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How to assess the compensations for home relocation: the case of the Malpensa airport

The development of the Malpensa airport into a Hub for the Central and South Europe has produced on one side relevant economic impacts, on the other one considerable environmental problems, due to the noise and atmospheric pollution, especially for the inhabitants who live within a distance of 400 meters from the airport. In the face of this difficult situation, the Lombardy Region has endorsed an agreement for relocating and compensating households affected by the environmental negative externalities. In this context the paper introduces the appraisal procedure used for estimating compensations and discusses the results, mostly in terms of deviation from the expected values and effectiveness of the model.

Introduction

The development of the Malpensa airport into a Hub for the Central and South Europe has caused on one side relevant economic impacts, on the other one considerable environmental problems, due to the noise and atmospheric pollution, especially for communities who live within a distance of 400 meters from the airport and bear the most detrimental conditions due to the proximity to the flight paths. Local oppositions groups have expressed strong complaints against the airport expansion, as proved by the local press, putting forward the urgency of defining an agreement about the inhabitants compensation without recurring to the expropriation.

As though the relationship between property value and airport noise exposure is a well-research topic over the world, there isn't a common approach of assessing the compensation for the decrease of real estate values. From the review of different studies since the 1970s by McMillen (2004) it emerges that even if the hedonic approach is mainly used, some scholars highlights the limits of using transaction data and suggest to use Stated Preference Methods (Feitelston, 1996; Riera and Macian, 1999; Faburel, 2002; Barreiro *et al*., 2005; Van Praag and Baarsma, 2005; Bristow and Wardman, 2006; Marmolejo Duarte, 2008). More precisely, in addition to the depreciation in property value, bore by the households, Feitelson (1996) identifies other relevant aspects of the total value of the damage as the loss of utility for residents who remains in situ and the relocation cost and loss of place-specific surplus for the inhabitants who move away form the noise exposure.

In this context the paper introduces a model for assessing the negative impacts generated by the Malpensa airport redevelopment on the property values and it discusses the outcomes of the compensation measures adopted through the analysis of the level of agreement of the compensation's beneficiaries about the opinion of value on the goods eligible for sale, as it can be deduced by the number of arbitration' procedures activated.

More precisely, the paper is divided in three sections. The first focuses on the environmental impacts and mitigation/compensation interventions. The second explains the evaluation model, by illustrating each factor that contributes to determine the Present Market Value and providing an overview of the steps of the evaluation procedure. The third is dedicated to the analysis of the results, mostly in terms of deviation from the expected values and effectiveness of the model. The last suggests some considerations about the indirect costs of the development of large infrastructure projects, that could be a crucial variable in the economic analysis of the investment.

Enviromental mitigations and compensations: assumptions and procedure

In the face of this difficult situation, the Lombardy Region have endorsed a programmatic agreement (Accordo di Programma Quadro, APQ) with the Provinces of Varese and Milano, the municipalities of Somma Lombardo, Ferno and Lonate Pozzolo, that are directly affected by the development of the airport, the Ministry of Environment and Transports, Finlombarda Spa (Lombardy Region's financial and administrative advisor) and the local social housing agency (ALER, Varese). The primary goal of this agreement was to manage the home relocation process by a shared approach, in order to make the households certain about the duration of the process and the economic compensation without appealing to expropriation procedures (Mattia *et al.*, 2003). More in deep, with reference to the article 43 of the law 17th may 1999, n. 144, the APQ envisages different kind of interventions: 1) environmental mitigations as soundproofing of public buildings (article 5, APQ); 2) environmental mitigations for those inhabitants who don't accept to move from their own homes (article 6, APQ); 3) compensations for relocating those inhabitants who are willing to move away (article 7, APQ).

Regarding the latter one, in order to put into effect the contents of the APQ and of its supplementary document developed in 2007, two Operating Plans have been defined and two tenders have been announced – the first in 2001 and the second in 2007 – for the purchase of the assets that fall within the closest areas (400 meters distance) from the airport, according to the following three main steps: a) recognition of the households damaged by the acoustic and atmospheric pollution; b) collection of home relocation queries proposed by the inhabitants through a public procurement procedure; c) definition of the ranking of proposals for the development of the relocation program on the basis of the location of residential units with respect to the airport and specific social and health conditions of inhabitants, included the ones generated by the airport redevelopment.

The damaged assets are located in the municipality of Ferno (17%), Somma Lombardo (22%) and Lonate Pozzolo (61%).

