measures are needed, which clearly cannot be exhausted by the increase in capital commitments. These actions should aim at a more transparent and careful selection of investment options and the prior identification of obstacles that could delay, prevent or distort the selected interventions. Full reintroduction of feasibility studies into the project cycle may be part of this design.

The relaunch of investment in infrastructure is continuously mentioned, with the almost unanimous consent of governments and opposition groups, institutions and academics, as a tool capable of sustaining growth and productivity.

In the following paper, we will analyze public investments, with a focus on infrastructure investments, and the process behind the decision to start or to stop a project.

The European Investment Plan (known as the Juncker Plan) represents a significant paradigm shift in the financing of public investment. The prevalent granting of direct financing to investments has led, at least in the Italian case, to a lack of attention to the expected results of the project. In these circumstances, rather than the centrality of the project, the ability to secure financing and the pressure of interest groups often counted more.

A central question, on the other hand, is the degree of efficiency of the investments, and the identification of how much of the expenditure for public investments can actually translate into capital accumulation. It should also be accepted the idea that an efficient process of public capital accumulation is a necessary condition for attracting private investment, facilitating crowding-in and increasing overall long-term investment.

Based on these considerations, the need to "invest in the investment process" to ensure positive returns and effects on growth should be underlined.

The paper is thought as divided into four parts. The first chapter is about the public investment in material fields such as infrastructures and looks at it from the Italian and European regulations' perspective. It tries to explain the reasons behind an investment and the concept of sustainability in the growth of the State.

Then, the discussion enters a lower level of analysis, and considers the processes of evaluation and decision. The two chapters covering these topics try to focus on the studies behind the final decision about the realization or the termination of the investment, both from a financial and an economical point of view, and the steps for the decision-making process.

The last chapter regards the NLT (Nuova Linea Torino Lione), the project for the highspeed railway connecting Torino and Lyon, and provides a brief introduction on the project's history and the issues that it should solve. The paper, finally, focuses on the Cost-Benefit Analysis performed for the project and compares the 2012 result with the 2019 result trying to shed light on the reasons underlying the completely different results.

## ***2. INVESTMENTS***

### **2.1. The public investment**

#### *2.1.1. What is an investment*

In the economic field, investment means the allocation of money in the expectation of some benefit in the future. An investment usually involves the use of an initial capital to reach the final goals, that for the privates could be more profit in the future (in a short time horizon) while for the public administrations could be the provision of public services (for example, an hospital to guarantee more health). The investment is always associated with a risk, which may be linked to the change in the value of the asset over time or to obtaining an income not in line with that expected. The investment can be distinguished according to the subject who buys the asset, so we can distinguish personal investments, business investments or public investments. Investments in the field of economics are very important because without investments there is no growth for the country. However, it is necessary that some basic conditions exist for investments to be made; these are: the existence of certain rules in the country system, an efficient public system and a well-prepared, capable and innovative managerial and entrepreneurial class.

Investments are generally focused on the realization or the implementation of goods and services (mainly in case of private investment) or works for the public utility (such as highways, railways, hospitals, schools, etc.) to provide an asset to the community or to increase the businesses' productivity (in case of public investment). The investment requires financial resources' availability that could derive either from internal sources (for example the self-financing) or external sources. In this paper, only the material investments, such as the infrastructures, will be taken into account.

#### *2.1.2. Private vs public investments*

The implicit assumption in any public assessment of investments is that the decision maker has some sort of collective welfare function as an economic objective, and therefore tends to maximize the "social surplus" (which measures the well-being of families and businesses and can be measured by the cost-benefit analysis), the GDP, the environment or the income redistribution.

A public investment is typically destined to produce impacts that do not end in the production of goods or services capable of satisfying the need (or the needs) from which the formulation of the original project-idea started. A wide range of collateral effects can in fact also be associated with the creation, management and financing of a work, and the sub-sets of the community that will derive benefits do not always coincide with those exposed to the negative impacts of the investment. The existence of a plurality of stakeholders - the parties that have an interest in the company and can affect or be affected by the business - imposes to pay attention not only to the supply of the output but also to the collateral effects that could facilitate or prevent their activation and affect its overall social efficiency.

While the choice of the right investment is relatively easy for a private investor, since his goal is to make profits in the short term, there is a common consensus that government has a role in undertaking public investments that private enterprises would not provide due to the incentive problems, since fundamental characteristics of public goods are the non-appropriability and the non-exclusivity. The challenge is to ensure that, where public investments are required, they should be undertaken with regard to efficiency and value for money. The experience of countries is that public investment decisions are often seen to be wastefully managed, subject to corruption and misappropriation, and a constant source of disappointment to citizens. Under these conditions, investing in the effort to establish effective systems for managing public investment is likely to yield high returns.

The idea that governments ought to invest in public infrastructure and institutional assets to support production and trade is established in the economic literature going back to Adam Smith (*Wealth of Nations*, 1776), the father of the modern economics. Smith's vision was centered on the idea that government provision of complementary public goods, such as roads and bridges, would facilitate the development and growth of markets and long-term economic growth. Private enterprise by itself would be unlikely to provide such public works, and this implicit market failure, without government provision, would constrain economic growth.

John Maynard Keynes (*The General Theory of Employment, Interest and Money*, 1936) provided a complementary rationale for public investment as a countercyclical fiscal policy tool, justifying public works program as a way to stimulate aggregate demand,

catalyze the income and the employment multiplier, and thus restore the economy to full employment. Since Keynes, governments have tried to justify public investment projects financed by the deficit as a corrective response, both as a countercyclical stimulus and to enhance the stock of public assets that could support private sector enterprises and long-term economic growth.

The models of economic growth that motivated plans and industrialization strategies in most of the developing world in the postwar years were heavily dependent on high levels of public investment and estimates of aggregate and sectoral growth based on capital output ratios. Countries invested not only in basic infrastructure for agricultural and industrial development (irrigation canals, roads and ports) but also, in some cases, in productive activities as state-owned enterprises grew and expanded into sectors where there was no justification (based on principles of public economics) for that role. Public infrastructure has typically been the preferred form of fiscal investment given its justification as a public good with its broadly distributed benefits to the population.

### *2.1.3. Contemporary situation*

The interest in public investment took an interesting turn in the early years of this century when a number of developing-country governments, particularly in South America, began to complain about the restrictions imposed on their capacity to undertake public investments by the macroeconomic stabilization framework recommended by the International Monetary Fund.

Much of the topic for public investment is based on the belief that resources allocated to investment translate into an equivalent value of public capital stock, which, by reducing the cost of production or distribution, benefits the private sector and affects the overall growth process. This effect is typically measured by the rate of economic or social return from public investment. The cost-benefit analysis (that will be discussed in detail later) intends to define the expected rate of return on an investment, taking into account the likely costs and benefits including any economic and social externalities.

This rate of return will depend very much on the effectiveness of the management of the public investments, both in the budgeting and execution of the investment projects and in the subsequent operation and maintenance of the public asset created by public

investment. Typically, cost-benefit analysis assumes a frictionless process of project implementation. However, if the quality of public investment management is low, and if resources are wasted or corruptly misdirected, it is likely that the realized (or ex-post) rate of return will be low or negative even for projects that showed high ex-ante rates of return. Without efficient public investments management, investment spending is unlikely to be fiscally sustainable and would not promote growth and development.

Given the fiscal constraints that limit the general level of public investment in most countries, the focus on maximizing efficiency through better selection and management of investment spending is a highly relevant political topic.

Since many public investment projects involve multiyear processes and significant planning, coordination, financing, and contract implementation challenges, it is usual for costs and completion dates to overrun even well-planned estimates. Budget allocations can be redirected by new priorities, key staff turnover can lead to loss of focus, and contractors may run into unexpected technical challenges. If such overruns are significant, they jeopardize the cost-benefit calculus that justified the project. Nevertheless, good management can limit such overruns.

#### 2.1.4. Italian contemporary situation

As it is known, in the last years, Italy has underlined a contraction in spending flows meant for investments (Table 2.1).

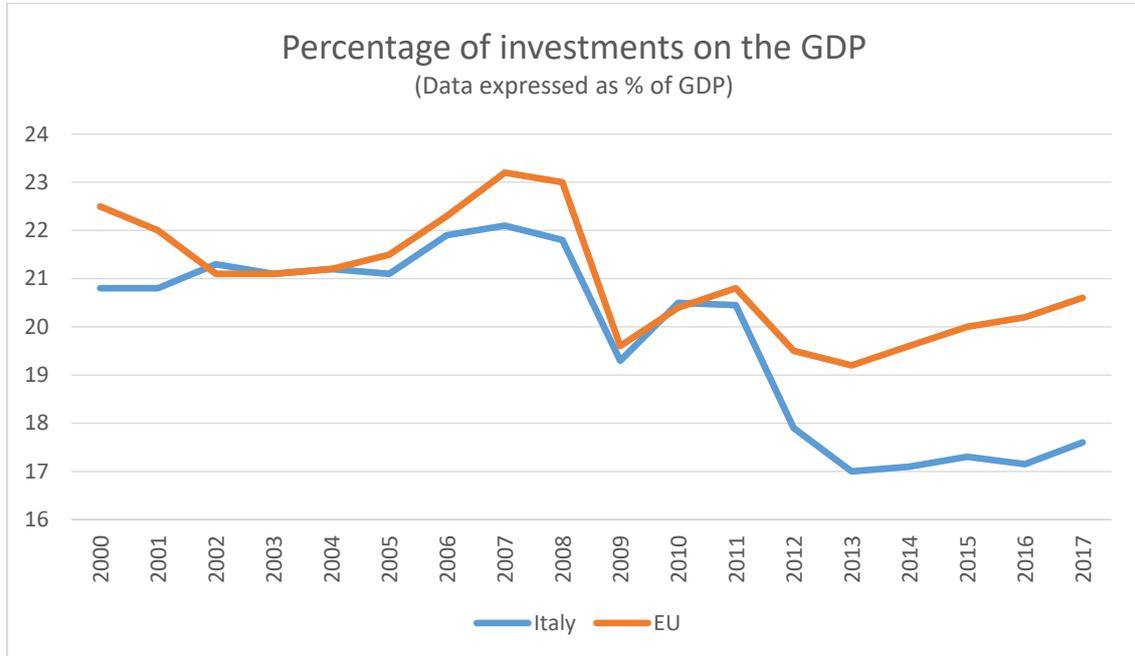


Table 2.1 – Source: International Monetary Fund (2019)

The situation does not change by considering public investments (Table 2.2). Total capital expenditure is reported together with the investment component; the other main component is capital transfers, the part of the capital expenditure relating to capital transfers to enterprises and households.

This phenomenon can be linked to the financial tensions and fiscal consolidation actions that have characterized fiscal policies over the last decade. It is, in fact, attributable also to the lack of planning capacity, which it has often suffered and continues to suffer from the Italian Public Administration.

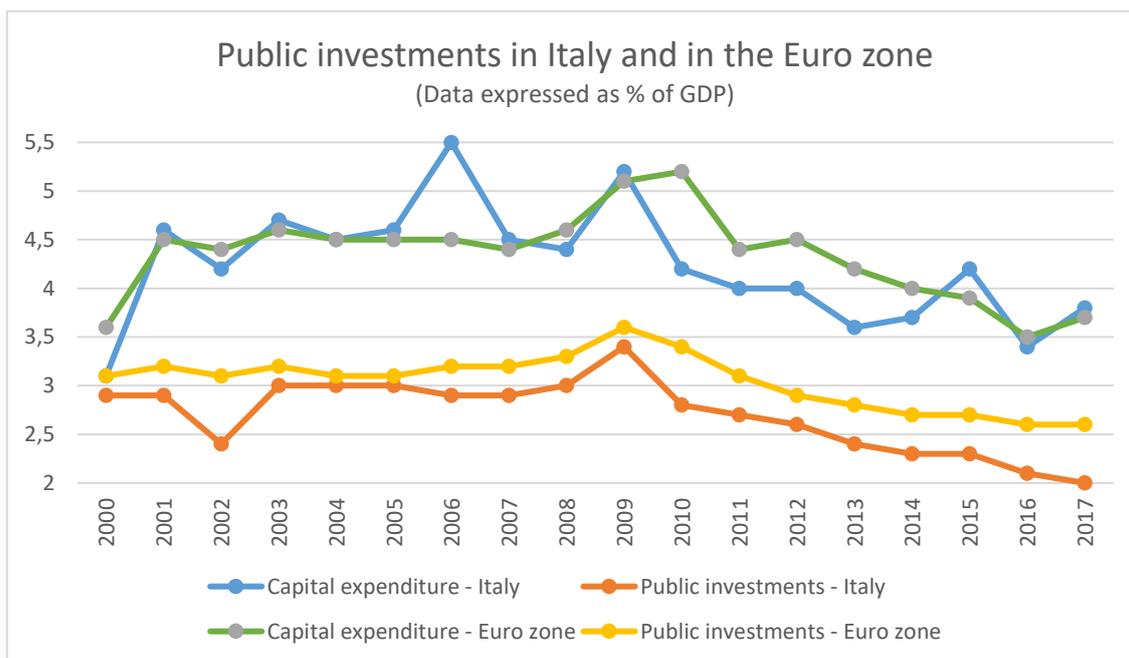


Table 2.2 - Source: Bank of Italy (2019)

The increase in the share of resources allocated to investments is a necessary but not sufficient condition to reduce the gap accumulated over the years by the Country. In addition, other actions are necessary, capable of promoting a more careful and transparent selection of investment options, in order to avoid the dispersion of scarce public resources, and to identify in advance the obstacles that could prevent or distort the selected interventions. In particular, it is a matter of introducing firmly in the project cycle support tools for decisions capable, on the one hand, of reducing the risk of inefficient use of resources and, on the other, an excessive expansion of the time taken to carry out the more promising interventions. Therefore, from a public point of view, the social convenience of an investment should be established as a priority factor of good decisions. There is also a second factor, as important as the previous one, represented by the economic opportunity of an investment project, as an intrinsic opportunity to create value for the company. By ignoring at least one of these two aspects, we face the risk of reducing the entity's ability to succeed, when the opportunity arises to resort to credit or other forms of financing to make a public investment.

The evaluation of a public project, so, is not an entirely internal affair to the entity, especially when the social impact of the investment is evident. It may indeed happen that a decision, not clearly justified by certain data or data perceived wrongly by the

community, ends up proving to be unsustainable. The evaluation and the decision-making processes should refer as much as possible to objective parameters, the comparison of which excludes the use of arbitrary choices that are difficult to reconcile with the necessary social consensus to the project and with the optimization of the use of resources.

## **2.2. Support to public investment from EU to promote growth**

Investments support demand in the short term and strengthen supply and potential output in the medium term. In a context of slow and still fragile recovery, investment is the top priority to bring the European Union back on a path of sustainable growth. In the recent past, the fall in investment in European countries has been dramatic and widespread and the recovery is still very slow.

To help reverse this trend, the Commission launched the Juncker Plan and created the European Fund for Strategic Investment (EFSI). The Plan is an important opportunity to stimulate private investment with public support and foresees the activation of projects that otherwise would not be possible due to excessive risk, market failures, or impediments generated by financial and budgetary constraints.

The potential catalytic role of the plan must be fully exploited, in synergy with resources from the EU budget and national resources, including national promotion banks, to create real European investment initiatives to finance European common goods, such as trans-European networks or the European Energy Union.

Initiatives to promote knowledge-intensive use, focused on human capital, research, innovation and high-level education are investments with very high growth potential and must be adequately supported. A strong commitment to structural reforms would enhance profit opportunities and thus stimulate investment.

Countries should make full use of their budgetary margins to increase investment. The governance framework should include additional incentives to invest in European public goods also at national level. Further joint initiatives at European level should be explored: projects to improve the EU's growth potential could be financed by common debt issuance.

Finally, it is shared the idea of a Union for Finance and Investment, in which the completion of the Banking Union, the realization of the Union of Capital Markets and the Juncker Plan would help to drive savings more efficiently into investment.

In order to make Monetary Union truly irreversible, a common systemic vision should be adopted. A strengthened monetary union requires strong common institutions. In addition to the Banking Union, the following other aspects should also be considered.

The establishment of a European Stability Mechanism (ESM) has been an important step forward in managing sovereign debt crises, through the use of common resources. The focus is on how to fully exploit the benefits of these common resources while preserving their primary function of containing contagion. An ambitious goal would be to transform the ESM into a European Monetary Fund. In the short term, the ESM would become the lender of last resort for the Single Resolution Fund to truly safeguard the financial stability of the Union.

The introduction of a European unemployment benefit would be a first step towards the creation of a stabilization system against asymmetric shocks and would strengthen the mutual trust needed for more ambitious future initiatives.

At the level of the European Union, a common fund for the financing and management of external borders would represent another important example of joint and several liability and the supply of European public goods.

In the long term, the Monetary Union should have its own budgetary capacity to promote investment and to activate counter-cyclical mechanisms. In a highly integrated area such as the European Monetary Union, public goods can be provided at a systemic level better than at the level of the individual State, as in the case of large-scale investments, the stabilization function and the financing of Member States' policies with positive external effects.

These functions could be managed by a Finance Minister for the Eurozone. The added value of a European Finance Minister would be to implement a common budgetary policy in a coherent and internally balanced way, at an aggregate level. This would require a properly resourced euro area budget. Obviously, the Minister will have to be given a political investiture in order to carry out his mandate effectively. The figure of Minister should be institutionally provided for within the European Commission, as is the case with the high representative for Foreign Policy, and should have a strong link with the European Parliament.

### **2.3. Public investments in Italy**

The Italian situation can be examined in the light of the operational instruments adopted in the Juncker Plan. These are instruments whose application would allow not only to take full advantage of the opportunities provided by the supranational framework, but also to have beneficial effects on the modalities of planning and evaluation at national level, improving the quality of the expenditure for investments financed with public resources.

The beneficial effects of transposing the tools and methods of the Juncker Plan into the national context emerge for several reasons. First, alongside the public financing of infrastructure projects, private financing can lead to the emergence of evaluation techniques aimed at improving the process of selecting and choosing interventions. There is, in fact, a positive automatism that provides that the private investor invests not only if he has the reasonable certainty of obtaining a satisfactory rate of return (as well as repaying the investment with the cash flow generated by the project), but also if the key data of the project (demand, costs, etc.) are considered reliable and verifiable with solid forecasting models. In addition, specific aspects, such as risk analysis, are developed and integrated into the economic analysis of the selected projects. Secondly, the Plan could be an opportunity to change the way in which Public Administrations (PA) make decisions about the choice of public investments.

