

Tackling the issue of quality and completeness of
feasibility studies of public investment projects.
An operational approach

Cities & Regions: Smart, Sustainable, Inclusive?
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- The infrastructure gap is seen as one of the most important among the many causes of the progressive deterioration of Italy's competitive position relative to its major trading partners;
- The extent of this gap is particularly significant at the local level, where municipalities account for the larger share of the national public expenditure;
- During the crisis, the local authorities have suffered more than the central government: persistent budget constraints at the local level - which descends from the application of the Domestic Stability Pact and from other national policies aimed at limiting public expenditure - are deemed the most plausible cause for this infrastructure expenditure slowdown.
- PPPs are thus seen as an effective tool for:
 - ensuring the implementation of infrastructure investment in the presence of a shortage of public funds;
 - orienting the public procurement sector towards market discipline, thereby increasing its efficiency.

A low use of PPP schemes: between 2002 and 2011 only 44 percent of tendered concessions have been awarded. This reveals the persistence of high mortality of project finance initiatives.

The uncertainty in the framework of tariff regulation of many areas of intervention makes private financing highly risky. This discourages equity and debt capital inflows or raises the interest rate.

Similar effects are determined by the indeterminacy of the availability of public resources involved in financing the construction of the work, as well as those provided for the management of the infrastructure (e.g. availability fees).

Many local authorities are tendering PPPs that lacks proper ex-ante analysis of the convenience of the management for the private operator. Why?

- local governments often resort to PPP as a mere substitute for standard contracts, a choice aimed at the goal of not affecting the level of debt or to circumvent the spending limits imposed by the Internal Stability Pact;
- the lack of technical and economic competence of local governments in carrying out in an effective way the role of promoter of the project and management supervisor (the excessive institutional fragmentation does not in fact favors the creation of the expertise required for the award of PPP contracts).

Most of the effort has focused so far on the orientation of public administrations and private operators to proper regulation of contractual relationships.

The most important indications are concerned with the proper allocation of risks, which is diriment in the accounting treatment of the project as on-balance and off-balance. Other important recommendations are related to the nature of the concessionaire (the recommendation is that it is a Special Purpose Vehicle) and to the degree of the project's definition put to tender (final project instead of the preliminary, leaving only the executive to the concessionaire).

In the light of these considerations, the relaunch of the PPP initiatives must be accompanied by an operation of stimulus to correct preparation of a **feasibility study**, which constitutes the first step in the infrastructure project realization process.

To this regard, recent investigations, have shown that for the vast majority of the works falling within a PPP scheme, there are not enough information for assessing the economic and financial feasibility:

752 projects out of 961 (the full sample), present no economic and financial indicators (IRR, NPV, IRR Equity, Equity NPV, DSCR, LLCR). Among the 209 remaining operations, only 30 projects present all the 6 indicators.

The poor quality of business plans and the heterogeneity of the setting mode is a phenomenon which also affects projects that do not fall within the PPP scheme.

In this context, guidelines such as those from the European Commission (for the Cost-Benefit Analysis of public investment projects co-financed with EU funds) prove particularly valuable. However, public managers often lack of an even more operational instrument, which may allow them to conduct feasibility studies in complete autonomy from private building companies.

With the aim of contributing to fill this gap, we have developed the web application **IRPET-SdF**: a web application devised to offer the public manager a clear and user-friendly instrument for the (pre-)feasibility analysis of public investments.

This analytical tool allows the public management to assess the feasibility of investment projects characterised by different mixes of funding schemes, including both the case of the total public funding as the public-private partnership.

Relying on the standard approach found in feasibility studies manuals, the web application is characterised by several connected sections such as demand analysis, financial assessment and market values conversion into economic ones by means of imputed shadow prices.

Both the financial and the economic analysis encompassed in the underlying model, provide the most important profitability indicators (including IRR, NPV, payback period). Moreover, the web-application performs sensitivity and risk analysis (including Monte Carlo analysis).

