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An overview of the landscape valuation studies conducted in France economy

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AN OVERVIEW OF THE LANDSCAPE VALUATION STUDIES CONDUCTED IN FRANCE

Abstract: This article presents an overview of the landscape valuation studies carried out in France. The reported studies are classified into three categories: rural landscapes, urban landscapes and periurban landscapes. We noticed that the majority of studies relate to rural landscapes, and more specifically to agricultural ones. Furthermore, we found that only one study relates to a remarkable architectural landscape and that no studies have been carried out in French overseas departments. Regarding valuation methods, the hedonic pricing method is the most widely used method.

1. Introduction

Landscape is defined by the European Landscape Convention as *“an area, as perceived by people, whose character is the result of the action and interaction of natural and/or human factors”*. According to this definition, landscape evolves through the seasons in the short run, and through town and country planning in the longer run (Oueslati et al., 2011). Landscape research studies typically belong either to the objective approach that insists on the material dimension of landscape, i.e. without reference to an observer, or to the subjective approach that deals with individual and collective representations (Aznar, 2002). According to the latter approach, each landscape is not only original and specific but also affected by its history (Lifran and Oueslati, 2007). Perception, i.e. individual and collective representations of landscape and expectations of the society towards it, becomes a key-

element (Lifran and Oueslati, 2007; Breman, 1998). This perception differs among individuals but also among social groups, periods, cultures or places (Colson and Stenger-Letheux, 1996). In other words, landscape perception is socially constructed (Rambonilaza, 2004). The concept of artialisation highlighted by Alain Roger is a good illustration of this. As an instance, commercial landscapes are badly perceived in our society contrary to green ones (Cavailhès et al., 2009d).

The demand for landscape is difficult to assess due to the nature of the good. Landscape is a more or less pure public good (Lifran and Oueslati, 2007). On the one hand, it is not destroyed through consumption (non rivalry) and, on the other hand, it is often impossible or difficult to limit its consumption (non exclusion). It becomes a club good, for instance, when one has to pay a ticket to reach the top of the Eiffel Tower in Paris in order to benefit from the view (non rivalry but exclusion). Landscape is furthermore most often a non-market good since the demand for it is not systematically expressed in a market (Rambonilaza, 2004).

The aim of this article is to propose an overview of landscape valuation studies conducted in France. French territory has specificities regarding landscape, which makes it an interesting case to study. It combines a huge diversity of landscapes belonging to different geographical types: cities, mountains, countries, coasts, forests, lagoons... As will be shown, many different types of landscape have been valued in France. Hence, the results presented in this article may be of interest for practioners who do not have time or budget to carry out surveys. For instance, the valuation of sea view (Travers et al., 2008) may be used for benefit transfers in many different countries. Besides, France attracted about 80 million foreign tourists in 2010, making it one of the most popular tourist destinations in the world. This is in particular to be linked with the diversity of its landscapes, which have inspired writers,

artists and poets for centuries. Furthermore, numerous measures are taken to protect landscape. For instance, one percent of the money invested in new highways serves for improving landscape conditions along the road. This is called the “1% landscape and development” (“1 % *paysage et développement*”). For instance, during the construction of highway 75, the rampart close to the road in La Cavalerie, Aveyron, was renovated. Another example comes from the French Grenelle II Law adopted in July 2010 that obliges cities to take into account the so-called “*trame verte*” (“green infrastructure”) in their Land Use Plans. This procedure aims at restoring ecological and landscape quality in France.

France is also well-known for its “remarkable” landscapes as opposed to “ordinary” ones. The historic centre of Avignon, Vaucluse (Papal Palace, bridge...) was for instance recognised by UNESCO as a World Heritage Site. The Jurisdiction of Saint Émilion, Gironde, and its famous vineyards were also classified. In 2011, The Causses and the Cévennes constituting the South of the Massif Central were recognised as “*representative of the relationship between agro-pastoral systems and their biophysical environment*”, i.e. as a remarkable Mediterranean agro-pastoral cultural landscape (www.whc.unesco.org).

