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The Financial Feasibility of a Real Estate Project: the Case of the Ex Tessitoria Schiatti

Leopoldo Sdino[a,*], Paolo Rosasco[a], Sara Magoni[b]

[a]*Politechnic of Milan, Department of Building Environment Science & Technology – Via Ponzio 31, 20133 Milan, Italy*
[b]*University of Genoa - Department of Architectural Sciences - Stradone S. Agostino, 37, 16123 Genoa, Italy*

Abstract

Over the last decade, italian real estate market has been characterized by a steady decline in prices and demand; the phenomenon, conjunctural to a broader crisis of the european and world economy, has affected every intended use and localization, but especially the residential sector, where, at least in Italy, over 70% of all of the sales and leases are concentrated. When the market is characterized by a high degree of uncertainty about the future evolution of his prices and, consequently, about the risk on the use of the capital, the assessment of economic and financial sustainability of real estate projects, especially if characterized by a high public value, becomes crucial in order to operate the right investment choices.
Interationally, the most widely used methodology for this assessment is the Discounted Cash Flow analysis (DCFA); this tool is based on the method of the discounted cash flows, namely on the discount of the balances between costs and revenues within the estimated duration of the investment.
Both in public and private sectors, an intervention is considered sustainable when it is able to generate a total balance of the positive cash flows (Net Present Value) and an annual percentage of return (Internal Rate of Return - IRR), that are greater than the ones generated by alternative investments at low (or no) risk (Prizzon, 1997).
The correct estimate of the costs and revenues generated from an investment becomes a crucial phase for the purposes of a reliable calculation of sustainability indicators. The difficulties concerning the costs and their accurate valuation are essentially attributable to the level of the information that is available at the time of the drafting of the project and, consequently, to the chosen method of estimation (synthetic in the concept and the design phases, analytical in the final and executive stages). When the project deals with former industrial areas, characterized by the presence of pollutants in the soil or subsoil, at the previous difficulties it is added also the uncertainty related to the correct estimate of remediation costs; these costs can only be evaluated with sufficient reliability when all the analysis related to the type of those substances have been developed and when the procedures of the intervention are defined.
In relation to these operating environments, this contribution is the result of the valuations of the economic and financial sustainability of some recovery and renovation's projects developed on the area of the former Tessitoria

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Schiatti, in Lentate sul Seveso (Italy) (that have) It has been carried out by the students of the Workshop in Architectural Project and Constructions of the Politecnico di Milano (proff. B. Croce, S. Cattaneo, L. Sdino).
These results confirm that because of the major cost of the reclamation, the feasibility of every proposed project cannot prescind from a public financial contribution that will cover those higher costs.

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Keywords: Reclamation costs; parametric analysis; economic sustainability; discounted cash flow analisys.

* Corresponding author. Tel.: +39-02-23995732; fax: +39-02-23995185.
E-mail address: leo.sdino@polimi.it

1. Introduction

An investment can be represented by a sequence of costs (needed for the construction, transformation or purchase of a property and its management) and revenues (from the sale or lease of the property); according to a certain time-based analysis (year, semester etc.), the differences between positive values (revenues) and negative ones (costs) determine cash flows.

During the life of an investment (which can go from a minimum of two to three years, in the case of production and sale, to fifty-sixty years, in the case of a rental property), costs and revenues never occur all at the same time, but they are arranged along the entire length of the life-cycle of the asset. For this reason, it is necessary that this cash flow has to be discounted to the present value, meaning that all the values have to be the same as they were at the time of the measurements (usually reported at the beginning of the investment) through the adoption of an appropriate discount rate.

The Discounted Cash Flow Analysis (DCFA) follows this principle: the financial sustainability of an investment property is assessed by bringing back all the cash flows, (positive and negative), to the beginning, through the application of several formulas of financial mathematics which involve the use of a discount rate appropriately identified on the basis of the investor's profile and on the type/duration of the investment. The discount allows the calculation of the investment sustainability indicators (Net Present Value - NPV, Internal Rate of Return - IRR) which are then compared with minimum thresholds of acceptability set by the investor.