The specific instruments of the European Plan that take on a crucial dimension are:

- The central role of economic assessment;
- The selection through the competition of projects and the constitution of a reserve of projects;
- The provision of technical assistance functions.

Despite the fact that in Italy the regulations of the central administrations provide for ex-ante evaluation procedures for public works (*D.Lgs. 196/2009, art. 30, paragraph 9* and the following implementing decrees), the evaluation of investment projects is an instrument that is little and badly used as an aid to public decisions.

In general, the institutional framework for the assessment of public investment (ex-ante and ex-post) in central government is very fragmented, composed of different institutional actors.

The *Nuclei di valutazione e verifica degli investimenti pubblici* (NUVV - Public Investment Assessment and Verification Units) are responsible for the evaluation activities. They are independent bodies set up within the central administrations and are flanked by various evaluation structures.

The regulation then establishes general rules for the preparation of the Multi-Annual Indicative Planning Document (MIPD), tracing a process that from the analysis of infrastructure needs, divided by sectors and sub-sectors, continues with the ex-ante evaluation of individual works through techniques specific to the cost-benefit analysis. The criteria for the selection of investments to be made in the different sectors of competence of each Ministry are then indicated, to be included in the MIPD. Finally, in order to improve the efficiency of the planning process and the overall effectiveness of public investments, ongoing monitoring and ex-post evaluation are envisaged to measure the usefulness of the works carried out.

### *2.3.1. Italian regulation*

In Italy, there is widespread dissatisfaction with the volume and quality of public investment. Projects are not normally identified on the basis of a structured process of needs analysis and ex-ante evaluation, based on standard methodologies and criteria.

The Italian legislator recently intervened to further strengthen the regulatory framework for the ex-ante evaluation of public works. The D.Lgs. 228/2011 was created with the premise of encouraging Public Administrations to good practice in the socio-economic evaluation of public investment in the path of a regulation that has remained partly unimplemented since D.Lgs. 144/1999.

The Legislative Decree provides for the obligation for Central Administrations to prepare the Multi-Annual Incentive Planning Document, containing the three-year investment program for public works and public utilities. Preparation of the MIPD is based on the drawing up, by the Administrations involved, of sector-specific guidelines concerning the

quantification of needs and the ex-ante and ex-post evaluation of the financed interventions.

According to the provisions of the 2011 Legislative Decree, the Ministries are required to draw up the MIPD by the 31st October and to send it to the *Comitato interministeriale per la programmazione economica* (CIPE - Inter-ministerial Committee for the Economic Planning); by the 31st December of each subsequent year, they must draw up a report on the state of implementation of the MIPD itself.

The Ministerial Order of August 3, 2012 contains several elements that facilitate the process of drawing up the MIPD through the drafting and elaboration, by each Ministry, of the Guidelines for the drafting of the Document. In order to facilitate the preparation of the MIPD, a Vademecum containing details and operational guidelines for the drafting of both the Guidelines and the MIPD has been prepared by a joint working group between the *Dipartimento per la programmazione e il coordinamento della politica economica* (DIPE - Department for Economic Policy Planning and Coordination), the department of the Presidency of the Council of Ministers and the *Unità di Valutazione degli Investimenti* (UVAL - Investment Evaluation Unit) of the Ministry of Economic Development, now part of the Agency for Territorial Cohesion.

The Vademecum, after having been promptly put on the net by the two institutions that drew it up, was transmitted on April 14, 2014 to all the Ministries required to carry out the evaluation activities.

### 2.3.2. *Planning activities*

When it comes to planning, the literature on public works is very extensive. In fact, there are numerous types of planning that can be traced back to the nature of the proposing body and to the specific subject of interest. There may also be activities for the planning and participation of private individuals through public procedures. The planning of public works can also be limited to specific sectors, such as the creation of certain types of works of public interest.

In order to complete the state of the art in planning, the legislator has introduced, through D.Lgs. 228/2011, the obligation to plan public works also in the Ministries.

A crucial moment for the correct setting up of a public work is the formulation of the feasibility study, which in Italy generally shows little robustness in the main steps of the economic-financial analysis prior to the realization of the work: analysis of demand, management and financial sustainability, the role of the public contribution, risk analysis and, finally, measures of socio-economic impact on the territory of reference.

In the absence of a solid monitoring of these critical issues, the financial assessments underlying the project are destined to undergo continuous adjustments, even after the conclusion of the contract or concession, thus becoming an unreliable unit for formulating judgments about the sustainability of an intervention.

One of the most significant criticalities is undoubtedly the lack of technical-economic tools to support local administrations in carrying out the function of design and management supervisor. Moreover, the uncertainty of the regulatory references and of the actual availability of resources introduces an element of risk that discourages the inflow of property and debt capital or increases its cost.

The new Procurement Code, approved by Legislative Decree 50/2016, introduces a renewed approach to the analysis and evaluation of a work through the "technical and economic feasibility project". The Code proposes the role of needs analysis, as a starting parameter for the feasibility of the same intervention and in the absence of which the project would suffer all the critical points of its own usefulness. First of all, the feasibility project puts the requirement of satisfying the needs of the community into perspective. In the practice of conducting planning and design activities, the survey of needs, in addition to being able to take place through direct qualitative-quantitative methods, is often carried out through proxy indicators of the need itself: the analysis by indicators of result (so-called *results indicators*) and implementation (so-called *output indicators*), subtend to an analysis of needs identifiable in the expenditure itself. Both indicators have an underlying logical analysis for the estimation of the relative values, derived from the expenditure for reference investments. The result indicators, defined ex-ante both in the initial situation (so-called *baseline value*) and after the intervention (so-called *target value*), must normally be already measurable when each national and regional program is approved by the EC. For most of the output/implementation indicators, the OPs (Operational Programs) have targets defined at the end of the implementation cycle.

The guide on the cost-benefit analysis of investment projects, drawn up and published in December 2014 by Directorate-General for Regional and Urban Policy of the EC, deepens several sectoral issues, such as to make, for each segment, sufficiently exhaustive the methodological guidelines to be addressed when it is intended to analyze, from an ex-ante point of view, the feasibility of a particular intervention.

Looking at the D. Lgs. 228/2011, we note with attention that the chapters developed in the text of the EC guide in itself appear to be quite refined cases of sectoral guidelines, and that, in addition to favoring the Management Authorities of regional competence that will be preparing to acquire the information contained in it, may also be useful for the Central Administrations, not only for what may relate to the use of the guide itself limitedly for the evaluation and formulation of a major project but also with a view to transferring the methodology followed to its Investment Plan and the related Multi-Annual Incentive Planning Document.

The chapters of the guide that make up the sectoral analyses have an almost identical methodological approach, not far from that defined in the Vademecum, according to the following index, which also corresponds to a sort of minimal list of a specific feasibility study on a sectoral basis:

1. Introduction;
2. Description of the context;
3. Definition of objectives;
4. Project identification;
5. Demand analysis;
6. Option analysis;
7. Financial analysis;
8. Economic analysis;
9. Risk assessment;
10. Case study.

## 2.4. Sustainability and growth of the country

In the last decade, the opportunity to increase public investment spending, which can have a positive impact on the level of economic activity in the short term and affect its long-term growth potential, has been supported by many parties.

In the medium-long term, the increase in growth potential derives from the opening of new opportunities for economic activity and from the stimulus to innovation: these effects can be achieved with the creation of material infrastructures, especially with technological content, and above all through investments in research and knowledge.

In the short term, the increase in the level of the product, measured by the "investment multiplier", can be so strong as to overcome the growth of the public debt due to the deficit (expenditure higher than revenue). If the longer-term effect on growth potential is not linked to this effect, the reduction of the debt-to-product ratio is temporary: while the deficit continues to increase the debt, the product returns to growth at rates similar to those prior to the increase in expenditure. The magnitude of the multiplier depends on some important variables: the speed and efficiency of interventions and the ability to identify those capable of determining an effective qualitative and quantitative increase in public capital are the qualities needed to maximize the direct impact on the product. The careful selection of programs to be funded is also crucial to obtain the longer-term effects on growth potential and must not penalize the resources available for intangible infrastructures.

### *Investment multiplier*

An investment multiplier refers to any increase in public or private investment spending that has a more than proportionate positive impact in the short term on aggregate income and the general economy. The multiplier attempts to quantify the additional effects of a policy beyond those immediately measurable. The larger an investment's multiplier, the more efficient it is in creating and distributing wealth throughout an economy.

For instance, extra government spending on roads or railways can increase the income of construction workers, as well as the income of materials suppliers. These people may spend the extra income in the retail, consumer goods, or service industries, also boosting

the income of workers there. Therefore, it is an example of a situation by which everyone can gain thanks to a public investment.

In the current conditions of public finance and with a low degree of efficiency in the administration, the use of the deficit should take place to ensure the use of resources aimed at supporting economic activity, in the short and long term. Even if an effective investment policy succeeds in bringing the economy on a higher path of growth, it would remain necessary to define a credible strategy in the budgetary objectives.

Direct public spending, like that for investments, can have a stronger impact on aggregate demand than expenditures with indirect effects, such as public transfers.

The evaluation of the short-term macroeconomic effects of an increase in public investment is surrounded by high uncertainty. The size of the “multiplier” depends on many factors:

- the degree of utilization of productive resources, the orientation of monetary policy and the resulting financial conditions;
- the presence of any delays and inefficiencies in the definition and implementation of investment programs;
- the assessment of the markets on the prospects for debt sustainability following the increase in expenditure.

It is reasonable to hypothesize that if the selection of investments were not accurate, or their implementation was characterized by waste and inefficiency, the multiplier would be significantly lower, approaching that of spending on transfers. A similar result would occur if the spending plan raised investors' fears: the increase in financing costs would reduce the stimulus to economic activity provided by greater investments, while the deficit would be higher due to the lower growth of the economy and of the progressive increase in interest expenditure.

In these circumstances, the ratio of public debt to GDP would increase.

### *2.4.1. Immaterial investments*

An adequate supply of public capital can facilitate the adoption of new technologies and the reorganization of production processes, also facilitating the creation of new businesses. This can be essential in supporting the early stages of developing particularly innovative technologies. It must be recognized, however, that the link between the accumulation of public capital and economic development is essentially elusive.

Public capital does not include only physical infrastructures, such as transport networks and those for telecommunications and energy, but also the set of knowledge and skills that an economy can have. These two types of capital, material and immaterial, share some characteristics of public goods and without the intervention of the State they would be available in insufficient quantities.

The State supports immaterial accumulation both directly, with scientific research in public universities and research centers, both indirectly, through subsidies and tax incentives to private activity. There is evidence that both these forms of intervention, if well designed, positively affect economic growth. In a context of rapid technological change, promoting the accumulation of human capital and its qualitative improvement appears just as if not more important than investment in physical infrastructure.

Public spending by education in Italy is around 4 percent of GDP, much lower than in the Euro area average (Table 2.3).

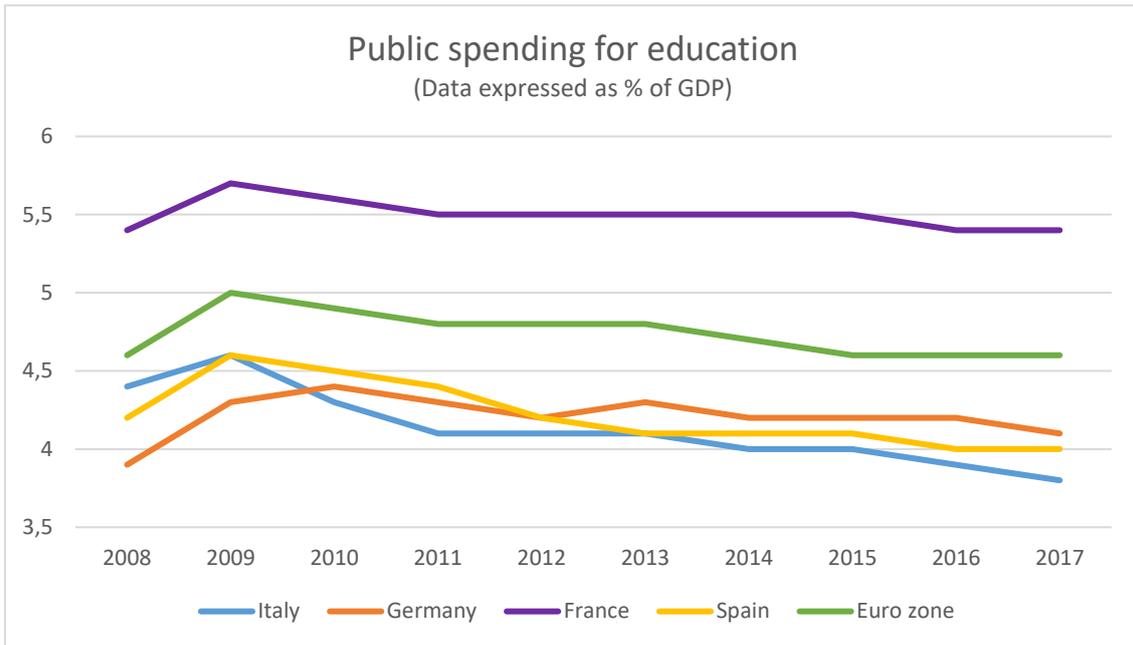


Table 2.3 – Source: Eurostat, based on the data of COFOG (2019)

Italy is in the last places among the developed countries for the skills of its workforce. The gap with the other countries is also pronounced with reference to the research and development activity, although in this case it is almost entirely due to the private expenditure component (Table 2.4).

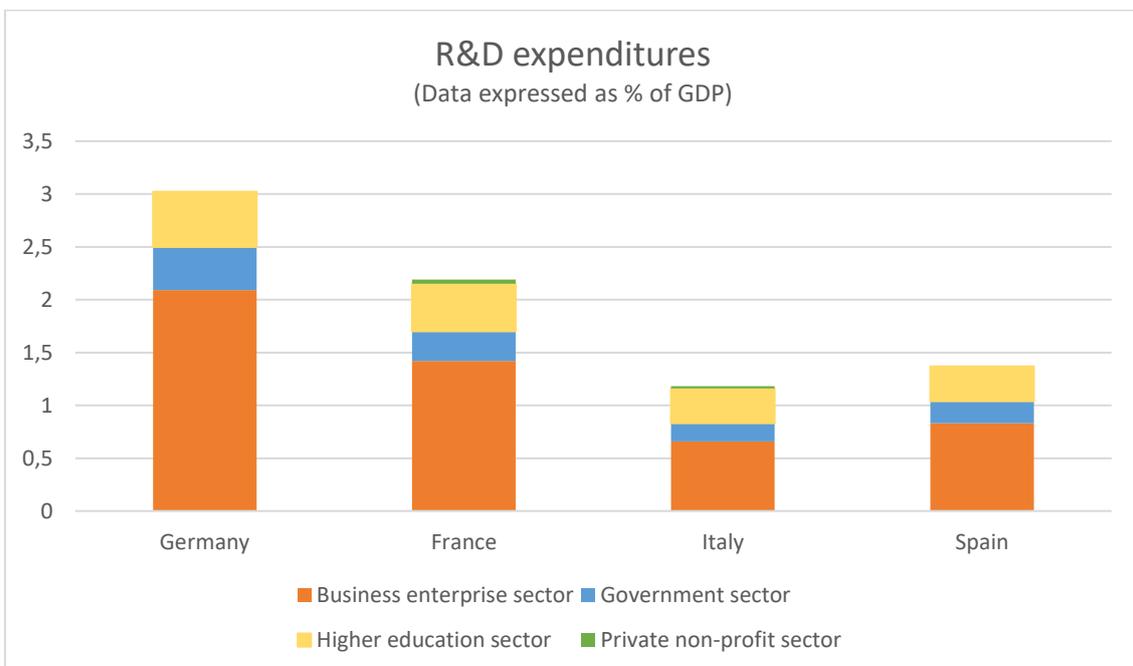


Table 2.4 – Source: Eurostat, year 2017 (2019)

#### 2.4.2. Public expenditure for investments and infrastructures

The expenditure for gross fixed investments of Public Administrations has decreased in Italy in the recent years and now is lower than that recorded in other European countries (Table 2.5). As a percentage of GDP, spending fell in Italy from 3 percent in 2008 to 2 percent in 2017. Recently, the European Commission has estimated that in our country there is a "deficit" of public investments. It should be kept in mind that the economic meaning of the expense items does not always coincide with the accounting classification.