The model underlying the web application also presents major innovations, mainly concentrated in the economic evaluation section:

- it allows the user to get an estimate of the indirect direct and induced effects generated in both the phase of infrastructure construction and management (to these is associated an estimate of CO2 emissions achieved through the NAMEA coefficients);
- it allows the user to get an estimate of some external effects, which are specific to the investment type. These effects are calculated on the basis of user-entered information, algorithms and parameters drawn from the literature.

The tool also allows the user to get an estimate - carried through IRPET econometric models – of the economic effects of the project on the specific territorial area on which it is implemented. This ensures that, for most sectors and types of work, the feasibility study will also include a proper economic assessment, which would otherwise require costly and expensive *ad hoc* analysis.

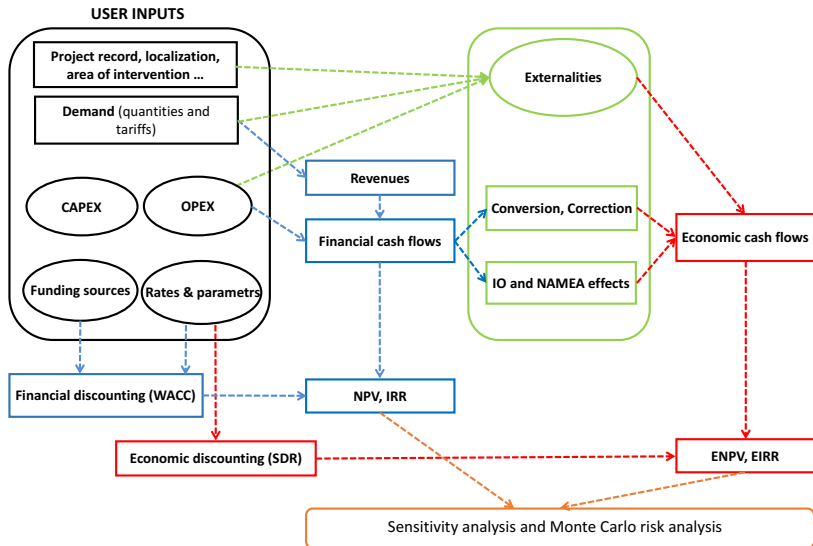
- The **methodological standardisation**, or the ability to obtain fully homogeneous feasibility studies with respect to the evaluation mode, both between different users and different types of projects;
- **Automaticity and elasticity**. The web application allows the user to automatically perform some operations which are complex from a computational point of view. At the same time, the web application leaves a wide margin of discretion on the choice of alternative hypotheses (final residual value, demand profiles, the cost of funding sources);
- The possibility to align the modalities of financial and economic assessment to the **most recent methodological standards**. This also allows the user to update the feasibility studies carried out in the past;

- the ability to **include any type of infrastructure**, for each of which can be defined the way in which major potential economic effects are estimated;
- the ability to **perform sensitivity analysis and risk analysis** in an integrated framework, which uses qualitative and quantitative information already entered by the user;
- The **simplicity of use**. The web application is designed as to guide the user step by step - through indications, suggestions, and comments - to the proper completion of the feasibility study. In this sense, it is the integration between a analytical-quantitative tool and a methodological guide.
- **customizable work environment**. The "*built-in*" guide, is adaptable to any type of user or project/infrastructure.

The *web application* and the underlying model are thus useful in order to:

- ex-ante assess the financial and economic feasibility of public works to be carried out with own resources (public) or with the contribution of private resources.
- select among several potential fundable infrastructure according to the financial/economic criterion.
- ex-ante assess the financial and economic feasibility of projects that include more than one infrastructure.

It is in fact possible, by means of the web application, to obtain an overall evaluation of a set of already completed feasibility studies. This allows the user to evaluate and compare the feasibility/profitability of different mix of interventions.