Figure 1. Areas affected by noise impact of the Malpensa airport. The grey area is the airport, the red one is the "C" zone (LVA 75), the light grey is the B zone (LVA 65-75) and the yellow is the "A" zone (LVA 60-65). Source: Malpensa Airport Environmental Impact Assessment Study. Report 1999.

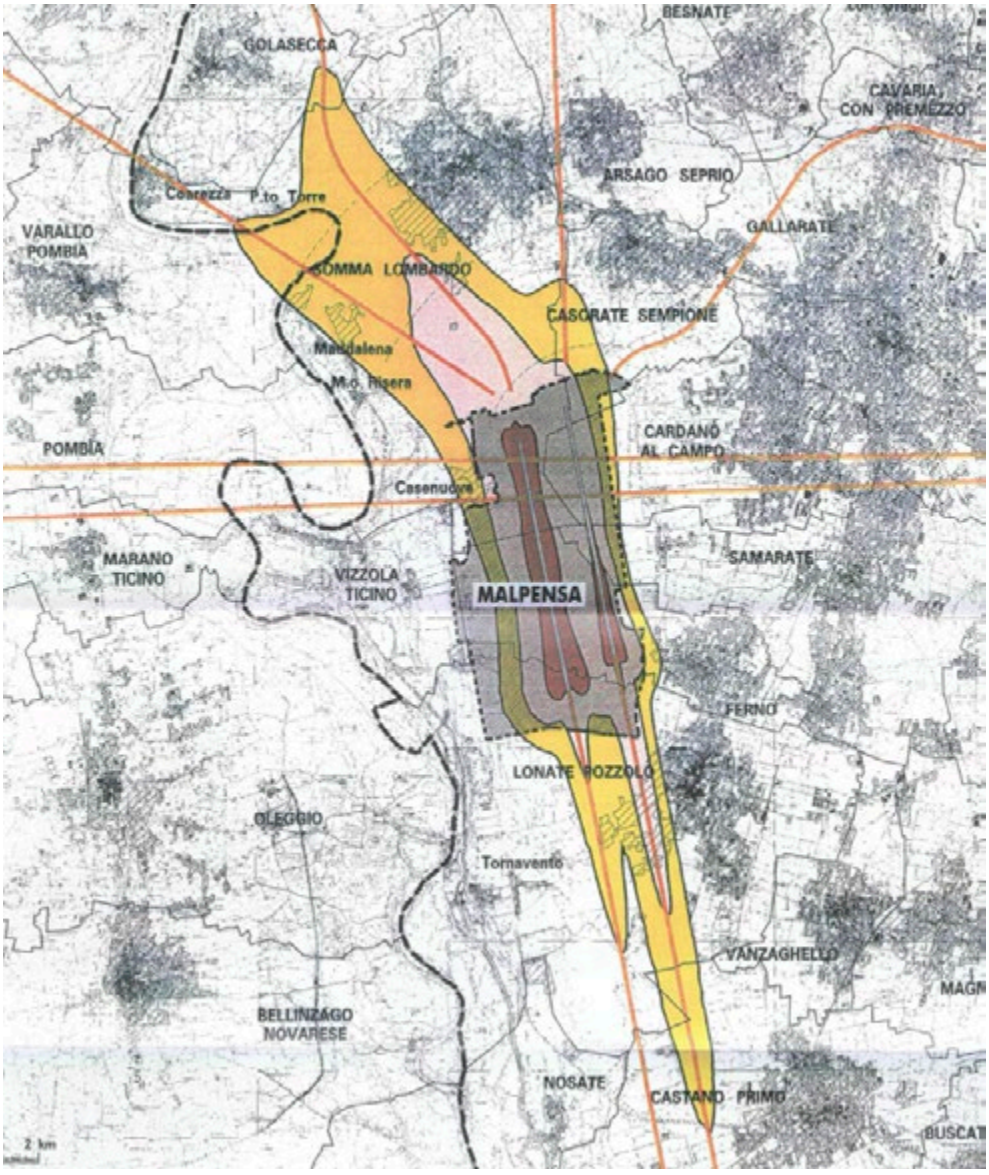


Table 1. Municipalities affected by the noise airport noise impact. The italic type points out the ones whose territory is inside the airport area. In the municipalities marked by the asterisk the noise curves don't affect urbanized areas.

