SSD

SCIENCE FOR A SUSTAINABLE DEVELOPMENT

LANDSCAPE CAPACITY AND SOCIAL ATTITUDES TOWARDS WIND ENERGY PROJECTS IN BELGIUM

"LACSAWEP"

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SCIENCE FOR A SUSTAINABLE DEVELOPMENT (SSD)

Energy

FINAL REPORT

LANDSCAPE CAPACITY AND SOCIAL ATTITUDES TOWARDS WIND ENERGY PROJECTS IN BELGIUM

"LACSAWEP"

SD/EN/01

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D/2011/1191/25
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0. **English Summary**

0.1. Objectives of the research project LACSAWEP

The recent increase of the price of energy and the awareness of the global warming stimulated the development of on wind energy parks in many parts of the world. In Belgium the wind power capacity increased significantly over the last 5 years from a capacity of 35 MW in 2002 to 287 MW at the end of 2007. It may be expected that the number of wind turbines will continue to increase in the coming decade.

Nevertheless experiences with various wind energy projects in Belgium and other European countries showed that the development of new on-shore wind energy project is not unanimously perceived as positive. The way a wind energy project is perceived by the surrounding inhabitants in strongly dependent on the landscape characteristics of the surrounding environment and the pathway of the development of a social attitude towards the wind energy project.

Hitherto however, very little was known about the factors that determine the ‘landscape capacity’ for wind energy parks. Especially in the Belgian context with a very high variability of landscapes a relative ranking of landscapes according to their suitability for wind energy projects may be useful for site selection. Moreover, at present it is not clear how social attitudes towards wind energy parks in Belgium are formed and which actions can be taken to develop positive attitudes towards wind energy farms.

The research project LACSAWEP had therefore a double objective:
1. To develop a tool for the evaluation of the landscape suitability for wind energy development in Belgium
2. To get a better understanding of the development of social attitudes and their controlling factors in Belgium

0.2. Development of a tool for assessment of the landscape suitability for wind energy development

In order to tackle the first objective the following methodology was adopted:
- A set of Belgian landscapes was photographed in order to compile a representative but sufficiently diverse sample. The original photographs were manipulated by adding simulated wind turbines in the panoramas.
- Each photographed landscape was described by means of a set of categorical and quantitative indicators.
- The visual quality of each photographed landscape was measured by means of photo-questionnaires.
- Finally, the regression model was applied to quantify the impact of a wind turbine on the visual landscape quality.
- A multivariate regression model was developed that allows predicting visual landscape quality based on the available landscape indicators.

An extensive photo survey was carried out during which 250 panoramic photographs of rural landscapes in different regions of Belgium were constructed. Each panoramic photograph covers a horizontal observation angle of around 120°. Out of the total database of 250 panoramas, 54 photographs were selected for the photo questionnaire.

The selected photographs cover a large variety of landscape types in the Belgian lowlands, the Belgian Loess Plateau and the Belgian Ardennes including forested, suburbanized, traditional, open and 'bocage' landscapes with or without disturbing elements.
Next, by means of photo manipulation techniques wind turbines were simulated on each of the 54 selected landscape photos using advanced photo editing software. Various spatial configurations of simulated wind turbines (solitary, line, arc) were simulated.
Finally, a database of 108 panoramic photographs (54 with and 54 without wind turbines) was created.

Each photographed landscape was described by means of a set of categorical and quantitative parameters. The quantitative parameters that were used in this study are the area percentages of the different land use types. For each selected photograph the area of the following land use types was assessed by means of digitalisation: woods, green elements (non-wood and non-agricultural), urbanised area, water surface and agricultural land. For each land use type a relative area proportion was calculated. For reasons of comparison the area on the photographs that was covered by sky was not taken into account. The categorical parameters that were derived for each selected photograph were the following: vista type, topography type, weather type, the presence of historical-cultural elements and the presence of anthropogenic point elements.

In the next step People were asked to score the visual quality of a set of 18 photographed landscapes on a 7-point Likert scale (1 = very low visual quality, 4 = neutral, 7 = very high visual quality) attractive). In total 1542 respondents evenly distributed over Belgium were interviewed door by door, at market places or in front of shops. Respondents were not explicitly informed about the possible presence of wind turbines on the landscape photographs. In order to make the scoring of the respondents comparable the scores of each individual respondent were standardized by calculating z-scores. In this way the mean of scores of each respondent is 0 and the standard deviation is 1.