The use of this calculation tool allows the development of a system with many economic variables, such as; the market value of the buildings and the value of the land in accordance with their intended use; the costs of production and management of the intervention; the revenues expected by the promoter as a result of the sale or rental of real estate units developed/transformed; the time required for the realization/processing and marketing (or lease) of the assets; the financial costs for the investor's exposure towards the institution who lent the credit.

For the evaluation of the cost of the recovery plan of the former Schiatti factory, two main economic and financial indicators for the sustainability of a real estate investment have been taken as a reference: the NPV and the IRR. The NPV is used as the "primary parameter" because it represents a sort of minimum threshold that, if not satisfied, makes the further verification of the IRR unnecessary; the failure to meet the requirements related to the NPV determines, in fact, the lack of profitability of the entire operation. It indicates the increase in the value (or value added), assessed at the starting date, carried out by the investment; it is, therefore, the summation of the discounted cash flow which, as said, must necessarily be a positive value.

The second parameter, the IRR, is the profitability rate of the invested capital: in other words, the IRR is the rate that nullifies the NPV, making positive and negative cash flows equivalent after their actualization. In order to develop an investment, it is necessary that the IRR assumes a value that has to be greater than the percentage of profitability (minimum threshold) defined by the investor, composed of the sum of a rate necessary to compensate the expected inflation, and of a rate equal to the profitability of an investment with zero risk (or almost no) and of an aliquot that can reward the investment's risk.

The IRR's computational difficulties arise because we obtain a polynomial of "n" degrees by putting it equal to zero (where "n" are the years of real estate investment term); therefore, the polynomial can have more than one IRR

solution, and that all of them are equally valid. This happens when there is a variation of the sign of cash flows over the time; this is frequent when real estate management is involved. In the case of recoveries and reutilizations of former industrial areas, such as the present case study, the need to realize remediation increases the costs of implementation and the uncertainty about the estimated values. (Catlett & Boehlje, 1979; Misiolek & Noser, 1982; Kun, Malli & Tufan, 2012; Janikowski & Korcz, 2003). This leads the investor to determine a much higher minimum threshold of acceptability of the IRR than those taken for ordinary interventions. That, often, holds back the advancement of the initiatives. This happens especially in the presence of a large supply of uncontaminated alternative sites in the surrounding areas who make the enterprise of such developments less attractive (Reho, Tonin & Trombetta, 2002).

2. Case study

The case study proposed in the Workshop in Architectural Project and Construction held at the Polytechnic of Milan is a recovery and renovation intervention on a currently disused industrial site, situated in the centre of the city of Lentate sul Seveso (MB, Italy), a medium-sized town in the north of Milan. After the functional and architectural definition of the future of the area, each work-group (11 in total) developed the assessment of the economic and financial feasibility of each project using a cost-revenue analysis.

The sustainability's indicators that have been used for this purpose are the NPV and the IRR; specifically the NPV's value had to be positive and, then, the IRR had to be at least of 10%. If those thresholds were not fulfilled by the projects, new "hypothetical" scenarios were going to be proposed, according to which the economic and financial feasibility would have been granted by the recourse to a public financial contribution.

In those scenarios, the quantity of the contribution would have been identified as the least amount of money needed in order to reach the already mentioned thresholds, but without exceeding them.

The "hypothetical" scenarios, as already mentioned, were configured according to a possible public financial contribution, which would have allowed the investor to reduce negative effects caused by higher remediation costs, which, when the real estate market is in crisis and the prices are decreasing, determines an insurmountable handicap for any real estate initiative.

Until a few decades ago, the concerned area hosted the production of Tessitoria Schiatti.

This factory, founded in 1900, has been active for most of the twentieth century; thanks to the introduction in 1960 of the Jacquard looms that enabled, with little labour, to implement complex designs, it has established itself in the global market by ensuring precious products and high quality.