Starting from a relatively small number of information requested to the user, the model provides a large number of financial indexes:

For what concerns **operating profitability**:

- NPV, IRR;
- payback period;
- Index of operating profitability, NPV / PV of the investment;
- Net of public resources: equity NPV, equity IRR;
- NPVs are computed by resorting to a standard discounting rate (4%) or by using the WACC.

For what concerns **financial sustainability**, the model provides the following bankability indexes:

- DSCR (Debt service coverage ratio);
- LLCR (Loan life coverage ratio);
- PLCR (Project life coverage ratio).

The model also produces the following reports:

- the factors needed to calculate the tax exposure of the project in terms of net VAT position;
- the calculation of *net working capital* through standard setting parameters, expressed in days and as percentage rates of liquidity return;
- the annual breakdown of the loan repayment schedule to the bank(s) involved in the project's funding process;
- straight-line asset depreciation schedule;
- the estimate of the final residual value, derived as the sum of residual accounting, financial and goodwill values.

All this information is made available to the user with different levels of detail.

In a nutshell, the web application requires the user to provide details of the investment costs (civil works, purchase of equipment, labor, overhead costs) and the costs and revenues from the management phase (service costs, personnel costs, ordinary maintenance) . This information is firstly used to obtain the financial cash flows generated by the project and to perform its financial profitability analysis. Economic flows are then generated from financial cash flows, through the following steps:

- 1 Elimination of the tax component of the costs and benefits of the project (input-output multiplier approach and calculation of direct and indirect taxes);
- 2 Market adjustment;
- 3 Inclusion of direct, indirect and induced effects of economic and environmental nature:
 - The I-O impact (I-O multiplier for every possible area of activity (work));
 - CO2 NAMEA coefficients → calculating equivalent tons and CO2 price (marginal emission damage);
- 4 Inclusion of other negative and positive externalities;
- 5 Discounting.

Each type of infrastructure project is in practice characterized by a different combination of external effects of environmental, health, territorial and economic nature as well as by a different balance between the investment impacts of direct nature (user benefits) and indirect nature (social benefits).

Our attempt was to estimate for each field of infrastructure, at least the most representative type of externality, i.e. the one closest to the policy maker goal.

The calculation of the externalities associated with investments required on the one hand the quantification of the effects, i.e. the change in the level of the relevant variables, on the other hand, the identification of appropriate shadow prices for monetization. The estimate of externalities requires the application of different methodologies and, among these, the hedonic price method plays in our case a particularly important role (school buildings, sports facilities, parks, protected parks/areas, ...).

The model, as regards the part of economic analysis, relies on a database which includes a large number of variables. These variables - some of which are characterized by a very high spatial detail - are used to calculate the project's economic effects (for instance, the externalities) and to provide a socio-economic overview of the territory on which the infrastructure is located.

Some examples:

Data used for the calculation of the Input-Output economic impact:

- Tax conversion factors;
- I-O multipliers for investment and management phases;
- Number of employees at the municipal, province level.

Data used for the calculation of the external effects

- Population
- Employment
- Real estate values

The software provides a series of output in terms of tables and graphs. These can be displayed on the web but also exported to a pdf document.

The main outputs are:

- Socio-economic territorial overview;
- Summary of the project's financial features;
- Summary of the financial analysis (profitability and financial sustainability in terms of IRR and NPV and debt coverage indexes);
- Summary of the economic analysis (economic IRR and economic NPV and I-O impact indicators);
- Graphical summary of the main results;
- Sensitivity analysis and Monte Carlo risk analysis.

The use of a web platform, in addition to facilitating the diffusion of the analytical tool, allows to obtain important advantages:

- **Users tracking.** Users must register in order to use the platform (registration is free);
- **Projects tracking.** The user keeps track of the analysis carried out and can modify/update them later, using the same platform;
- **Model and database updating.** The user can always rely on the most current version of the analytical model and the associated database, by means of which she can update already carried out feasibility studies;
- **Technical assistance.** IRPET can access completed or draft feasibility studies, correcting any user compilation errors;
- **Support for statistical/econometric aggregate analysis.** The application can also be used as a data collector (collect in a single dataset information from all completed feasibility studies).



