

# Urban analysis and development studies for the area of the Santa Chiara Hospital in the city of Pisa (Italy): a comparison between different redevelopment options<sup>1</sup>

Sergio Mattia\*, Alessandra Oppio\*\*, Alessandra Pandolfi\*\*\*

\* *Department of Architecture and Planning (Di.A.P.), Via Bonardi n. 3, Politecnico di Milano (sergio.mattia@polimi.it)*

\*\* *Department of Building Environment Sciences and Technology (Best), Via Bonardi n. 9, Politecnico di Milano (alessandra.oppio@polimi.it)*

## 1. Introduction

This paper represents an excerpt of the theses of the I cycle of the Master in “Real Estate Finance and Development – Part Time” and concerns the projects prepared for the International Town Planning Competition announcement called “Urban redevelopment of the University Hospital of Santa Chiara, facing Piazza dei Miracoli”, promulgated from the Town Council of Pisa (by the Building standards and urban redevelopment office of the Town planning division) in 2007 and developed through an only phase with pre-selection. The Competition terms have been accepted by 40 architecture design groups (of which, 10 have been selected for the following project pre-design stage<sup>2</sup>) in order to solve the urban planning “conflict” emerged between the hospital uses of the involved area and the symbol of the Township of Pisa, the Unesco site of Piazza dei Miracoli, on which the Santa Chiara pole overlooks. The essential requirement of the International Competition was the selection of the best design idea on the basis of some fundamental principles, particularly referring to the capability of the scheduled investments to create value: therefore, the primary purpose of the Master theses was to evaluate the extent to which every project meets different levels of economical and financial balance.

The area took up by the Santa Chiara complex is more than 10 hectares wide and it is placed in the heart of the old town of the city of Pisa, immediately nearby the Cathedral dome square, listed in the Unesco sites as World Heritage. On this kind of qualification depends the need for a Management plan that could take into account not only the demand for the preservation of the cultural heritage, but also its correct use in the wider cultural, social and economical context. The Management plan should be enlarged to an appropriate surrounding area of adequate size, referring to the reciprocal influence between the site and its framework, not only considered as respect area, but also as service zone or as space that could take an advantage from the monumental presence.

The Santa Chiara Hospital area is very close to the square, therefore, it should be absolutely considered by the Management plan of the site. The Redevelopment plan of the Hospital and University area should then consider both the monumental presence and the complexity of functions, referring to services and actual or predictable “pressures” in the historical surroundings; consequently, it will or should become an important part of the Unesco Management plan (cf. the Competition materials, 2007).

The Santa Chiara Hospital and University complex has been developed since the year 1257 and it has always been intended for hospital and university uses; referring to the plans of the actual Administration, this area will be disused and redeveloped, whereas the functions originally set in this place will be relocated in the Cisanello district, a quarter, identified on purpose, in a part of the city that is more suitable to receive the specific features of the displaced functions. Moreover, the design of the redevelopment plan has been elaborated to be consistent to the directives on the drawing up of management plans of Unesco sites. As a matter of fact, the importance of the Santa Chiara area for the city of Pisa is actually strategic, as it represents the opportunity both of developing the city center out of the Piazza dei Miracoli pole and of enlarging and emphasizing the old town characteristics, creating new

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1. This study has been developed with Arch. Maria Mattia, Arch. Federica Pedroni and Eng. Massimiliano Tromba, that contributed in the writing and editing of the master thesis that is described in this essay.

2 For knowledge aims, the names of the 10 groups selected for the final phase are reported: Luigi Snozzi Architetto; Metrogramma: Arch. Alberto Francini; Arch. Giorgio Grassi Associati; Allies and Morrison; Arch. Carlo Magnani St. Architer; David Chipperfield Architects L.T.D.; Oriol Bohigas; Arch. Cino Zucchi; Arch. Gian Piero Buffi; Canali Associati s.r.l.

relationships and increasing the value of the elements that today are the symbols for the urban environment of latent and unexpressed values.

The International Town Planning Competition took place through a restricted procedure and consisted of an only phase, anticipated simply from a pre-selection stage (developed in the so-called “open form”), planned in order to select the participants, open to all the groups that met the requirements pointed out in the competition announcement. The so-called “single competition stage” is anonymous and it consists in the drawing up of the design of the redevelopment plan in accordance with the requirements involved in the call and it was reserved to up to ten applicants, selected during the pre-selection stage as previously described. The winner (the project elaborated from the group of David Chipperfield) received a prize of 100.000,00 €.

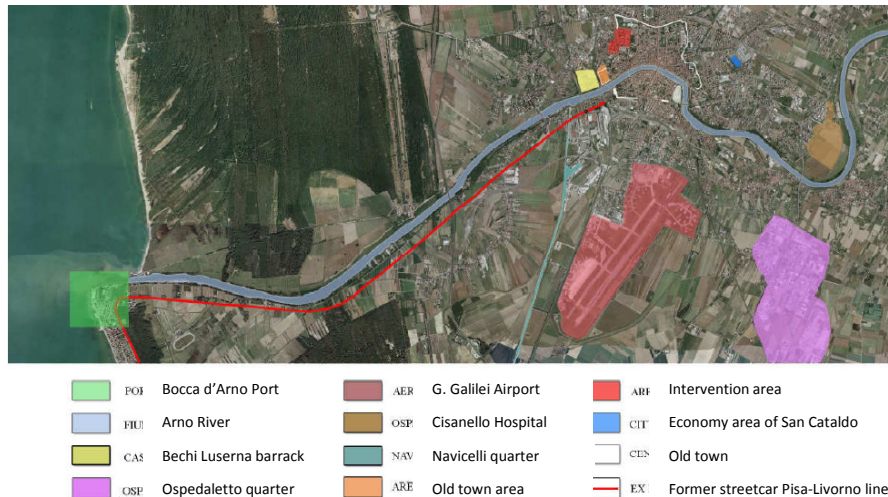


Fig. 1 – The urban area of Pisa (Reference: Bohigas, 2007)

The consciousness of this chance to redevelop the Santa Chiara Hospital area emerges clearly both from the materials of the Competition announcement and, first of all, from the town planning documentation that dealt with the area of Pisa and particularly with its old town<sup>3</sup>: an unique opportunity for such a unique city. As a matter of fact, the hospital complex of Santa Chiara represents an exemplary slice of the history of the city of Pisa, from the Middle Ages up until now, whose first nucleus is the Campo dei Miracoli square, though its placement in the urban system is unexpected<sup>4</sup>. The old Misericordia Hospital could be assumed as the symbolic relationship between two urban metaphors: the sacred city (where the salvation viaticum comes true from the earth Jerusalem to the heavenly Jerusalem that, with its *de niveo marmore* volumes, represents a sort of revelation after death) and the actual centre (made of stones and bricks), that stretches to South and South-East. Moreover, the role of imaginary core<sup>5</sup> given to Piazza dei Miracoli is really singular, as it is at the border of the old urban centre: the centrality of this place is equivalent, actually, to the lack of a real central polarity, of a square that acts as urban catalyst (as verified in many Italian and European cities), replaced from a linear central area that twists and turns through two extreme poles, Piazza dei Miracoli and the Railway Station (in between of which the symbolic center of the political power, the Municipality offices, is located, overlooking on the

3. The objective given from the Public Administration through the programming documentation concerns the drawing up of a unitary project decided for the urban scale development and adapted both to the importance of the area and to the interest that the relationships between the area and the rest of the city will assume. Our reprocessing of the International Competition materials.

4. Actually, Piazza dei Miracoli is not the real center of the city, even if it is its symbolic fulcrum (being physically placed just outside the real monumental area, although it is less famous than the Leaning Tower esplanade): as paradigm of the globality and of the punctual hierarchy of values, the entire monumental system expresses the capability of symbolizing and ordering profane and eternal spaces and times, as shown by the Cosmogony (painted in the Holy area), the seasons sculptures carved in the Baptistery doorposts and the metronomic meaning of the bell tower. Our reprocessing of the International Competition materials.

5. The objective of this complex operation should be putting to regime the presence of the “high quality and planetary level calamity” (as Salvatore Settis defined the monumental complex of the Piazza dei Miracoli) and of the ascertained vocation to become symbol city of culture and scientific training with the different historical and typological souls, recognizable within the area. Our reprocessing of the International Competition materials.

Arno river, near Ponte di Mezzo – an important bridge). Near to the cathedral dome square, the *hospes peregrinorum* marks out the limits with the distribution and organization system of the city; conceived since the XIII century as a fortified monastic citadel, it is identified with a solid volume in the networks of vegetable gardens, that only in the last centuries have been filled with the advancing of the hospital structures<sup>6</sup>. Referring to this dialectic, the redevelopment plans for the existing built complex have been elaborated in order to create new relationships with the Campo dei Miracoli square, completing the “framework” formed by the different linear horizontal architectural systems of the walls, of the Holy area and of the Sinopie museum, a system that contains and prepares to the “miracle” of the huge emptiness of the monumental complex, as it was in Rome for the San Pietro Square before the realization of Via della Conciliazione<sup>7</sup>. In reference to the actual configuration, the collocation and combination of the different buildings – the holy complex and the hospital – that border Piazza dei Miracoli identifies the relationship between some fundamental museum functions: the Enlightenment roots (that collects the antique remains and the burial-grounds of some famous people), the didactic-conservative of the Sinopie museum and, finally, the innovative one that sets out in continuity to the artistic and scientific culture represented by a museum open to multidisciplinary and multicultural.

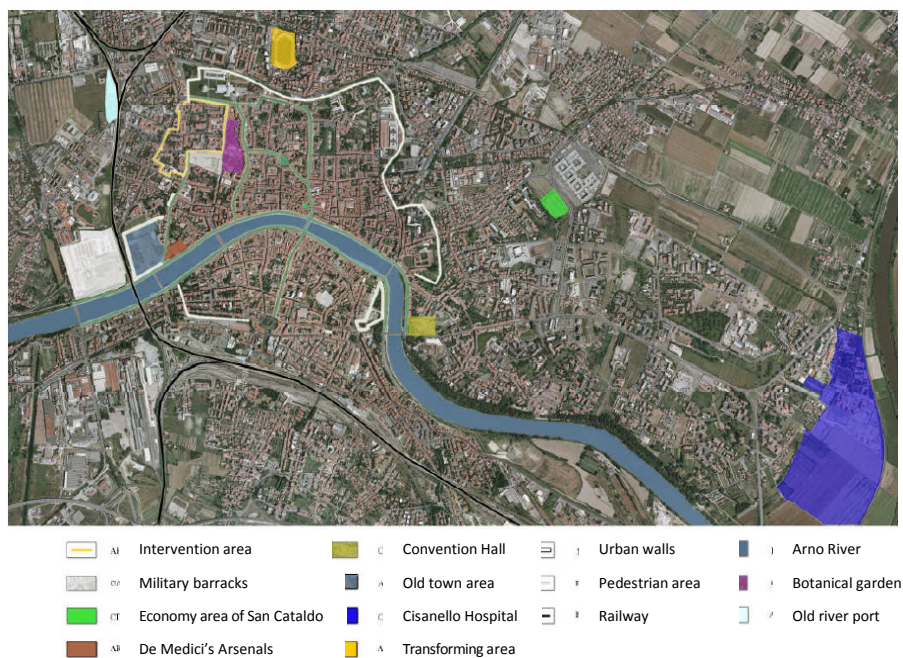


Fig. 2 – The intervention area of the city of Pisa (Reference: Bohigas, 2007)

6. The same historical genesis confirms the interconnection with the monumental system of the Cathedral dome: built about twenty years before the Holy area from the same architect (Giovanni di Simone), the Santa Chiara Hospital is the opposite limit to the monumental quarter; in a symbolic key, the Holy area and the Hospital represent the terms of the dialectic of the cycle “life-death-resurrection”. The old hospital, in fact, is the place of transit and suffering, preamble to death and, then, to the eternal life, shadow space compared to the abstract and metaphysical light of the Heavenly Jerusalem, whose image is traditionally perceived in an ancillary way referring to the “wonder” of the square monuments: this area gains, therefore, a relative identity in reference with the other laic character, represented by the city. Our reprocessing of the International Competition materials.

7. The overlook of the new Santa Chiara quarter will be a fundamental balcony, a loggia – a shadow room – a huge public belvedere, external extension of the museum and suspended on the *Theatrum Basilicae*. This idea decodes the tradition of view and landscape painters of the 18th and 19th century that concerned the area as field *limes*, pause place, from which observing the “miracle” of the Holy area. Real theatre, to quote the famous *Theatrum basilicae Pisanae*, printed in Rome in the year 1705, that is a precious cultural reference of the actual redevelopment project, because it documents the first attempt of global interpretation of the square monuments and, generally, of the beginning of the process of consciousness raising from the city past. The ideation center on which the redevelopment projects are based is the objective of ransoming to a full public use the spaces of the old hospital with the volumetric integrations that follow the previous urban system, forming a functional connection in parallel to the square and in the direction North-South. The projects are inserted uninterruptedly with the Medical School and the Giardino dei Semplici, facing Via Roma, one of the principal roads of the old town. The strong relationship refers to the tradition of the Pisan Studies that from Fibonacci to Galilei, up to Pacinotti and Fermi, made Pisa a world disciplinary reference. An higher interaction between these two elements determine a sort of Wunderkammer at the urban scale, reinforcing the university scientific culture pole of Pisa. This issue is at the base of the functional choices around which the high quality and mixed (residential, commercial, services) settlement is built, both for the most recent history testimonies and for the new insertions. Our reprocessing of the International Competition materials.