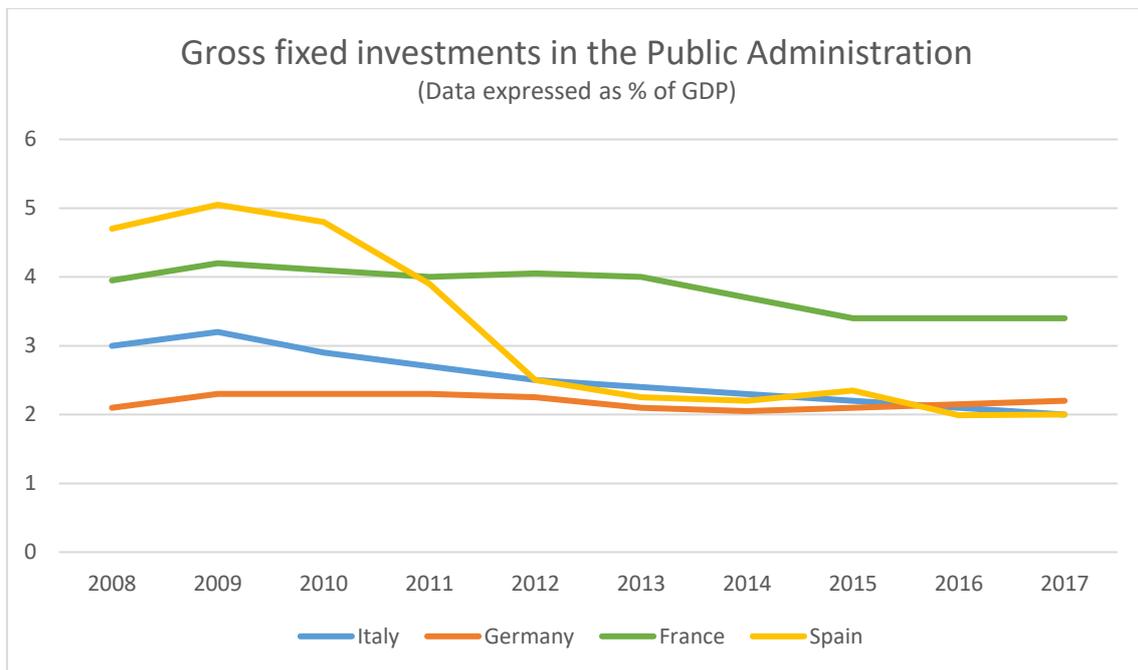


Table 2.5 – Source: Database AMECO, European Commission (2018)

Expenditures recorded in the Public Administrations account under the heading "gross fixed investments" are not intended entirely for the formation of physical infrastructures, nor do they represent the totality of the financial resources allocated for this purpose. About half of this concerns other types of expenditure, such as those for plant, machinery and patents. Investments in physical infrastructures are also carried out by parties outside the public sector who still carry out works of public utility (among them the concessionaires of the railway, road, energy and telecommunications networks). Only part of these expenses passes from the public budget and are accounted for in the item "investment grants", a very heterogeneous item whose composition is influenced by

national peculiarities in the sectoral classification of the entities involved (inside or outside public administrations) and in the regulation of public utilities.

Measuring a country's infrastructure is a complex exercise. Financial indicators based on the resources employed can be used or physical endowments (length and density of transport networks, energy and water supply, telecommunications, etc.) can be used, which can also reflect differences in the morphology of the territories and in the degree of efficiency with which resources are employed. Furthermore, there are indices that aim to capture the overall adequacy of the infrastructure networks, taking into account as far as possible the potential demand, the connections between the various networks, and the congestion phenomena. If we refer to indicators based on the permanent inventory method, which accumulates historical data on annual investment expenditure net of the estimated depreciation, the situation in Italy appears substantially in line with that of the major economies of the Euro area.

In relation to the population (as a measure of the potential transport demand), the Italian road and rail network is less extensive than that of France, Germany and Spain. Similarly, if we compare the minimum travel time between two territories, weighted for the population, we confirm a disadvantageous position of Italy against the European average, suggesting possible effects of congestion.

To measure the adequacy of the infrastructures of a country as a whole - not only those of transport - subjective evaluations are available, whose interpretation requires particular caution. For example, the World Economic Forum produces a synthetic index for 137 countries in the world; Italy is in the 58th place, distanced from all the major European countries. According to a similar survey (although restricted to European countries and municipal infrastructure) conducted by the European Investment Bank in 2017, Italy would have a quality level similar to that of Spain but lower than that of France, Germany and the average European Union (Table 2.6).

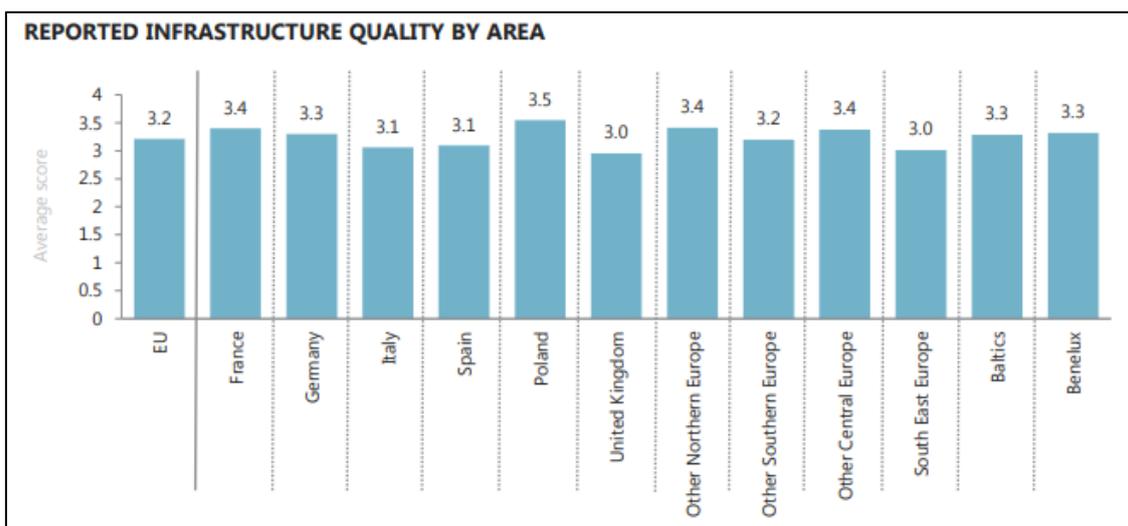


Table 2.6 - EIB Group Survey on Investment and Investment Finance 2017

Overall, a divergence can be noted between the indicators suggested by historical spending and what can be deduced from more analytical indicators of network adequacy (a delay of Italy compared to other European countries emerges only from the second group of indicators). It could be assumed that this divergence is also due to a lower "efficiency" in the realization of the works. As noted above, efficiency is a key variable in determining the macroeconomic impact of investment spending, both in the short and long term.

#### 2.4.3. Realization of works

According to the audit conducted in 2018 by the European Court of Auditors, Italy is the EU country with the highest construction cost for the high-speed rail lines already completed (€ 28 million per kilometer, compared to 12 for the Spain, the 13 from Germany and the 15 from France). If the projects already completed add up those in progress, the cost per kilometer for Italy rises to € 33 million, against the € 14 million of Spain and the € 15 million of Germany and France. Our country also records the most consistent delays on completion times.

Surveys conducted over the past decade indicated average costs per kilometer for our country and high-speed production times approximately three times higher than those of France and Spain, while the average costs per kilometer of the motorways were more than double compared to Spain. With reference to the main projects co-financed by the

European Regional Development Fund, those analyses indicated that for Italy execution delays amounted to more than three times the European average and cost increases exceeding double. These are differences whose extent is not justifiable only on the basis of the different conformation of the territories.

The different phases of realization weigh in a different way. The so-called “crossing” times have a high impact on the timing, that are the time intervals between the end of a procedural phase and the beginning of the next (for example, planning and assignment of the works) or between them sub-phases (for example, preliminary, definitive and executive planning). These intervals, which at least partly reflect administrative activities and inefficiencies, represent on average about 54 per cent of the total duration (this value rises to 60 per cent by looking only at the design phase). In recent years, the average time taken to complete the works has grown. The increase concerned exclusively the phase of assignment and execution of the works, while the duration of the planning phase remained substantially unchanged.

The short-medium term macroeconomic impact of an increase in public investment resources could be greater for funding aimed at accelerating interventions already in place than at the start of new initiatives. In a structural perspective, it is essential to rationalize the entire process of planning, evaluation and monitoring of the realization of the works. Improvements could derive from more accurate analyses of the costs and benefits of the works to be carried out during the selection phase. Greater attention to the quality of design, especially for more complex interventions, can increase the effectiveness of public investments, while lengthening design times. In particular, it can lead to an acceleration of the successive phases, contributing to stem the phenomenon of renegotiation of the offers, among the main causes of time dilation (and rising costs) of works execution.

#### *2.4.4. Sustainability of the public debt*

In Italy, the allocation of infrastructure is inadequate, or it risks to become so due to lack of maintenance. At the same time, it appears evident that the necessary interventions must be accompanied by incisive improvements in the selection, planning and implementation of public works: the infrastructural delay of our country compared to the other main economies does not derive exclusively from the insufficiency of financial resources.

Given the high ratio of public debt to product, Italy must make the best use of resources: only in this way the increase in expenditure can be consistent with debt sustainability. Instead, recourse to the deficit should be used with caution.

Increasing investment spending by financing it in deficit, without affecting the growth potential, would provide only temporary benefits. By reducing the primary surplus by one percentage point of the product compared to the current level, the incidence of debt on GDP would be slightly reduced thanks to the expansionary impulse given to the level of economic activity. However, without an increase in economic growth in the long run, the debt-to-product ratio would soon increase again, even in the absence of negative reactions on the financial markets. The situation would be different if the resources obtained with the greatest deficit were used to increase the potential for growth and if the risk premium on Italian government bonds were reduced: with an annual growth higher than one point, the debt-to-product ratio would start on a stable, albeit not particularly rapid, path of decline.

Above all, the risks to which, given the high public debt, an unproductive deficit increase would expose should not be underestimated. A negative market reaction would trigger a rapid increase in the debt-to-product ratio. Considering the negative impact on economic growth exerted by the increase in interest rates and the crisis of confidence, the relationship would soon be placed on an unsustainable trajectory.

## **2.5. EU regulation**

After the global financial and economic crisis, the EU has suffered low levels of investment. Collective and coordinated efforts at European level were needed to reverse this trend and put Europe on the path to economic recovery. Now, thanks to the Juncker Plan and the EFSI, adequate levels of resources are available, to be mobilized across the EU to support investment.

In the context of the European Commission's interventions to support the real economy, a trend had already emerged towards a shift from non-repayable public grants to innovative financial instruments and resources that must be returned to lenders.

The Juncker Plan aims to finance riskier projects, which are currently lacking resources, with the aim of strengthening the growth prospects of the European economy.

To this end, the European Fund for Strategic Investment Fund has been set up. The EFSI is an innovative financial instrument to promote projects that attract private investors. It should serve as a guarantee, whose role is to increase the European Investment Bank's (EIB) capacity to take risks, so that it can invest in riskier projects, as required by many Member States. In a way, the EFSI fund would function as a kind of EIB section dedicated to riskier projects.

The idea of the Plan is therefore to use public financial resources as a buffer to absorb part of the potential losses of investment projects, so that such projects, previously assessed as too risky and not sufficiently profitable, can become profitable for private investors.

EU Regulation 1017/2015, approved at the end of June 2015, made the Juncker Plan and the EFSI operational. The Regulation outlines, among other things, the governance of the EFSI and the criteria for choosing investments.

The process outlined in the Regulation highlights the EIB's central role in project selection. The Investment Committee, on the other hand, decides on the access of individual projects to the EU guarantee. The Investment Committee also uses information drawn up by EIB experts, but this information is not binding for the granting of the guarantee.

The Regulation lays down a number of mandatory principles that must guide the choices of the Investment Committee in the selection of projects. The selection criteria are, according to the Regulation:

- additionality, i.e. the need for EFSI support to go to operations addressing market failures or sub-optimal investment situations (which could not have been financed in equal measure);
- compatibility with EU policies, including the objective of smart, sustainable and inclusive growth, the creation of quality jobs, and economic, social and territorial cohesion;
- the technical and economic viability of the projects;
- the ability to mobilize private capital when possible.

The Investment Committee, its existence and role are consistent with international practice, which requires an "independent assessment" of proposers or stakeholders. Based on the findings of the Investment Committee's investigation, the EIB gives its opinion on the guarantee, and may decide, by separate procedure, to finance, from its own resources and without the use of the EU guarantee, a project that has not been considered eligible by the Committee.

The European Commission uses the Cost-Benefit Analysis for the evaluation of intervention projects in the case of structural funds and international cooperation. In 1997, the Commission drew up a Guide to the Costs and Benefits Analysis of Major Projects, which provides some indications for the implementation of the analysis. The guide is divided into two parts: one general and one analyzing sectoral issues.

In order to make the analysis more consistent and comparable, the guide provides for a homogenization of the calculation methods for financial and economic analyses. Another important innovation is represented by the result indicators, such as NPV and IRR, which influence the calculation of the Community co-financing rate.

### ***3. EVALUATION PROCESS***

#### **3.1. How to evaluate an investment**

The evaluation of investments uses special techniques of an economic and financial nature to establish the acceptability of a project with respect to pre-established standard values and to compare alternative projects, i.e. to determine a list of priorities among several investment proposals. The effectiveness of a project is given by direct and indirect, tangible and intangible returns. The efficiency must be estimated as a ratio:

- to the project's economic return;
- to the economic benefits produced;
- to the non-economic returns and their effects on resources.

The ex-ante assessment of needs is based on a comparison between supply and demand for infrastructure and services, carried out over a period of several years (typically one hundred years or more), and aims to identify the interventions, consistent with the strategies of the general plan, to be submitted to the analysis of technical, environmental and economic-financial feasibility, aimed at filling the supply gap to meet the demand and to achieve the strategic objectives that the State has set itself. The investment requirement responds, in fact, to the need to satisfy the demand of passengers and goods: not only the current one but also the future one, foreseen in the light of the evolution of the demographic and socio-economic context, both national and international. Any "unfulfilled demand" will require an adjustment of the current project, in order to guarantee an adequate level of service. This can be done through the realization of new works or interventions of technological and managerial nature (for example, the speeding up of a railway line, the rationalization of port and airport connections, the increase of services, etc.).

The needs analysis is aimed at identifying the distance between the chosen indicators and their level, consistent with the full satisfaction of the strategic objectives and interventions on the system, of a technological or infrastructural nature, necessary for their achievement, to be submitted for feasibility study. Further needs in investments may also derive from the need to intervene on the performance of the infrastructure in terms of

safety, maintenance levels, reduction of environmental impact and technological updating.

From an operational point of view, the ex-ante evaluation of needs involves the following steps:

1. the feasibility analysis;
2. the convenience analysis;
3. the economic analysis, usually a cost-benefit analysis.

### *3.1.1. Evaluation techniques*

There are several techniques and methods for the evaluation and these are used for assessing when the invested funds return. Evaluation is simpler for direct financial investment that leads into clearly measured outcome: the profit. In practice, however, we have kind of investments where a direct financial result may not be clear at first sight or in the short term. This analysis can be carried out using different economic indices, which can be distinguished into static methods and dynamic methods. Static methods focus especially on monitoring of cash benefits or measuring of the initial expenditures. They do not include a risk factor and consider the time only in a limited extent. Among them, we find:

- Average Annual Return, a ratio of all cash flow related to investment and number of years of lifetime of the investment;
- Average Payback Period, a method that indicates in what time the initial investment should be repaid (at a uniform implementation of cash flows);
- Average Percentage Return, a method that indicates the percentage of invested capital that average annually returns;
- Payback Period, the number of years that are needed to make the cumulative cash flows from the year 1 offset the investment, thus it is the number of years, after which the investment will return.

On the other side, dynamic methods take into account the time and risk factor, the basis is discounting of input parameters. These are:

- Net Present Value, one of the best and most widely used financial criteria. It is included in it the whole life of the project, also the possibility to invest in another equally risk project;
- Internal Rate of Return, an indicator for relative yield (profitability) that the project provides during its lifecycle;
- Profitability Index expresses the ratio of benefits to initial capital expenditures;
- Accounting-Based Profitability Measures are calculated as the ratio of the estimated profits and the average net book value of the investment.

### *3.1.2. The feasibility analysis*

In the evaluation of an investment, various analyses are involved, aimed at identifying what the final result could be, both in terms of feasibility and in economic terms.

A crucial moment for the correct approach of a public work is the formulation of the feasibility. Robust analysis is needed in the main steps of the preliminary economic-financial analysis: demand analysis, management and financial sustainability, the role of public contribution, risk analysis and measures of socio-economic impact on the territory of reference.

The feasibility study will proceed to a careful analysis of the costs of the intervention, identifying, where possible, parametric costs or unit costs, incurred for similar interventions in similar territorial areas, given that an incorrect estimate of the same may result in the removal from the Multi-Annual Indicative Planning Document by the Ministry.

The firm will also have to provide information on the assumptions made for the determination of the timing of the work, with particular reference to the duration of the phases of design, contracting and execution of works. Similarly to the cost estimate, the duration of the main implementation phases must also be based on a detailed comparative analysis carried out with reference to similar interventions.

Due to the criticalities reported, the financial assessments are destined to undergo continuous adjustments, even after the conclusion of the contract or concession, becoming a not always reliable benchmark for judging the sustainability of an

intervention. The tools of the ex-ante evaluation of projects in Italy require guidelines that make them effectively mandatory and applicable.

The regulatory interventions have sometimes been characterized by intermittent dynamics, by incomplete application, by the lack of concrete sanctions for entities that do not complete the required evaluation process. The technical-economic tools supporting local administrations in the performance of their planning and management supervision functions are lacking.

The functions assigned to a feasibility study derive from its placement in the project cycle. Positioning itself downstream of the identification of a need and the consequent formulation of an idea-project, but upstream of the decision to satisfy it through a specific intervention, the feasibility study should be conceived and carried out in such a way as to transform the initial idea into a specific intervention hypothesis, through the identification, specification and comparison of two or more alternatives capable of grasping different ways of implementing the original idea and through the production of information to allow the competent political-administrative authority a well-founded and motivated decision.

Feasibility studies should therefore be interpreted as investments in the production of information and knowledge and should be capable of producing recommendations, without replacing the final political judgment.

The feasibility analysis must be based on a first set of intervention hypotheses that can be reduced or expanded, or in any case better specified through the same analysis. Apart from the need to explore the technical-engineering feasibility of the proposed interventions, the analysis must identify characteristics, intrinsic or external, that could hinder the realization of the investment, prevent its operation or reduce or compromise its social desirability.

In short, the feasibility analysis should aim to ascertain whether the proposed design hypothesis appear feasible, i.e. both materially feasible and financially sustainable and compatible with the capabilities of the competent Administration, and should help to lay the foundations for the actual design of the solution that will be accepted by the Administration, suggesting the necessary insights for greater operational effectiveness.

Feasibility studies should be carried out in such a way as to make it possible to reduce the degree of complexity of public choices by identifying the impacts of an investment that can be objectively assessed, without, however, preventing PAs from exercising their discretion, which can be verified through the various analyses carried out.

### *3.1.3. The convenience analysis*

An investment can be considered significant if it appears capable of contributing to the satisfaction of a specific set of needs, abstractly considered worthy of being satisfied, and consistent with the policy framework adopted by the decision-maker.