The remainder of the article is as follows. Section 2 presents some of the landscape functions and values. The subsequent sections follow the classification suggested by Lifran et al. (2011). Section 3 presents rural landscapes studies while Section 4 presents urban landscape studies. Finally, the last section is devoted to periurban landscape studies.

2. Landscape functions and values

Landscape provides services to economic agents (Aznar, 2002). These services, defined as the actual or potential benefits coming, directly or indirectly, from the landscape (Costanza

et al., 1997; Hueting et al., 1998), generate satisfaction to households. It is common to decompose the value of landscape into two types of values as shown in Table 1: use values (recreation, tourist attractiveness, living environment...) and non-use values (aesthetic and ecological functions) (Oueslati et al., 2008)

In some cases, market data allow to directly assess landscape demand. In other cases, such direct market does not exist (Choumert and Travers, 2010). Then, specific techniques, known as economic valuation methods, are used in order to estimate the economic value of the demand, i.e. the economic value of the benefits raised by landscape. Several methods exist and are used depending of the type of value one is interested in. For instance, if one wants to estimate non-use value, Stated Preference Methods (SPM) may be preferred over Revealed Preference Methods (RPM) (see Table 2).

Studies in which landscape is not distinguished from other recreational features will not be reported since reviewing recreation valuation studies goes beyond the scope of this article. We can nevertheless cite studies as Rulleau (2008) who applied Choice Experiment (CE) in order to estimate coastal forest recreation value in Gironde, the scenic quality of the site being one of the attributes. The results of this survey involving 168 residents show that the coefficient corresponding to the maximum level of scenic quality is positive and significant although the result is somewhat sensitive to the model used. In Contingent Valuation (CVM), where a single good is valued, landscape can be a part of the scenario, such as when valuing an afforestation program (e.g. Mogas et al., 2005) or valuing a change in the location of a rubbish dump (e.g. MV2 Conseil, 2004); strictly speaking these studies are not focused on landscape or on the visual impacts of a policy.

3. Overview of the rural landscape studies

In France, a municipality with less than 2,000 inhabitants is rural according to the French National Institute of Statistics and the Economic studies. Approximately 25% of the population is living in rural areas. According to Rambonilaza (2004), rural landscapes can be classified into two categories: those that relate to agriculture or forest activities and those that do not. Rural landscapes are specific in the sense that most policies that had an impact on their evolution did not have this objective but were rather directed towards local development and country planning (Breman, 1998). A large majority of landscape valuation studies in France relates to these rural landscapes and especially to agricultural landscapes.

3.1. Agriculture and forest landscapes

As in other European countries, agriculture and forest landscapes were in France highly impacted by the evolutions of agricultural policies and in particular by the Common Agricultural Policy (Ferrari et al., 2011). Rural landscape is thus strongly related to the concept of multifunctionality, i.e. it is considered as a joint-product of agricultural production that can be subject to private appropriations (Oueslati et al., 2011). Agriculture and forest landscapes support a variety of activities such as tourism and outdoor recreation carried out by local residents as well as visitors.

Several valuation methods are used to assess the economic value of French agriculture and forest landscapes. In order to facilitate reading comprehension, we decided to sort the studies by method¹.

¹ Other studies dealing with French rural landscapes include Pereira (1993), Delache and Jacques (1994), Goffette-Nagot (1994), Allard (1995), Di Pietro and Drilleau (1999), Noublanche (1999), Bonnieux et Rainelli (2000), Siriex (2003), Lecat (2004) or Cavailhès et al. (2008c). An example of economic valuation of visual impacts of electric installations can be found in RTE (2008).

The oldest identified study was conducted by Le Goffe and Delache (1997) who applied the Hedonic Pricing Method (HPM) using 600 holiday cottage prices in Brittany. Five environmental attributes were introduced into the model. Both forage crops and battery farming reduced the price by FF300 (€1 = FF6.55957), i.e. 15% of the mean rental price. On the other hand, permanent meadows increased the price while neither forest nor grain production affected it.