	Urban surface (Skm)	Population
Castano Primo	*	11.071
Arsago Seprio	1,332	4.869
Lonate Pozzolo	3,763	11753
Ferno	1,455	6.980
Samarate	*	16206
Cardano al Campo	*	14158
Casorate Sempione	1,441	5.806
Somma Lombardo	4,297	17.323
Golasecca	*	2.644
Varallo Pombia	*	5.002

Table 2. Eligible demands proposed by the owners. First tender.

Municipalities	Ferno		Lonate		Somma		Total	
	(n.)	(%)	(n.)	(%)	(n.)	(%)	n.	(%)
Eligible demands	49	81,67%	165	72,37%	62	73,81%	276	74,19%
Not eligible demands	11	18,33%	63	27,63%	22	26,19%	96	25,81%
Total	60	16,13%	228	61,29%	84	22,58%	372	100%

Through the first tender 289 units (276 residential and 12 not residential) were purchased by the Lombardy Region for an amount of 82,26 million of euro, whereas the second tender has allowed the acquisition of 266 units (257 residential and 9 not residential) for an amount of 80,34 million of euro. As it emerges from the table 2, the number of residential units acquired by the Lombardy region represents the 74% of the total demands proposed by the households, with no relevant differences in the three municipalities.

The financial sources for the fulfillment of these interventions are mainly national and in part regional funds.

The evaluation model

In this context has been defined the "Guidelines for estimating the compensation" for those owners who were negatively affected by the development of the Malpensa intercontinental airport.

This procedure has been defined consistently with the principles of safeguarding the interests of all the parties and of the fair compensation of the damaged households. In order to exclude from the estimate of the compensation the potential alternative best uses and to adequately consider the value of the damaged properties, the Present Market Value has been identified as appraisal criterion and the Cost Approach as method, since both of them

With reference to the principles and theoretical models of Appraisal, this assessment methodology makes the entire process of estimating rational, objective and transparent. Thus, the Present Market Value is obtained through a clear and verifiable process on the basis of economic and qualitative data objectively surveyed. The various factors that contribute to determine the Present Market Value are assumed or assessed in accordance with specific suggestions with the aim of reducing the degree of subjectivity during the application of the model.

The Present Market Value (PMV) is a different concept from the Market Value. More precisely, differently from the standard definition of market value – that represents the estimated amount for which an asset should be exchanged on the valuation date between a willing buyer and a willing seller in an arm's length transaction after proper marketing wherein the parties had each acted knowledgeably, prudently and without compulsion (EVS, 2008) – the guidelines don't consider the full potential of the asset, so far as it is recognized by the market place (highest and best use). Thus, the concept of PMV refers to the state of the properties at the date of the evaluation without taking into account the opportunities of different uses of such goods from the present ones (residential) and the depreciation due to the impact of the airport, as established by the article 6, paragraph 6.2, letter b) of the APQ.

The PMV is estimated by an automated and verifiable process according to the following formula:

$$PMV = (1+Y)(Lv \cdot GLA) + 1,20(Vkc \cdot GLA) - (Df + De)(Vkc \cdot GLA) + P \quad (1)$$

where:
PMV = Present Market Value of the property
Lv = Land value
Y = Localization coefficient
GLA= Gross Leasable Area
Vkc=Unit construction cost value
Df = Physical decay
De= Economic decay
P= Developer profit

The formula defined according to the Cost approach is not new, but it's of importance to underline that the coefficients has been tuned on the basis of a preliminary study aimed to verify the use of the Cost approach for identifying homogenous areas as regard the properties' values and thanks to a deep knowledge about the dynamics of real estate market (Mattia *et al.* 2003).

Specific recommendations address the calculation of each of the previous elements. The homogeneity of land value due to the same conditions of accessibility and quality of built environment has allowed a rapid assessment of the land value incidence on the property value Thus, the basic land value (Lv), that considers both urban and rural localization, should be adjusted according to the basic services supply within a distance of 200 meters from the property under evaluation with the coefficient Y that goes from 0,6, when there are more than 3 services, to 0, when there isn't any service. Primary public health services, collective transport lines, public schools, bakeries and greengroceries, religious places are defined as basic services..

Their presence and distribution should be demonstrated by adequate technical reports to be presented with the sale proposal.

In order to ensure a uniform measurement of Gross Leasable Area (GLA) the guidelines provide a standard methodology based on the use of shared adjustment factors for adjoint spaces as cellars, attics, terraces, lodges, galleries (Codice delle Valutazioni, 2000).