Welcome on IRPET-SdF

IRPET-SdF is a *Web application* devised to offer the public manager a clear and user-friendly instrument for the pre-feasibility analysis of public investments.

This tool allows to evaluate the viability of projects financed with different combinations of sources, from public funding to public-private partnership schemes.

IRPET-SdF combines simplicity of use, methodological rigour and a high level of detail. The structure of the Web application provides for all the necessary steps to organize an accurate cost-benefit analysis, from the description of the investment's qualitative and quantitative characteristics to the development of demand for infrastructure-related services, the financial analysis and, finally, the economic analysis through the appropriate fiscal and market corrections of financial flows. The analysis is partly performed drawing on IRPET's well-established experience with multi-regional input-output models.

Compilation support: sdf-counseling@irpet.it

Technical support: sdf@irpet.it

Login

Email

Password

Remember me [Forgot password?](#)

Log in

You not registered?

Register now



Docs and guides



Your list of projects [logout](#)

Add new project

Legend of actions

Add new project: when you press this button, you proceed to create a new project.

Edit: when you select this item, you can modify the project's input data. The item will be selectable only when the project is still in draft.

View input: when you select this item, you can view all the input data already inserted and eventually export them in PDF format. This item will be visible only once the entry data procedure is completed.

View output: when you select this item, you can view the feasibility study results and eventually export them in PDF format. This item will be visible only once the entry data procedure is completed.

Delete: when you select this item, you will permanently delete the project. This item will be visible only when the project is still in draft.

Clone: when you select this item, you can create a clone of the project, and thus proceed to modify the input data.

Overall evaluation: when you press this button and select some of the projects displayed on the left side bar, you will get their overall evaluation, and eventually export it in PDF format.

Monte Carlo Analysis: when you select this item, you can access a specific section and carry out a risk analysis of the feasibility study results. This item will be visible only once the entry data procedure is completed.

ID	Project	Status	Creation	
<input type="checkbox"/>	3 Stadium	Output ready	Aug 20, 2016, 2:07:04 PM	actions ▾

Overall evaluation



IRPET

Regional Institute for the Economic Planning of Tuscany

IRPET-SdF

A tool for the implementation of feasibility studies of public-investment projects

Your list of projects [logout](#)

[Add new project](#)

Legend of actions

ID	Project	Status	Creation	actions
<input type="checkbox"/>	3	Stadium	Output ready	Aug 20, 2016, 2:07:04 PM

Overall evaluation

- [Edit](#)
- [View input](#)
- [View output](#)
- [Monte Carlo simulation](#)
- [Clone](#)
- [Delete](#)



User menu

- ☰ Projects list
- + New project
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Input data

- Project name
- Project description**
- Investment scenario
- Management scenario
- Revenue flow
- Cost flow
- Risk allocation matrix

Project description (STADIUM)

- 1. Project identification
- 2. Characteristics
- 3. Project schedule
- 4. Management outline

This form collects all relevant qualitative information necessary to identify the project. Please note that, in case they are presently not available to the respondent, he still must fill the mandatory fields entering the sentence: "Information not available yet".

Title of intervention *	<input type="text" value="New Stadium of Florence"/>	?
CUP or MIP identification code *	<input type="text" value="CG15888"/>	?
EU programme *	<input type="text" value="FESR measure 1.4"/>	?
Description *	<input type="text" value="Building of a new sport facility (football stadium)"/>	?
Main technological solutions *	<input type="text" value="None"/>	?
Specific goal *	<input type="text" value="None"/>	?
Final beneficiary *	<input type="text" value="Municipality of Florence"/>	?



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Project description (STADIUM)

1. Project identification
2. Characteristics
3. Project schedule
4. Management outline

This form collects all relevant information about the project's geographical location and functional profile. Choose from the pull-down menu both the Province and municipality/neighbourhood of location.