With technological progress, however, the original area became inadequate and the need to transfer the entire industrial complex towards a more congenial area (to new production's requirements) was inevitable. Although it has been recently purchased by a private entity, the area is currently abandoned because of the decline in property values and because the demand has significantly reduced its profit margins, slowing down, in fact, the recovery operations for this type of properties.

The groups have found different solutions related to the recovery of the area in accordance with the indications derived from local operators of the real estate market and from the requirements of the Territorial Master Plan (TMP) of the City of Lentate Seveso. Acknowledging a particular aesthetic and symbolic value to the area, all groups have opted for an intervention that wasn't a complete reconstruction, but rather a partial adaptation of the existing structures to new functions. The area has been built with residences (Inside the area, mix of functions has been placed, with residences) - that cover most of the Planned Gross Leasable Area created - buildings intended for tertiary, commercial, and different services.

These development projects have affected, on average, an area of about 21,500 square meters of the GLA, 4/5 of which consists of new buildings and 1/5 consists of the recovery and rehabilitation of the already existing industrial buildings, that are now abandoned. It should be noted that while evaluating the project, about half of what has been realized, (following what is stated in the TMP), has been given for free to the municipality in exchange of a reduction of the costs of the urbanization (Table 1).

Table 1. Areas interested by projects developed from the different work-groups

Group	Total (sqm.)	Ex-novo (sqm.)	Recovery (sqm.)	Transferred as services (sqm.)
1	19,500	16,000	3,500	10,369
2	14,500	11,000	3,500	8,847
3	29,500	23,500	6,000	21,384
4	20,000	15,500	4,500	10,618
5	27,000	19,500	7,500	12,790
6	22,000	19,500	2,500	11,448
7	25,000	20,000	5,000	13,938
8	26,000	22,500	3,500	13,608
9	16,000	9,000	7,000	6,052
10	26,500	22,000	4,500	16,082
11	11,000	7,500	3,500	3,506
Average	*21,500*	*17,000*	*4,500*	*11,695*

For the evaluation of the economic sustainability of this operation, the students initially proceeded estimating the amount of the expected costs and revenues. To evaluate the revenues, the students estimated the sales value of the properties: among the number of different evaluation methods available from the literature, the Market Comparison Approach is the one that has been used (The European Group of Valuers Association, 2012).

According to what this method prescribes, they proceeded with the identification of comparable assets selected from the local real estate market; these are properties similar to the ones planned in the various projects and that are already valued by the market. For this purpose, local operators have been consulted (real estate agents); in fact, they provided information and data in order to establish the estimated sample.

In order to better reflect the technical and economic characteristics of each property included in the estimated sample, three correction coefficients have been applied to the sales prices of detected assets, "Ki", "Ke" and "Km". Precisely: "Ki" stands for the intrinsic characteristics of the asset (related specifically to the property unit, such as size, technology used, obsolescence, etc.); "Ke" stands for the extrinsic characteristics of the asset (related to the context in which the asset is inserted, such as the presence of services, accessibility, etc.); "Km" stands for the market's characteristics (phase of the real estate cycle and the principle of marginal utility).

The estimate of the construction costs was developed using a synthetic mono- parametric method, as the solutions of the project were not yet defined in detail. In fact, there were no essential technical specifications, in order to allow the application of an analytical appraisal method (bill of quantities); in this particular case the students used the price list of the College of Engineers and Architects of the Province of Milan (College of Engineers and Architects Milan, 2014).

The estimated cost and selling values have been then inserted in the DCFA model for the evaluation of each solution planned (Table 2).