Since the need to perform a lot of evaluation procedures, the Unit Construction Cost value (Ccv) estimation has been carried out by a unit cost method using cost data regarding selected residential typologies taken from a construction price list, edited ones in a year by the Engineering and Architects Council of Milano. The choice of the method employed has been influenced by the great amount of buildings to be valued and the time available. The basic Ccv has been increased by a factor of 0,20 in order to take into account the other categories of costs in addition to the construction one, as site work costs, permits, urban taxes, professional fees, financial charges and contingency allowance.

Regarding the Physical decay (Pd), that represents the loss in value of a building over time associated with the aging and decay of its structure an materials, in both short-lived items (appliance,…) and long-lived ones (frame, windows, foundations, doors,…), it has been assessed by a synthetic procedure focused on the construction period of the building, time and entity of renovation interventions of the buildings and of some internal technical elements (see figure 2).

The Economic decay (Ed) represents the loss in value associated with a decrease in useful capacity. It is a loss in value within a structure due to changes in tastes, preferences, technical innovations, or market standard. Similar to physical deterioration, functional obsolescence tends to be linked with the passage of time. Newer building materials, construction techniques, and designs, coupled with changing consumer tastes and preferences, generally make older buildings less desiderable to tenants and thus not as valuable as newer buildings. It has been assessed by the use of the following formula defined by the Federation of European Accountants:

$$Ed = \frac{(A+20)^{2}}{140-2,86} \tag{2}$$

Figure 2. Synthetic assessment of physical decay (Source: Lombardy Region Bulletin, II Supplement to n. 22, 31st may 2007).

Construction period	In the last 15 ys	Between 1990 and 1999	Between 1989 and 1980	Before the last 40 ys
Period of building's requalification/ renovation	In the last 15 ys	Between 1990 and 1999	Between 1989 and 1980	Before the last 40 ys
Renovation of internal technical elements	In the last 15 ys **5** or more of the followings ❑ Floors ❑ Walls and ceilings ❑ Internal windows frame ❑ External windows frame ❑ Electrical equipment ❑ Heating system ❑ Hygiene equipment	Between 1990 and 1999 **4** or more of the followings ❑ Floors ❑ Walls and ceilings ❑ Internal windows frame ❑ External windows frame ❑ Electrical equipment ❑ Heating system ❑ Hygiene equipment	Between 1989 and 1980 **3** or more of the followings ❑ Floors ❑ Walls and ceilings ❑ Internal windows frame ❑ External windows frame ❑ Electrical equipment ❑ Heating system ❑ Hygiene equipment	
Percentage of physical decay	**PD=0%**	**PD=7,5%**	**PD=15%**	**PD=25%**

where:
Ed = Economic decay
A= Ratio between the age of the building on 31st of December 2000 and its expected life cycle.

The developer's profit is the last element to be considered according to the Cost Approach method. Since it is associated to the ordinary business risk, it is generally calculated as a 20% of the sum of the other costs as shown in the following formula:

$$P = 0,20\left[(1+Y)\cdot(Lv\cdot GLA)+1,20(Ccv\cdot GLA)-(Pd+Ed)(Ccv\cdot GLA)\right] \quad (3)$$

In addition to the compensation amount estimated by the Cost Approach method, other kind of compensations are envisaged, as the a) Place-based compensation (Root compensation - Rc) for the disadvantage due to the duration of the place of residence; b) the Transfer compensation (Tc) for changing the place of residence and c) Additional compensation (Ac). More in deep, the Rc goes from 0% to 10% of the PMV, considering the number of residence calendar years from 1999 for those who live in the areas affected by the delocalization interventions (4):

$$Ar = 0,1\cdot PMV\cdot Ar/25 \quad (4)$$

The Tc is given by the 3% of PMV when the new property is bought from a private seller, while by the 4% of PMV, when it is bought from a company or a new building has to be developed. The Ac covers the payment of professional fees, relocation, painting, cleaning and water/energy/sewerage/telephone connections.

Finally, the guidelines provide operating suggestions also for the evaluation of other two types of goods: the non residential unit and the so called sensitive goods, as hospitals, retirement homes, rehabilitation centers, schools, nursery schools and permanent collective residence. Their PMV should be assessed by the combined use of the i) Market Comparison Approach with reference to the sales price of comparables goods; ii) the Cost Approach on the basis of the reproduction or replacement costs for a similar good and iii) the Income Capitalization Approach, with reference to the income streams the property is expected to generate. The value is thus assessed in the simultaneous considerations of the sale, production and rent market of comparable goods.