Location (specify one or more areas)

Region

Toscana

Municipality/area

[C248017] Firenze SAN JACOPINO - PONTE ALLE MOSSE - CASCINE

Delete area

Region

Toscana

Municipality/area

[D1748017] Firenze CARLO DEL PRETE - FIRENZE NOVA - NUOVO PIGNONE - MERCAFIR

Delete area

User menu

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Input data

- Project name
- Project description
- Investment scenario
- Management scenario
- Revenue flow
- Cost flow

Investment scenario (STADIUM)

1. Costs 2. Time allocation of costs 3. Extraordinary maintenance 4. Financing 5. Financing cost 6. Residual value

This form collects all relevant information about investment costs. Insert VAT-exclusive values.

Civil works *	€ 6000000	
Plants and equipment *	€ 3000000	
Expropriation/Purchase of land or buildings (<10% of eligible expenses) *	€ 1000000	
Human resources *	€ 500000	
Planning *	€ 100000	
Other (overhead expenses) *	€ 500000	
Subtotal initial investment	€ 11100000	
Unexpected expenses (percentage share: 5-10%) *	7.00 %	

Investment scenario

Management scenario

Revenue flow

Cost flow

Risk allocation matrix

Data entry confirmation

Priority area selected: Sport Infrastructures

Remove service

Name of service *

Sport services

Description *

Renting of sport facilities

Area *

Sport Infrastructures

Recommended unit of measure for the calculation of external costs (economic analysis).

No suggestions. Select among the alternative units of measure or manually entered unit.

Alternative unit of measure

Do not use an alternative unit

Manually-entered unit of measure

Visitors per year

Warning: selecting the manually-entered or the alternative unit of measure may result in the exclusion of a part of economic externalities from the calculation of the (economic) feasibility indicators. Be sure to specify one of these two options only in case a recommended unit of measure is not available or if the latter is not actually usable.

Demand satisfied without project *

0

Potential demand *

90000

Maximum production capacity *

50000

Standard growth profile

This section allows to automatically calculate the annual trend of demand under the logistic growth assumption.

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Input data

Project name

Project description

Investment scenario

Management scenario

Revenue flow

Cost flow

Risk allocation matrix

Data entry confirmation

Revenue flow (STADIUM)

1. Sport services 2. Food services 3. Total revenue stream composition and graphic

This section allows to specify the year-by-year evolution of demand. If the user has also previously chosen a standard growth profile (i.e. calculated under the logistic growth assumption), its value will appear in the first column. Later on, he will be allowed to choose one of the two profiles for the calculation of total revenue flow.

Year	Standard profile		Customized profile	
	Revenues (Euros)	Demand (unit)	Unit tariff (Euros)	Revenues (Euros)
2021	€ 1150000.00	<input type="text"/>	€ <input type="text"/>	€ 0.00
2022	€ 1166925.00	<input type="text"/>	€ <input type="text"/>	€ 0.00
2023	€ 1181150.00	<input type="text"/>	€ <input type="text"/>	€ 0.00
2024	€ 1193075.00	<input type="text"/>	€ <input type="text"/>	€ 0.00
2025	€ 1203000.00	<input type="text"/>	€ <input type="text"/>	€ 0.00
2026	€ 1211250.00	<input type="text"/>	€ <input type="text"/>	€ 0.00
2027	€ 1218100.00	<input type="text"/>	€ <input type="text"/>	€ 0.00
2028	€ 1223750.00	<input type="text"/>	€ <input type="text"/>	€ 0.00

close sidebar
fullscreen (ESC to exit)

Alternative hypothesis



Projects list

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Output data



Territorial indicators

Summary chart

Graphical summary

Financial Analysis Details

Economic Analysis Details

Budgetary data

Risk allocation matrix

Other tables

Summary chart – project feasibility indicators

The following table contains the project feasibility indicators, mainly drawn from the results of the financial and economic analyses. In particular, the table includes the main indicators used in the cost-benefit analysis, i.e. the Net Present Value (NPV) and the Internal Rate of Return (IRR). In addition, the following indicators are presented:

- **Payback period.** It represents the minimum number of consecutive operating years necessary to obtain a NPV at least equal to zero, thus compensating the negative values usually registered because of early investment disbursements.
- **Investment's NPV/Present Value (PV) ratio.** It is especially useful for financial analysis. A well-established range of cases suggests that a project's feasibility is significant when this indicator is higher than 5%.¹
- **Operating profitability index.** It is expressed as the ratio of the present value of net operating flows to the investment costs. The index provides a simplified measure of the investment's net operating profitability before financing activities.

		indici di bancabilità: 'Analisi finanziaria: indici di bancabilità'		Economic analysis	
Indicators common to financial and economic analyses	Unit of measure	Full project cost	Project cost, net of public contributions	Municipal	Provincial
Discount factor (financial/social discount rate)	%	4,0	4,0	3,5	3,5
IIR	%	5,9	6,6	26,9	26,9
NPV	Euros	3.304.516	4.214.858	35.367.964	35.367.964
Payback period	years	17	18	3	3
Investment NPV / PV	%	29,6	41,2	3,2	3,2
Operating profitability index (operating PV / investment's PV)	Scalar value	1,6	1,7	3,7	3,7

- close sidebar
- fullscreen (ESC to exit)

Alternative hypothesis

Alternative hypothesis	Change %	New values	Unit of measure
Total investment costs	0%	12.18	Total (M€)
Total operating costs	0%	915692	Annual average (Euros)
Total tariff revenues	0%	2183044	Annual average (Euros)
Availability fee	0%	40000	Annual average (Euros)

Cancel Apply

Territorial indicators

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discoursements.

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Discount factor (financial/social discount rate)	%	4,0	4,0	3,5	3,5
IIR	%	5,9	6,6	28,9	28,9
NPV	Euros	3.304.516	4.214.858	35.367.964	35.367.964
Payback period	years	17	18	3	3
Investment NPV / PV	%	29,6	41,2	3,2	3,2
Operating profitability index (operating PV / investment's PV)	Scalar value	1,6	1,7	3,7	3,7

close sidebar
 fullscreen (ESC to exit)

Projects list
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Output data



Territorial indicators
 Summary chart
 Graphical summary
 Financial Analysis Details

Alternative hypothesis



Alternative hypothesis	Change %	New values	Unit of measure
Total investment costs	0%	12.18	Total (M€)
Total operating costs	40%	1281969	Annual average (Euros)
Total tariff revenues	0%	2183044	Annual average (Euros)
Availability fee	0%	40000	Annual average (Euros)

Cancel Apply

- **Operating profitability index.** It is expressed as the ratio of the present value of net operating flows to the investment costs. The index provides a simplified measure of the investment's net operating profitability before financing activities.

		indici di bancabilità: 'Analisi finanziaria: indici di bancabilità'		Economic analysis	
Indicators common to financial and economic analyses	Unit of measure	Full project cost	Project cost, net of public contributions	Municipal	Provincial
Discount factor (financial/social discount rate)	%	4,0	4,0	3,5	3,5
IIR	%	4,0	4,6	27,5	27,5
NPV	Euros	-40.526	869.815	31.969.440	31.969.440
Payback period	years	anno esterno	anno esterno	3	3
Investment NPV / PV	%	-0,4	8,5	2,9	2,9
Operating profitability index (operating PV / investment's PV)	Scalar value	1,2	1,3	3,4	3,4

close sidebar
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Alternative hypothesis