The convenience analysis, the second step in the evaluation process, should ascertain whether a significant and abstractly feasible investment hypothesis is also desirable, i.e. whether the public financing, estimated through the analysis of the feasibility conditions and necessary for the activation of the investment (realization and management of the work or of the set of works), is or is not justified on the basis of its expected performance.

More in detail, the convenience analysis should suggest to the decision-maker a ranking of design alternatives, based on feasibility and the ability to ensure adequate performance. Depending on the case, the set of alternatives will include the different ways of implementing the original idea or abandoning the idea itself. As this is a public investment, the judgement should be based on the social return of the intervention and on sufficient conditions to affirm its social utility.

Since these are public investments, the judgement of convenience must be based on criteria and parameters of evaluation typically different from those that would be adopted by a private entity. It is therefore a question of ascertaining the social return of the intervention, since its capacity to ensure an adequate financial return is not a sufficient and sometimes even necessary condition for affirming social utility. The judgement of convenience must be based on a comparison or synthesis of benefits and costs attributable to the different ways of implementing the original idea of the project.

In general, benefits can be defined as the results of the proposed interventions, which appear to be in line with the objectives pursued by the decision-maker or by the financier; costs as well as the impacts that would lead to a deviation from these objectives.

Both the identification of significant impacts and the attribution of a sign to them presuppose an explicit definition of the objectives pursued through public investment, since without such definition the judgement of convenience would be exposed to ambiguity and arbitrariness. Due to the frequent non-explanation of objectives, the editor of the convenience analysis is often asked to make an effort to interpret the wishes of the decision-maker and to carry out an economic evaluation (such as the cost-benefit analysis) with the aim of maximizing the collective well-being.

### **3.2. CBA: Cost-Benefit Analysis**

Another type of analysis often used to deal with market failure and the need for public intervention in decision-making is economic-financial analysis. The Cost-Benefit Analysis (CBA) is a technique used to predict the effects of a public investment, verifying whether, with the implementation of the intervention involving resources to which the market is not able to attribute a price, the company obtains a net benefit or cost.

Among the European countries, the culture of evaluation in Italy is almost non-existent, whereas in the other countries adoption is more widely considered. While in the past the instrument was not used at all and the decision was only in the hands of the decision-maker, in the recent years, we are witnessing a paradigm shift and in the public and private sector the use of the CBA has become a common practice.

The Cost-Benefit Analysis is one of the main tools for measuring the efficiency of investments; it quantifies the anticipated costs and benefits of a program or project with the aim of comparing them and determining whether the benefits outweigh the costs. Each choice produces advantages for some and disadvantages for others and the public decision-maker assesses which interests, among the various involved, deserve to prevail, basing his judgment on criteria of a financial nature and of cheapness and social convenience.

The CBA is an analytical tool for judging the economic advantages or disadvantages of an investment decision, for assessing the welfare change attributable to it and, in so doing, the contribution to EU cohesion policy objectives. The purpose of CBA is to facilitate a more efficient allocation of resources, demonstrating the convenience for society of a particular intervention rather than possible alternatives.

The issue of Cost-Benefit Analysis, the adoption of which is exclusively a political (and therefore discretionary) choice, usually promoted by the government for many large public investments, is of lively political relevance.

A detailed evaluation of the planned investments would necessarily take a very long time, but it is possible to take prudential decisions immediately. In fact, over the years, simplified analyses have been elaborated for the main works in the project, which provide

sufficient elements at least to foresee a stop to the authorization's procedures for new expenditures.

In the practice of evaluating the investments to be selected, the theory (as well as the practice) seems to be stuck at the CBA, even if it takes into account externalities, direct employment impacts, and the marginal opportunity cost of public funds.

The CBAs are a support in the choices and do not bind the political decision-maker, who can always depart from the results contained in them. However, they are useful and necessary to measure the economic and social impact of projects and their convenience. Even if Cost-Benefit Analysis are an exercise of limited rationality that does not require an optimization of choices, they are considered as a reliable test that allows a reasoned selection of projects and their alternatives.

For the purposes of the growth effects, in some cases it could be much more effective to use more direct analysis, such as the comparative added value analysis, which we will see later.

The CBA consists of two parts: a financial analysis and a social-economic analysis.

### *3.2.1. Financial analysis*

The financial analysis, preparatory to the economic one, analyzes the monetary flows, that is, the movements of money, and looks at the project from a particular point of view, generally that of the promoter, but which can also be that of the different stakeholders, among which there is the State. It is in this part of the analysis that phenomena such as variations in the turnover of companies or in tax revenue must be adequately represented and evaluated.

The financial analysis makes it possible to assess the sustainability and financial performance of the project by aggregating the items in the company's financial statements and aims to establish whether the project will be able to generate a sufficient flow of revenue to cover expenditure as it occurs.

The most common method used to aggregate the values of the financial analysis is that of discounted cash flows. This method records all the actual disbursements or monetary revenues generated by the project over the project's lifetime (the time horizon) and aggregates them, by discounting future values, with an appropriate discount rate.

### *Discount rate*

The choice of a discount rate is very important in the NPV analysis. The minimum attractive rate of return (MARR) is usually the minimum acceptable discount rate the investor is willing to accept for the risks associated with a given project. In general, the MARR can be represented as:

$$MARR = r_f + r_i + r_r$$

where  $r_f$  is the “risk-free” interest rate offered by a reliable source such as a government bond or a similar security,  $r_i$  is the inflation rate, and  $r_r$  encompasses market risk, industry risk, firm specific risk, and project risk.

Thus, the minimum attractive discount rate for a given project may or may not be appropriate to use for another project. If two projects are very similar in capital structure and risk, then it may be appropriate to use the same discount rate. However, it is often the case that projects are of varying levels of risk and this must be reflected in the choice of discount rate; the discount rate is the primary means of capturing the risk associated with a project.

To ensure the verification of financial sustainability, the analysis is functional to assess whether, and under which conditions, the project assumptions appear feasible, from the point of view of financial costs and revenues, and to provide initial project feedback on the financial aspects of the chosen alternative, depending on further analyses to be carried out.

When reorganizing financial information, various items which do not correspond to actual cash inflows or outflows, such as depreciation and amortization and reserves, must be excluded. In addition, at the end of the relevant time horizon, the residual value of the investment, which can be calculated as if the investment were to be sold, must be taken into account among the incoming items.

The financial analysis ends with the calculation of the summary result indicators and the verification of financial sustainability. The return on intervention, measured by synthetic indices such as the Internal Rate of Return (IRR) and the Net Present Value (NPV), can be calculated for the project or for the capital invested.

The project's return measures the ability of operating revenues to cover investment costs. It indicates the return on real resources invested. It is calculated from the revenues generated by the project and the management and investment costs.

The return on capital measures the ability of the project's revenues to guarantee a return on the project's financial resources, regardless of all the resources used. It is calculated as the difference between the operating income and the equity invested, the interest paid on the loan and the operating costs.

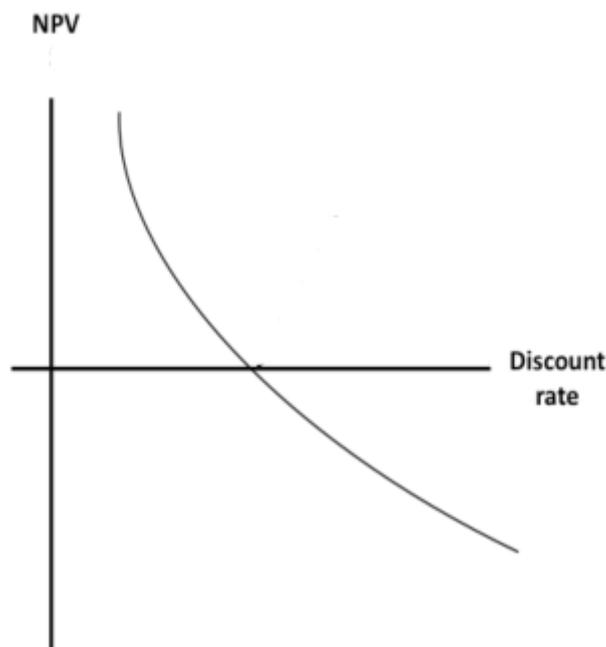
### 3.2.1.1. Net Present Value (NPV)

The net present value is the sum of the discounted cash flows at an appropriate discount rate. It is defined as:

$$NPV = -C_0 + \sum_{i=1}^T \frac{C_i}{(1+r)^i}$$

where  $C_i$  is the cash flow balance of year  $i$ ,  $T$  is the time horizon and  $r$  is the discount rate.

The NPV measures the discounted value of the net flows generated by the investment. Since there are likely to be negative flows in the first few years, due to initial investment expenditure, while revenues will occur in subsequent periods, the choice of time horizon and discount rate affects the calculation, as shown in the figure.

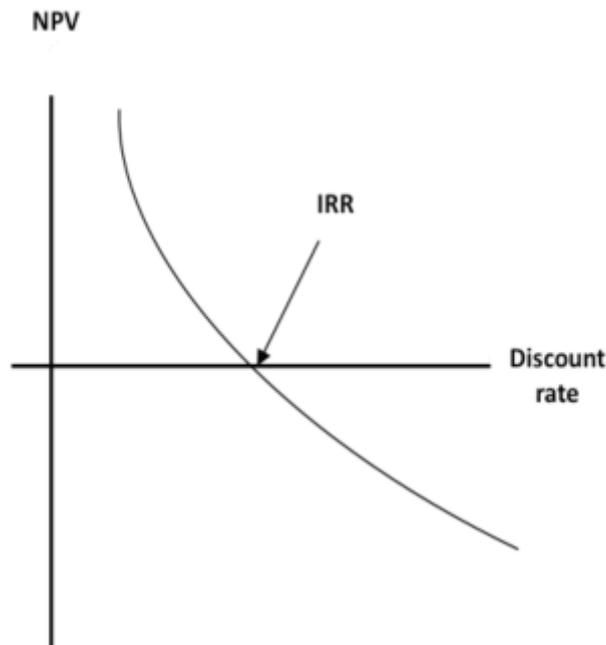


The NPV can be used to screen out irrelevant design alternatives, as a  $NPV > 0$  indicates that the project generates a net benefit and is desirable: the higher the NPV, the greater the attractiveness of the project.

### 3.2.1.2. Internal Rate of Return (IRR)

The internal rate of return of an intervention is defined as the value of the interest rate that eliminates the NPV, as the formula:

$$IRR = NPV = \sum_{t=1}^T \frac{C_t}{(1+r)^t} - C_0 = 0$$



The IRR can be interpreted as the maximum value that can be assumed without generating a net loss compared to alternative uses of capital. Although the IRR may be used as a criterion for assessing the appropriateness of a project, it may sometimes have ambiguous cases, which cannot be assessed without the help of the relevant NPV of the project.

### 3.2.1.3. *Ranking techniques*

It is common for the IRR and NPV approaches to produce the same ranking of projects. However, IRR ignores the capacity to reinvest and captures a project's rate of gain, but not its size. Thus, a more appropriate method is to use IRR and NPV complementarily instead of independently. This method involves the use of the IRR, requiring it greater than the MARR limit, to give an idea of which projects should be explored, and then the use of the NPV analysis to further narrow the list by choosing projects in descending order of NPV.

It is important to remember that IRR is defined in terms of NPV, and that NPV captures everything the IRR method does, and more. Thus, if a project cash flow has the greatest

NPV but not necessarily the highest IRR, it is opportune to verify the equity capital net cash flow profitability. Once the debt leverage has been determined for a project, the equity cash flow includes cash outflows related to the equity investment into the project and the later net income cash inflows: then the higher Equity NPV project should be chosen. Also, while the NPV of a project is unique and well-defined, the IRR of a project can be ambiguous. This can occur, for example, when a project exhibits significant alternating periods of high future expenses and revenues.

Methods other than IRR and NPV are sometimes used to quantitatively evaluate projects. The minimal length of time for a project's benefits to repay its costs, or the project's payback period, is sometimes used as a secondary assessment. This method and its discounted version, the capital recovery period, ignore the costs or benefits occurring after the payback period. These methods are typically used in an informative manner rather than as a comparison and decision tool.

Discounted cash flow analysis assumes some certainty regarding future cash flows. The discount rate attempts to capture any uncertainty stemming from the risk of a given project, but the valuation produced is only as good as the estimates and projections provided.

Furthermore, discounted cash flow analysis considers only quantifiable monetary benefits. The social benefits occurring from the construction of schools or hospitals, or the strategic benefit of a long-term partnership or entry into new markets are further examples of benefits the analysis fails to capture properly. In such cases, benefits/cost ratios can be used to assess a project feasibility and accept if the ratio is greater than one (benefits higher than costs).

### *3.2.2. Social-economic analysis*

The second part is the social-economic analysis, which disregards monetary flows and accounts for "costs" and "benefits": it looks at the project from the point of view of the entire community of reference, neglecting the redistribution effects produced by the project and already highlighted in the financial analysis, and analyzes the performance of the real resources used in the project.

In economic analysis, "costs" are not "expenses", as they represent the consumption of resources diverted from alternative use. There is a complex methodology for assessing costs from expenses: these must be cleaned of what is not resource consumption, such as tariffs or taxes (which simply transfer a sum between two actors in the community), but also of the distorting effects that market imperfections can cause in the price system.

The costs of a work are usually broken down into:

- Investment costs: materials, expropriations, labour, transport and freight, extraordinary maintenance in the years of operation, etc.;
- Operating costs: ordinary maintenance, service costs, personnel costs.

Much more complex is the evaluation of the "benefits", that is, of the usefulness that the various subjects of the community as a whole obtain from the realization of the project. Since the analysis uses currency as a metric, all the effects must be expressed in currency: it is therefore easier for the goods and services treated in the market, which have a detectable price, and more difficult for the non-market effects, as many externalities. Therefore, the "willingness to pay" is used as an indirect indicator of the benefit. The passage presupposes in fact that all the subjects of the community have the same spending capacity, which is almost never true. Here, then, comes into play the "compensation" for the unequal spending capacity, making available essential or useful services, such as transport, to those who do not have sufficient economic availability.

Having accepted the simplification of using willingness to pay as an indicator of utility, we are faced with the problem of how to measure it. There are two ways: "revealed preference" and "stated preference". In the first case, we deduce from the behaviour of a subject the value that he attributes to the action; in the second case, we have to go and ask him, with direct surveys that subject the interviewee to different alternatives from which he will have to choose.

### *3.2.2.1. Externalities*

An externality occurs when a producer or a consumer influences the welfare of another consumer or producer, both positively and negatively, without this being reflected in market prices. Externalities limit the ability of prices to provide accurate information about the quantities to be produced or consumed.

There is a close relationship between externalities and public goods: like a public good, externalities generally give rise to a situation of non-rivalry in consumption and of non-excludability from consumption. Consequently, the price paid by a person for a given good or service generating external effects is not equal to the social value of the good or service itself, since it does not contain the component given by the value of the externality.

Among the most influential, environmental externalities are linked to the use of the environment as a resource and source of direct or indirect services. The quality of the environment generates potentially numerous social benefits, so the reduction in the quality of the environment reduces the quality of the services provided (air, water, etc.) and consequently, when this happens, the social benefits linked to their consumption are reduced.

Most projects generate significant direct or indirect impacts, both positive and negative, the intensity of which depends on the size of the project and the location. The externalities to be assessed as a matter of priority are effects on human health, soil and land productivity, water productivity and effects on income generation. Externalities may not have an immediate impact, but may be linked to the future availability of the resource or its existence.

The positive externalities include the increase in real estate values in presence of historical-architectural resources, the local development induced by the presence of commercial activities, and by the presence of a green area in front of the residence of some citizens, which increases the value of the property of the latter.

The value of an externality can be estimated through direct and indirect methods. With the former, a market is simulated by questioning a sample of the population about the willingness to pay for a good or service; with the latter, a market, in which goods or factors of production influenced by externality are bought and sold, is investigated. Among the most used techniques, there are:

- Consider the totality of protection expenditures incurred by consumers and producers, considered as an estimate of the value attributed to services by stakeholders;

- The requirement for the population to be willing to pay for a benefit or to contain or eliminate a loss.

The assessment of externalities has particular limitations, the main one being the uncertainty or unavailability of information concerning the phenomenon, which makes it difficult to assess the impact. Among the limits, we also find the impossibility for subsequent generations to express their point of view for decisions that concern them or are characterized by irreversibility. Particular importance is then assumed by the context and the techniques used, which make the analysis of externalities, and costs or benefits related to it, varying from situation to situation.

### 3.2.3. *Sensitivity and risk analyses*

The Cost-Benefit Analysis involves a certain level of uncertainty deriving from the assumptions made on the trend of the variables examined. The uncertainty in the estimation of the data and parameters used as a basis for the calculations must be assessed together with the other criteria of judgement. The tools supporting the CBA are the sensitivity and risk analyses.

Uncertainty can be described as a probability distribution: the high number of variables that influence the results and the complexity of the analysis that should be carried out make it necessary to select the critical variables, i.e. those whose deviation from the value of the best estimate most affects the result indicators.

The criteria to be adopted for the choice of critical variables change case by case depending on the project. The procedure generally followed is as follows:

- Identify the variables used to calculate outputs and inputs in financial and economic analyses;
- Carry out an analysis of the listed parameters to identify any dependent variables and exclude them;
- It is advisable to carry out a qualitative analysis of the impact of the variables, in order to select those that have a marginal or small elasticity;
- The elasticity of the variables is assessed by performing the calculations;
- Identify the critical variables, applying the chosen criterion.

To carry out the risk analysis, each identified critical variable must be associated with a probability distribution, defined in a precise range of values around the best estimate used in the base case for the calculation of the synthetic result indices.

The probability distribution may derive, for each variable, from different sources; the most common is the result of studies carried out to detect experimentally the values sought. After establishing the probability distribution of critical variables, the probability distribution of the project's IRR or NPV is calculated.

For the simplest cases it is possible to calculate with direct methods, such as analytical methods of probability calculation composed of several independent events, while for larger projects it is possible to use the Montecarlo method, applied with an appropriate calculation software, randomly extracting a set of values of the critical variables and calculating the indices from each group of extracted values.