The results of the questionnaire were used to calculate an average visual quality score for each of the selected 108 photographs (54 original and 54 simulated). This resulted in an average visual quality score (VQ-score) for each of the landscapes.
Next, the impact of wind turbines on the visual quality of the selected landscapes (VQ) was quantified by calculating for each photo-pair a D-VQ-value. A D-VQ-value is the difference in visual quality between the original landscape and the landscape with simulated wind turbines. A positive D-VQ-value implies that the visual quality of a landscape decreases after the installation the wind turbines. A negative D-VQ-value implies that the visual quality of a landscape increases after the installation the wind turbines.
Finally, the relation between VQ-values and the calculated D-VQ-values were explored by means of regression analysis. The relation between VQ and D-VQ can be use to assess D-VQ if VQ is known.
In order to assess VQ-values (i.e. the visual quality of a landscape without wind turbines) a predictive model was calibrated. Univariate regression analysis was used to identify quantitative landscape parameters that are significantly correlated with visual landscape quality. By means of T-tests significant categorical landscape parameters were identified.

Next, a multivariate linear regression model was calibrated in order to predict the mean visual landscape quality by means of a linear combination of the assessed landscape parameters (both categorical and quantitative). The developed model was validated using a Jackknife validation procedure.

The model fitting resulted in the following equations:

$$VQ = -0.1183 + 0.9427\ Wo - 1.6817\ U - 0.1847\ T1 + 0.0002\ T2 + 0.2386\ APE0$$

and

$$D\text{-}VQ = 0.32 + 0.19 * VQ$$

Where: VQ = visual quality of the original landscape; D-VQ= Delta Visual Quality = $VQ_{original\ landscape} - VQ_{simulated\ landscape}$, Wo = area percentage of forest in the landscape, U = area percentage of built-up area in the landscape, T1 = rolling topography, T2= flat topography, T2= rolling topography, APE0= absence of anthropogenic point elements.

0.3 Analysis of the social attitudes towards wind energy parks in Belgium

In order to get a deeper insight in the formation of social attitudes towards wind energy parks in Belgium qualitative discourse analyses were carried out for a 5 selected wind energy projects in Belgium: Houyet and Mettet-Fosses in Wallonia and Kruibeke-Beveren, Kortrijk and Lombardszijde-Middelkerke.

For each selected case, the project leaders or the developer(s) have been interviewed; together with the responsible officials and politicians possibly involved at the local level, primarily on the process and the discourse they produced. Of course they were also considered as prime sources to find crucial respondents, as it is expected that they – together with the developer of the project – have the best knowledge about who has been involved in the process (possibly even lists of participants in information sessions or petition signatories).
Secondly, about 15 residents have been interviewed per case as 'discourse receivers and/or producers'. In the case of protest, both activists who joined the protest and 'regular' residents (randomly chosen) have been interviewed.
In the case of cooperatives, residents who became shareholders alongside 'regular' residents were interviewed, but also opponents were searched for. In the case of projects across different municipalities, or at the municipal border, residents from both sides of the border have been interviewed to assess the influence of local discourse production by the municipal governments.
Thirdly, the media were covered in order to get an insight on how they interact with other actors, and how they reflect the different discourses from relevant actors in the project.
In a first round, the analysis of the discourses and their influences on shaping and developing attitudes was organized around the following questions:

- Who are discourse producers?
- At what scale level do they produce it?
- In which stage of the process do they produce it?
- What are their arguments and motivations?

In a second round, the questions were:

- How were these discourses perceived?
- What were people's fears?

The development of attitudes and the reasons behind it were analyzed in the respondents' interviews and summarized in attitude formation diagrams. Based on the discourse analysis the following influencing arguments on attitude formation could be identified:

- **Physical disadvantages** such as: visual landscape disturbance, flickering shadows, noise, the possibility of braking rotor blades and the possible negative impact on bird migration areas and routes.
- **Economic factors** such as: the devaluation of property, the amount of economic gain one can have on behalf of the project and the economic efficiency of wind turbines
- **Symbolic arguments**: wind turbines are often seen as energy for the future generation and as a way to pay 'the ecological sin' of mankind
- **Type of decision making process**: the discourse analysis pointed out that there is a great need for more collaboration in the planning system of local wind projects. Residents and other stakeholders need to be involved, by which means there can be created institutional trust, a feeling of equity and fairness, and a lower degree of dissatisfaction towards the project.

0.4. Conclusions and recommendations for developers and policy makers

A perception-based approach was used to construct a subjective landscape appreciation model of non-urban Belgian landscapes. A questionnaire among the 1542 inhabitants of Belgium resulted in a model of rural landscape preference and information about the change in landscape appreciation after the implantation of a single wind turbine or wind turbine park. The main concern of the study was to provide a tool for spatial planners in order to evaluate future wind power landscapes.

A first finding is that landscape appreciation can be predicted using a set of quantifiable landscape indicators. In this study the following landscape parameters were found to be significant: the percentage of forest, the percentage of built-up area, the topography type and the presence of anthropogenic point features. The methodology used to create the landscape model can be extended to other types of landscapes, if a sufficient number of new respondents are interviewed with photographs from new landscapes. The landscape model parameters presented in this study are only valid for rural and semi-rural landscapes in Belgium.

A second finding is that after the installation of a wind farm the appreciation of high-quality landscapes decreases and the appreciation of low-quality landscapes increases.