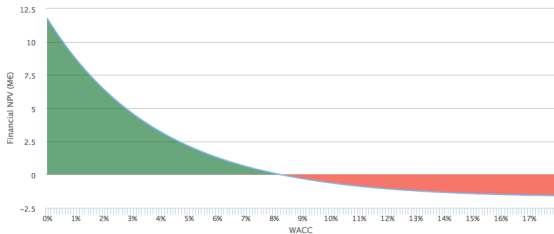
- Projects list
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Output data

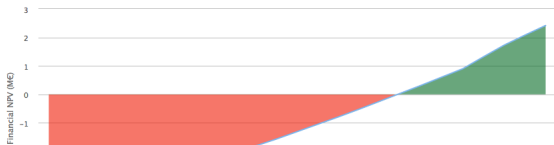


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Sensitivity to financial discount rate



Financial payback period



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Alternative hypothesis



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Analysis of financial profitability	Total	2016	2017	2018	2019	2020	2021
Cash flows from tariff revenues	54.576.112	0	0	0	0	0	1.60
Canone di disponibilità	1.000.000	0	0	0	0	0	40.0
Service costs	-7.847.092	0	0	0	0	0	-205
Personnel costs (gross of social charges)	-11.770.639	0	0	0	0	0	-307
Other operating expenses	-2.728.806	0	0	0	0	0	-80.0
Ordinary maintenance	-545.761	0	0	0	0	0	-16.0
Gross Operating Margin	32.683.814	0	0	0	0	0	1.03
Depreciation amount	11.177.000	0	0	0	0	0	508.0
memo item, operating income	21.506.814	0	0	0	0	0	523.0
memo item, operating income after taxes	13.644.784	-188.118	-399.947	-445.952	-515.615	-593.639	-80.2
Net operating income taxes	-5.240.853	0	0	0	0	0	0
Net operating cash flow (= GOM - taxes)	27.442.961	0	0	0	0	0	1.03
Total investment cost	-12.177.000	-7.219.000	-906.000	-856.000	-1.819.000	-1.177.000	0
Change in net working capital	71.016	-443.836	394.521	0	-73.973	49.315	114.0
Final residual value	1.499.637	0	0	0	0	0	0
Net financial cash flow after public contribution	16.836.614	-7.662.836	-511.479	-856.000	-1.892.973	-1.127.685	1.14
Net financial cash flow	17.822.405	-7.067.809	-440.431	-784.952	-1.741.996	-1.029.994	1.14

Financial profitability indexes

	Full project cost	Project cost, net of public contributions
Discount rate for NPV calculation	4 %	4 %
Financial IRR	5,93 %	6,59 %
Financial NPV	3.304.516	4.214.858
Investment PV	11.146.979	10.236.638
Operating PV	17.582.454	17.582.454
Profitability index	1,6	1,7

244.204/en/progetto/wizard

User menu

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[3] Stadium - Monte Carlo simulation

In this section, it is possible to perform a Monte Carlo risk analysis on the project's data previously entered. For each relevant project variable (investment costs, revenues, operating costs, and other external costs), you can set a variation range, expressed as a percentage of the base value. The pre-set range is +/-50%. The analysis will extract 10,000 random samples from the variables' values included in the range and present the probability distribution (including cumulative distribution) of the financial and economic NPVs.

Base case of financial NPV		<i>mEUR</i>	3,3	
Base case of economic NPV		<i>mEUR</i>	26,6	
Variables	Base case(VA) <i>mEUR</i>	Min. %	Modal %	Max. %
Investment costs	11,2		100%	
Operating costs				
Sport services	4,9		100%	
Food services	6,2		100%	
Revenues				
Sport services	15,7		100%	
Food services	11,0		100%	
Other external costs				
Sport Infrastructures	27,1		100%	
Other/Standard	0,0		100%	
Number of iterations			10000	

Monte-Carlo analysis results

Analysis on financial NPV

Mean	mEUR	3,3	Min.	mEUR	-5,4
Median	mEUR	3,2	Max.	mEUR	12,2
Standard deviation	mEUR	2,9	Prob.{ NPV > 0 }	%	86,09%