The most useful presentation of the result is to express it in terms of the cumulative probability of the IRR or NPV in the range of the resulting values. The cumulative probability curve allows a degree of risk to be assigned to the project by verifying whether or not the cumulative probability is higher than a reference value, considered critical, and allows an assessment to be made of the probability that the IRR or NPV is lower than a given value, taken as the limit. For the evaluation of the result, it is important to achieve the compressed value in the preference for high risk and high social performance projects and low risk and low social performance projects.

#### *3.2.4. The use of the CBA*

The use of Cost-Benefit Analyses is a valuable tool to accompany public investment choices. To estimate the benefits of a work we are forced to use approximations, "spies", which can provide an approximation of something as vague as "the benefit that a consumer receives" from a service. The most consolidated of these "spies" is the so-called "generalized cost": the price, time and effort spent indicate that the benefit must be at least equal to their sum.

The distinction between financial and social-economic analysis helps to understand that, within the latter, the variation of a price or tax is not a consumed resource, and therefore

a "cost", but is considered in the total of the "perceived cost" as a "spy" to "estimate a benefit" (a clue that suggests how much that trip is worth for the user).

No one is insensitive to the effects that the project can produce on the state budget: the financial analysis will have the right space to analyze it and any positive change in the social surplus will indicate the presence of resources, created by the project, on which to apply, if necessary, a specific tax.

While in the financial analysis it is necessary to analyze the impact that the project will have on the budgets of the various managers, in the economic analysis it will be necessary to limit oneself to assessing the operating cost differential linked to the use of the service and the possible under-utilization of the fixed capital employed.

CBA are usually carried out at different stages in the project cycle. These are:

- a) **Ex-ante evaluation** carried out before the start of the program or project implementation. The aim of the CBA, based on projections of costs and benefits, is to guide the formulation of investment programs or projects to assess various options for achieving the targets set, as well as decision-making about whether to fund the proposed investment;
- b) **Medium term evaluation** carried out approximately halfway through the implementation period of the program or project. The CBA aims to provide information to managers of programs or projects on how the implementation is being carried out in relation to what was planned in terms of physical goals and their corresponding benefits, and the costs of implementation. The CBA results are usually useful for identifying areas that require particular attention and for reconsidering options for the management of the project;
- c) **Ex-post evaluation** carried out at the end of the implementation of the program or project to be evaluated. The CBA seeks to evaluate whether the investment as implemented was economically or financially beneficial, as determined during the ex-post evaluation. The results of the ex-post CBA are compared with the results of the ex-ante CBA and if there is a significant difference between the indicators of both, an attempt is made to identify the reasons for this difference. However, the same assumptions must be used during the ex-post CBA as during the ex-ante CBA. The analysis of the causes of any differences may be useful for identifying

factors of success or failure and generating information which may be useful for a new stage of the program or project.

This analysis helps to make informed choices, i.e. it provides the decision-maker with the basis on which to base his or her assessments.

Moreover, the transparency of the analyses process, of the criteria adopted and of the motivations underlying the final determination makes the choice democratic, and therefore negotiable by the people, who have given the mandate to the decision-makers. In other words, the technical analyses, if made public and conducted on the basis of parameters made known, are useful to ensure that anyone can know how much the more specialized motivations have affected the final resolution and how much, instead, the more political reasons. These analyses have no binding value in any case, as the choice remains with the decision-makers.

### *3.2.5. Limits of the analysis and the EU directives*

The conclusions of all Cost-Benefit Analysis depend on who sets the assumptions, so if the new CBAs are based on different assumptions than the previous CBA, they will produce different results. However, if the analysis process - including assumptions, evaluation criteria and elements considered - is made public, any interested party can verify the validity, completeness and objectivity of the examination.

Different methodological approaches and parameters lead to different results: since 2008, therefore, the European Commission has developed guidelines. Since 2011, standardized analyses are mandatory (D.Lgs. 228/2011) for all projects financed by the ministries, which were required to prepare guidelines by 2012 for each infrastructure sector. The guidelines were, and are, intended to provide the evaluators with the accepted methods, the procedures to be followed, as well as parameters and assumptions by the decision-makers. The Italian Ministry of Infrastructure, for the same reasons, also issued its own, consistent with the European ones. Following these indications has several advantages: it makes the results homogeneous and comparable and reduces the possibility of manipulating the instrument.

There are numerous ways of interaction between decision-makers and technicians, in order to clarify all the steps of the analysis, to agree on the parameters to be used and

jointly verify objectives and assumptions. In doing so, the analyses carried out represent a set of knowledge and information and not a mere rivalry between technicians and decision-makers.

The results of this analysis should be considered in conjunction with the results of other analyses, for example on employment impacts, but above all on legal profiles, in particular on the possible penalties to be paid to those claiming damages resulting from the interruption. In other words, the various competing analyses will serve to calculate, for the purposes of the final decision, how much money has already been spent on the works not completed, how much money has still to be incurred, how much it would cost to withdraw from the contracts and what is the economic value of the benefits assumed.

As stated above, the CBA is not binding, the decision-maker can depart from it and the final resolution remains discretionary: therefore, there are no “technical” alibis to hold against a responsibility, which in any case remains “political”.

The limits of the analysis may include the objective itself, implicitly attributed to public intervention, which inspires the economic assessment. Since this is an analysis to establish a positive net balance between benefits and costs, any distributive consideration is irrelevant, so that a positive judgement must be interpreted as meaning that the gains exceed the losses, so that it would be possible to fully compensate the injured parties. For the purposes of the final judgement, it is not necessary for the potential compensation to become actual compensation, as it is a purely political judgement.

Since collective choices are not based on considerations of efficiency, but also incorporate considerations of distribution, the results of an economic analysis should always be accompanied by a description of the distribution of impacts (positive and negative), so as to allow the decision-maker to make an independent judgment on the social desirability of the proposed interventions.

Another limit is the difficulty of dealing with the time variable. The costs and benefits produced by the realization of a public work, in fact, do not occur at the same time, but are staggered over time in a period that can be many years. In order to homogenize the valuations over time, it is necessary to update the values considered using discount factors. This choice plays a delicate role that can significantly influence the final results of the analysis.

Other limits arise, or may arise, from certain operational difficulties. The concept of collective efficiency requires the quantification of all real economic effects (all impacts likely to affect positively or negatively the welfare of members of the community) including those without an explicit monetary manifestation.

### *3.2.6. Advantages of the CBA*

The main advantage is that the analysis requires the adoption of a coherent and comprehensive evaluation framework and the identification of all the real socio-economic effects of the project. If carried out by experts, it presents the adoption of a well-defined set of evaluation parameters. These may be judged, in whole or in part, to be inadequate or unsatisfactory, but have the merit of being verifiable and linked to a well-defined set of assumptions and value judgments.

Since the evaluation concludes with the production of certain investment performance indicators, it makes it possible to deliver a result that is easy to interpret and capable of allowing comparisons between different investment options. This is particularly important when the investment is intended to compete with other uses of public funds.

Finally, if carried out rigorously, the implementation of a CBA has the advantage of helping to make the exercise of discretion by the decision-maker or the public lender verifiable.

### *3.2.7. Mitigation and compensation*

One of the main objectives of an impact analysis carried out in parallel with the design of a project is the possibility of avoiding, or minimizing, negative impacts and enhancing positive ones. To this end, continuous interaction between impact analysts and project designers is necessary.

Mitigation and compensation works are based on the principle that each intervention must be aimed at improving quality or at least must ensure that there is no decrease in such quality. From an environmental perspective, the landscape report identifies the proposed improvement measures, the mitigation and compensation measures and indicates the various alternative solutions examined and, at the end, the project proposal chosen from among them.

Mitigation works can be either immediate or carried out over time, they are directly related to impacts (e.g. noise barriers) and may have a different degree of ability to counteract the negative effects of the intervention: cancellation, reduction and rehabilitation.

Mitigation measures can be defined as "measures designed to minimize or even eliminate the negative impact of a plan or project during or after its implementation". Following the impact analysis and the identification of all the mitigation measures to minimize negative impacts, it is appropriate to define which measures can be taken to improve the condition of the environment concerned, by compensating for the impacts.

To this end, the project is also associated with the implementation of compensation works, i.e. works with value not strictly related to the impacts induced by the project itself, but carried out to partially compensate for the damage produced, especially if not fully mitigated.

The compensation measures do not reduce the residual impacts attributable to the project but replace an resource that has been depleted with a resource considered equivalent (for example, environmental restoration or measures to mitigate the social and environmental impact). In the case of localized projects, these are mainly aimed at the inhabitants of the area, who often have fewer benefits as a result of the intervention.

Since it is very close to impossible to find a policy measure that improves the situation of all, it is necessary to measure individually the gains and losses of well-being. In this case, compensation can also take the form of infrastructure (e.g. hospitals or green areas) and its value should reflect the difference between the overall and local costs and benefits.

A first way is to observe what people are willing to pay for a certain product. The degree of individual preference is given by the willingness of individuals to pay in exchange for a given product. A second methodology is to measure what individuals are willing to pay to avoid something they do not like or, similarly, how much they are willing to accept a reward to tolerate a product or service.

Once we have defined these parameters, and the improvements or deteriorations in terms of the well-being of individuals, we can imagine compensating individuals for their losses. Compensation is defined as the sum of the differences between the benefits and

costs of two different groups of individuals. Once an economic value has been attributed to the investment, it is possible to proceed with the compensation.

The projects submitted must include all the mitigation and compensation measures necessary to reduce the residual negative impacts and to establish a positive balance of the work. The mitigation and compensation works must be included in the design of the interventions and must take into account the criteria of integration of the infrastructure. For the identification of the best techniques, the use of the technique with the least impact must be envisaged, with the same technical, functional and naturalistic result.

The in-depth examination of the environment allows a more complete understanding of the need for protection and safeguarding. Protecting does not mean preventing any type of change: modelling and transformation interventions must be also reconciled with the conservation of biodiversity and with the natural dynamism of the landscape.

Mitigation and compensation interventions, although designed to minimize the effects of a project mainly on a component and/or environmental factor, can be effective against multiple components and/or factors.

### *3.2.8. Summary of the CBA's use*

In short, the correct use of the results of a CBA for the purposes of the final decision presupposes the responsibility of the editor to:

- Make explicit the objective assumed for the analysis;
- Accurately explain the assumptions, with a particular view on those underlying the monetary estimation of the impacts associated with the individual project alternatives;
- Identify appropriate confidence intervals for critical assessment parameters and develop a sensitivity analysis to illustrate the stability of the results obtained, or their sensitivity to the parameters adopted;
- Describe the real impacts, associated with the planned interventions, not accounted for in the economic analysis, possibly quantifying them through appropriate units of measurement.

### **3.3. Added Value analysis – an alternative to CBA**

The added value (AV) represents the way in which the economic wealth produced is distributed to stakeholders, thus highlighting the direct economic impacts produced for businesses and employment. For the purposes of the growth effects, it seems more effective to use analyses such as those of AV. These analyses can only be comparative as they always give positive results if used for individual projects, as opposed to CBA. For this reason, however, the non-comparative use of value added analyses is generally favoured by policy makers to obtain positive results for their discretionary spending choices.

AV valuations are based on the sum of labour and capital remuneration generated by a public investment and measured according to input-output tables.

In the investment choices made in Italy in previous years, there is no trace of disaggregated AV measurements. In the transport sector, for example, a number of multi-year investments are on the table that have never been evaluated even in terms of cost-benefit.

To clarify further: a revision of a national investment plan based on the AV method would give very different results than those obtained on the basis of the CBA, as the priorities would probably shift towards investments more oriented to the productive reality. Moreover, an optimization to given resources would shift the choices towards those with the greatest prospects of financial returns, i.e. with lower net public costs for the same added value.

If the government were to shift more spending towards investment, it would have to proceed quickly to simplified forms of comparative assessment of AV, also in order to support the debate on priorities in a transparent manner. If public resources are scarce, it is first a question of paying the highest attention not to waste them, but it is also a question of transparency, and therefore, in the end, of democracy in the choices made.

### **3.4. Conclusion on the evaluation process**

The evaluation of public investments has an essentially informative function: it produces information for a plurality of subjects. First of all, the evaluation provides a basis for information to the political decision-maker, both in the ex-ante evaluation phase and in the ongoing and ex-post evaluation phases. It also provides information to those called upon to implement political choices, mainly to the managers who find useful information in the evaluation to verify their ability to pursue the objectives assigned to them by politicians. Finally, the other stakeholders (mostly the citizens) can also find in the evaluation of investments an important source of information to verify:

- the consistency between the content of electoral and government programs and the choices made;
- the amount of public resources allocated to investments;
- the capacity of planned and implemented investments to meet the needs of the community.

In general, there is more and more of a design solution to meet a given need. The different alternatives should always be considered and evaluated to see if there are more efficient and effective ways to respond to that specific need. Each alternative should be assessed against a reference scenario, i.e. the scenario that does not include the intervention in question and that must be consistent with the development assumptions made during the needs assessment phase.

The non-intervention solution, often referred to as "do-nothing", serves as a reference for estimating demand, financial and economic costs, revenues and benefits of the project and other possible alternatives.

It is important to underline that the reference scenario must be defined with care and realism: in fact, if it includes too many interventions, it will tend to make no investment profitable; if it does not include any, it will risk amplifying the benefits of any project. Also for this reason, sometimes the reference solution is also referred to as the "do-minimum" scenario, i.e. the scenario that provides for the investments and maintenance necessary to keep the existing system in operation without excessive deterioration.

## ***4. DECISION-MAKING PROCESS***

In short, this is a process that structures the field of choice by reducing the concrete options available and that leads to the formal adoption of the policy or to the “do-nothing” phase. The decision-making phase can be summarized as a small number of alternatives and a small number of actors including politicians, judges and government officials with the power to take authoritative decisions in the management area.

In most cases, the process of analyzing an investment is conducted on a set of investment projects and not on a single investment. It is then a matter of making two types of decisions:

- Selection: the choice between several alternative investments;
- Preference: a sequence of investments must be determined on the basis of their priority, from what appears most necessary to what appears most superfluous.

The process of choosing an investment project is quite complex, since it is not limited to the phases of analysis and decision, but also includes phenomena of social interaction and political negotiation. The process can be divided into two stages:

- **Decision-making process**

In addition to the use of mathematical models for the analysis of an investment project, it is important to identify the information needed for the analysis and to obtain it in an appropriate manner. In the research phase, it is important to consider both qualitative and quantitative aspects, while in the survey phase it is good to involve all those who can provide suggestions and relevant analysis, trying to integrate different experiences and opinions.

The fundamental requirements for an effective information gathering process are the completeness, accuracy and measurability of the information and the evaluation of the cost of the investment analysis process.

It is important to bear in mind that the decision results are affected by many uncertain and time-varying parameters, so a decision made today will certainly not be the same as a decision made tomorrow.

- **Control of results**

This phase is a critical reading of the actual results achieved, so as to allow the company to activate processes of organizational learning around the activity of investment analysis. The aim is to improve the process of analysis and decision-making in an incremental way, reducing errors and increasing the skills and experience of all operators involved in the process. The control of the results allows the evaluation of the actual performance of the investment and the correctness of the methods of analysis of the investment.

For this phase to be successful, two important constraints must be respected: the objectives expected to be achieved through the investment must be defined in advance and the evolution of the context in which the company will operate must also be defined.

Finally, it is possible to take any corrective action: in the case of individual projects, the management rules can be modified and, in the case of larger projects, the activation plans for subsequent investments can be modified.

The public policy to be evaluated is seen as a set of actions directed at a given segment of the population to modify one or more of its conditions. The beneficiaries can be the community as a whole, or a group of geographical areas, or certain groups or categories of subjects, such as individuals, families, businesses, territorial authorities. A public policy can obviously make use of a multiplicity of instruments: it can use a targeted transfer of resources, an imposition of obligations or prohibitions, a supply of services to certain users, an incentive that wants to favor or inhibit a particular behavior, and a communication campaign that tries to change a certain attitude. Moreover, it can be a more or less complex mix of these different tools.

Those who propose to evaluate a public policy must be able to understand this complexity and recognize the particular process underlying the policy in its essential content, in order to establish what kind of treatment has actually been administered, according to which logic that treatment should induce a certain type of change, who among the potential beneficiaries has received it and possibly with what intensity.

The decision-making process of an investment is done by collecting data and analyzing it, and then the investment must be monitored and managed using the same method. Therefore, it is a process that cannot be standardized, since it depends on various variable factors. While in classical financial theory, made up of rational economic agents, this reasoning does not seem to have obstacles, studies of behavioral finance teach us that not only do we have to deal with data and our reasoning but also with our non-rational part, and the process can be summarized as an interpretation of the project evaluation.

In the decision-making process of a non-rational economic agent, that is ourselves, various distortions come into play that can be divided into two macro-categories: emotional and cognitive. The cognitive distortions group the procedural errors of our reasoning and the convictions of our mind, the former arise from the impossibility for the non-rational economic agent to access and process all available information, the latest from incorrect analysis of the cause-effect processes. Emotional distortions influence decision-making through sensations, intuitions, anxiety and can generate impulsive choices.

The study of behavioral finance suggests the correction of cognitive distortions through an educational process, usually translating into the re-elaboration of the decision-making process. The aspect linked to emotional distortions that for a non-professional investor can be the basis of the decision-making process is difficult to manage. Awareness of one's own capacity in risk tolerance is the only tool for managing our emotional part in the field of investments. Therefore, to be a good investor it is important to know your risk tolerance.

## 4.1. Five steps of decision-making process

The quality of an investment depends on several factors and so it can be, at the same moment, both negative and positive.

There are five steps involved in the process of investment decision. These are:

1. Define the *purpose* of the investment;
2. Determine the *time* frame to achieve the purpose and for how long it will exist;
3. Assess the *risk* from every perspective;
4. Choose your *tools* based on the previous factors;
5. *Monitor* the plan and make adjustments as needed.

### Purpose

It usually makes sense to define the desired result before selecting the tools that will be used to achieve the purpose. If we think of money, investments and savings as tools, it becomes clear that we must first define our purpose in order to select the proper tool for the job.

Purpose can be specific to a desired item; it could be to achieve certain goals, like funding your children and grandchildren's education, or your purpose might be to fund your retirement. The list is varied, but the main point is that you must define your purpose before choosing your tools. You can have several different purposes at the same time, and each purpose may require a different set of tools.