Between the largely shared indications contained in the Planning and programming document, Ppd (in Italian, Documento di Programmazione e Pianificazione, Dpp), it is possible to identify two principal themes that have been used as interpretation key of the planning strategy of the area both from the Township of Pisa and in the presented projects, referring to the development principle and coherently to the implications of the Structural Plan. First of all, the development of the programming agreement is a result of the Structural Plan and of the new interests framework that emerges from the discover of the roman ships, totally reshaping the city perspectives<sup>8</sup>, as well underlined from the museum itinerary scheme of the Ppd, from the recovery plan of the city barracks and from the richness of the cultural supply system, that will be noticeably increased with the effects of that agreement. The second issue consists of the functional relationship between the Santa Chiara Hospital and Piazza dei Miracoli and the balance relationship between these two fundamental urban elements.



Fig. 3 – Aerial view of the Santa Chiara area and of the neighborhood (Reference: Snozzi, 2007)

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8. With this agreement (whose respect has been carefully followed from the local Public Administration and, therefore, it has reached the results previously foreshadowed) the city is coming out from its long exile, absolutely not lacking of astonished tourists (or inattentive consumers) and not devoid of an inner life, in which the knowledge city represented a significant presence in the world; anyway, an exile from the most significant cities. With the Programming agreement the city is reshaped as a new cultural and hospitality center that tries to remove the city from its postcard limits and return it to its citizens and tourists with the traces, the memories, the testimonies of the most significant phases of its history. The city moves with the times and reallocates in its external part the public functions that need new technologies and modern organization systems (as police and military stations and hospitals) and contemporarily expands its systems of knowledge and life quality, addressed to its citizens and to the pilgrims interested into the “third millennium grand-tour” and to the “culture and science pilgrims”, that, accordingly to Galileo’s teachings, need space and time and observing conditions. Our reprocessing of the International Competition materials.

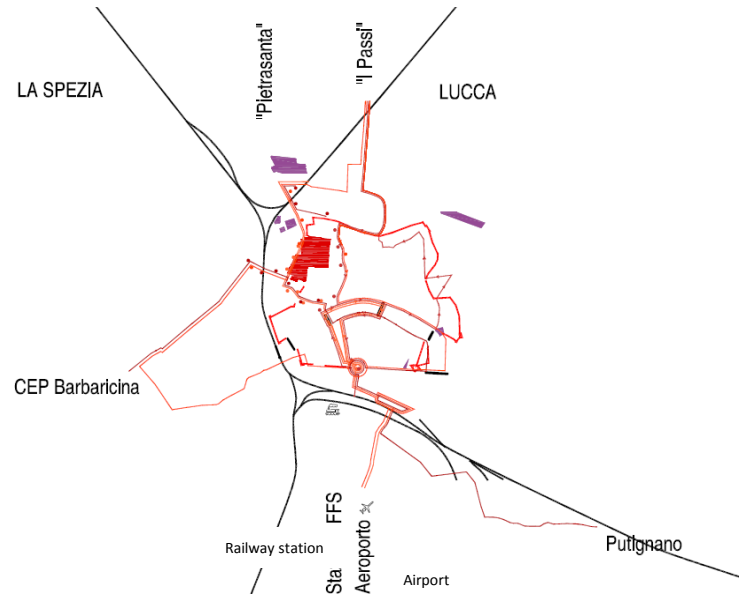


Fig. 4 – The principal public mobility system of the city of Pisa (Reference: Zucchi, 2007)

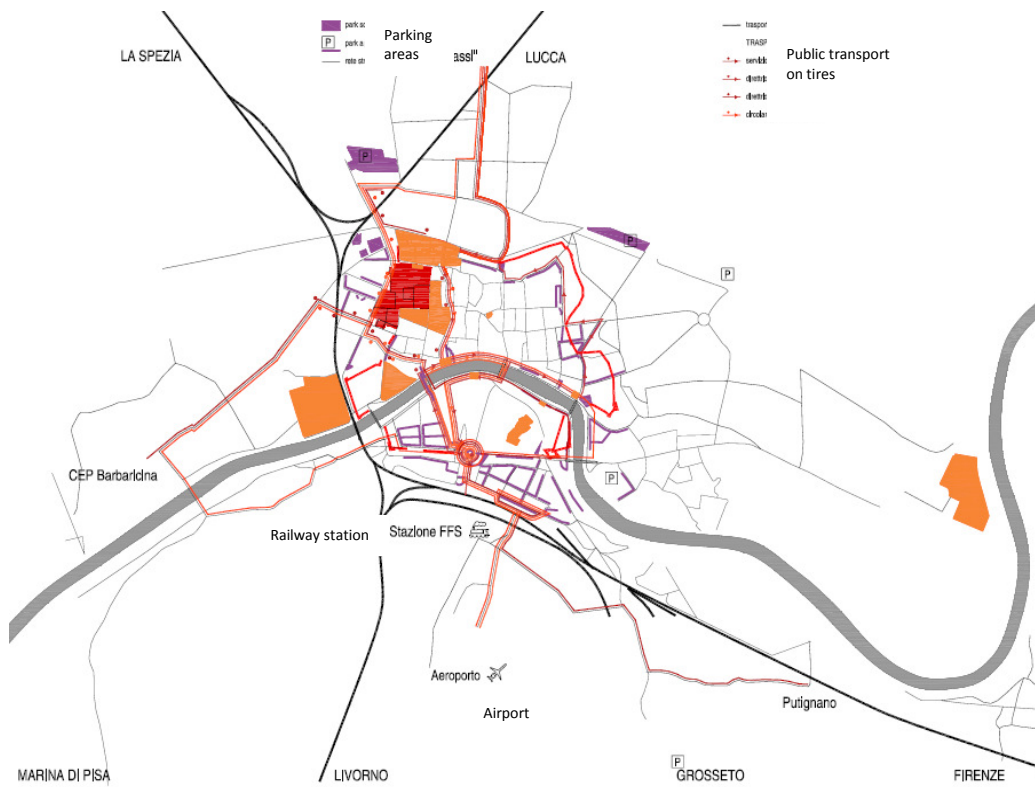
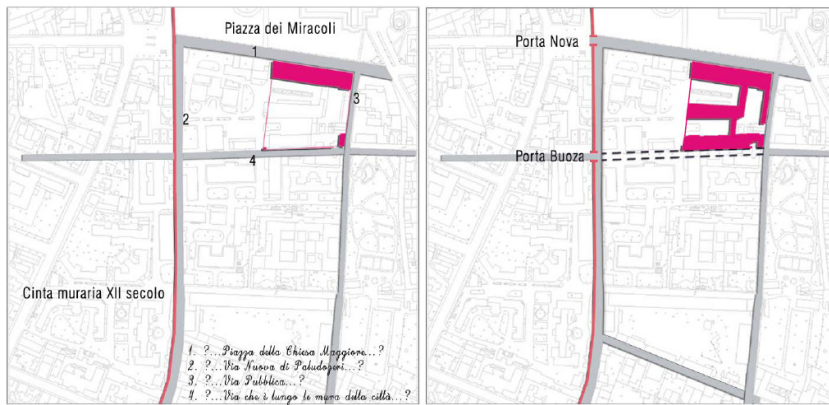
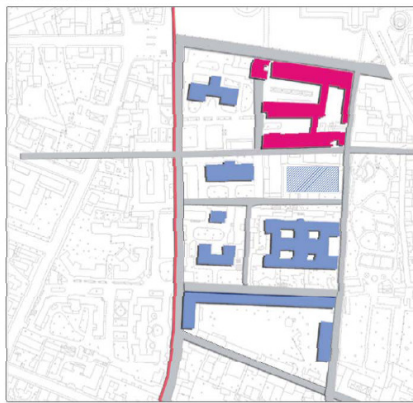


Fig. 5 – The total accessibility system of the city of Pisa (Reference: Zucchi, 2007)

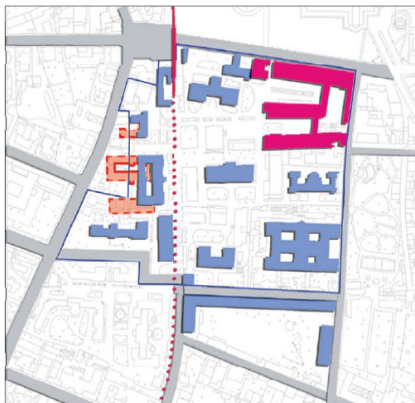


Fase 1: circa 1250

Fase 2: fino al 1750



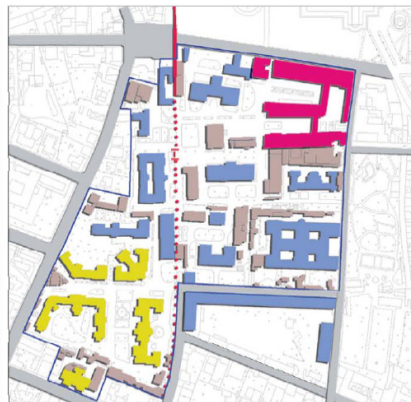
Fase 3: 1° ampliamento 1872 - 1919



Fase 4: 2° ampliamento con "adattamento" 1919 - 1930



Fase 5: 3° ampliamento anni '30/'45



Fase 6: dopo il 1945

Fig. 6 – Evolution of the Santa Chiara area between 1872 and the present configuration (Reference: Canali, 2007)

## 2. Description of the local real estate market

Pisa has always been a dynamic and lively city, also thanks to its innovation drive promoted by its important universities, that assure a stable presence of workers graduated in technical and scientific subjects. Because of this exceptionally active nature Pisa has a very high level structure of production, that is strongly diversified and it is able to react to the crises that the world economy had to face in these last years. Many industries knew how to contain the crisis, creating the bases of a development that is recently giving interesting effects: the best economic results have been reached in sectors as the constructions division and the real estate field. The economic system of Pisa is characterized by the presence of different activities in the industrial, touristic and food sectors: in the last years the production industry has been revalued with its potential. As a matter of fact, the industrial division holds a fundamental economic role, even for the significant existence of some relevant industrial districts<sup>9</sup>. Pisa is the principal support center for the services to enterprises: it is suitable to functions as assistance and promotion to the industrial development for small and medium business, thanks to infrastructures as the Technological park, the National Research Council pole (in Italian, Consiglio Nazionale delle Ricerche, CNR), the Universities and the airport. Moreover, the local Public Administrations provide incentives for the local direct investments, exploiting the potential elements that the entire city offers: the geographic position of Pisa and the local professional and research skills could promote a strong process of development, innovation and growth even for the entire national level. As a matter of fact, the real estate market of Pisa is ever-growing: this constant increase partially depends on the consistent presence of university students and partly on the enlargement of the industrial parks of the city itself and of its province. The real estate market area, in which the Santa Chiara Hospital complex is placed, is positively influenced from the centrality of the district in study. Moreover, this localization is incredibly sought both for its monumental beauties and for the huge confluence of people attracted from the monuments themselves. The Santa Chiara complex takes easily advantage of all the services offered from the city (particularly, of the ones for touristic functions related to the fruition of Piazza dei Miracoli), as it is at about two kilometers to the railway station and it is connected also to the airport “Galileo Galilei” through frequent urban bus rides. This area, as by now most of the old towns, has problems with parking zones on public land and car spots on streets, as they are mostly reserved to residents or they are payment-places (Piazza dei Miracoli is closed to traffic).

Referring to the collection about the local values of the real estate market in order to predict the market price levels in the following analysis phases for the selling and renting of the assets to be evaluated, the research group analyzed different data produced from independent institutes, with the aim to establish an affordable average value for the different uses. More in depth, the research team used the information given by the real estate market observatory of the Italian Land Register Agency<sup>10</sup> for the Township of Pisa, by the real estate assets price collection of the Pisa office of the Business Agents Federation<sup>11</sup> for the year 2008 and by the real estate market observatory of the Pisa office of the Professional Real Estate Agents Federation<sup>12</sup> for the year 2008. From the analysis of the available data it came out that the development produced in the period 2000–2005 in the residential division registered a setback (that is still enduring with significant market fluctuations), caused prevalently from a demand downturn, as all the investors, that from the 2000 bet on this market sector to obtain a significant profitability, have extremely diversified their funds, investing again in some areas as Siena and Pisa, where the expectations, related to the economic advantages that buildings are able to ensure, are high and where earnings are comparable to gains of non residential assets. The considerable increase of rents, registered since the Euro came into force, in all the Tuscan provinces and in the principal cities, determined a stable decrease of the percentage of families interested into renting houses; the most significant downturns were recorded in the central areas of the main towns and of the townships with more than 10.000 inhabitants, already characterized by a restricted market where, apart from the rents

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9. The sectors in crisis are: shipping, footwear, automotive, chemistry and pharmaceutical, leather goods.