Mollard et al. (2006) and Mollard et al. (2007) considered territorial rent differential via the importance of environmental externalities in cottages service-differentiation strategies. They observed holiday cottages rental price differences in the Massif Central (3 departments, 2,331 observations) and in the Drome (730 observations). Landscape values in a given area were shown to depend on land use on broader scales (at least on the communal scale). The authors also noted that landscape defined via physical measures in the model can be very different from actual individual perceptions.

Colson and Stenger (1996) applied CVM to estimate Loire-Atlantique residents' Willingness To Pay (WTP) for two scenarios: the conservation of agricultural landscapes in France and the restoration of traditional bocage landscapes in the department of Loire-Atlantique. This distinction between conservation and restoration/transformation is commonly used (e.g. Lifran et al., 2011; Rambonilaza, 2004). Results based on 750 interviews showed that the variables influencing the stated WTP for conservation and restoration were different. Bonnieux and Le Goffe (1997) and Bonnieux (1998) were also interested in the bocage restoration but in the Cotentin, close to Cherbourg, Manche. Their survey was conducted on 400 residents and led to a mean WTP of FF200 per household per year against a mean WTP around FF600 in Colson and Stenger (1996).

Finally, Point et al. (2007) mobilized a multi-attribute CVM a la Santos (1998) in the Monts d'Arrée in the Armorica Regional Nature Park, Finistère. In order to build scenarios, they used the attributes identified by Dachary-Bernard (2004) (cf. *infra*). In total, 353 residents were interviewed. The mean WTP for the full policy (trimmed scrublands, presence of hedgerows and good integration of farm buildings) was €134. The survey respondents proved to be sensitive to the nature of the valuation scenarios.

Dachary-Bernard (2004) was the first to use CE to investigate preferences for landscape in France. This method was applied in the Monts d'Arrée on a sample of 607 tourists and residents. The attributes selected for the design were peaty scrublands, bocage, non-traditional farm buildings and price. Furthermore, a majority of tourists thought that landscape protection is one major goal of the Park. Finally, the amount of time the tourists spent in contact with the landscape influenced their WTP. Regarding preferences, tourists and residents preferred non-trimmed scrublands and integrated farm buildings. This PhD thesis was latter published as Dachary-Bernard (2005), Dachary-Bernard (2005) and Rambonilaza and Dachary-Bernard (2007).

Westerberg et al. (2010) used CE to study a restoration program of the Marais des Beaux. This wetland located in the Bouches-du-Rhône is disappearing due to intense drainage for agriculture, which affects landscape configuration. Results based on a sample of 90 individuals showed that respondents were willing to restore the wetland to one third of its original size even if mosquito problems may get worse. Furthermore, people turned to be in favour of planting tree hedges. The authors concluded that welfare benefits derived from the restoration program justifies the Natura 2000 compensation payments for wetland restoration.

3.2. Other rural landscapes

3.2.1. Aquatic landscapes

The collected landscape valuation studies relating to coastal landscapes or sea view exclusively use HPM. In France, zones located close to the coast and remarkable areas are protected by the French Coastal Law since 1986. These coastal areas are often attractive and are thus under pressure by tourism (Travers et al., 2008).

Part of Travers' PhD Thesis (2007) dealing with coastal view was published as Travers et al. (2008). The authors collected data on 185 houses sales in Finistère. They classified the sea view into several categories based on the literature and on the taxonomy used by real estate agencies. The possible influence of the French Coastal Law was tested via a dichotomous variable. Results showed that an "excellent" view increased the price of liveable houses by €32,510. A "good" or "excellent" view increased the price of houses to be renovated by 78%.

Rinaudo et al. (2007) applied HPM in Normandy. This study was based on a large number of assumptions among which the fact that an improvement of water quality would involve an increase of the value of the goods by 5%. On the basis of the number of houses and flats and of their average costs, the authors found that an improvement of water quality would increase the total price of real estate properties by €808,333. The authors related this increase to landscape amenities.

3.2.2. Wind farm landscapes

Two SPM studies on the loss of welfare due to the implementation of wind farms were conducted by the French Ministry of Ecology and Sustainable Development.