### Time

Knowing how long we have to achieve our purpose is the next important step in our decision-making process. Our goals should be structured as short-, mid- and long-term. Knowing when we want to achieve our goal/purpose and its duration will greatly affect our choice of investment tools.

For example, short-term goals might require that we take less risk and keep the funding in an accessible form. Some products or investments require that the funds be

committed for a set or indeterminate period. These types of tools might not be the best choices for short-term goals.

Each financial product or investment program has rules, restrictions, time commitments, and costs associated with it. Establishing a time frame for each purpose/goal allows us to make better choices about the tools we use to best achieve the purpose.

## **Risk**

Risk might be the most misunderstood function of selecting investment tools. Not all risks are equal, nor does everyone view risk the same way. We each must work to understand the risk-reward relationship and determine our own willingness to accept risk.

We have a concept when we risk our money to earn more. The true test of how much loss we can stand is represented by the pain threshold. Once we find that limit, it will be easier to decide whether an investment or product has the right risk/reward relationship for us.

When the funds will be needed in the short term, you should not be looking at an investment vehicle in light of its long-term risk potential. In opposition, longer-term purposes should be based on long-term risk/reward potential with less emphasis on short-term fluctuations. The risk level should match the timeline of the investment's purpose.

## **Tools**

Once we have defined our purpose, determined our time frame, and assessed our risk, it is time to choose our tools. Every financial product in existence has its own benefits, costs and rules of use. There can be great variations in these features, even within different versions of the same types of products or investments.

In comparing benefits, costs and rules, you should always do so in relation to your needs and desires. It is crucial to understand which tool fits your needs the best. All of the tools can be great for the right purposes; their misuse puts them in a good or bad light. Fees should be considered in light of the services, management and results you will receive.

## **Monitor**

Goals, economic conditions, investment climates and rules can change over time. You need to work at monitoring your plan and make adjustments as needed. This requires you and your advisor or money manager to be proactive in monitoring the plan and meet regularly to discuss progress or changes.

With technology available today, your portfolio could be monitored on a daily basis with prompt updates of the account's status. There can be an advantage by deciding to quarterly review the plan during the first year, and then choose the comfort level for full reviews thereafter, since regular exchanges will help keep you in the loop.

These rules define standard procedures for the production of a certain type of policy, thus limiting the decision to the decision-maker, who has the task of deciding the best solution.

It is clear that some public policies have a predominantly symbolic purpose, i.e. they are not motivated by the desire to really tackle a problem but only by the desire to show that those who promote or support that policy "care about the problem". This is true both in the case of policies that are only "announced", and in the case of policies that have a concrete implementation; in both cases, what characterizes this type of policy is a clear disproportion between the results that it claims to want to achieve and the resources deployed. Behind a symbolic policy is therefore hidden the objective of the policy maker to gain public visibility by proposing fictitious solutions to unsolvable problems.

## 5. NLTL: NUOVA LINEA TORINO LIONE – AN EXAMPLE OF PUBLIC INVESTMENT

### 5.1. NLTL project

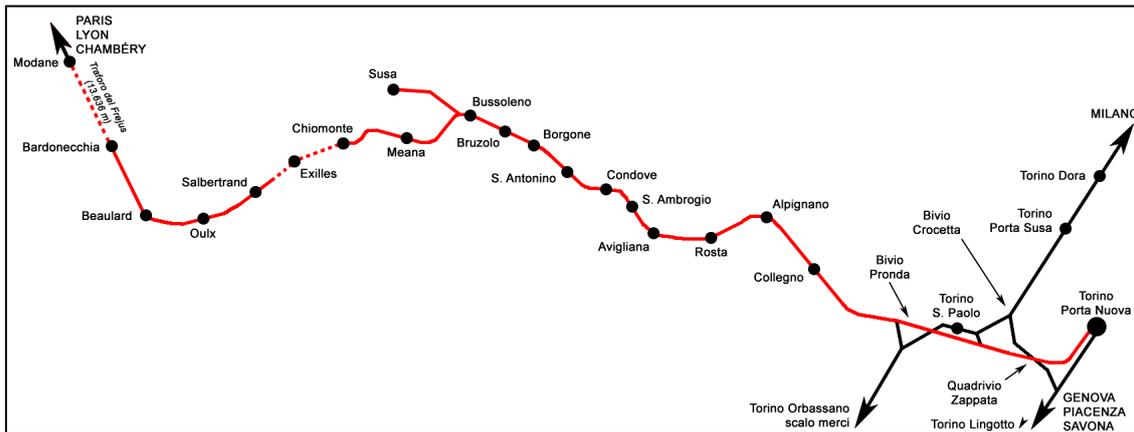


Figure 5.1 – The NLTL project, highlighted in red

#### 5.1.1. Susa Valley: the affected area

The 70% of the Italian exportation must cross the Alps: regarding these about the 45% should pass through the mountain pass of Brennero (Italia – Austria border), about the 28% through France and 27% through Swiss. In recent years, in the Piedmont area, some large-scale works of national interest have been started, mainly linked to the adaptation and the new construction of mobility infrastructures. The size of the projects is such that it involves many problems that affect the various environmental matrices.

One of the current topics in Italy concerns the passage of goods and passengers through the border between France and Italy with a high-speed railway line. In this context, we will examine the case of the so called TAV (*Treno ad Alta Velocità*) project.

The Susa Valley is in Northwest Italy at the border with France, from which it is separated by the Alps, and is the widest valley in the Western Alps (it has about 90,000 inhabitants, divided into 39 municipalities). The Susa Valley is among the most developed alpine valleys from economic and infrastructural points of view. It is crossed by two main roads through the passes Monginevro and Moncenisio. Moreover, a motorway and an

international railway reach France through the Fréjus tunnel. Many tourist and sport resorts make the valley a tourist attraction (it was the base of the 2006 Winter Olympics).

The Susa Valley, situated between Maurienne (France) and Torino (Italy), has been urbanized by the economic development of the region. The construction of infrastructures like the Fréjus highway, the international railway, and a large number of dams, tunnels and industries, has generated significant environmental and social impacts. The proposed high-speed railway (HSR) line between Torino and Lyon would pass cross the Susa Valley. Main pollution problems dealing with the railway construction have been put into evidence by several studies and official reports. In this scenario, it is important to understand why this project was proposed and what could be the results of constructing this infrastructure.

#### 5.1.1.1. Contemporary economic situation identification

In Italy, according to the latest studies by ISTAT, with € 35.4 thousand in 2017, the North-West is the geographical area where the GDP per inhabitant (measured in nominal terms) is the highest. Despite this result, Piedmont is the region with the lowest pro capite GDP among all the regions of Northern Italy.

In the region, there are very important companies, like FCA, that now export to almost the whole world. The result is that exports see Piedmont in a good position (Table 5.1), but all of this is not enough to make the region grow as much as the first Italian regions.

Piedmont and provinces	2017			
	Jan-Mar	Apr-Jun	Jul-Sep	Oct-Dec
Torino	5.682.692	5.739.142	5.146.155	5.567.214
Vercelli	511.321	572.599	529.354	599.338
Novara	1.198.589	1.246.444	1.252.458	1.269.242
Cuneo	1.838.231	1.790.782	1.934.904	2.121.902
Asti	450.839	451.082	424.426	486.696
Alessandria	1.449.602	1.797.107	1.627.496	1.630.482
Biella	462.658	517.065	435.438	499.892
Verbania	169.482	175.432	162.331	165.563
<b>Piemonte</b>	<b>11.763.414</b>	<b>12.289.653</b>	<b>11.512.562</b>	<b>12.340.329</b>

Table 5.1 - Export of Piedmont and provinces in 2017 - Source: ISTAT (2018)

As can be seen from the table below, the pro capite GDP sees Piedmont only 10 or 11 (Table 5.2) depending on whether the two autonomous provinces of Trento and Bolzano are considered divided.

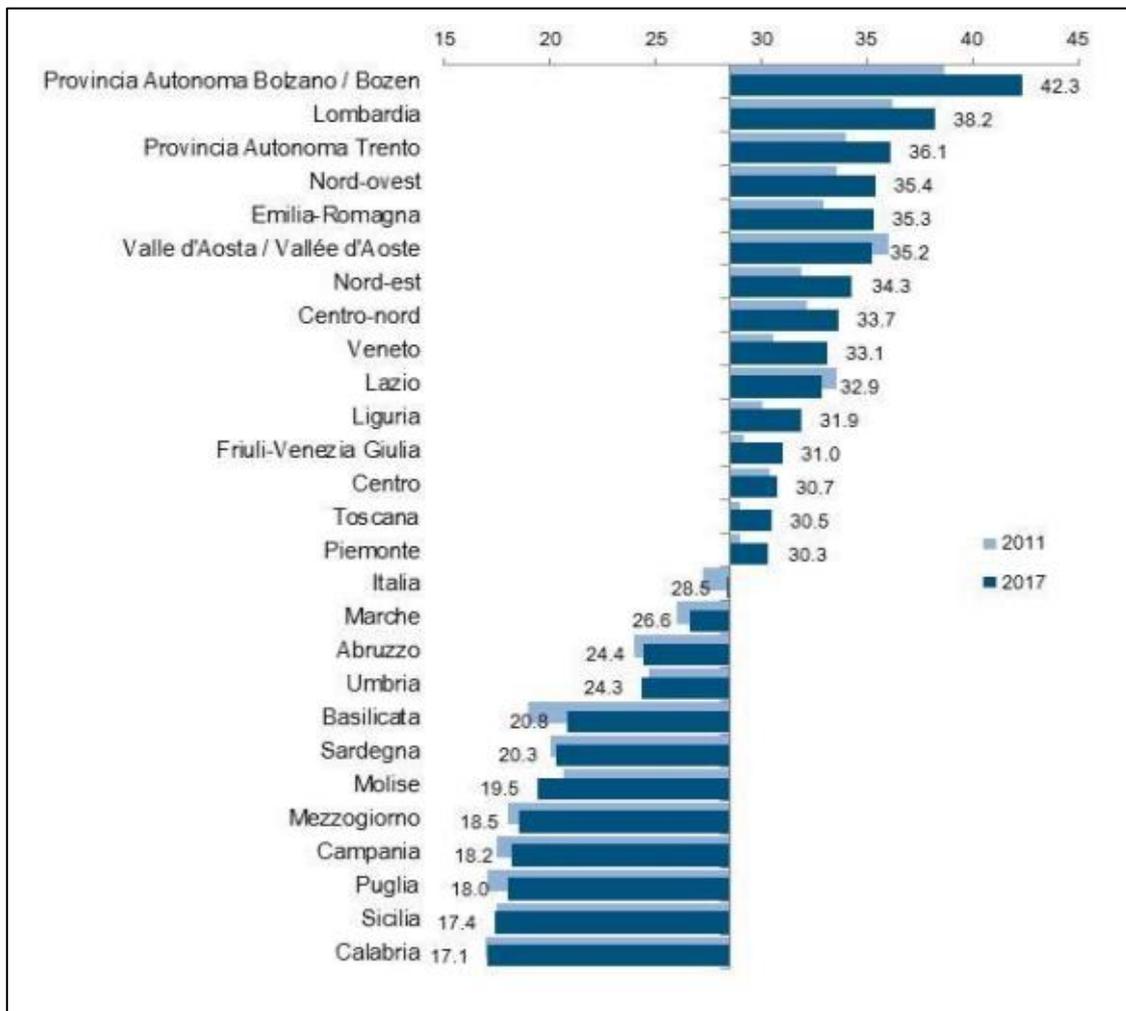


Table 5.2 - Pro capite GDP of Italian region in 2017 – Source: ISTAT (2018)

The Piedmont, which together with Lombardy and Liguria in the twentieth century towed the Italian economy, no longer keeps pace and has the GDP pro capita slightly more than the national average but has been far exceeded by Veneto, Emilia Romagna and Friuli Venezia Giulia: three regions that in the '50s and '60s have sent over 100 thousand families to look for a job and a future there.

According to the forecasts of the work, the Piedmont will have the TAV only in 2029-2030, meanwhile it risks losing other companies that see in Switzerland, and the other

countries beyond the national border, a place where it is possible to produce at lower costs.

### 5.1.2. *Project overview*

The new railway line Torino – Lyon, *Nuova Linea Torino Lione* (or NLTL, Figure 5.1) in Italian, is a project started to substitute the old railway line, dating back more than 140 years. In the current topics, it is improperly called TAV, due to the misinformation about the project. The NLTL is conceived as a mixed line, therefore conciliating AV (*Alta Velocità*, high speed) and AC (*Alta Capacità*, high capacity), more voted for goods traffic than for passengers, and with a lower speed than normal high speed. So, from now on, in this paper there will be used only the acronym NLTL for the project.

The reasons behind this work and the other European railway lines are to be included in a general concept of network, and not a single communication axes between neighboring European countries; a network that will globally have to meet future needs, and will have to cover and serve each European region in a homogeneous and logically distributed manner and from which some global advantages will arise. The overall motivations are the following:

- creation of new railway infrastructures with optimal technological, functional and safety features;
- structuring of projects such as to favor and develop inter-modality and combined transport with the provision of "railway highways";
- transfer of a greater share of goods traffic from rubber to iron to the benefit of emissions into the atmosphere.

#### 5.1.2.1. *What does it regard*

The Trans-European Transport (TEN-T) Network is a European Commission policy directed toward the implementation and development of a Europe-wide network of roads, railway lines, maritime shipping routes, ports, airports and rail-road terminals. It consists of two layers: the Comprehensive Network, covering all the European regions, and the Core Network, which includes the most important connections and nodes within the Comprehensive Network. The objective of TEN-T is to “close gaps, remove bottlenecks

and eliminate technical barriers” between the transport networks of the Member States by creating a single transport area for the Europe.

The Mediterranean Corridor (Figure 5.2) is the main east-west axis in the TEN-T Network south of the Alps. It runs between the south-western Mediterranean region of Spain and the Ukrainian border with Hungary, following the coastlines of Spain and France and crossing the Alps towards the east through Italy, Slovenia and Croatia and continuing through Hungary up to its eastern border with Ukraine. The corridor primarily consists of road and rail, aside from the Po River, several canals in Northern Italy and the Rhone River from Lyon to Marseille. The corridor is approximately 3,000 km long; it will provide a multimodal link for the ports of the Western Mediterranean with the center of the EU. It will also create an east-west link through the southern part of the EU, contribute to a modal shift from road to rail in sensitive areas such as the Pyrenees and the Alps, and connect some of the major urban areas of the EU with high-speed trains.



Figure 5.2 - TEN-T Mediterranean Corridor

The key section of the corridor is the new cross-border rail link between France and Italy (Lyon-Torino). In addition, the cross-border links with Slovenia, Croatia and Hungary need to be taken into account. Multimodal connections with ports in Spain and France have to be developed and some railway sections in Italy and France need to be upgraded in order to remove key bottlenecks.

The Mediterranean Corridor connects the Iberian Peninsula to Eastern Europe, passing through Italy for the Torino-Trieste route. Central to the new line is the cross-border section, which with its 65 km runs from Susa to Saint-Jean-de-Maurienne, in France, and crosses the Alps through the Moncenisio tunnel. The regions served by this link represent the 18% of the European population and the 17% of the Community's GDP. Almost 150 years after the inauguration of the Fréjus tunnel, this tunnel transforms the current mountain line into a plain line, adapting it to current European standards.

The 2012 agreement introduced another important change. In fact, the article 4 said that the works "will be carried out in different functional phases". Therefore, we start talking about "*fasaggio*" of the work - until then inexistent term in the Italian vocabulary, but the cast of the French word *phasage* instead of the alternative version "phasing". In concrete terms, this means that the Torino-Lyon line will not be built all together, but in four stages, with the first Stage providing for the construction and installation of the Moncenisio tunnel and - for the Italian side - the upgrading of the line historical between Bussoleno and Avigliana and the realization of the Avigliana-Orbassano variant.

The interventions of the successive stages (1 *bis*, 2 and 3) do not have a defined time schedule, but they will be activated at the conditions of "saturation" of the line. Regarding the total cost of the whole work, the current Government Commissioner estimated € 24.7 billion. The estimate made in 2012 by the French Court of Auditors, which set the total cost at € 26.1 billion, was higher.

Therefore, the meaning of this subdivision into four phases is economic and functional, i.e. it aims to lower the costs of the work by anticipating the realization of the indispensable components to obtain the most significant benefits and postponing the less urgent parts.

On February 24, 2015 the agreement was signed in Paris for "the start of the definitive works of the cross-border section of the new Torino-Lyon railway line". The economic

investment is € 8.6 billion, certified by the international company Tractebel Engineering-Tuc Rail. The 40% of the amount is co-financed by the European Union, while the remaining share is divided between the two countries (35% for Italy, 25% for France).

The current project of the Moncenisio tunnel and of the Italian section is very different from the initial one. The general criticism and opposition to the first version of the project produced radical changes. The initial project expected the construction of 82 km of new lines, reduced to 14 with the reuse of the existing historical line, essentially accepting the criticisms addressed to the original proposal. The cost for Italy fell to € 2.9 billion for the Moncenisio tunnel and € 1.9 billion for the adduction lines, consequently reducing the project cost to € 4.8 billion against € 9 initially planned. Since the distance between Lyon and the tunnel is 150 km, compared to 60 km from Torino, the adjustment of the national section costs more to France, with estimates between 5 and 7 billion €. This is the reason that led Italy to decide to take on a higher percentage of the tunnel costs. Italy, then, with the redesign launched in 2007 by the government found less costly solutions and less land consumption for the internal section of its competence and this seems to be aimed at making the new French government for the Moncenisio – Lyon. The Italian anti-mafia regulations will be applied to all contracts, including those on French territory, because they have been recognized as more effective than the trans-Alpine ones.

From the last cost-benefit analysis conducted on the Torino-Lyon, published in December 2011, it is estimated:

- The annual reduction of greenhouse gas emissions of approximately 3 million tons of CO<sub>2</sub> equivalent;
- The move of more than one million heavy vehicles from rubber to iron.

The 89% of the cross-border section is made in the tunnel (57.5 kilometers, of which 45 in French territory and 12.5 on the Italian side), while most of the plants on the surface are located on areas already populated, effectively eliminating the consumption of raw ground.