Results

As it emerges from the low percentage of arbitration' procedures activated on residential properties, the application of the evaluation model most within the second tender (5,26%; 50% in Lonate Pozzolo and 50% in Case Nuove, Somma Lombardo), than the first (20%; 44,83% in Lonate Pozzolo, 20,69 in Ferno and 34,38% in Case Nuove, Somma Lombardo). This geographical distribution of the arbitration requests was reasonably expected given the greater proximity of the municipalities of Somma Lombardo and Lonate Pozzolo to the airport area.

As regard the total amount of compensation, as shown by the figure n.3, most of the compensation is covered by the Present Market Value. The place-based and the transfer compensation represent respectively the 7% and the 3% of the total one.

The deviation between expected and adjusted values is quite negligible since it goes from a minimum of 3,47% to a maximum of 6,66% (see table 3).

Furthermore a deeper analysis at each municipality level shows the deviation of most of the cases goes from -10% to 0% (see table and figure 4).

Discussions

As shown by the results obtained through the application of the guidelines, the model could be considered effective since the households are fully compensated for various kind of noise exposure. Many are the strengths of the evaluation model. Firstly, the compensation scheme includes three different measures: the compensation for the property depreciation (PMV), a place-based (Rc) and a transfer (Tc) surplus compensation. Secondly, the renters are included in the compensation program, as they are interested in use value of their residences as well as the own-

Figure 3. Incidence of the three different compensation measures.

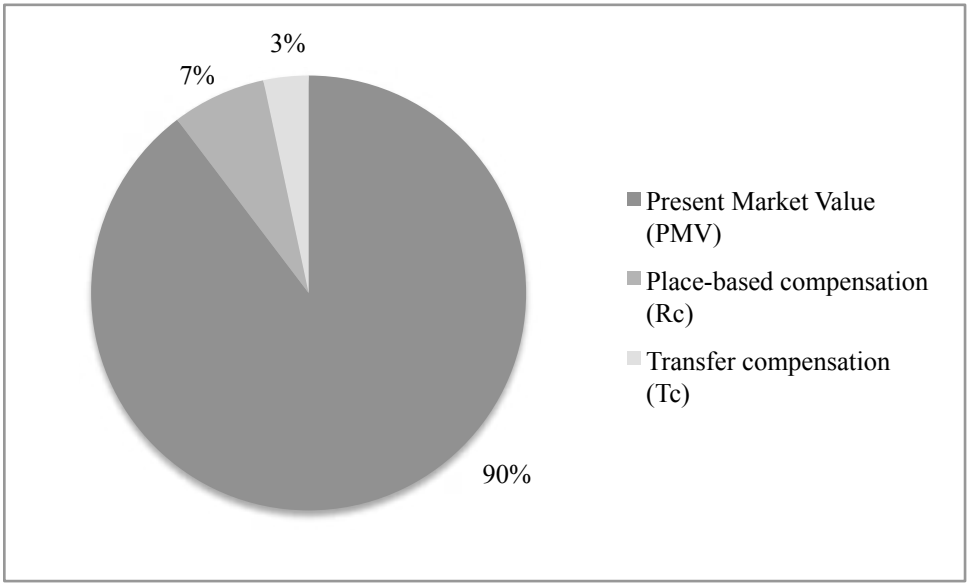


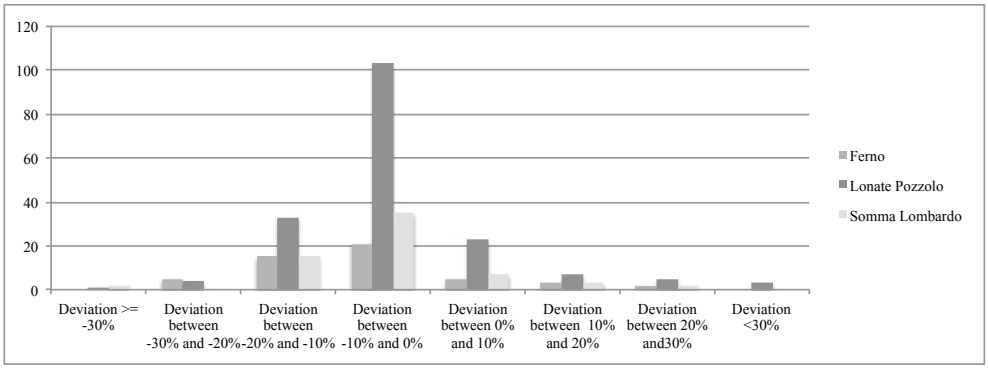
Table 3. Deviation among expected and adjusted value.