The first study was carried out by Scherrer (2001) in Sigean, Aude. A sample of 2,000 households living at less than 20 kilometres from wind farms were administered a CVM questionnaire. Three values were estimated: (1) the willingness-to-accept compensation for wind farms visual nuisances, (2) the WTP for their dismantlement and (3) the WTP for the implementation of off-shore farms. Whereas nuisances are often perceived as a limit to the development of wind farms (Terra and Fleuret, 2009), only 5% of respondents considered that they degrade the environment and 6% found that they were a visual nuisance. Terra (2004) inferred the estimated WTP to the global population and obtained an actualised value of €1.73 millions.

Terra and Fleuret (2009) conducted two surveys, one using CVM (2,000 residents in Corbières-Souleilla, Aude, in Mardyck, Nord, and in Montjoyer-Rochefort, Drome) and one using CE (300 residents of Corbières-Souleilla, Aude, and of Bouin, Vendée). The mean WTP in CVM proved to be sensitive to whether people felt bothered by wind farms. The valorisation of those who were not or little bothered ranged between €24 and €74, while it ranged between €14 and €98 for the others. Results of the CE were sensitive to the site. The attributes were the number of wind mills, their height and the distance between the wind farm and the house. In Corbières-Souleilla, residents were not sensitive to the distance unlike in Bouin where they preferred the wind farms to be far away from their house.

4. Overview of the urban landscape studies

Urban landscapes can be classified into two categories: urban green spaces, which have been widely studied in France, and urban landscapes.

4.1. Urban green spaces

Urban green spaces are enjoyed by part of the local populations (Oueslati et al., 2008) who assign them, as for other types of landscapes, use and/or non-use values. The access to these areas is generally free of charge (Oueslati et al., 2011). Well-known examples of such areas are the public gardens and parks such as the Parc des Buttes Chaumont or the Jardin du Palais Royal in Paris. But roundabouts, sports grounds, cemeteries... also enter in this category (Choumert and Salanié, 2011; Oueslati et al., 2008) even if they are seldom studied. Landscape quality relates for urban green spaces to a will to safeguard quality of life through the control of urbanisation, the protection of the architectural heritage and the limitation of visual degradations (advertising posters for instance) (Oueslati et al., 2011). This phenomenon is linked to cities expansion that led to a retreat of natural and agricultural spaces and a transformation of landscapes (Choumert and Travers, 2010).

If the value assigned to urban green spaces depends on each society (Jim, 2004), they take in France an important place in residential choices (Dumas et al., 2005). These choices raise in general a trade-off between access to jobs, infrastructures... and landscape and environmental amenities (Brossard et al., 2005). But the role of landscape variables is difficult to assess (Cavailhès et al., 2007). The price of housing which depends on the choice of residential localisation can be an indicator of landscape demand (Facchini, 1994). Thus, the majority of the studies used to estimate the economic value of urban green spaces mobilise HPM.

A study was conducted by Ahamada et al. (2007) in Brest, Finistère, on the sale of 1,156 real estate properties. The parametric and semi-parametric approaches used showed that green

spaces had a linear and decreasing influence on the prices of the goods up to 200 meters. The WTP represented 10.5% of the price when they were located in this interval.

Cavailhès et al. (2009d) applied an approach combining economic and geographic tools and reconstituted the landscape using a satellite view and land use databases in urban Besançon, Doubs. The results showed that most of landscape attributes did not affect the price. But trees seen up to 70 meters and agricultural spaces seen between 140 and 280 meters had a positive influence on the price; on the other hand, roads had a negative influence. Beyond 300 meters, the landscape no longer affected prices suggesting a “*myopia*” of the purchasers.

Cavailhès et al. (2009a) used a similar approach combining satellite view and Digital Terrain Models to reconstitute the view in three dimensions. This information was introduced into a Geographic Information System (GIS) model in order to estimate the value. This method was applied to 2,667 estate properties sales in Dijon, Côte-d’Or. Again, visible trees and agricultural spaces close to the houses had a positive influence on the price, contrary to roads, but this impact was no longer significant beyond 100-300 meters.