#### *5.1.2.2. What has been done and what is missing*

All the preliminary work carried out until today in Italy and France, worth around € 1.4 billion, 50% financed by the EU and 25% by France, show that the cross-border section

of the Torino-Lyon is not a project, but a work in progress. Simultaneously with the design phases, more than 24 km of tunnels were excavated, which constitute an integral part of the work; once the first geognostic function is completed, the descents will form an integral part of the base tunnel, as they are essential for its ventilation, maintenance and safety management (exits). In addition to the descents, about 8.200 m of tunnels between Saint Martin la Porte and La Praz (of about 9 km of contracted lines) are excavated on the axle and in the diameter, which will form a part of the south barrel of the basic tunnel.

Of all the excavations, 160 km (57.5 for each tunnel tube, in addition to the connecting bypasses and descents), the 14% has already been built (it will become 18% once the section between Saint Martin La Porte and La Praz will finish) and contracted the 20%. The Torino-Lyon is therefore undergoing advanced construction. In Italy and in France, the sites of the geognostic and reconnaissance tunnels are active. In Chiomonte, Val di Susa, the Maddalena tunnel has been completed while in Saint-Martin-La-Porte is being excavated, in addition to nine other descents, or access tunnels, already built in Savoy.

### *5.1.3. Integration of the project in the European Community*

In 1990, the Commission of the European Community established a coordination unit of the G24 Group (representatives of the EU and Eastern European countries) with the aim of extending the Union's transport networks to the east. Following the pan-European Conferences of Crete (1994) and Helsinki (1997), ten pan-European multimodal corridors were identified, useful for the mobility of people and goods by road, rail, waterway and air routes. One of these interested Italy (Venice-Trieste / Koper-Ljubljana-Budapest-Lviv-Kiev), the same that some years later will incorporate the Trans-Padan and Torino-Lyon routes and will acquire the Lisbon-Kiev extension. However, the awareness of complexity soon took over and in the following years more and more trans-European (inside the EU borders) corridors will be discussed.

Over the years, the TEN-T program will be defined, and it will identify the main European traffic axes and will subsequently be the primary reference for the provision of Community co-financing for optimization and enhancement of network's infrastructures. The document listed 14 major railway works, motorway and airport, defined as a priority interest. On 23 July 1996, the Council of the European Union issued *Directive 96/48/EC*

on the interoperability of the trans-European high-speed rail system. It defined the technical specifications of interoperability that the design of the new lines must undergo. The requirements relate to sectors of a structural nature, including infrastructure and energy, and sectors of a functional nature, including maintenance, the environment and users. An instrument of particular importance is the ERTMS / ETCS (European Rail Traffic Management System / European Train Control System) which manages the removal of restrictions for international circulation, deriving from the diversity of the systems used in the various countries. A benefit made possible is the possibility of simultaneous circulation of two trains in the same direction in a double-track line.

The White Paper was presented by the European Commission on 12 September 2001. This answers the need for a more organic design and more binding programmatic commitments. The first part summarizes the main aspects of the problem: the road absorbs 44% of the transport of goods against 41% of short sea shipping, 4% of the waterways and 8% of the railway; passenger road transport accounts for 79%, air transport for 5% and rail transport for 6%. Among the consequent effects we find traffic congestion as well as environmental or health problems of citizens. The second part relates to rapid passenger networks, to major infrastructure projects and completion of the Alpine passes. The third part deals with the problem of road safety, costs for users, quality of services and urban transport. The conclusion is that political measures are needed:

- taxes to promote the use of less polluting means of transport;
- incentives to use public transport;
- financial policies;
- promotion of combined transport; and
- infrastructures.

The list of major works is proposed with revisions in 2005. Projects that have "priority" status go up to 30, of which 14 concern high-speed, high capacity and conventional railway lines. These lines coincide with the main traffic routes extended to the European borders. Subsequently, the new cross-border sections will be co-financed up to 30% of the eligible costs. A concrete step in the direction of co-financing of infrastructure works

and of modal rebalancing is made by Directive 2006/38/EC, also called Directive Eurovignette, concerning taxation on heavy vehicles used to transport goods by road for the benefit of some infrastructures. On 11 March 2009, the European Parliament extended the toll surcharge to vehicles transporting goods exceeding 3.5 tons instead of the 12 provided by the Directive Eurovignette. The fundamental problem is the huge expenditure and, since the Community financial instruments in their current form are not adequate, the Member States must ensure that the most substantial part of the projects is completed. If the useful resources proved to be insufficient, it was also due to the strong increase in costs compared to the initial forecasts, due to the lengthy completion of the major works.

The results of consultations, discussions and studies carried out between 2005 and 2010 are summarized in the version of the White Paper, dismissed by the European Commission on March 28, 2011. With a view to containing consumption and emissions, the construction of suitable infrastructures plays a primary role, because the current transport system is not sustainable, and measures of containment can no longer be deferred. The document lists multiple measures to be taken for: an increase in energy-efficient modes of transport, improvement of vehicle energy efficiency, sustainable urban mobility, and motor vehicle disincentive policies. The proposal for a regulation on 19 October 2011 was accompanied by the one concerning the geography of TEN-T, whose new objective is that of an interconnected, integrated and coordinated network (in 2009, a wide TEN-T network review process was started by the European Commission, that led to the current configuration of the network, with the aim of realizing an effective integration of national transport systems into a European transport system and therefore of encouraging, through the free movement of people and goods, the achievement of the single market as a precondition for economic growth and for Europe's competitiveness.). The novelty on the section of the Mediterranean corridor concerns the extension to the south of Spain, no longer in Lisbon, on the one hand and the border between Ukraine and Hungary on the other. The corridors, now nine, involve a minimum of three states; have lengths exceeding 500 km and take account of initiatives already in place. The premise is not comforting with regard to the results achieved: rail goods transport has undergone a trend reversal in the European Union from 2000 to 2012, passing from 11.5% to 10.2%, and the percentage of passenger transport remained constant, around 6%. The main causes

are problems of efficiency, excessive duration and high costs of authorization procedures, inadequate development of the structures.

Following a 2013 review of TEN-T policy, nine Core Network Corridors were identified to facilitate the development of the Core Network. These are complemented by the ERTMS deployment and Motorways of the Sea (the Horizontal Priorities), both established to carry forward the implementation of the objectives of the Core Network. The first Work Plans for each Corridor and Horizontal Priority were presented in 2014, outlining the objectives of each Corridor, following the framework of the TEN-T policy; this is the process that takes into account also the current developments, so it should be updated and presented continuously.

The new milestone of European transport policy is represented by the CEF (Connecting Europe Facility for Transport). This is the funding instrument to realize European transport infrastructure policy and aims at supporting investments in building new infrastructures for the transport all over Europe, or rehabilitating and upgrading the existing ones. The CEF focuses on cross-border projects, like Torino-Lyon, and projects aiming at realizing missing links on the Core Network and on the Comprehensive Network (Figure 5.3). It also supports innovation in the system in order to improve the use of infrastructure, reduce the environmental impact due to transport, enhance and increase energy efficiency and safety. The total budget for CEF Transport for the period 2014-2020 is € 24.05 billion, and INEA (Innovation and Networks Executive Agency), the successor of TEN-T EA, is responsible for implementing € 22.4 billion of the CEF budget.

Pre-identified Project / Connection	Mode of Transport	Current State
Lyon - Torino	Rail	Cross-border section, works base tunnel; studies and works access routes

Figure 5.3 - Current state of the project – Source: CEF (2019)

#### 5.1.4. Expectations of the current project

The Fréjus tunnel, after 145 years, is technologically obsolete and must be replaced. At the time of the completion, and for more than a hundred years, it represented not only a work that helped the development of the country but also the symbol of the vision that

Cavour, who promoted and could not see it realized, wanted to give the new Italy finally reunified: a Country determined to end the previous history of closure, provincialism, economic, social and cultural backwardness and persistent internal conflict, and rather willing to open up to freedom, to cultural and commercial exchanges, to economic and social innovation, to Europe, to modernity, to technological progress.

Italy today exports goods for € 448 billion, almost one quarter of our GDP, but it is below the levels of 2007. The Italian GDP is € 1.935 billion, while the public debt accounts for 131.8% of GDP in 2017. By having a higher annual growth than today, Italy can reduce the public debt, which every year increases by € 70 billion. With the increase in revenue, part of can be allocated to reduce the debt. The consequence of an increase in revenue is an increase in job position, so there are two benefits: public account and employment. Recently, the Bank of Italy stated that in the next three years Italy will grow by one percentage point each year, thus not making the Country able to reduce the public debt or to create jobs. Italy needs to grow at least of 2 percentage points of GDP per year and this can be possible by capturing the 3% more of the world market per year, so adding 13 to 448 in order to have exports for € 461 billion, which corresponds to about 1 percent of the current GDP. By considering these € 13 billion, one half could be used for taxes and the other half to create job positions. € 13 billion more each year for 20 years gives € 260 billion, of which one half is used for taxes and the rest can finance all the infrastructure, such as the NLTL.

The goods exchange that transits between Italy and France accounts for more than 50 million tons per year and includes, in addition to the flows between the two countries, those with the Iberian Peninsula and Great Britain, for a total worth of about € 150 billion. Italy has a current account balance of payments behind only the one of Germany in Europe, which means that millions of jobs depend on international trade. Italy therefore needs the movement of goods generated by its economy to be able to use adequate and modern transport infrastructures, ceasing to generate the heavy environmental impacts and the high economic costs nowadays produced by the millions of TIRs that cross the borders.

## **5.2. The CBA of the NLTL**

The crucial point in the NLTL case concerns the economic analysis and, in particular, the issue underlying the fate of the line is linked to the Cost-Benefit Analysis.

The choices made on the transport of people and goods across Europe and individual countries depend on the strategic constraints and objectives on which the EU and its Member States have expressed their views, including through long-term policy documents, or the EU objectives on energy efficiency and greater independence from oil at EU level.

There are numerous methods for assessing whether or not an infrastructure, such as the high-speed railway Torino-Lyon, meets these objectives:

1. economic and social analysis, defined in a synthetic way as cost-benefit analysis (CBA), which uses as a unit of measure the monetary values to calculate the positive (benefits) and negative (costs) effects for the community;
2. multi-criteria analysis, suitable for comparing several alternatives even in the presence of ordinary scales and not only quantitative, with a series of weights that reflect the sensitivity of decision-makers with respect to the various objectives;
3. analysis of the costs of inaction (the costs of “do-nothing”), suitable for understanding the effects of "lagging behind", when competitors or other surrounding actors advance;
4. life cycle cost analysis, of industrial origin but also extendable to infrastructural contexts.

The first is the most consolidated and used both in Italy and internationally.

The analysis normally considers a few years up to a maximum of about 30 years, even with the assumptions and reservations of the case as the time horizon extends, so that the values considered are variable over time and are compared with each other through an economic discount, thus arriving at the Net Present Value (NPV).

To calculate the economic impact of a work, the CBA adds the variation of the benefits (or consumers' surplus), of the operating costs (or producers' surplus) and of the external

environmental costs, and subtracts the investment costs. The result, if positive, indicates that it is right to perform the work.

The CBA considers the welfare of the community as an objective and assesses the impacts of public spending: for this reason, internal taxes and transfers (typically tariffs, tolls, etc.) are not considered while only the impacts on primary resources (time, raw materials, primary resources, value of human life, etc.) are quantified.

The CBA is transparent and works well when it compares different solutions to the same problem typically on a microeconomic scale.

The objectives of an investment project in the transport sector are generally multiple, being able to have an economic value but also environmental and social, and involve a plurality of interests and social, political and administrative actors. The technical complexity of the solutions, the multiplicity of objectives and the plurality of interests involved represent the peculiarity of the transport projects. Above all, the trade-off between multiple interests allows the CBA to be considered a valuable tool for the analysis of alternatives and for a weighting of the positive and negative externalities that the intervention produces.

Each type of work determines specific impacts and specific positive or negative externalities. The most common economic benefits of transport are the following:

- reduction of freight and passenger transport costs;
- time saving;
- reduction in the number of accidents;
- economic development (tourist flows, accessibility of markets, etc.);
- environmental benefits.

Compared to the previous benefits, there are costs such as:

- environmental costs;
- loss of soil assets;
- replacement of existing assets.

The phase following the identification of economic benefits and costs is represented by their discounting and comparison. First, a time horizon, representing the economic life of the project, is taken into account and the NPV and IRR indices are calculated.

Particular care must be taken when assessing projects using NPV and IRR, since some economic benefits and costs, although not quantifiable or monetized, are of crucial importance in the choice, since they are linked to externalities that are relevant for collective well-being (the environment, the public health, the safety, etc.). It is therefore essential, when assessing the outcomes of the CBA, to take account of these types of benefits.

The aim of the CBA is therefore to make explicit the cost that citizens pay for the social welfare that a specific project can generate. It applies to the HSR, as well as to schools, hospitals or streets.

Several analyses have been published over the years. In this paper we will analyze the last two analyses, which ended with totally conflicted results.

### *5.2.1. The analysis of 2012*

The first CBA was published in December 2011 in the *Quaderno 8* of the *Osservatorio sul collegamento ferroviario Torino-Lione*. The analysis involved all the stakeholders related to the project: Lyon Turin Ferroviaire, Rete Ferroviaria Italiana, the representatives of local authorities, the Agency for Metropolitan Mobility, the Government Commission and the Technical Observatory.

The report, very extensive and in-depth (about 400 pages), analyzes the costs, benefits and the impact of the high-speed line, and was the empirical basis on which the Italy-France Agreement for the section was finalized in the following years.

In favor of the line, the results of the study, by considering both the Italian and the French regulation and a discount rate of 3.5% for the entire project, showed between € 11.9 and € 14.2 billion of net additional benefits in sixty years, which includes the construction and operation of the work, from 2023 to 2072, in a "prudential" hypothesis. In the event of a more sustained economic recovery, the report showed benefits between € 24.8 and € 27 billion (Table 5.3). Here we notice an incongruence with the best practice: the time

horizon that should be used is 100 years, while the analysis only considers a period of 60 years.

	Pessimistic scenario		Prudential hypothesis		Optimistic scenario	
	F	I	F	I	F	I
NPV	-1.156	-3.253	14.291	11.972	27.055	24.818
IRR	3.51%	3.09%	5.09%	4.72%	6.12%	5.78%

Table 5.3 – CBA results in M€ (2012)

The report pointed out that with the HSR, both on the freight and passenger fronts, “it will greatly increase competitiveness”. The report also rejected the hypothesis that it would be more useful to improve the existing line.

The 2012 CBA was developed starting from the historic 1985-2005 period, which shows strong growth rates for the traffic (2.0% annual growth for rail). Between 2005 and 2010, due to the two economic crises experienced by Europe, traffic grew much less (0.6%). In the last period, however (2010-2016), railway traffic was growing again (1.4%).

Moreover, while until 2000 the mode of freight transport across the Alps by road drove the growth of traffic, since 2000 the trend has been reversed: in the last three periods (2000-2005, 2005-2010 and 2010-2016, the last year available), rail freight has grown significantly more than road freight.

This analysis suggests several considerations. It is true that the assumed traffic has been overestimated compared to the actual traffic. It is also true, however, that freight traffic in the Alps has resumed to grow since 2010 and that the iron mode is already establishing itself compared to the competition from the road.

In calibrating the traffic model, the analysis foresaw a progressive improvement of rail freight service and a progressive worsening of the service provided by roads and motorways. Consistent with this approach, the study assumed increasing levels of road congestion and thus a worsening of the level of service and ultimately an increase in the overall cost.

With regard to externalities, the 2012 study takes into account greenhouse gases, air and noise pollution, accidents and road congestion. The results state that the project allows to

obtain a reduction of these external effects, with more relevant results related to the reduction of accidents.

### 5.2.1.1. Pollution

One of the biggest challenges on the Alpine arc is to control road transit and to promote alternative road transport. Transalpine goods traffic has doubled over the last 30 years. The preponderance of road transport remains always significant with respect to the railway. Given the small number of Alpine crossings, traffic growth translates into a concentration of heavy vehicles in the few valleys that ensure international transit. This makes the traffic hardly tolerable by the affected populations. Without an active policy in favor of a transfer to the rail, the road will continue to concentrate most of the transits on the Italian - French border. The contribution of modal shift of a share of goods transport from road to rail is essential in the European strategy to reduce greenhouse gases. The cost-benefit analysis conducted on the Torino-Lyon (2012) estimated that the construction of the new line will lead to an annual reduction of greenhouse gas emissions of about 3 million tons of CO<sub>2</sub> equivalent, equal to those produced by a city of 300 thousand inhabitants. This is due to the move of about 1.3 million heavy vehicles from rubber to iron, of which 700 thousand in the Susa Valley.

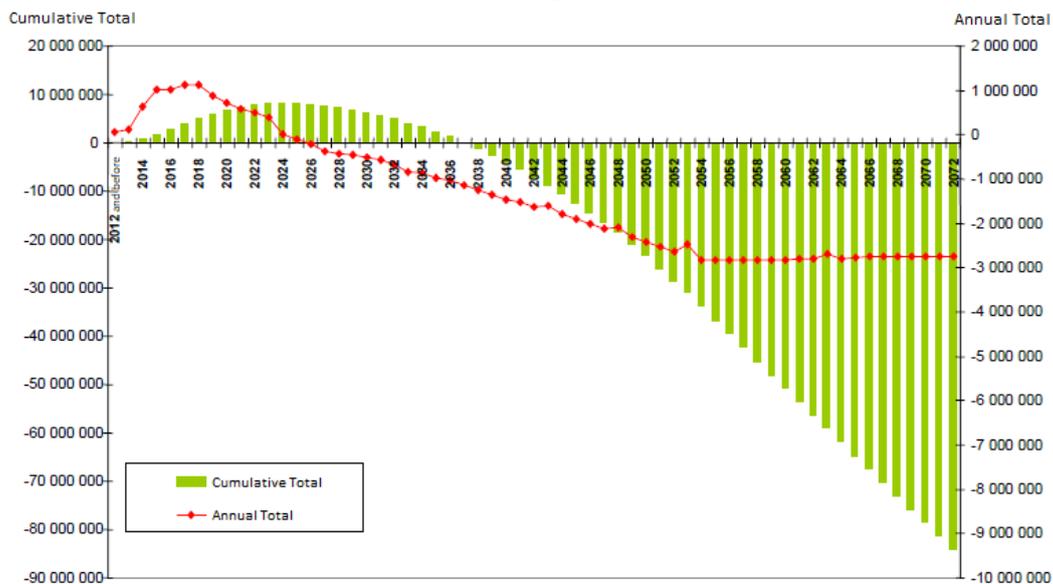


Table 5.4 - Estimations about the reduction of CO<sub>2</sub> – Source: Torino-Lyon CBA (2012)

A ton of goods carried by a modern train produces less than 20 percent of the CO<sub>2</sub> produced by equivalent road transport, in addition to costing half. The inter-modal readjustment to the benefit of the eco-compatible transport that will be induced by the new Torino-Lyon railway line will remove more than one million trucks a year from the roads. It will make the Alpine mountains and Liguria breathe and will reduce CO<sub>2</sub> emissions (Table 5.4) to an extent equal to the carbon dioxide production of a city of 300 thousand inhabitants. All Alpine countries are committed to the goal of removing TIRs from their roads. In Switzerland, goods travel 70 percent on railways thanks to the opening of new modern tunnels (Loetschberg in 2007, Zimmerberg in 2010).