10. In Italian, Osservatorio del mercato immobiliare, Omi, di Agenzia del Territorio. The reference is the Micro-zone n. 1, with the last available time indication of the 1st semester 2009; the area in study is in between of two different zones, or better the central area – called B1 – and the mid-central part – C1 –, even if most of the buildings belongs to the first part of the city.

11. In Italian, Federazione Italiana Mediatori Agenti d’Affari, Fimaa. The references are the areas of Santa Maria, San Martino, San Francesco.

12. In Italian, Federazione Italiana Agenti Immobiliari Professionali, Fiaip. The references are the areas of the old town and of Porta Lucca.



increase, the supply has not been able to conform to standards of higher quality required from the demand. This occurrence interested principally Livorno, Grosseto and Lucca, where the difference between required rents and offered quality was higher, but also in some areas of the old town of Florence, in which the most considerable increase of rents were recorded; not only the condition for which the interest rates on mortgages remain low promotes the shifting from renting to purchasing, but also the high costs of living and then the lower buying power of families. The unbearable rents created social anxiety or worse strain, caused by the tough pressure given by the low income families, considering the lack of available flats, whereas the small owners expressed dissatisfaction and doubts for the duration of contracts: that is why the demand for short term rents, instead, is not decreasing, especially in Siena, Florence and Pisa. As a matter of fact, in the three main towns, that are characterized by the presence of activities related to universities, hospitals and research centers, the rent market could count on a wide catchment area, formed by university students, people that moved because of job reasons and other temporarily users: this kind of demand, numerically significant, could shift the market and ensure an interesting performance, but it is often interested by informal negotiations with unregistered contracts. Moreover, in the principal cities, the rents remained in their increase trend, as quoted by the Forth report on the real estate market in Tuscany, published by Ance Toscana in 2006. Finally, all the mentioned trends are still continuing up till now, even if with some fluctuations of volumes and prices in the reference market.

The office market reversed the trend, increasing the turnover in the period 2006-2008, after three years in a row of slowing down in the real estate cycles between the 2003 and the 2005, as a matter of fact, the proceeds of total sales in December 2005 amounted to about 320 million of Euros, realizing a 3% decrease referring to the 2004, year in which the business volume came through 330 million of Euros. The negative result was caused by the decrease of the number of transactions (-5,6% on a year base), reducing from 180.000 to 170.000 square meters, and to the limited increase of rates (less than the inflation) and of rents; moreover, the demand is increasingly selective in choosing the investments to be handled, fact that is determined by the enlargement of the demand requirements about the endowment of quality standards, but also by savings needs. As a matter of fact, most of the quoted trends are still enduring in the 2010, even if with some significant fluctuations of business volumes and prices in the reference market, due to specific uses and destinations. The prudent attitude of demand created longer processes of negotiations even in the most dynamic areas of Tuscany, as Florence and its hinterland (that concern most of the regional market), whereas the request for spaces for small professional offices or for services to people is still operating; finally, the division of second-hand offices is still decreasing, even after the reference period of the Forth report on the real estate market in Tuscany, published by Ance Toscana in 2006.

The division of industrial buildings is particularly affected by the whole economic climate and mood, as a matter of fact, the entire sector suffers from a oversupply situation both for used assets and for new or recent goods. The national market at the end of the 2005 broke the level of 4 million Euros, with a decrease of the business volume, referring to the 2004, of the 3,6 percent, trend that is still ongoing, with several fluctuations. Even selling prices and rents are still decreasing, although a significant, but brief increase registered in the 2006 (with sales proceeds of about 4,3 million Euros). At the regional level, areas with a strong vocation to manufacturing productions in recession (as in the textile division and in sectors as the clothing industry, mechanics and goldsmiths) are in comparison to other zones that are demonstrating significant signals of resistance, in particular, in the districts of the food farming and electronics production, supporting the local industrial division of the real estate market and limiting its reductions. The prices of the last years fluctuated around weak increases and decreases (since the 2005, the first year of fluctuation, with a reduction of the 0,5 %) and the tendencies for the immediate future are inclined to a stabilization of the rates on the actual values. The commerce division, that is usually anti-cyclical and in countertrend referring to the offices and industrial sectors, is, with the residential market, is the one that suffered less from the economic situation, principally thanks to the consumers resistance; this division was the best performer of the non residential markets from the 2004-2005 up till now and the forecasts for the immediate future are stable. In Tuscany, the sector is always moving in a clearer way to two different directions: the large and short retailers. The large-scale retail trade is offering positive perspectives to international and national investors that want to invest both in existing centers and in new development projects, especially in the peripheral areas of the main cities and in the



provincial zones with Townships of higher intensity of inhabitants, with the opening of innovative buildings, outlets and retail parks (Ance Toscana, 2006).

Market values in €/sm	OMI		FIMAA		FIAIP	
	min	max	min	max	min	max
New residential buildings	2250	3300	3000	4000	3000	3800
New commercial buildings	2500	3800	1400	2500	2000	2200
New office buildings	2000	2950	2000	2800	2000	2300

Tab. 1 – Market values trend in the principal data collection analyzed in the research (Reference: our own elaboration on data collected by the Land register agency, Fimaa and Fiaip)

## I semester 2009

Area: Old Town, B1

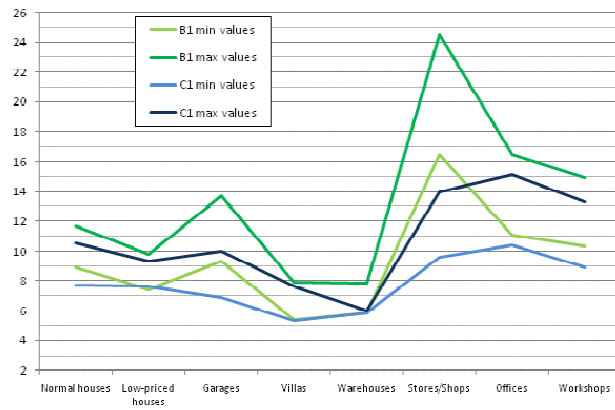
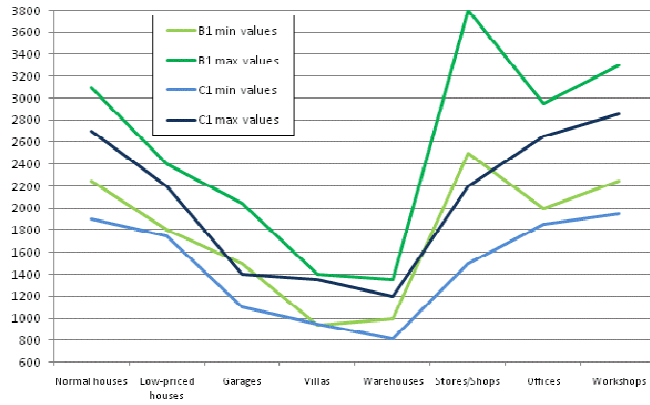
Districts: Sant'Antonio, San Martino, San Francesco, Santa Maria

Typology	Preservation status	Market value (€/sm)		Area (Gross/Net)	Rent value (€/sm per month)		Area (Gross/Net)
		Min	Max		Min	Max	
Normal houses	NORMAL	2250	3100	Gross	8,9	11,7	Net
Low-priced houses	NORMAL	1800	2400	Gross	7,4	9,8	Net
Garages	NORMAL	1500	2050	Gross	9,3	13,7	Net
Villas	NORMAL	2250	3300	Gross	10,3	14,9	Net
Warehouses	NORMAL	1000	1350	Gross	5,9	6,3	Net
Stores/Shops	NORMAL	2500	3800	Gross	7,2	7	Net
Offices	NORMAL	2000	2950	Gross	5,9	5,9	Net
Workshops	NORMAL	940	1400	Gross	5,4	7,9	Net

Area: Mid-central, C1

Districts: Station, Convention Hall, Don Bosco, Pratale, Stadium, Engineering, Porta a Mare (P)

Typology	Preservation status	Market value (€/sm)		Area (Gross/Net)	Rent value (€/sm per month)		Area (Gross/Net)
		Min	Min		Min	Max	
Normal houses	NORMAL	1900	2700	Gross	7,7	10,5	Net
Low-priced houses	NORMAL	1750	2200	Gross	7,6	9,3	Net
Garages	NORMAL	1100	1400	Gross	6,9	10	Net
Villas	NORMAL	1950	2850	Gross	8,9	13,3	Net
Warehouses	NORMAL	810	1200	Gross	5,9	6	Net
Stores/Shops	NORMAL	1500	2200	Gross	7	6,9	Net
Offices	NORMAL	1850	2650	Gross	6	6,1	Net
Workshops	NORMAL	950	1350	Gross	5,3	7,6	Net



## II semester 2008

Area: Old Town, B1

Districts: Sant'Antonio, San Martino, San Francesco, Santa Maria

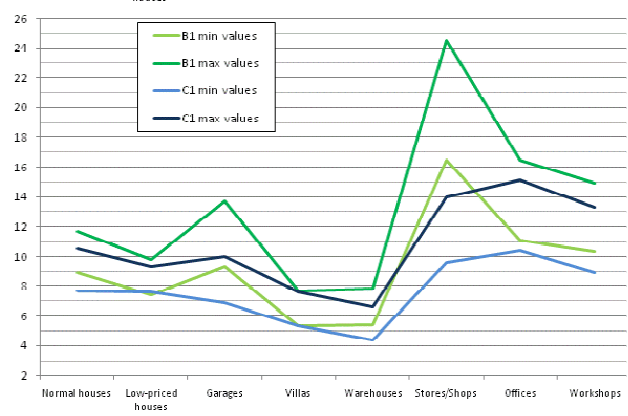
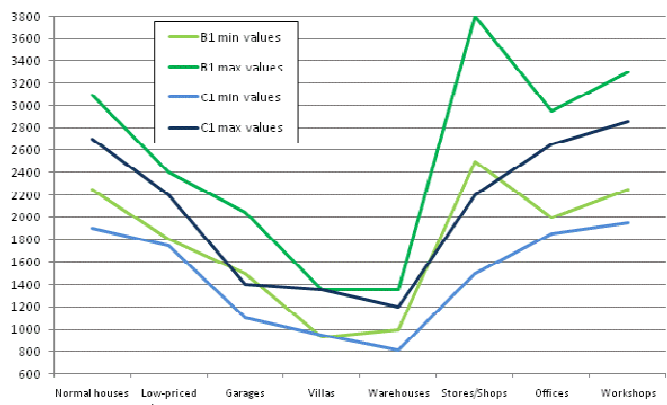
Typology	Preservation status	Market value (€/sm)		Area (Gross/Net)	Rent value (€/sm per month)		Area (Gross/Net)
		Min	Max		Min	Max	
Normal houses	NORMAL	2250	3100	Gross	8,9	11,7	N
Low-priced houses	NORMAL	1800	2400	Gross	7,4	9,8	N
Garages	NORMAL	1500	2050	Gross	9,3	13,7	N
Villas	NORMAL	2250	3300	Gross	10,3	14,9	N
Warehouses	NORMAL	1000	1350	Gross	5,4	7,8	N
Stores/Shops	NORMAL	2500	3800	Gross	16,5	24,5	N
Offices	NORMAL	2000	2950	Gross	11,1	16,5	N
Workshops	NORMAL	930	1350	Gross	5,3	7,7	N

Area: Mid-central, C1

Districts: Station, Convention Hall, Don Bosco, Pratale, Stadium, Engineering, Porta a Mare (P)

Typology	Preservation status	Market value (€/sm)		Area (Gross/Net)	Rent value (€/sm per month)		Area (Gross/Net)
		Min	Max		Min	Max	
Normal houses	NORMAL	1900	2700	Gross	7,7	10,5	N
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Garages	NORMAL	1100	1400	Gross	6,9	10	N
Villas	NORMAL	1950	2850	Gross	8,9	13,3	N
Warehouses	NORMAL	810	1200	Gross	4,4	6,6	N
Stores/Shops	NORMAL	1500	2200	Gross	9,6	14	N
Offices	NORMAL	1850	2650	Gross	10,4	15,1	N
Workshops	NORMAL	950	1350	Gross	5,3	7,6	N