Choumert (2009) also used HPM in her PhD. Choumert and Travers (2010) worked on 1,016 flats sales in Angers, Maine-et-Loire, in a model including the Euclidean distances and landscape ecological indicators. When green spaces were 100 meters closer to the good, its price increased by 1.4%; when they were 1 kilometre closer, it increased by 7%. This result also applied to the density of green spaces around the good since a rise of 10% involved an increase of prices by 1.6%. Lastly, purchasers preferred green spaces of lower surface and a greater diversity of landscape.

Oueslati et al. (2008) used CVM to estimate visitors' WTP in a city park in Angers. They proposed two scenarios with modifications in landscape attributes (level of opening, level of luminosity and level of bloom). On the basis of 118 questionnaires, they have shown that landscape amenities differed across scenarios. Coming to the park for recreational purposes had a positive influence on the WTP for the "more forested oak grove" scenario. For the "flowered dunes" scenario, aesthetic quality also played a role.

Caula et al. (2009) valued the natural or hand-made attributes of green spaces in Montpellier, Hérault. Over 90% of the 212 respondents wished to benefit from additional green spaces in their city and more than 70% preferred natural attributes. WTP was influenced by their will to preserve wildlife, their frequentation of urban green spaces, their wish to increase the green spaces in their city along with sex, profession and the fact to have children. WTP ranged between 0.18-0.28% and 0.08-0.12% of the average monthly income respectively for the natural and the hand-made scenarios.

4.2. Urban and architectural landscapes

The urban landscape is an interaction between an object and the subject who observes it (Oueslati et al., 2008). We are interested in this section in the object, e.g. the buildings. In France, the importance of these areas was recognized in 1983 by the creation of the Protection Zones for Architectural, Urban and Landscape Heritage Sites ("*Zones de Protection du Patrimoine Architectural, Urbain et Paysager*") that were part of the French Landscape Law in 1993. The city of Bordeaux, Gironde, for instance conducts, since September 2004, a census of its architectural and urban landscape.

Architectural landscape and cultural heritage share common features. Both imply a will of bequest to future generations (Benhamou and Thesmar, 2011). They can generate use and

non-use values. A study carried out by the Economic Analysis Council, under the authority of the French Prime Minister, recognizes the importance of the economic valuation of culture (Benhamou and Thesmar, 2011).

We only identified one study estimating the economic value of a French architectural landscape: Prigent's PhD thesis (2001). This work aimed at estimating visitors' WTP for restoring the maritime character of the Mont Saint Michel, Manche. The CVM valuation was based on three restoration scenarios: a development plan, a "sand removal" policy and a combination of both. A sample of 1,077 visitors was interviewed. The valorisations of the first two programs were not significantly different (access fee between FF21.76 and FF34.80 per person depending on the assumptions). The mean WTP for the complete program was FF40 per person.

5. Overview of the periurban landscape studies

Urban expansion and suburbs development towards rural areas initiated in the 1970's (Le Jeannic, 1997) involved a modification of living conditions but also of landscapes in peri-urban areas (Choumert and Salanié, 2011). These peri-urban areas are mixed places where some residents work in town while others work in farms. They are generally localised close to the city (Cavailhès et al., 2003) and are characterized by their low population density, their calm, their less polluted environment, the presence of green spaces and landscapes and a lower cost of housing but higher cost of travel and less access to services (Cavailhès et al., 2007; Cavailhès et al., 2009d; Donadieu and Dalla Santa, 1998). Landscape is also an appeal of these territories as many people like open spaces (Brossard et al., 2007). There is thus a trade-off to be made between these various criteria (Le Jeannic, 1997). According to

Cavailhès et al. (2009c), landscape contributes to periurbanisation by affecting the trade-off households are expected to make.

The studies found in this section exclusively mobilize MPH² and combine economy and geography.