### **Should we switch from road to rail?**

It is a question of removing heavy goods transport from the road and transferring it to the railways, at least for long distances. In a country where freight transport is mainly carried out by road (52%), with the known environmental and air pollution consequences, adopting such a solution would also mean economically relaunching one of the most important logistics hubs that now overlooks the Mediterranean.

Transport generates different types of negative externalities:

- global effects on the environment: mainly linked to the emission of climate-changing gases, responsible for the greenhouse effect and the increase in temperature;
- direct effects on human health: mainly linked to the emission of substances harmful to man ("polluting substances"), with direct pathogenic effects;
- accidents;
- noise;
- road congestion and occupation of space.

These items can be traced back to three macro-themes, which can be summarized as climate, health and quality of life.

Road transport is the largest contributor to negative externalities, accounting for more than a quarter of Europe's greenhouse gas emissions and one of the main causes of pollution in urban centers. The volume of annual road transport generates external and

environmental costs (defined according to EU parameters) of around € 6 billion. If this volume were to travel entirely by rail, it would instead generate external costs worth around € 2 billion, with major environmental savings.

The analysis of data on freight and passenger traffic in Italy shows a substantial prevalence of road transport, in the breakdown of traffic by type of transport, measured in terms of tons-km for freight and passenger-km for passengers.

In the last 20 years, in Europe, the extension of the motorway network has increased by 8% or little more, while for the railway network the increase has not even reached 4%. This is despite the fact that Legambiente (an Italian environmental association) notes that the transport sector is the activity that accounts for the largest share of the national energy balance (about one third of the total), of which almost all is absorbed by road transport (90%) and the railways are responsible for less than 2%.

The proportions remain the same when it comes to harmful CO<sub>2</sub> emissions. According to the European Environment Agency, pollution from rail transport is 3.5 times less per tons-km than from road transport.

In Italy, only 8% of goods travel by rail while the traffic of trucks and trucks continues to increase. As reported in the latest Mobility Index published by Anas, the Italian national road authority, in May 2019 the segment of heavy vehicles grew in comparison with the previous month (+8.2%).

This is because there is a lack of incentives to turn to rail. Continuing to ignore railways makes us a slow, polluted and low-competitive state, as roadways are already struggling to cope with this amount of traffic.

### *5.2.2. The analysis of 2019*

In 2018, the Ministry of Infrastructure and Transport, representative of a completely different government from that of 2012, both in terms of actors and in ideologies, appointed a working group to carry out a new assessment of the new Torino-Lyon high-speed rail line and to draw up an updated Cost-Benefit Analysis. The aim was to verify the opportunity to continue a project already shared at international level, started in the works and financed for almost all the phases, and to clarify the last points not covered, or changed for economic and temporal needs, by the previous analysis.

### **Why carry out new cost-benefit analyses on works already under way?**

As a rule, the economic evaluation of projects should be done before making decisions and contracting out the works, precisely because it makes it possible to test the efficiency and effectiveness of the interventions and to indicate in advance the usefulness or otherwise of proceeding with the implementation. However, there are cases of works that have been started, but never subjected to a Cost-Benefit Analysis, or of projects that undergo variations and changes with respect to the initial phase.

If cost-benefit analyses are formally mandatory and usually necessary, what should be done to limit the potential discretion of the assessor, in the absence of a more precise indication (by the decision-maker) of parameters and procedures to be followed? There are only two ways. The first one is that parameters and methods are agreed in advance so that if two evaluators carry out two independent CBAs they arrive at similar or compatible results (thus obtaining a sort of "reproducibility" of the analyses made). Alternatively, the analysis carried out by an evaluation team could be submitted to the scrutiny and criticism of the experts, and the conclusions of that debate submitted to the public decision-maker.

A CBA is always useful because it should help the decision with clearer arguments than political and ideological ones. The 2019 analysis considers costs and benefits extended to all European states affected by the work. This right approach should have resulted in an extrapolation of costs and benefits for Italy alone, as we are interested in.

The analysis produced by the Ministry on the Torino-Lyon high-speed train line, made public on 12 February 2019, concludes with a negative result (NPV) of about € 7 billion in the "realistic" scenario (Table 5.5). As the previous analysis, it considers a wrong time horizon (60 years including the construction and operation of the work) and a discount rate of 3% for the entire project, but the result reverses the previous analysis and reject the project. This is considered strange, given that the total economic commitment required of Italy for the Torino-Lyon high-speed line is at most € 5.082 billion (including the amount already spent on projects and surveys), and is not in line with the NPV results.

	Realistic scenario	Optimistic scenario
NPV	-7.093	-8.167

Table 5.5 – CBA results in M€ (2019)

The 2019 CBA argues that the balance of the work is negative even by taking into account the cost of not completing the project, estimated in the technical and legal report: one and a half billion to restore the places where sites have already been opened, plus penalties for contracts already signed by Telt, estimated between 1.3 and 1.7 billion euros.

The analysis did not develop its own model for the traffic forecast and it is not clear whether the estimated traffic flows result from an allocation, so it is not possible to understand exactly the assumptions underlying the modal choice on the basis of which the traffic forecast was set. The optimistic scenario foresees an increase in passenger and freight traffic of 2.5% per year for the entire duration of the project, while the realistic one is based on an increase of 1.5%. Furthermore, the analysis clarifies that for the traffic estimation it is necessary to start from the actual value of the last year available (mostly 2017) and shows a difference between this value and the value estimated in the 2012 analysis. The latest analysis starts from a lower current actual data than previously estimated and applies a lower traffic growth rate than the previous one.

With reference to the traffic model, the analysis describes that motorway passages for France have a very high residual capacity, that congestion situations on the road network are very rare, and that the traffic on the corridor can be managed without problems by the existing infrastructure. Therefore, it is implicitly assumed that the service provided by road freight transport will continue to be able to maintain full efficiency in the future.

As for externalities, the position of the 2019 study is that vehicle manufacturing technology, with particular reference to heavy-duty vehicles, is evolving rapidly and this process allows for a significant reduction in unit emissions. The adoption of the Euro 5, Euro 6 and other classifications, are accompanied by a sharp decrease in emissions of climate-changing gases and, for this reason, the study provides evidence on NO<sub>x</sub> and PM<sub>10</sub>.

With regard to CO<sub>2</sub> emissions, according to the analysis, ambitious reduction targets can only be achieved thanks to the technological innovation of vehicles and the consequent reduction in unit emissions; this necessary condition would automatically lead to a strong

reduction in the "environmental competitive advantage" of the rail transport mode and, therefore, in the benefit of the shift from road to rail.

Therefore, the only factor that can affect the reduction of emissions related to mobility is technological innovation in road vehicles.

### 5.2.3. *The results*

The cost-benefit analysis expresses a simple number, with a positive or negative sign, which summarizes the sum of all the estimated effects of the project over the long term: the net present value. To define this number the process goes through 15-20 phases of analysis, in each of which the decision-maker takes a position, partly derived from current methods and partly subjective, thus influenced by individual choices and positions, albeit motivated and argued.

The CBA of the project was differently structured from the previous one and used as a macroeconomic analysis instead of as a microeconomic analysis. This type of analysis can be applied to give to the public opinion an account of the benefits of the individual project, but should not be used to allocate public expenditure for investment. This error has led to somewhat unrealistic results: in fact, comparing the results of the two scenarios analyzed in the CBA, one defined as "realistic" and the other as "optimistic" (i.e. with a greater volume of traffic shifted from road to rail), the optimistic is worse than the realistic one. That is to say, the more the underlying objective of the project is achieved, the worse the economic balance of the investment would be.

These inconsistencies indicate that in the document, produced on the Torino-Lyon high-speed line, there are some anomalies, of method and/or application, which contradict, among other things, numerous analyses made in previous years by various actors, which have led to always positive and consolidated results at European (EU Commission) and international level (with France).

An important topic is the timing. In fact, several years have passed between the last two analyses, and different situations have changed at their basis. Starting from the traffic flows, those who carried out the analysis considered different data, which therefore led to different results. So, who is right? In theory, both analyses should be correct, based on actual trends and forecasts for the period.

Therefore, the conclusion is that no analysis can be perfect, but it is a useful tool for the decision-maker. Moreover, the task of the commissioners in charge is only to carry out an analysis: anyone who reads the results will have their own idea and the choice of whether or not to carry out the work, by subsidizing it in the event that it is not profitable, remains a political choice unrelated to the analysis.

This gives an idea of how the final result of the analysis changes by changing the methodology, despite the fact that it is a scientific and accurate analysis. Cost-Benefit Analyses are difficult to do, and it is not surprising to have cases of discordant results.

The conclusion of many - for and against - is that CBA involves very different themes and subjects, with varied interests, sometimes overlapping and sometimes contradictory, and that it can therefore provide useful tools for making a political decision but cannot replace a political one.

#### *5.2.4. Compensations*

On 23 November 2018, the government and TELT (Tunnel Euroalpin Lyon Turin), the French-Italian society in charge for the cross-border section of the tunnel, signed a protocol. It contains several points in which there are proposed:

- the completion of the mitigation works for which TELT is responsible as part of the economic framework of the final project for the new line;
- the implementation of measures accompanying the construction site designed to make the work an opportunity for the community and the development of the territory, with particular reference to the needs to promote training and employment, reduce the impact on the territory and the environment, ensure personal and public health, protect the environment, ensure transparency and communication;
- the execution of measures and works for the environmental, territorial and social protection, in accordance with the provisions of the resolutions of the CIPE and with particular reference to environmental requalification, the development of renewable energy sources, agricultural, tourist and productive activities, the requalification of public and private building heritage, and urban requalification interventions.

The works and compensatory measures can be implemented, as established by Resolution n.67/2017 of the CIPE, which allocates € 98.5 million, of which € 32 available and € 10 already spent, for interventions to be carried out in the municipalities involved in the main work and in the municipalities interfered.

#### *5.2.5. Conclusion on the comparison*

The Italian government is divided on the topic, with the two parties in power having completely opposing ideas on what to do and how to proceed. This is the context in which the new governor of Piedmont, who defines himself as in favor of the work and considers it strategic, and the mayor of Torino, opposed to the entire project, respectively represent the two forces in government.

**So, what will happen to the Torino-Lyon project?** At this moment, nothing official has been established. For this issue, the government is unable to decide on whether or not to support the project.

The realization of the work involves the Rete Ferroviaria Italiana for Italy and the Société Nationale des Chemins de fer Français for France. Then there is TELT, the company that deals with the cross-border section.

With reference to the first Stage of the work, in March 2019, the Board of Directors of TELT decided to proceed with the publication of calls for tenders for the construction of the main works of the Torino-Lyon tunnel, divided into three lots for a total value of € 2.3 billion, concerning the excavation of the base tunnel on the French side. The notices for the launch of tenders relating to the works in France for the Torino-Lyon base tunnel "contain the explicit right to interrupt the procedure at any stage without obligations and costs".

The decision to formally launch the procedure guarantees that TELT will not lose the € 300 million tranche (out of a total of € 813 million) made available by the European Union for the 2014-2020 period.

In any case, the final decision will be up to the government, despite the pressure that the various stakeholders can exert, with the only certainty that if Italy decides to withdraw from the treaty with France, it will open a long phase of international arbitration.

## ***6. CONCLUSION***

In this thesis, we have looked at the problem of investment evaluation, with a particular focus on public investments. We have seen that, despite established methodologies, there is scope for public investment to improve the evaluation process based on cost (duration, discount rate, etc.). All these problems in the evaluation have become evident by analyzing the specific problem of NLTL, where we have seen and still see a wide diversity of opinions.

The basic concept is that if we want to base the analysis on a political idea the way to its realization is very simple, otherwise if the analysis is only demonstrative it could be a waste of time and money. It is also clear that if the evaluation process ends with a balance of costs and benefits at the limit between positive and negative, the decision will be purely political.

Everything we have seen so far demonstrates the need for an analytical evaluation of each individual investment hypothesis, while a political approach that does not distinguish between the different types of investment is misleading, just as an a priori preference of the decision-maker is unjustified.

In any case, the analysis does not represent a constraint, since other interests and other stakeholders are able to totally change the results of analysis.

In Italy, decisions on new investments in the entire infrastructure sector have never been preceded by public cost-benefit analyses. It cannot therefore be ruled out that there have been cases of infrastructure with no economic justification, but which was built solely on the basis of the certainty of the return on the capital invested.

In conclusion, public investment is essential, but it is not the only recipe for growth. It is therefore crucial to assess the quality of the investments in order to weigh up the final decision.

Perhaps it is really useful to overcome the mantra that "any public investment is good for the growth of the country".

## ***7. ABBREVIATIONS AND ACRONYMS***

AV = Added Value

CBA = Cost-Benefit Analysis

CEF = Connecting Europe Facility for Transport

CIPE = Comitato interministeriale per la programmazione economica

DIPE = Dipartimento per la programmazione e il coordinamento della politica economica

D.Lgs. = Legislative Decree

EC = European Community

EFSD = European Fund for Strategic Investment

EIB = European Investment Bank

ERTMS / ETCS = European Rail Traffic Management System / European Train Control System

ESM = European Stability Mechanism

EU = European Union

GDP = Gross Domestic Product

HSR = High-Speed Railway

INEA = Innovation and Networks Executive Agency

IRR = Internal Rate of Return

ISTAT = Istituto nazionale di Statistica

MIPD = Multi-Annual Indicative Planning Document

NLTL = Nuova Linea Torino Lione, the new railway line from Turin to Lyon

NPV = Net Present Value

NUVV = Nuclei di valutazione e verifica degli investimenti pubblici

OP = Operational Programs

PA = Public Administrations

TAV = Treno ad Alta Velocità, the Italian expression for HSR

TELT = Tunnel Euroalpin Lyon Turin

TEN-T = Trans-European Transport

UVAL = Unità di Valutazione degli Investimenti

## **8. BIBLIOGRAPHY**

Turner R. K., Pearce D. W., Bateman I. (1993), *Environmental Economics. An Elementary Introduction*, Johns Hopkins University Press, Baltimore.

Martini A., Sisti M. (2009), *Valutare il successo delle politiche pubbliche*, Il Mulino, Bologna.

Dabla-Norris E., Brumby J., Kyobe A., Mills Z. and Papageorgiou C. (2011), *Investing in Public Investment: An Index of Public Investment Efficiency*, IMF Working Paper No. WP/11/37.

Commission on Growth and Development (2008), *The Growth Report: strategies for sustained growth and inclusive development*, World Bank, Washington DC.

Munnell A. H. (1990), *How does public infrastructures affect regional economic performance?*, New England Economic Review.

Arslanalp S., Bornhorst F., Gupta S. and Sze E. (2010), *Public Capital and Growth*, IMF Working Paper No. WP/10/175.

D. Lgs. 228/2011, *Linee guida per la valutazione degli investimenti in opere pubbliche*, Ministero Italiano delle Infrastrutture e dei Trasporti, Roma.

Florio M. (1991), *La valutazione degli investimenti pubblici*, Il Mulino, Bologna.

Parmentola N. (1991), *Programmazione e valutazione dei progetti pubblici*, Il Mulino, Bologna.

Economic Development Institute (1996), *The Economic Evaluation of Projects*, World Bank, Washington DC.

Dasgupta P., Marglin S. and Sen A. (1985), *Guida per la valutazione dei progetti – Manuale Unido*, Strumenti Formez n. 1, Napoli.

Economic appraisal tool for Cohesion Policy 2014-2020, *Guide to Cost-benefit Analysis of Investment Projects*.

Pennisi G., Scandizzo P.L. (2003), *Valutare l'Incertezza. L'Analisi Costi Benefici nel XXI secolo*, Giappichelli, Torino.

Commissione Europea (2006), *Orientamenti metodologici per la realizzazione delle analisi costi-benefici*.

Brent R.J. (1996), *Applied cost-benefit analysis*, Edward Elgar, Cheltenham (UK).

Commissione Europea (1997), *Guida all'analisi costi benefici dei grandi progetti*.

European Commission (1997), *Financial and Economic Analysis of Development Projects*, Office for Official Publications of the European Communities, Luxembourg.

Virano M. (2011), *Quaderno 1: Linea storica – Tratta di valico*, Osservatorio sul collegamento ferroviario Torino-Lione, Torino.

Cialdini P. (2011), *Fréjus. Storia del primo traforo delle Alpi*, Ministero Italiano delle Infrastrutture e dei Trasporti, Roma.

Virano M. (2011), *Quaderno 8: Analisi Costi-Benefici*, Osservatorio sul collegamento ferroviario Torino-Lione, Torino.

Ponti M., Beria P., Drufuca A., Parolin R. and Ramella F. (2019), *Analisi costi-benefici del nuovo collegamento ferroviario Torino – Lione*, Ministero Italiano delle Infrastrutture e dei Trasporti, Roma.

Pucciariello P. (2019), *Relazione tecnico-giuridica*, Ministero Italiano delle Infrastrutture e dei Trasporti, Roma.