Table 2. Market values and cost for the different intended uses expected

Group	RESIDENTIAL			COMMERCIAL			OFFICIES		
	WMV[a] (€/sqm.)	CCN[b] (€/sqm.)	CCR[c] (€/sqm.)	WMV[a] (€/sqm.)	CCN[b] (€/sqm.)	CCR[c] (€/sqm.)	WMV[a] (€/sqm.)	CCN[b] (€/sqm.)	CCR[c] (€/sqm.)
1	1,992	1,424	*not realized*	1,730	1,182	*not realized*	1,675	1,182	*not realized*
2	1,929	1,187	831	1,393	1,000	700	1,634	900	630
3	2,798	1,251	1,042	1,692	*not realized*	522	1,849	*not realized*	1,055
4	1,742	1,042	900	1,518	*not realized*	1,055	1,602	1,166	*not realized*
5	1,934	1,091	764	1,513	*not realized*	1,055	1,460	*not realized*	963
6	2,254	1,424	997	1,624	1,111	778	1,622	1,111	778
7	1,607	1,043	730	1,687	913	639	1,691	963	674
8	1,932	1,029	*not realized*	1,401	1,182	827	*not realized*	*not realized*	*not realized*
9	2,334	1,424	*not realized*	1,444	1,170	819	1,604	*not realized*	900
10	2,211	1,285	900	1,265	1,170	819	1,623	*not realized*	900
11	1,835	1,146	781	1,345	652	482	1,469	*not realized*	1,231
Average	*2,052*	*1,213*	*868*	*1,510*	*1,047*	*769*	*1,622*	*1,064*	*891*

[a] Weighted Market Value
[b] Construction Cost Ex-Novo
[c] Construction Cost Recovery

According to these values it follows that, for a total gross area of 21,500 square meters, the total costs for the construction is € 21,269,000, while the average revenues are € 16,779,500 (Table 3). This disproportion is mainly due to the fact that, as mentioned above, the TMP imposes that about half of the gross area realized must be transferred - at no charge - to the municipality in exchange for a reduction in urbanization costs. In this way we have an increase of the production costs without having any benefit in terms of revenues. With this assumption, it is clear that the financial sustainability of the entire operation is very high.

Table 3. Costs and Revenues

Group	Total area (sqm.)	Total costs (€)	Total revenues (€)
1	19,500	25,616,000	18,789,000
2	14,500	13,792,000	9,081,000
3	29,500	21,338,000	18,288,000
4	20,000	21,405,000	14,471,000
5	27,000	24,752,000	20,674,000
6	22,000	21,011,000	19,611,000
7	25,000	19,852,000	18,261,500
8	26,000	23,895,000	20,778,500
9	16,000	21,060,000	13,810,000
10	26,500	23,892,000	19,804,500
11	11,000	17,349,000	11,005,000
Average	*21,500*	*21,269,000*	*16,779,500*

The cash flows have been determined following the estimation of the costs and revenues and in adherence with

the reality of the market, the sale of some of the building units has been already hypothesized during the construction phase through the development of an appropriate marketing action on the offered real estate products. For this reason the need to increase the attractiveness of the proposed assets through the publicity and the "branding" of the project, have emerged.

This “branding” action was often, at least in the most successful cases, addressed strategically towards a specific target particularly aligned with the characteristics of the developed area, identifying, for example, as recipients of the entire operation, luxury-consumers or, in other cases, senior-consumers, attracted by both a housing and services perspective that have been tailored to their needs. Following these criteria, the profiles of the financial sustainability of the projects have been configured assuming three different exemplary scenarios (Table 4 and Figure 1).

The first scenario, following a hypothesis according to which the costs, revenues and timing are plausible, does not provide any kind of additional public contribution. In this scenario, predictably, no design solution has proven to be financially sustainable.

The second scenario, however, retains the conditions of the previous scenario but involves, in addition, the use of a public financial contribution given entirely on the fifth year of the operation (last period considered in the analysis of cash flows). The contribution’s amount should just be enough so that the entire operation will become financially sustainable (positive NVP and an IRR of, at least, 10%). In this case, the necessary contributions to the projects, are ranging from € 3.5 million to € 19.1 million with an average contribution requested equal to € 11.4 million. The third scenario, finally, involves a public contribution, just like the second one, but it differs from the previous one because this contribution is entirely donated at the beginning of the operation, on the first year. In this case, the contributions needed oscillate, for the different projects, from € 2 million to € 11.1 million with an average contribution requested equal to € 7.2 million. Noteworthy is the fact that the required contributions in the third scenario are always lower (approximately 60%) than those required in the second one; this finds its explanation in the theory of discounted cash flows in which, in order to reduce the amount of revenue needed, one has to anticipate them over time.