Residential properties	Expected value	Adjusted value	**Deviation (€)**	Deviation (%)
Present Market Value (PMV)	77,22	72,12	-5,1	-6,60%
Place-based compensation (Rc)	6,01	5,61	-0,4	-6,66%
Transfer compensation (Tc)	2,88	2.87	-0,1	-3,47%
TOTAL	86,11	77,73	-8,38	-9,73%

Table 4. Range of deviations for each municipalities.

	Deviation >= -30%	Deviation between -30% and -20%	Deviation between -20% and -10%	Deviation between -10% and 0%	Deviation between 0% and 10%	Deviation between 10% and 20%	Deviation between 20% and30%	Deviation <30%
Ferno	0	5	15	21	5	3	2	0
Lonate Pozzolo	1	4	33	103	23	7	5	3
Somma Lombardo	2	0	15	35	7	3	2	0

Figure 4. Deviations values for each municipalities.



ers, given the frequent need to evaluate their residential choice (Feiteston *et al.*, 1996), whereas there are many cases that shows lower compensation for renters than for the owners. Finally, the guidelines focus on residential assets due to the oppositions to the airport that comes from neighbour residents, but the evaluation model covers other kind of properties, the so called sensitive goods, that are negatively affected by noise even though few transaction data are available.

As further development of the study it could be interesting to verify the outputs of the evaluation model by exploring the consumers' willing to pay for noise reduction, that should suggest the minimum compensation threshold. At the same time the scenarios proposed within the contingent valuation method one side could better understand the incidence of other kind of annoyance in addition to noise, in order to address policy measures at different government level on the basis of as fair as possible measure of social and environmental cost of large infrastructure projects.

References

Bollettino Regione Lombardia, "Aeroporto intercontinentale di Malpensa 2000 – Interventi di mitigazione d'impatto ambientale e di delocalizzazione degli insediamenti residenziali ricompresi nell'ambito territoriale prioritario del Piano Territoriale d'Area Malpensa, ed in particolare, in prima istanza, siti nel territorio dei Comuni di Somma Lombardo, Lonate Pozzolo e Ferno, adiacenti al sedime aeroportuale", II Supplemento al n. 22, 31 maggio 2007.

Bristow, A. L. and M. Wardman (2006), "Valuation of Aircraft Noise by Time of Day: A Comparison of Two Approaches", Transport Reviews, Vol. 26, pp. 417-433.

Faburel, G. (2002), "Évaluation Du Coût Social Du Bruit Des Avions. Application De La Méthode d›Évaluation Contingente Au Cas d›Orly", Les Cahiers Scientifiques du Transport, Vol. 42, pp. 43-74.

Feitelson, E., Hurd, R., and Mudge, R. (1996), "The Impact of Airport Noise on Willingness to Pay for Residences", Transportation Research Part D: Transport and Environment, Vol. 1, pp. 1-14.

Ling, D.C. and Archer, W. (2008), Real Estate Principles: A Value Approach, Irwin/New York: McGraw-Hill.

Marmolejo Duarte, C., "Willingness to pay for noise reduction in residential areas affected by airport traffic: the case of Barcelona", Paper presented at the 15th Annual Congress of the European Real Estate Society, Cracow 18-21 june 2008, available at http://upcommons.upc.edu/e-prints.

Mattia S., Balestreri A.M. and Cucchi M. (2003), Interventi di mitigazione degli impatti ambientali: il caso dell'aeroporto intercontinentale di Malpensa 2000, in Fusco Girard L., Cerreta M., De Toro P., Forte B., Forte F. (eds), L'uomo e la città: verso uno sviluppo sostenibile e umano, vol. 1, Milano: Franco Angeli, pp. 536-552.

McMillen, D. P. (2004), "Airport expansions and property values: the case of Chicago O'Hare Airport", Journal of Urban Economics, Vol. 55, pp. 627–640.

Riera, P. and Macian, M. (1999), "Análisis Coste-Beneficio De La Ampliación Del Aeropuerto De Barcelona Con Externalidades Ambientales. Ruido, Polución Atmosférica y Ocupación De Humedades", Estudios sobre la Economía Española, Vol. 47, pp.1-18.

UE (2003), Guide to Cost Benefit Analysis of Investment Projects, http://ec.europa.eu.

Van Praag, B. M. S. and Baarsma B. E. (2005), "Using Happiness Surveys to Value Intangibles: The Case of Airport Noise", The Economic Journal, Vol. 115, pp. 224-246.