## I semester 2008

Area: Old Town, B1

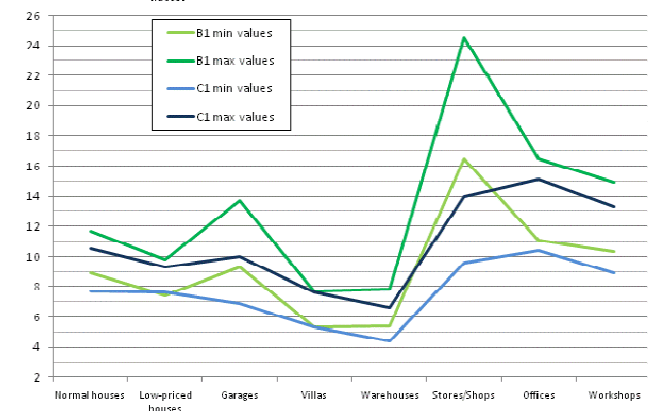
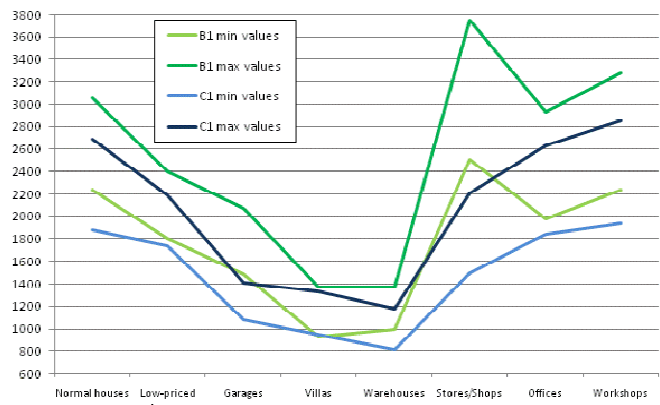
Districts: Sant' Antonio, San Martino, San Francesco, Santa Maria

Typology	Preservation status	Market value (€/sm)		Area (Gross/Net)	Rent value (€/sm per month)		Area (Gross/Net)
		Min	Max		Min	Max	
Normal houses	NORMAL	2240	3060	Gross	8,9	11,7	N
Low-priced houses	NORMAL	1800	2400	Gross	7,4	9,8	N
Garages	NORMAL	1490	2070	Gross	9,3	13,7	N
Villas	NORMAL	2240	3280	Gross	10,3	14,9	N
Warehouses	NORMAL	1000	1370	Gross	5,4	7,8	N
Stores/Shops	NORMAL	2510	3750	Gross	16,5	24,5	N
Offices	NORMAL	1980	2930	Gross	11,1	16,5	N
Workshops	NORMAL	930	1370	Gross	5,3	7,7	N

Area: Mid-central, C1

Districts: Station, Convention Hall, Don Bosco, Pratale, Stadium, Engineering, Porta a Mare (P)

Typology	Preservation status	Market value (€/sm)		Area (Gross/Net)	Rent value (€/sm per month)		Area (Gross/Net)
		Min	Max		Min	Max	
Normal houses	NORMAL	1880	2690	Gross	7,7	10,5	N
Low-priced houses	NORMAL	1740	2190	Gross	7,6	9,3	N
Garages	NORMAL	1080	1410	Gross	6,9	10	N
Villas	NORMAL	1940	2850	Gross	8,9	13,3	N
Warehouses	NORMAL	810	1180	Gross	4,4	6,6	N
Stores/Shops	NORMAL	1500	2210	Gross	9,6	14	N
Offices	NORMAL	1840	2630	Gross	10,4	15,1	N
Workshops	NORMAL	950	1330	Gross	5,3	7,6	N



## II semester 2007

Area: Old Town, B1

Districts: Sant' Antonio, San Martino, San Francesco, Santa Maria

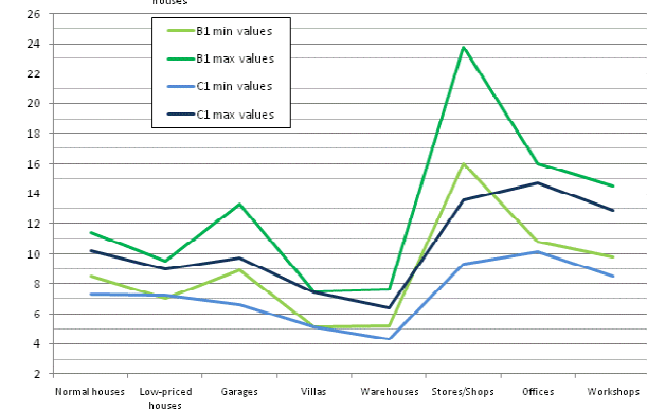
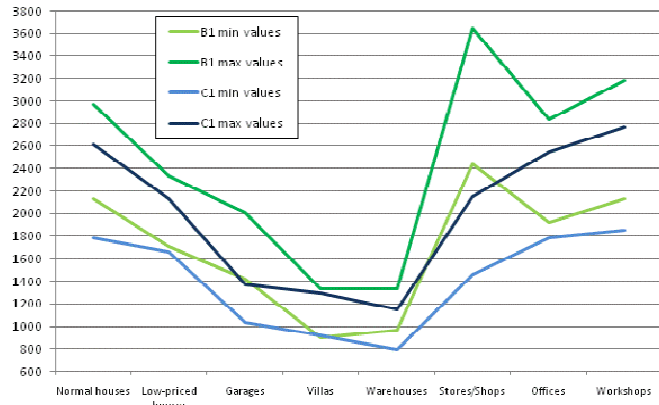
Typology	Preservation status	Market value (€/sm)		Area (Gross/Net)	Rent value (€/sm per month)		Area (Gross/Net)
		Min	Max		Min	Max	
Normal houses	NORMAL	2130	2970	Gross	8,5	11,4	N
Low-priced houses	NORMAL	1710	2330	Gross	7	9,5	N
Garages	NORMAL	1420	2010	Gross	8,9	13,3	N
Villas	NORMAL	2130	3180	Gross	9,8	14,5	N
Warehouses	NORMAL	970	1330	Gross	5,2	7,6	N
Stores/Shops	NORMAL	2440	3640	Gross	16	23,8	N
Offices	NORMAL	1920	2840	Gross	10,8	16	N
Workshops	NORMAL	900	1330	Gross	5,1	7,5	N

Area: Mid-central, C1

Districts: Station, Convention Hall, Don Bosco, Pratale, Stadium, Engineering, Porta a Mare (P)

Typology	Preservation status	Market value (€/sm)		Area (Gross/Net)	Rent value (€/sm per month)		Area (Gross/Net)
		Min	Max		Min	Max	
Normal houses	NORMAL	1790	2610	Gross	7,3	10,2	N
Low-priced houses	NORMAL	1660	2130	Gross	7,2	9	N
Garages	NORMAL	1030	1370	Gross	6,6	9,7	N
Villas	NORMAL	1850	2770	Gross	8,5	12,9	N
Warehouses	NORMAL	790	1150	Gross	4,3	6,4	N
Stores/Shops	NORMAL	1460	2150	Gross	9,3	13,6	N
Offices	NORMAL	1790	2550	Gross	10,1	14,7	N
Workshops	NORMAL	920	1290	Gross	5,1	7,4	N





## I semester 2007

Area: Old Town, B1

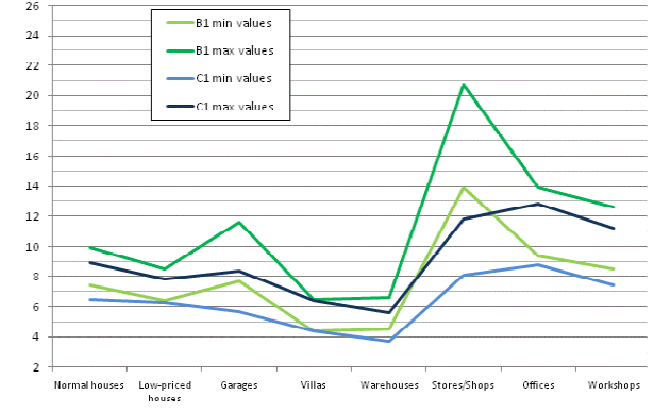
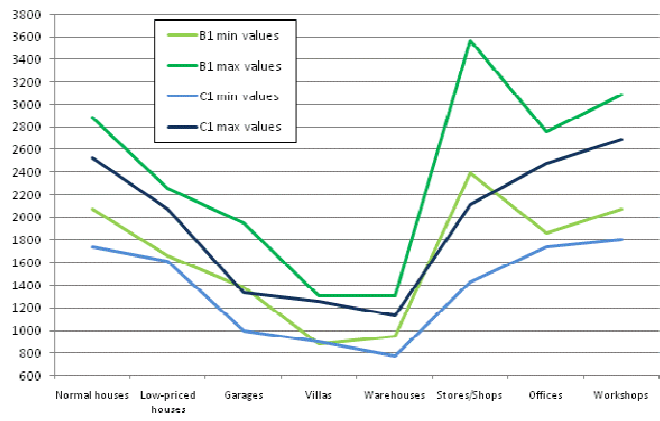
Districts: Sant'Antonio, San Martino, San Francesco, Santa Maria

Typology	Preservation status	Market value (€/sm)		Area (Gross/Net)	Rent value (€/sm per month)		Area (Gross/Net)
		Min	Max		Min	Max	
Normal houses	NORMAL	2070	2880	Gross	7,4	9,9	N
Low-priced houses	NORMAL	1660	2260	Gross	6,4	8,5	N
Garages	NORMAL	1380	1950	Gross	7,7	11,6	N
Villas	NORMAL	2070	3090	Gross	8,5	12,6	N
Warehouses	NORMAL	950	1300	Gross	4,5	6,6	N
Stores/Shops	NORMAL	2390	3570	Gross	13,9	20,7	N
Offices	NORMAL	1860	2760	Gross	9,4	13,9	N
Workshops	NORMAL	880	1300	Gross	4,4	6,5	N

Area: Mid-central, C1

Quarters: Station, Convention Hall, Don Bosco, Pratale, Stadium, Engineering, Porta a Mare (P)

Typology	Preservation status	Market value (€/sm)		Area (Gross/Net)	Rent value (€/sm per month)		Area (Gross/Net)
		Min	Max		Min	Max	
Normal houses	NORMAL	1740	2530	Gross	6,5	8,9	N
Low-priced houses	NORMAL	1610	2070	Gross	6,3	7,8	N
Garages	NORMAL	1000	1330	Gross	5,7	8,4	N
Villas	NORMAL	1800	2690	Gross	7,4	11,2	N
Warehouses	NORMAL	770	1130	Gross	3,7	5,6	N
Stores/Shops	NORMAL	1430	2110	Gross	8,1	11,8	N
Offices	NORMAL	1740	2480	Gross	8,8	12,8	N
Workshops	NORMAL	900	1260	Gross	4,4	6,4	N



## I semester 2006

Area: Old Town, B1

Districts: Sant'Antonio, San Martino, San Francesco, Santa Maria

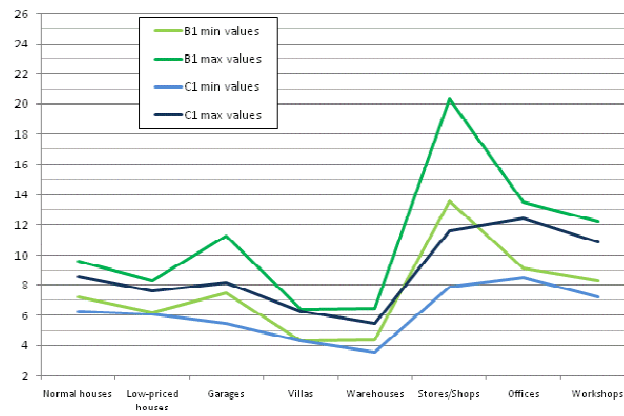
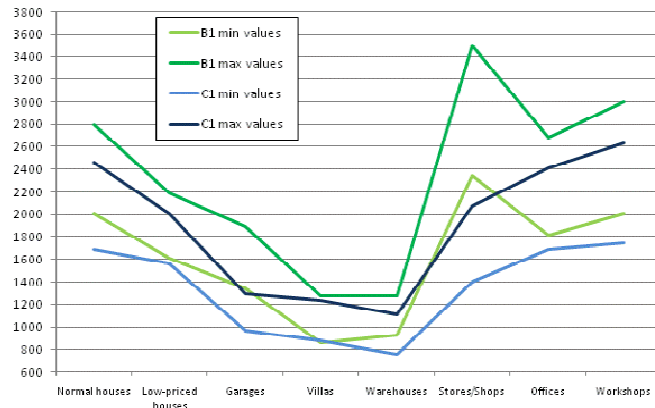
Typology	Preservation status	Market value (€/sm)		Area (Gross/Net)	Rent value (€/sm per month)		Area (Gross/Net)
		Min	Max		Min	Max	
Normal houses	NORMAL	2010	2800	Gross	7,2	9,6	N
Low-priced houses	NORMAL	1610	2190	Gross	6,2	8,3	N
Garages	NORMAL	1340	1890	Gross	7,5	11,3	N
Villas	NORMAL	2010	3000	Gross	8,3	12,2	N
Warehouses	NORMAL	930	1270	Gross	4,4	6,5	N
Stores/Shops	NORMAL	2340	3500	Gross	13,6	20,3	N
Offices	NORMAL	1810	2680	Gross	9,1	13,5	N
Workshops	NORMAL	860	1270	Gross	4,3	6,4	N