Table 4. Public contribution needed for the sustainability of the operation

Group	Scenario 1[a] (NVP) (€)	Scenario 2[b]		Scenario 3[c]	
		NVP (€)	Public contribution needed (€)	NVP (€)	Public contribution needed (€)
1	Nvp < 0	3,032,500	17,903,000	302,500	10,185,000
2	Nvp < 0	2,330,500	12,293,000	441,206	7,028,000
3	Nvp < 0	999,500	11,100,000	473,500	8,000,000
4	Nvp < 0	3,343,000	18,376,000	487,000	10,570,500
5	Nvp < 0	1,591,000	10,597,000	496,000	6,800,000
6	Nvp < 0	2,068,000	8,002,000	801,000	5,522,500
7	Nvp < 0	1,276,500	7,061,500	123,000	4,038,000
8	Nvp < 0	3,829,500	19,145,500	937,500	11,100,000
9	Nvp < 0	1,138,000	11,471,500	658,000	8,500,000
10	Nvp < 0	90,500	6,258,000	387,000	5,400,000
11	Nvp < 0	1,484,500	3,452,000	955,500	1,967,500
Average	-	1,926,000	*11,423,500*	551,000	*7,192,000*

[a] No public economic contribution
[b] Public economic contribution given at 5th year
[c] Public economic contribution given at 1st year

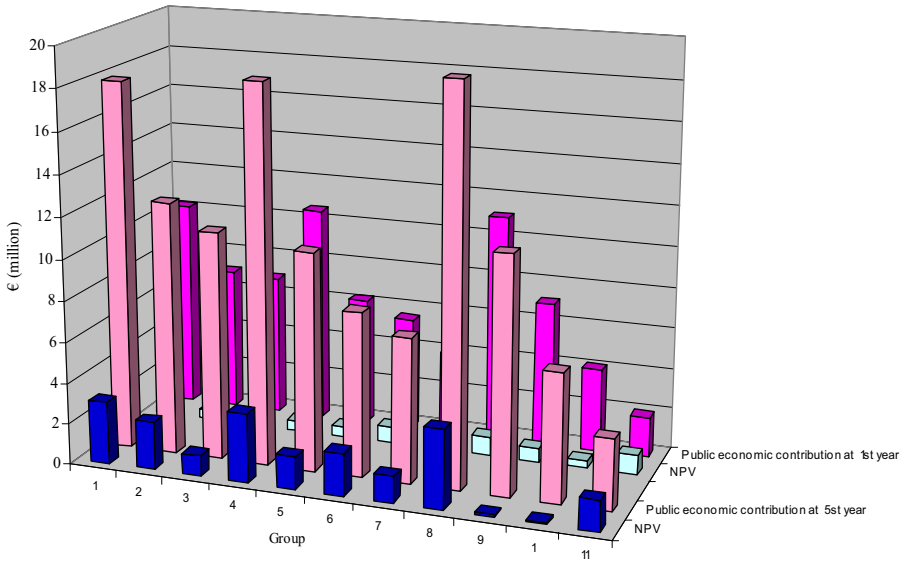

Figure 1. NPV obtained in scenario 2 and 3 with public economic contribution

3. Conclusion

The results obtained from these three scenarios show that, for all the projects that have been developed, the economic feasibility of the intervention is strongly conditioned by a public financial contribution; according to the less onerous hypothesis for the public subject, this is, on average, equal to € 7.2 million (Table 4). For the investor this contribution allows him to obtain an NPV that is positive and a sufficient profitability. If one compares the average value of the public contribution with the estimated costs for remediation and site preparation, it is evident that the first one is much higher (Table 5).