Brossard et al. (2007) and Cavailhès et al. (2007) proposed to reconstitute the quantity of landscape seen by an observer using a satellite sight and Digital Terrain Models. The data related to six geographical zones in France, four cities (Dijon, Besancon, Brest and Lyon) and two departments (Bouches-du-Rhône and Nord-Pas de Calais). They showed that the contribution of the landscape attributes to the price of goods was significant but weak. These results were different from one geographical zone to another.

Three other studies were based on the same idea of reconstituting the view in Dijon peri-urban area. The first was conducted by Brossard et al. (2005), the second by Cavailhès et al. (2008b) and the third by Cavailhès et al. (2009b). The results were similar to the Cavailhès et al.'s (2009d) and Cavailhès et al.'s (2009a) for urban landscapes. The authors showed that the presence of forest and agriculture in the vicinity had a positive influence on the price while the road had a negative influence. Landscape attributes had to be visible to affect the price even if located close to the good. Actually, Cavailhès et al. (2009c) have shown in their literature review on periurban landscape valuation studies conducted both in France and in other countries (in the US for instance) that forest and agriculture were generally found to have a positive effect on the price of housing. However, they observed that the effect was significant as long as the distance between the amenity and the house was low.

² Other studies include Cavailhès et al. (2005a; 2008a; 2006; 2006).

Dumas et al. (2005) proposed a model combining HPM and ecological indicators. They used 15,000 transactions in Bouches-du-Rhône. The results stressed the importance of landscape in residential choices. While the distance to the city centre is usually a crucial factor in HPM, they proved that its effects were limited when land use was better taken into account. In the same order of idea, Cavailhès et al. (2005b) proposed to value the surrounding landscape environment rather than the view from the house. This allows integrating purchasers' anticipations regarding territorial dynamics (Cavailhès et al., 2008b). Furthermore, the authors estimated a price for landscape based on the quality of life index of €2,850, i.e. 2.7% of the mean price of houses.

6. Conclusion

The aim of the paper was to propose an overview of the landscape valuation studies carried out in France. These studies were classified into three categories: rural, urban and peri-urban. For each study, the method was given, along with the location.

Three features may be highlighted from this French literature overview. The first one concerns the subject of the studies. We can actually point out that the majority of studies relate to rural landscapes, and more specifically to agricultural ones. Only one study has for instance been conducted on a remarkable landscape whereas France is widely known for its remarkable landscapes. The second feature relates to the methodology. The overview that we conducted highlights the fact that MPH is the most generally used valuation method. The studies focussing on periurban landscapes that we presented for instance exclusively mobilize this method as well as the ones relating to coastal landscapes or sea view. The third

feature is about the location of the studies. This overview of French landscape valuation studies has shown that a high number of studies have been conducted close to Dijon. This is linked to the presence of the CESEAR research centre there. Furthermore and surprisingly, no studies have been carried out in French overseas departments.

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Pictures 1-4: examples of landscape in France



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Table 1: landscape values (adapted from Choumert and Salanié (2011) and Ferrari et al. (2011))

Values		Examples of amenities
Use values	Direct use value	Recreation (hunting, hiking...)
	Indirect use value	Protection against soil erosion, jobs creation
Non-use values	Bequest value	Preservation for future generations
	Existence value	Biodiversity protection
	Altruism value	Possibility for contemporary people to recreate there
	Option value	Future recreational activities

Table 2: landscape economic valuation methods (adapted from Choumert and Salanié (2011))

Methods		Description	Value	Affected population
Revealed preferences	Travel cost Method	Estimation based on the expenditures and time spent to reach a recreation site	Use value	Local and non-local Users only
	Hedonic Pricing Method	Estimation based on the decomposition of the prices of real estate properties in the area, landscape being one feature of the good	Use value	Local only Users and non-users
preferences	Contingent Valuation Method	Estimation based on a survey on people where they state their willingness-to-pay/accept	Use and non-use values	Local and non-local Users and non-users
	Choice Experiment	Estimation based on a survey in which people choose between different hypothetical scenarios involving a landscape quality change	Use and non-use values	Local and non-local Users and non-users