Area: Mid-central, C1

Quarters: Station, Convention Hall, Don Bosco, Pratale, Stadium, Engineering, Porta a Mare (P)

Typology	Preservation status	Market value (€/sm)		Area (Gross/Net)	Rent value (€/sm per month)		Area (Gross/Net)
		Min	Max		Min	Max	
Normal houses	NORMAL	1690	2460	Gross	6,3	8,6	N
Low-priced houses	NORMAL	1560	2010	Gross	6,1	7,6	N
Garages	NORMAL	970	1290	Gross	5,5	8,2	N
Villas	NORMAL	1750	2630	Gross	7,2	10,9	N
Warehouses	NORMAL	750	1110	Gross	3,6	5,5	N
Stores/Shops	NORMAL	1400	2070	Gross	7,9	11,6	N
Offices	NORMAL	1690	2410	Gross	8,5	12,4	N
Workshops	NORMAL	880	1240	Gross	4,3	6,3	N





### 3. Economic and Financial Analysis of the projects

The main purpose of the Master theses was to verify the economic and financial balance of the proposals for the Competition announcement about the urban redevelopment plan of the area of the Santa Chiara Hospital, through the model of the Unlevered Discounted Cash Flow Analysis (cash flows available for promoters and investors). This model of cash flow is based on the meaning of operating income, that considers the cash flows before the financial deductions and, then, the liquidity produced from the investment project referring to all the financing sources (equity and debt). In this sense, from one side, the cash flow are discounted by the use of the Weighted Average Cost of Capital (Wacc), that represents the earning opportunity for the capital (both equity and debt) and, on the other side, the determination of the net value of the operating capital for the promoters is given by the difference between the value available for all the investors and the market value of the debt amount<sup>13</sup>.

The calculation procedures of the cash flow model have been applied as follows:

#### 1. Costs:

- Total investments, given by the sum of all the construction costs, calculated for the specific typology of use (residential, commercial, offices, hotels, museums, convention halls, industrial, schools, social, parking places, paved areas arrangement, green areas arrangement, demolitions) through a procedure of comparative analysis, using the so-called “buildings typologies” of the Dei price list<sup>14</sup>, divided into the number of years of construction;
- Cost of land, calculated as average of the values declared in the technical analyses of every design proposal (or better, 90.000.000 €), divided into three amount to be paid to the Township of Pisa in the first three years of investment;
- Extraordinary maintenance costs, calculated through a specific maintenance plan. In particular, the team forecasted that the maintenance costs will be the 2% of the assets value after 5 years from the completion date and the 5% after 10 years, repeating progressively this succession every decade<sup>15</sup>;
- Local council property tax (in Italian, Imposta comunale sugli immobili, Ici), determined referring to the regulation proclaimed by the Township of Pisa for the year 2009 and referring to the D. Lgs. n. 504 of 1992 (a decree requiring the approval of Parliament), integrating its specific rules (in the full regulatory powers of Townships provided from the art. n. 52 and 59 of the D. Lgs. n. 446 of 1997) and identifying the following categories:
  - Land suitable for development (land registry value 524,58 €/sm, multiplier 1, rate 0,007);
  - Residential (land registry value 9,87 €/sm, multiplier 100, rate 0,007);
  - Commercial (land registry value 27,11 €/sm, multiplier 34, rate 0,007);

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13. Cf. F. Pedriali, edited by, *Analisi finanziaria e valutazione aziendale*, Hoepli, 2007.

14. The economic evaluation of projects in the preliminary phase has been made through the comparative analysis of prices given by the buildings typologies calculated from the Board of Engineers and Architects of the Milan Province (in Italian, Collegio degli Ingegneri e Architetti di Milano) and published in a specific volume (yearly updated) edited by the typography of the Italian civil engineering (Tipografia del Genio civile italiano, Dei), that contains projects syntheses, divided for every group of buildings (residential, offices, industrial, public, extraordinary maintenance, urbanization, green areas, plots). The principal purpose of the publication is creating a tool for the evaluation of the economic attractiveness of interventions, through the preliminary estimate of costs and timesheets for the work completion, in particular, through the concept of the “parametric cost index”. The fundamental technical and economical data, referring to the calculation of the construction costs, are identified on the base of the following criteria: *a)* the construction costs and the concerning elements should be recognizable and reachable, referring to a reference time, geographical and technical context; *b)* the sample should be representative on the base of the typological function and of the basic technical and construction features; *c)* the parameter should be descriptive referring to the intrinsic characteristics of the intervention. Through “type projects” regarding the different buildings typologies, it is possible to determine the economic perimeter of interventions in a preliminary way through the application of a standard parametric cost index, referred to the most representative extensive unit for the project; the disposition of contents in project charts, with the concerning costs tables, makes the consultation very quick and intuitive. After a brief methodological introduction, that describes the criteria followed for the determination of the parametric cost index related to interventions, the book explains the charts of every single “type project” for different intervention categories: residential buildings; office buildings; industrial assets; public buildings (schools, hospitals, and so on); cult buildings; urbanization works (parking places, streets, and so on); external arrangement works (green areas, and so on); naturalistic engineering works (reclamations, slopes stabilization, and so on); extraordinary maintenance works (for residential buildings, industrial assets, and so on). Every project is defined through: a technical description of the intervention, with dimensional parameters and technical drawings explaining the works; time programming of interventions (GANNT); costs incidence, divided for significant macro-entries of works (structural works, finish works, and so on); parametric costs of works referring to the most representative extensive parameter, indicating the validity limits of the described parameter.

15. Cf. P. Gasparoli, C. Talamo, *Manutenzione e recupero: criteri, metodi e strategie per l'intervento sul costruito*, Alinea, 2006; J. Perret, *Guida alla manutenzione degli edifici: 308 schede tecniche su frequenze e modalità di intervento*, Maggioli, 2001; J. Albano, *La manutenzione degli edifici: 250 schede pratiche*, Esselibri-Simone, 2008; C. Talamo, *Il sistema informativo immobiliare: il caso del Politecnico di Milano*, Sistemi editoriali, 2003.

- Office buildings (land registry value 23,64 €/sm, multiplier 50, rate 0,007);
- Hotels (land registry value 12,91 €/sm, multiplier 50, rate 0,007);
- Museums (exempt as stated by the D. Lgs. n. 504 of 1992, article n. 7, paragraph 1, letter c);
- Schools, Convention halls and social buildings rented from private organizations (land registry value 2,07 €/sm, multiplier 140, rate 0,007);
- Schools, Convention halls and social buildings rented from the local Administration (land registry value 2,07 €/sm, multiplier 140, rate 0,002);
- Exempt schools and social buildings (as made over to the Township in deduction);
- Industrial (land registry value 4,03 €/sm, multiplier 50, rate 0,007);
- Park places (land registry value 8,80 €/sm, multiplier 100, rate 0,007);
- Total operating costs, obtained as follows:
  - in the construction phase, from the estimation of costs related to (divided for the specific percentage of work progress):
    - contribution on construction costs, as described in the specific regulation<sup>16</sup>;
    - urbanization charges, obtained as the specific regulation of the Township of Pisa describes<sup>17</sup>;
    - management expenses (design, legal issues, safety, contracts and works supervision costs), calculated in a forfait way, or better, referring of the 8% quota generally provided in similar interventions of project financing, regarding the specific law dictates<sup>18</sup>;
    - other non predictable costs, estimated in the proportion of the 1% of the construction costs<sup>18</sup>;
  - in the management phase, from the estimation of costs related to (divided for the specific percentage of sales and rents):
    - Asset management, equal to the 0,3% of the assets values, meant as construction costs of the buildings interested from the interventions, excluding demolitions and external arrangements and the incidence of the costs of land (as specified from the data kindly given by Tishman & Speyer and deriving from the business sector analyses made on similar assets);
    - Property e Facility management, equal to the 3% of the total value of rents<sup>18</sup>;
    - Insurances, proportionally applied to the assets values (described as the construction costs of the buildings interested from the interventions, excluding demolitions and external arrangements and the incidence of the plots costs) and equal to the 0,12% of the value itself;
    - Brokerage fees for sales (with or without internal arrangements, to be used on the base of the project hypotheses), calculated as the 1,5% of the transaction value, or better, the

16. In the specific regulations of the Township of Pisa the contribution on the construction costs for residential buildings is described as the 9% (percentage applicable to new constructions and in the renovations) of the average costs stated from the Township (218,40 €/sm), whereas for commercial or offices or touristic buildings it is as follows: for commercial assets and offices it is equal to the 10% of the average costs stated from the Township (234,00 €/sm), for touristic buildings it is equal to the 6% of the average costs stated from the Township (234,00 €/sm).

17. In the specific regulations of the Township of Pisa it is pointed out that the urbanization charges should be paid referring to the concerning costs, determined on the base of the uses typologies and of the made construction interventions; in particular, the urbanization charges are divided in: *a) residential buildings within the walls* for the following categories: restoration and conservative preservation interventions, buildings renovation, buildings replacement, urbanization renovation and new buildings (divided for the concerning development indexes, or better (a) if the index is lower than 1,5 cm/sm, (b) if the index is between 1,5 and 3,0 cm/sm or (c) if the index is higher than 3,0 cm/sm); *b) residential units outside the walls* for the following categories: restoration and conservative preservation interventions, buildings renovation, buildings replacement, urbanization renovation and new buildings (divided for the concerning development indexes, or better (a) if the index is lower than 1,5 cm/sm, (b) if the index is between 1,5 and 3,0 cm/sm or (c) if the index is higher than 3,0 cm/sm); *c) touristic uses* for the following categories: restoration and conservative preservation interventions, buildings renovation, buildings replacement, urbanization renovation and new buildings (divided for the concerning development indexes, or better (a) if the index is lower than 1,5 cm/sm, (b) if the index is higher than 3,0 cm/sm); *d) retail and industrial buildings* for the following categories: restoration and conservative preservation interventions, buildings renovation, buildings replacement, urbanization renovation and new buildings (divided for the concerning development indexes, or better (a) if the index is lower than 1,5 cm/sm, (b) if the index is higher than 3,0 cm/sm); *e) offices* for the following categories: restoration and conservative preservation interventions, buildings renovation, buildings replacement, urbanization renovation and new buildings (divided for the concerning development indexes, or better (a) if the index is lower than 1,5 cm/sm, (b) if the index is higher than 3,0 cm/sm); *f) social and cultural uses, museums, schools* for the following categories: restoration and conservative preservation interventions, buildings renovation, buildings replacement, urbanization renovation and new buildings (divided for the concerning development indexes, or better (a) if the index is lower than 1,5 cm/sm, (b) if the index is higher than 3,0 cm/sm).

18. Cfr. C. Cacciamani, *Real Estate - Economia, diritto, marketing e finanza immobiliare*, Egea, 2008; C. Cacciamani, *Rischi puri e valore di impresa*, Goliardica Editrice, 2004; C. Cacciamani, *Il rischio da interruzione dell'attività di esercizio*, Egea, 2001.

- total value of the interventions, including demolitions and external arrangements, the incidence of the plots costs and the operating costs in the construction phase;
- Brokerage fees for rents, to be estimated as a quota of the 10% of the new rent contracts;
  - in the phase of overlap between construction and management, as sum of the proportional quota, proportioned to the specific percentage of work progress or sales and rents of assets, referring to the management hypotheses;
  - Costs for direct management, to be estimated referring to the specific management hypotheses created for the projects in study, through specific models;
  - Value-added tax (VAT), to be calculated on the previous elements referring to the specific taxation level (4%, 10% or 20%);
  - Taxes, to be calculated referring to income taxes of corporations (in Italian, Imposta sul reddito delle società, Ires) and regional taxes on production activities (in Italian, Imposta regionale sulle attività produttive), respectively equal to the 26,50% and the 3,90%;
2. Revenues:
- Revenues from rents, estimated on the base of the specific hypotheses of development, using as source the average prices determined from the Italian Land Register Agency in the reference area for the 1st semester of 2009; in addition, the team made specific suggestions for particular contracts based on the estimation of sales proceeds (according to which, usually, the gross sales of an enterprise that will rent an asset are estimated in order to establish the rent level as equal to the 10% of the gross sales proceeds themselves, as for hotels and restaurants, museums and private congress halls, non public primary and nursery schools, clinics and other similar uses);
  - Revenues from sales, estimated on the base of the specific hypotheses of development, using as source the average prices determined from the Italian Land Register Agency in the reference area for the 1st semester of 2009;
  - Annual revenues from the direct management of assets (as the museums and the park places);
  - Subsidy (deduction of the works to be given back to the Township of Pisa on the base of the negotiations to be established in specific agreements);
  - Value-added tax (VAT), to be calculated on the previous elements referring to the specific taxation level (4%, 10% or 20%).