Table 5. Total remediation cost

Group	Cost (€)
1	2,186,500
2	1,180,000
3	2,286,000
4	2,525,500
5	2,568,000
6	1,180,000
7	1,593,000
8	2,125,000
9	2,139,500
10	2,139,500
11	2,159,500
Average	*2,007,500*

This is explained by the fact that the TMP requires the operator to produce and transfer an amount of services and public facilities that is going to reduce further profit margins. The economic contribution (which can be in the form of a total exemption of the payment of urbanization costs) can then be justified as a financial reward for the

realization of those public facilities that the public administration is not able to achieve but that will greatly contribute to the improvement of the population's quality of life. Moreover, it can be seen as a kind of compensation for the environmental damage that the population has suffered over the years by the presence of industrial activity on its territory. This, however, is expected to be provided according to the national law, which states that, in case of impossibility of attributing the economic expenses of the remediation to the people who caused the pollution, these should be supported by the Public Administration (Environment Ministry, Region of competence). The economic valuation developed through the DCFA model, allows, already at the stage of pre-feasibility, to determine which are the minimum profit margins for this type of operations and the amount of public contribution needed in order to make this type of interventions sustainable, preventing the undertaking of operations that are often destined to remain unfinished. The economic feasibility can also be extended to the potential public monetary benefits arising from reclamation of the ex-industrial site due to the lower costs for the publicly funded health care due to the lower amount of population exposed to environmental hazards (Guerriero & Cairns, 2009; Guerriero, Bianchi, Cairns & Cori, 2011).

References

Catlett L. & Boehlje M. (1979). Strip-mine reclamation laws and regional cost implications. *Southern Journal of Agricultural Economics*. July 1979. pp. 157-161.

College of Engineers and Architects Milan (2014). *Prezzi tipologie edilizie*. Roma: Tipografia Genio Civile (DEI).

Del Ross P.E. (2002), Appraising Environmentally Contaminated Property and Tax Reduction, *Assessment Journal*, 9,5, pp. 63-74.

Guerriero C., Bianchi F., Cairns J., Cori L. (2011). Policies to clean up toxic industrial contaminated sites of Gela and Priolo: a cost-benefit analysis, *Environmental Health*, 10:68.

Guerriero C., Cairns J. (2009). The potential monetary benefits of reclaiming hazardous waste sites in the Campania region: an economic evaluation, *Environmental health*, 8:28.

Janikowski R. & Korcz M. (2003). Financing and cost of redevelopment of post-industrial sites in Poland. *Land Contamination & reclamation*. 11 (1), pp. 49-57.

Kaufman M.M., Rogers D.T. & Murray K.S. (2005). An empirical model for estimating remediation costs at contaminated sites. *Water. Air. and Soil Pollution* (2005) 167: 365-386.

Kun M., Malli T. & Tufan B. (2012). The determination of reclamation parameters and cost analysis in mining sites. *Carpathian Journal and Environmental Sciences*, November 2012. Vol. 7, n. 4, pp. 117-124.

Meyer P.B. (2003), Brownfields and Red Ink: The Costs of Contaminated (and Idle) Land. *Environmental Practice*. Vol. 5. Issue 01, March 2003, pp. 40-47.

Misiolek W. S. & Noser T. C. (1982). Coal Surface Mine Land Reclamation Costs. *Land Economics*. Vol. 58. No. 1 (Feb. 1982). pp. 67-85.

Prizzon F. (1997). La valutazione degli investimenti immobiliari. Torino: Celid.

Reho M., Tonin S. & Trombetta F. (2002). "La promozione della bonifica nelle aree industriali dismesse". In Gajo P. & Stanghellini S. (a cura di) *La valutazione degli investimenti sul territorio.* Atti del XXII Incontro di Studio Ceset, Venezia, 2002.

The European Group of Valuer's Association (2012). *European Valuation Standards*.