Parameter	Measure
Annual inflation	2,00%
Annual inflation + Gordon rate	4,50%
Cost of Debt	4,50%
Cost of Equity	2,00%
Discount rate	7,13%
Equity rate	12,00%
Equity proportion	35,00%
Debt proportion	65,00%
Income taxes of corporations	27,50%
Regional taxes on production activities	3,90%
Financial charges	10,00%

Tab. 2 - Input of cash flow models applied to the four project in study (Reference: our own processing)

For every project in study the team made different hypotheses of development, in order to verify the different conditions necessary to reach the economical and financial balance. The common elements of the analyses repeated for the different projects are *a)* the calculation of revenues, *b)* the appraisal procedure of construction costs and *c)* the features of management hypotheses.

Typology	HP 1	HP 2	HP 3	HP 4
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Sales of residential + garages	75%	60%	45%	45%
Sales of retail	30%	20%	10%	10%
Sales of offices	30%	20%	10%	10%
Sales of hotels	0%	30%	100%	0%
Direct management	Museum + park places			

Tab. 3 – Common elements of management hypotheses (Reference: our own processing)

Referring to the different management hypotheses, then, the team used the same annual percentage of sales and, consequently, of the real estate assets kept for rents and direct management, differentiating the specific development requirements about functions that are not common between projects or differently conceived by the four projects, or better prevalently public activities (museums, convention halls, social buildings and schools) and some private uses (industrial areas and underground car parks).

In the same way, in order to determine meaningful comparisons between the economic and financial performance of different projects, starting from the data given by projects reports, the team identified minimal intervention units (in Italian, unità minime di intervento) and the number of years of construction, assuming common progressive percentages for sales and rents (estimated from the data given by Beni Stabili on the so-called “period of absorption” of the market for different building types and from the different hypotheses of development), from the first year of operating activities; the evaluation team excluded the opportunity of selling the assets before the construction, because it was not possible to prepare a proper appraisal on it, for reasons of lack of data.

Rents percentage	Year n	Year n+1	Year n+2	Year n+3	Year n+4	Year n+5	Year n+6	Following
	10,00%	40,00%	60,00%	75,00%	85,00%	92,00%	97,00%	98,00%

Tab. 4 – Common percentage of rents of different management hypotheses (Reference: our own processing)

Sales percentage	Year n	Year n+1	Year n+2	Year n+3	Year n+4	Year n+5	Year n+6	Year n+7	Year n+8	Year n+9
	8,00	15,00	20,00	18,00	15,00	8,00	6,00	5,00	4,00	1,00
	8,00	23,00	43,00	61,00	76,00	84,00	90,00	95,00	99,00	100,00
	100,00	92,00	77,00	57,00	39,00	24,00	16,00	10,00	5,00	1,00

Tab. 5 – Common percentage of rents of different management hypotheses (Reference: our own processing)

Referring to the results obtained from the 16 models of unlevered discounted cash flow applied to the four hypotheses on the four analyzed projects in this paper, the team selected the most gainful solutions in the terms of the economical and financial sustainability of investments through specific indexes (Irr, Internal rate of return, and Npv, Net present value). The following tables describe the main features of the selected hypotheses and the comparison between the chosen solutions in order to compare the design ideas elaborated from the four groups participating to the International Competition for the Santa Chiara Hospital area in Pisa.

Because of the configuration of the projects, moreover, the team introduced some development hypotheses to which a public subsidy was added to cover the significant costs caused by the nature and quantity of public spaces, in particular, for the projects of the groups of Makower and Bohigas. This last project, because of the significant use of underground areas, had very high costs of construction.

## **Bohigas Project**

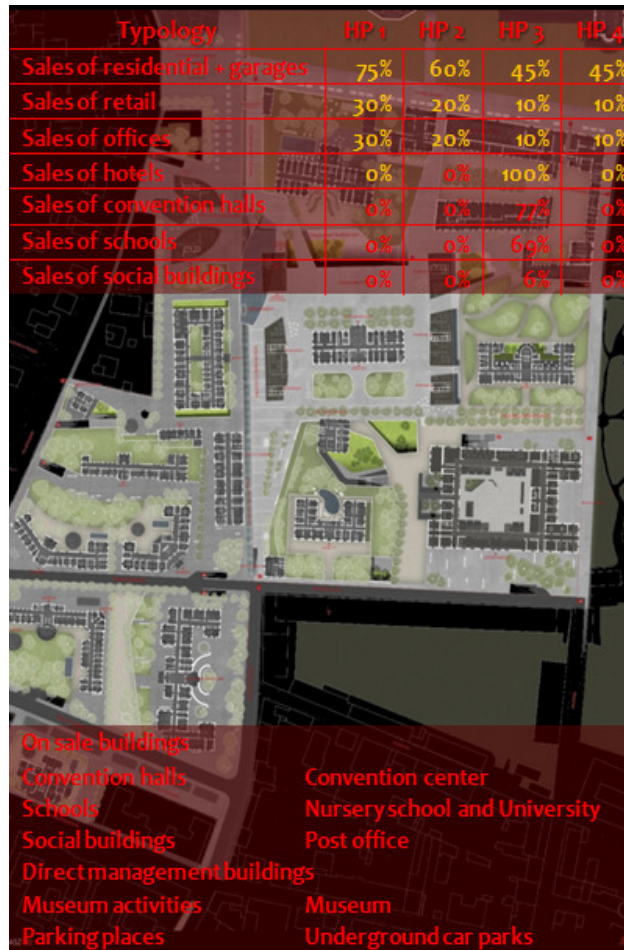
Principal issues of the project:

- Public spaces as cultural reference
- Underground city
- Regaining the memory of the urban walls
- Old town redevelopment: functional mix, green spaces, public areas.



Construction costs	€ 314.811.699
Renovation costs	€ 123.933.580
New buildings costs	€ 93.513.819
Area acquisition costs	€ 90.000.000

Length of concession	30 years
Years of construction	5
First year	2009
Earnings from the third year	
Buildings without taxes	Library, Church, Senior Center
Costs of no tax buildings	€ 12.901.602
Municipality buildings	Tourist Infopoint



Main features of intervention:

- The new central pedestrian square
- The auditorium (850 seats)
- The civic library

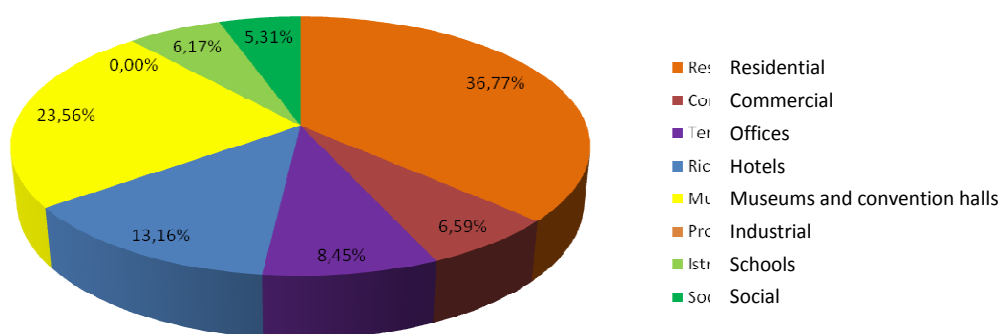
Total area amount:	110.000 sm
Underground areas:	12.000 sm
Existing volume kept by the project:	330.000 cm
New buildings volume:	110.000 cm

## Bohigas Project: the best hypothesis

- Sales of gross areas of residential buildings and pertinence garages: 45%
- Sales of gross areas of commercial buildings and offices: 10%
- Total percentage of sold assets referring to the sellable areas: 31%
- Buildings to be given back to the Township: Library, Church, Senior Citizens' Center
- Rents: 55% of residential buildings, 90% of commercial and offices uses and 100% of other activities (hotels, convention halls, schools, social buildings), for a total amount of the 58% of the whole assets.

Data	Project details
Length of concession	30 years
Years of construction	5
First year	2009
First year for sales	third
First year for rents	third
Buildings to be given back to the Township	Library, Church, Senior Citizens' Center
Value of buildings to be given back to the Township	€ 12.901.602
Buildings rented to the Township	Tourist Infopoint
Costs of public use functions	€ 72.119.483
Estimated construction costs	€ 314.811.699
Estimated renovation costs	€ 123.933.580
Estimated new buildings costs	€ 93.513.819
Area acquisition costs	€ 90.000.000

Uses	Areas		
	Total	Renovation	New
Plots	117.895	62.776	55.161
Residential	39.500	25.420	14.080
Commercial	7.081	2.475	4.606
Offices	9.078	7.355	1.723
Hotels	14.135	14.135	0
Museums and convention halls	25.311	20.282	5.029
Industrial	0	0	0
Schools	6.629	6.629	0
Social	5.705	5.705	0
Parking places	50.000	0	50.000
Paved areas arrangement	37.084	22.250	14.834
Green areas arrangement	25.400	15.240	10.160
Demolitions	33.810	33.810	0
<b>Total</b>	<b>194.523</b>	<b>104.251</b>	<b>90.272</b>



Total construction costs			
Uses	Areas	€/sm	Costs
Land			90.000.000
Residential	39.500	1.247,13	49.261.600
Commercial	7.081	1.554,50	11.007.447
Offices	9.078	1.372,05	12.455.449
Hotels	14.135	1.599,11	22.603.420
Museums and convention halls	25.311	2.757,14	69.785.941
Industrial	0	0,00	0
Schools	6.629	216,12	1.432.650
Social	5.705	157,91	900.892
Parking places	50.000	1.000,00	50.000.000

Paved areas arrangement	25.400	250,00	6.350.000
Green areas arrangement	33.810	30,00	1.014.300
<b>Total construction costs</b>	<b>157.439</b>	<b>1.999,58</b>	<b>314.811.699</b>

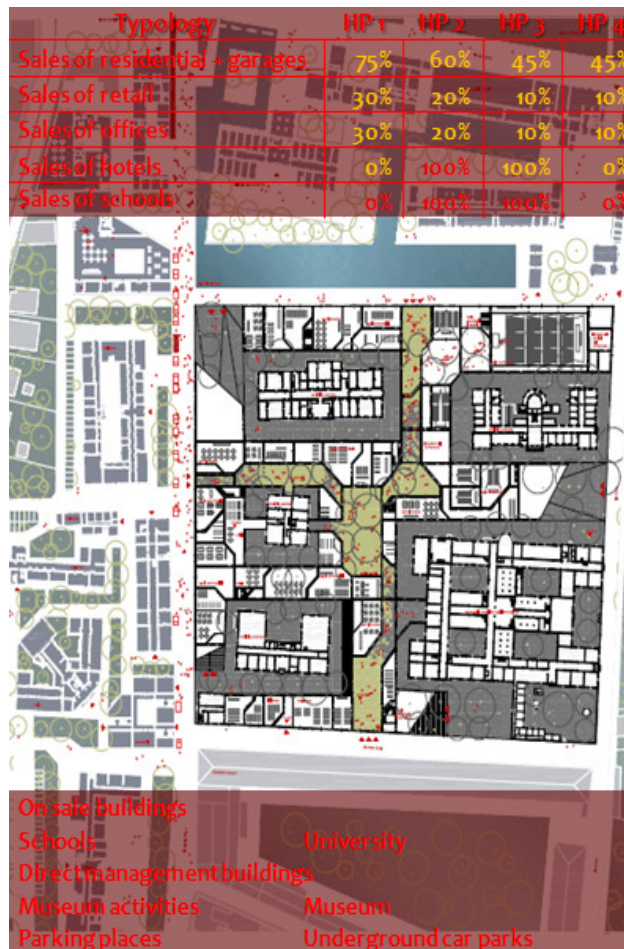


## **Francini Project**

Principal issues of the project:

- Multifunctional public area: Silicon Plaza
- Relationship with the context and the city
- Relationship with other development and redevelopment interventions in the city of Pisa
- Green areas, interventions on different levels, functional mix.





Main features of intervention:

- The new multilevel pedestrian square
- The “Mediateca” and the Made in Italy Center
- The civic library and the Anatomy museum.

Total area amount:	110.000 sm
Underground areas:	13.500 sm
Existing volume kept by the project:	275.000 cm
New buildings volume:	64.000 cm

## Francini Project: the best hypotheses

### 1. A hypothesis:

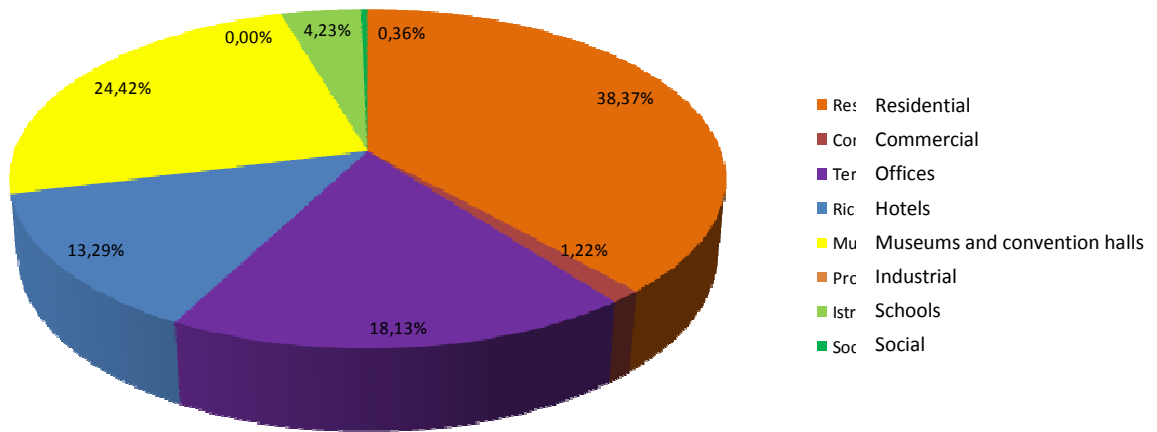
- Sales of gross areas of residential buildings and pertinence garages: 45%,
- Sales of gross areas of commercial buildings and offices: 10%,
- Sales of gross areas of hotels and schools: 100%
- Total percentage of sold assets referring to the sellable areas: 38%,
- Buildings to be given back to the Township: Library,
- Rents: 55% of residential buildings, 90% of commercial and offices uses and 100% of other activities (social buildings), for a total amount of the 43% of the whole assets;

### 2. B hypothesis:

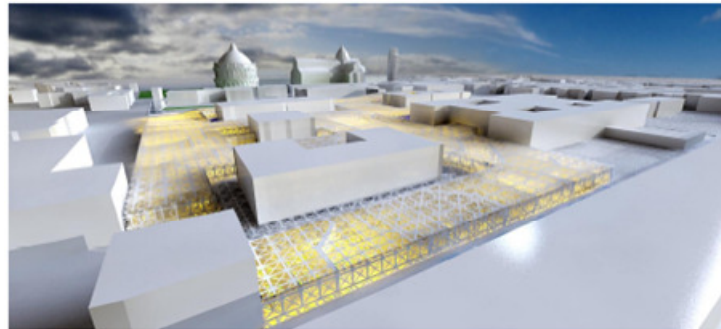
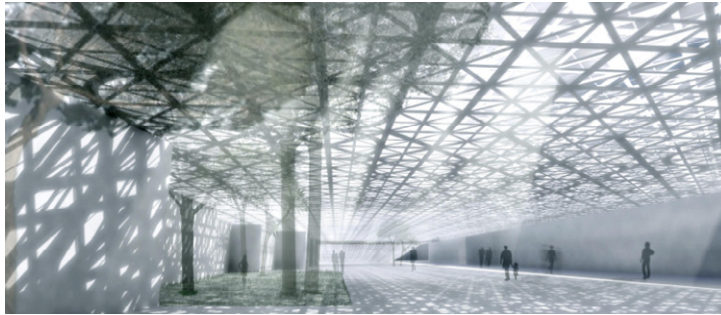
- Sales of gross areas of residential buildings and pertinence garages: 45%,
- Sales of gross areas of commercial buildings and offices: 10%,
- Total percentage of sold assets referring to the sellable areas: 26%,
- Buildings to be given back to the Township: Library,
- Rents: 55% of residential buildings, 90% of commercial and offices uses and 100% of other activities (hotels, schools, social buildings), for a total amount of the 56% of the whole assets.

Data	Project details
Length of concession	30 years
Years of construction	4
First year	2009
First year for sales	second
First year for rents	second
Buildings to be given back to the Township	Library
Value of buildings to be given back to the Township	€ 1.205.668
Buildings rented to the Township	Mediateca
Costs of public use functions	€ 41.965.300
Estimated construction costs	€ 268.440.280
Estimated renovation costs	€ 118.585.230
Estimated new buildings costs	€ 59.855.050
Area acquisition costs	€ 90.000.000

Uses	Areas		
	Total	Renovation	New
Plots	117.895	62.776	7.175
Residential	43.319	36.144	1.250
Commercial	1.372	122	0
Offices	20.471	20.471	15.000
Hotels	15.000	0	0
Museums and convention halls	27.568	27.568	0
Industrial	0	0	0
Schools	4.775	4.775	0
Social	404	404	27.400
Parking places	40.145	12.745	27.954
Paved areas arrangement	37.084	20.389	19.485
Green areas arrangement	14.600	20.397	0
Demolitions	33.389	33.389	<b>78.779</b>
<b>Total</b>	<b>190.138</b>	<b>122.618</b>	7.175



Total construction costs			
Uses	Areas	€/sm	Results
Land			90.000.000
Residential	43.319	1058,68	45.861.042
Commercial	1.372	1405,61	1.928.499
Offices	20.471	1417,46	29.016.888
Hotels	15.000	1479,72	22.195.761
Museums and convention halls	27.568	1312,37	36.179.349
Industrial	0	0,00	0
Schools	4.775	868,75	4.148.283
Social	404	4053,63	1.637.668
Parking places	40.145	577,63	23.188.900
Paved areas arrangement	37.084	250,00	12.085.750
Green areas arrangement	14.600	30,00	1.196.460
Demolitions	33.389	30,00	1.001.680
<b>Total construction costs</b>	<b>190.138</b>	<b>1.411,82</b>	<b>268.440.280</b>

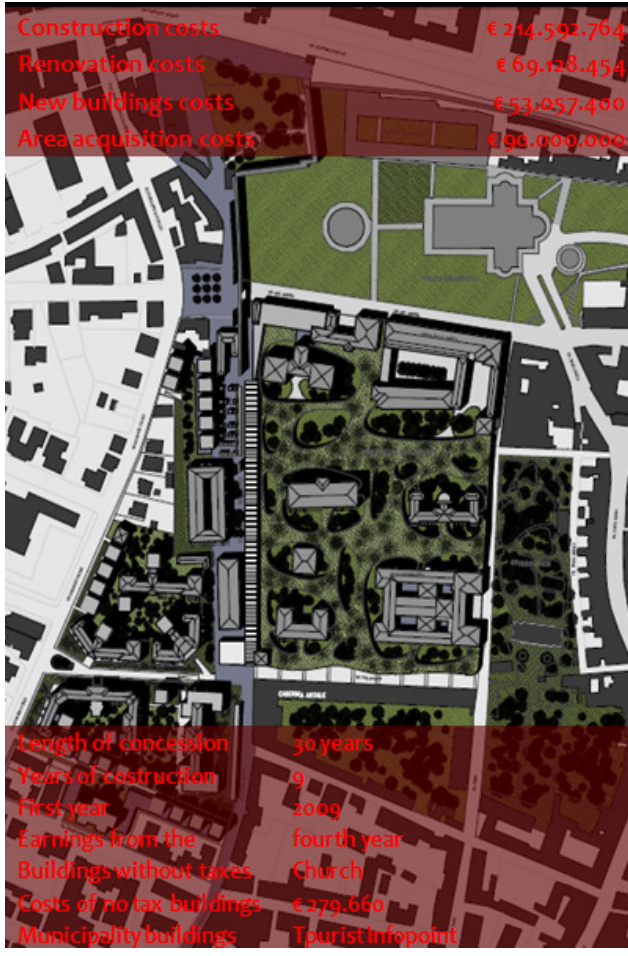


## **Magnani Project**

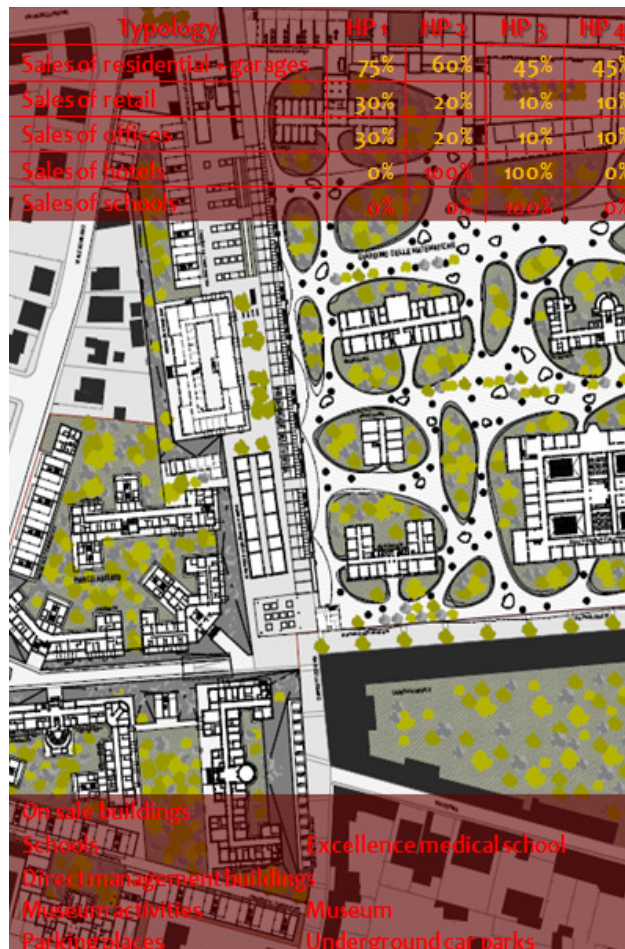
Principal issues of the project:

- Relationship with the existing public spaces
- Relationship with the context through the green areas
- Decrease of the urban density
- Urban renovation and functions mix
- Relationship with the old town and the urban poles.









Main features of intervention:

- New multilevel green areas
- The excellence medical school
- The promenade and paths for tourists.

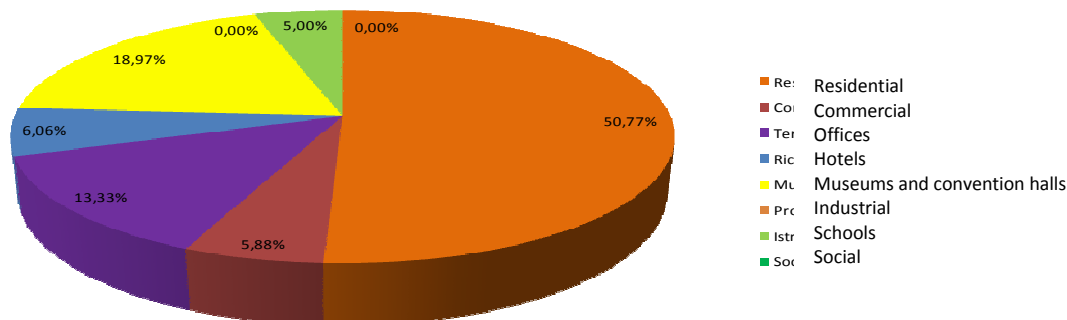
Total area amount:	110.000 sm
Underground areas:	30.000 sm
Existing volume kept by the project:	325.000 cm
New buildings volume:	120.000 cm

### Magnani Project: the best hypothesis

- Sales of gross areas of residential buildings and pertinence garages: 75%
- Sales of gross areas of commercial buildings and offices: 30%
- Total percentage of sold assets referring to the sellable areas: 50%
- Buildings to be given back to the Township: Church
- Rents: 25% of residential buildings, 70% of commercial and offices uses and 100% of other activities (hotels, schools, social buildings), for a total amount of the 29% of the whole assets.

Data	Project details
Length of concession	30 years
Years of construction	9
First year	2009
First year for sales	fourth
First year for rents	fourth
Buildings to be given back to the Township	Church
Value of buildings to be given back to the Township	€ 279.660
Buildings rented to the Township	Tourist Infopoint
Costs of public use functions	€ 10.947.435
Estimated construction costs	€ 214.592.764
Estimated renovation costs	€ 69.128.454
Estimated new buildings costs	€ 53.057.400
Area acquisition costs	€ 90.000.000

Uses	Areas		
	Total	Renovation	New
Plots	117.895	62.776	55.161
Residential	48.920	28.771	20.149
Commercial	5.662	1.162	4.500
Offices	12.841	12.841	0
Hotels	5.837	4.758	1.079
Museums and convention halls	18.279	18.279	0
Industrial	0	0	0
Schools	4.814	4.814	0
Social	0	0	0
Parking places	46.615	0	46.615
Paved areas arrangement	37.015	22.209	14.806
Green areas arrangement	30.285	18.171	12.114
Demolitions	49.945	49.945	0
<b>Total</b>	<b>260.213</b>	<b>92.834</b>	<b>87.149</b>



Total construction costs			
Uses	Areas	€/sm	Results
Land			90.000.000
Residential	48.920	1.079,02	52.785.807
Commercial	5.662	1.009,09	5.713.459
Offices	12.841	1.027,95	13.199.859
Hotels	5.837	1.215,80	7.096.644
Museums and convention halls	18.279	318,95	5.830.153
Industrial	0	0,00	0
Schools	4.814	1.063,00	5.117.282
Social	0	0,00	0
Parking places	46.615	497,46	23.188.900
Paved areas arrangement	37.015	250,00	9.253.750

Green areas arrangement	30.285	30,00	908.550
Demolitions	49.945	30,00	1.498.360
<b>Total construction costs</b>	<b>260.213</b>	<b>824,68</b>	<b>214.592.764</b>

## **Makower Project**

Principal issues of the project:

- Linear public spaces: the Walls Square
- Relationship to the city through green areas: the Pisan vegetable gardens and the Santa Chiara gardens
- Improving the social networks: the Market square
- Slow mobility, environmental sustainability.

Construction costs	€ 247.075.111
Renovation costs	€ 59.221.256
New buildings costs	€ 55.179.914
Area acquisition costs	€ 90.000.000



Length of concession	36 years
Years of construction	6
First year	2009
Earnings from the	third year
Buildings without taxes	Library, Church
Costs of no tax buildings	€ 972.689
Municipality buildings	Tourist Infopoint

Typology	HP 1	HP 2	HP 3	HP 4
Sales of residential + garages	75%	60%	45%	45%
Sales of retail	30%	20%	10%	10%
Sales of offices	30%	20%	10%	10%
Sales of hotels	0%	30%	100%	0%
Sales of convention halls	0%	0%	99%	0%
Sales of industrial buildings	35%	30%	25%	25%
Sales of schools	0%	0%	100%	0%
Sales of social buildings	0%	0%	15%	0%



On sale buildings	Convention center
Convention halls	University
Schools	Nursery school and Clinic
Social buildings	Museum
Direct management buildings	Underground car parks
Museum activities	
Parking places	

Main features of intervention:

- New squares and pedestrian streets
- Museums and multifunctional conventions center
- Social spaces: the Music school.

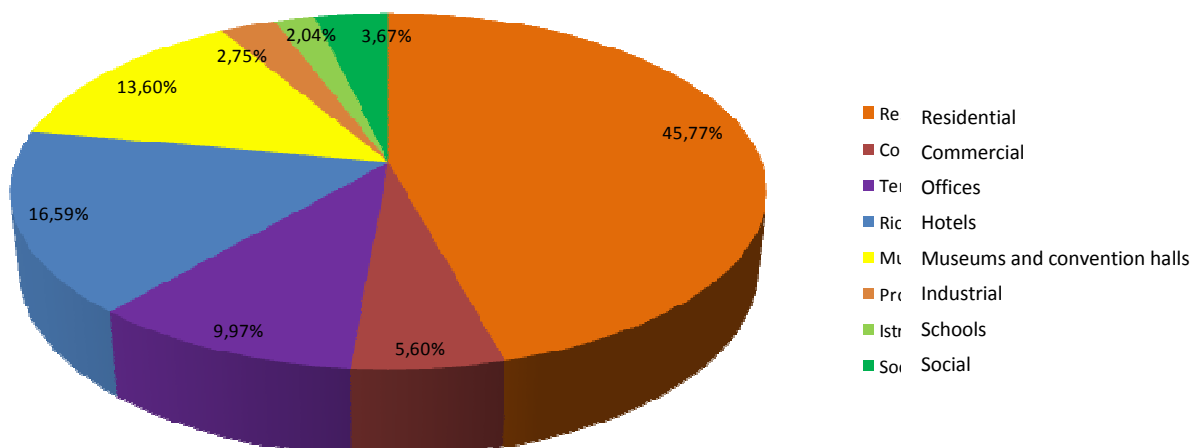
Total area amount:	110.000 sm
Underground areas:	20.000 sm
Existing volume kept by the project:	325.000 cm
New buildings volume:	69.000 cm

### Makower Project: the best hypothesis

- Sales of gross areas of residential buildings and pertinence garages: 60%
- Sales of gross areas of commercial buildings and offices: 20%
- Sales of gross areas of industrial buildings: 30%
- Sales of gross areas of hotels (3 and 4 stars): 66%
- Total percentage of sold assets referring to the sellable areas: 54%
- Buildings to be given back to the Township: Library, Church
- Rents: 40% of residential buildings, 80% of commercial and offices uses, 70% of industrial buildings, 33% of hotels and 100% of other activities (museum, schools, social buildings), for a total amount of the 42% of the whole assets.

Data	Project details
Length of concession	30 years
Years of construction	6
First year	2009
First year for sales	third
First year for rents	third
Buildings to be given back to the Township	Library, Church
Value of buildings to be given back to the Township	€ 977.685
Buildings rented to the Township	Tourist Infopoint
Costs of public use functions	€ 16.993.980
Estimated construction costs	€ 247.075.111
Estimated renovation costs	€ 99.221.256
Estimated new buildings costs	€ 55.179.914
Area acquisition costs	€ 90.000.000

Uses	Areas		
	Total	Renovation	New
Plots	117.895	62.776	55.161
Residential	51.771	35.701	16.070
Commercial	6.336	3.414	2.922
Offices	11.283	4.579	6.704
Hotels	18.761	16.403	2.358
Museums and convention halls	15.389	14.805	584
Industrial	3.114	1.432	1.682
Schools	2.311	2.311	0
Social	4.154	3.222	932
Parking places	52.604	25.000	27.604
Paved areas arrangement	59.400	35.640	23.760
Green areas arrangement	14.200	8.520	5.680
Demolitions	44.157	44.157	0
<b>Total</b>	<b>225.123</b>	<b>142.507</b>	<b>82.616</b>



Total construction costs			
Uses	Areas	€/sm	Results
Land			90.000.000
Residential	51.771	1.100,75	56.986.722
Commercial	6.336	1.233,47	7.815.236
Offices	11.283	1.450,92	16.370.703
Hotels	18.761	1.592,11	29.869.495
Museums and convention halls	15.389	800,86	12.324.420
Industrial	3.114	1.233,47	3.841.011
Schools	2.311	828,96	1.915.715
Social	4.154	662,94	2.753.845
Parking places	52.604	326,54	17.177.319
Paved areas arrangement	59.400	45,00	2.673.000
Green areas arrangement	14.200	95,00	1.349.000
Demolitions	44.157	30,00	1.324.706
<b>Total construction costs</b>	<b>225.123</b>	<b>1.097,51</b>	<b>247.075.111</b>

Tab. 6 – Comparative analysis of the most remunerative hypotheses for the economic and financial sustainability of investments

Uses	Areas				
	Bohigas	Francini A	Francini B	Magnani	Makower
Residential	17.775	19.494	19.494	36.690	31.063
Commercial	708	137	137	1.699	1.267
Offices	908	2.047	2.047	3.852	2.257
Hotels	0	15.000	0	0	12.321
Museums and convention halls	0	0	0	0	0
Industrial	0	0	0	0	934
Schools	0	4.775	0	0	0
Social	0	0	0	0	0
Garages	13.500	5.735	5.735	14.809	15.000
<b>Total</b>	<b>32.891</b>	<b>47.188</b>	<b>27.413</b>	<b>57.050</b>	<b>62.842</b>

Tab. 7 – Summary of the sales areas for the most effective hypotheses for the four projects in study (Reference: our own processing)

Uses	Areas				
	Bohigas	Francini A	Francini B	Magnani	Makower
Residential	21.725	23.825	23.825	12.230	20.708
Garages	16.500	7.010	7.010	4.936	10.000
Commercial	6.373	1.235	1.235	3.963	5.069
Offices	8.170	18.424	18.424	8.989	9.026
Hotels	14.135	0	15.000	5.837	6.440
Museums and convention halls	12.676	15.800	15.800	954	9.525
Industrial	0	0	0	0	2.180
Schools	6.629	0	4.775	4.814	2.311
Social	5.705	0	0	0	4.154
Parking places	0	0	0	0	0
<b>Total</b>	<b>91.913</b>	<b>66.294</b>	<b>86.069</b>	<b>41.723</b>	<b>69.413</b>

Tab. 8 - Summary of the rents areas for the most effective hypotheses for the four projects in study (Reference: our own processing)

	Bohigas	Francini A	Francini B	Magnani	Makower
IRR	7,37%	7,32%	7,88%	7,81%	8,46%
NPV	8.092.460,08	5.527.685,57	20.916.384,94	14.060.206,08	25.499.523,40
IRR with inflation	14,85%	17,96%	16,11%	16,62%	19,52%
NPV with inflation	69.695.139,44	155.569.545,68	150.001.499,12	120.763.121,43	61.031.841,28
IRR with inflation and financial costs	7,21%	9,97%	9,62%	9,87%	7,59%
NPV with inflation and financial costs	3.742.204,89	101.108.646,56	95.540.600,00	76.949.422,19	12.558.534,41



Tab. 9 – Synthesis of the results of the cash flow models applied to the most effective hypotheses of the four projects in study (Reference: our own processing)

	<b>Bohigas</b>	<b>Francini A</b>	<b>Francini B</b>	<b>Magnani</b>	<b>Makower</b>
Total investments	224.811.699	173.166.518	173.166.518	124.592.764	154.405.918
Area acquisition	90.000.000	90.000.000	90.000.000	90.000.000	90.000.000
Extraordinary maintenance	22.932.451	12.176.713	15.808.940	5.761.194	10.413.675
Local council property tax	14.467.944	13.713.275	15.814.450	10.604.094	18.346.881
Total operating costs	165.678.407	112.491.643	134.809.705	63.727.513	101.163.673
Costs for direct management	209.162.776	192.308.634	193.434.710	169.605.470	96.694.679
Value-added tax	108.742.652	88.494.378	93.546.429	68.701.992	65.053.630
Taxes	447.406.406	436.678.521	458.292.441	361.164.973	279.847.521
<b>Costs</b>	<b>1.283.202.334</b>	<b>1.119.029.683</b>	<b>1.174.873.193</b>	<b>894.158.001</b>	<b>815.925.976</b>
Revenues from rents	467.059.359	360.067.450	464.234.912	220.976.879	313.477.631
Revenues from sales	308.487.959	339.290.239	269.911.724	302.940.414	384.007.180
Revenues from direct management	898.477.951	772.461.594	772.461.594	648.761.417	419.520.520
Subsidy	0	0	0	0	0
Value-added tax	196.464.491	170.573.980	186.157.659	136.646.973	127.400.219
<b>Revenues</b>	<b>1.870.489.761</b>	<b>1.642.393.263</b>	<b>1.692.765.889</b>	<b>1.309.325.682</b>	<b>1.244.405.550</b>
<b>Net cash flows</b>	<b>606.209.220</b>	<b>519.267.608</b>	<b>555.507.430</b>	<b>415.167.681</b>	<b>441.179.371</b>

Tab. 10 – Total results of the cash flow models applied to the most effective hypotheses of the four projects in study (Reference: our own processing)

As shown from the comparative analysis described in the previous tables, the most remunerative hypothesis for the economic and financial sustainability of investments is the best solution of the Makower project, both for the Internal rate of return (Irr) and for the Net present value (Npv). Anyway, improving these assumptions to the indexes calculated afterwards and including the study of the trends about inflation rates and the incidence of the financial costs on the cash flows performance, the hypothesis that is more effective for the economic and financial sustainability of investments is the third solution of the Francini Project. Referring to issues as the acceptability of the proposed options, considering *a)* the functions programmed in the management assumptions and *b)* the project system proposed from the groups participating to the competition, the B solution of the Francini Project is the less effective, as for reaching the economic and financial sustainability of investments it needs to give back to the Township of all the schools, while the second hypothesis of the Makower Project does not consider this operation. Finally, referring to the efficacy in remunerating the total economic and financial sustainability of investments, the Magnani Project is the most suitable, as all the four solutions provided and analyzed reach the economic and financial balance (even if performance indicators are lower for the objectives of remuneration for a development investment of this kind and lower than the initial expectations about the project features), while the Bohigas Project is more suitable to reach the needs expressed from the Public Administration for the Santa Chiara area competition, as it is able to create quality public spaces and it postulates the objective of giving back to the Township of Pisa assets of higher values and quantity.

Introducing a subsidy, equal to the construction costs of some public buildings, obviously to be given back to the Public Administration for free, all the hypotheses, even the most compound ones for the economic and financial sustainability of investments, are more suitable to the remuneration profile that a similar intervention should obtain, with the exception of the Magnani Project, that does not need any public support to reach that condition.

Finally, the economic and financial sustainability of investments is a parameter for choosing between different alternatives that is quite effective and able to describe the chosen solutions of an intervention, anyway, it is not the only criteria to be considered in a decision-making process for a strategic plan, as in the case of the Santa Chiara International Competition. Therefore, in order to improve the results of this study the research team should make further multicriteria analysis on the projects that could be able to

integrate economic and financial issues to other features, as the social and environmental sustainability of interventions.

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