This implies that the change in landscape appreciation after the installation of wind turbines can be quantified. The results of the LACSAWEP project suggest that **quantitative landscape modeling should be included in the site selection process** in order to minimize the (perceived) degradation of landscape quality.

Qualitative research methods revealed 4 different categories of arguments that may have a negative impact on the formation of social attitudes towards wind energy parks in Belgium: physical disadvantages, economic factors, symbolic factors and the type of decision making process. In depth discourse analysis in 5 case studies suggested that here is a **great need for more collaboration in the planning system** of local wind projects. Residents and other stakeholders need to be involved, by which means there can be created institutional trust, a feeling of equity and fairness, and a lower degree of dissatisfaction towards the project. Three different systems to increase the involvement of surrounding residents could be adopted:

- Offer residents **the possibility of becoming a shareholder** in the wind turbines: In the interviews, No example of shareholders who opposed the wind turbines could be found, and in this perspective, it is a good mechanism to overcome protest. Nevertheless, the system creates in some cases an in-group/out-group effect, with the risk of a group of non-participators dissatisfied who could become opponents just because of their out-group status.

- Installation of a more direct distributive system where **people who live close to the turbines get a reduction** for the energy they buy. A wind project – which is by its private character based on profit-making – creates opponents when it produces direct economic profit for the developer and only long-term ecological profit in combination with certain direct annoyances for the surrounding residents.
- **Avoidance of the negative annoyances** for the residents by collaboration and consultation between all local stakeholders, including the local residents implemented in a bottom-up planning process. The interviews show clearly that the minimal collaboration through an information gathering for residents is not enough. The information gathering in most of the cases is organized after the real planning has been made, and is therefore too late for residents to collaborate. In most of the cases, the only option residents have is to accept totally or to protest, while collaboration from the beginning of the process could create intermediary results that make both parties satisfied.

1. Objectives, methodological framework and state-of the-art

1.1. Objectives

The recent increase of the price of raw material and energy and the awareness of the global warming stimulated policy makers to promote sustainable development of the world in which (i) the economic, (ii) the social and (iii) environmental needs of the society are well-balanced.

The development of wind energy projects seems to contribute to the three aspects of sustainable development and is therefore promoted by European and national policy makers. Nevertheless experiences in various European countries show that the development of on-shore wind energy projects is not unanimously perceived as a sustainable development.

The perception of a wind energy project is strongly dependent on the surrounding environment (landscape impact) and the development of a social attitude towards wind farms.

However, hitherto little is known about the factors that determine the 'landscape capacity' for wind energy parks. Especially, in a Belgian context with a very high variability of landscape types a relative ranking of landscapes according to their suitability for wind energy development may be useful for site selection. Moreover, at present it is not clear how social attitudes towards wind energy parks are formed and which actions can be taken to develop positive attitudes towards wind energy farms.

Therefore the research project LACSAWEP has a double objective:

(i) To develop a tool for the evaluation of landscape suitability for wind energy development in Belgium

(ii) To get a better understanding of the development of social attitudes and their controlling factors in Belgium.

The research activities of the LACSAWEP project were grouped in three research lines:

- In the first research line quantitative landscape appreciation models were developed based on a large-scale survey (photo-questionnaires) among about 1500 inhabitants of Belgium. The objective of this research line was to quantify the importance of various landscape elements on its perceived visual quality. What is for example the impact of topography, openness, land use, visible biomass and disturbing elements on the perceived visual quality? By putting these parameters in a quantitative prediction model, the impact of a wind farm on the perceived visual quality of a landscape can be evaluated from various viewpoints within the view shed of the wind turbines.
- In the second research line the formation and evolution of social attitudes towards wind energy projects is evaluated. In five case-studies in Belgium in depth interviews were carried out with project stakeholders and local residents in order to reconstruct the dynamic process attitude formation and development by means of qualitative research methods.
- In the third research line results from research lines 1 and 2 are brought together in order to get a better understanding of (i) the role of landscape quality and (ii) the role of the characteristics of stakeholders in the formation and development of social attitudes.

This introductive chapter starts with a state-of-the-art of wind energy development Belgium and Europe. Next the research project LACSAWEP is situated in a methodological context by means of a literature review on social attitudes and landscape capacity towards wind energy farms.

1.2. Wind energy in Belgium

In 2007 the total cumulated installed wind power capacity in the countries of the EU was estimated around 56 347 MW, with an annual installed wind power capacity of 8332 MW (EurObserv'ER, 2008). This wind power capacity produced 81.4 TWh of electricity in 2007, which is approximately 3 % of the EU electricity production. It represents 43.5% of the global wind energy production in 2007 vs. 50.9% in 2006, showing that wind energy is developing worldwide. In Belgium, the wind power capacity increased significantly over the last 5 years. In 2002, 35 MW of wind power capacity was installed in Belgium while at the end of 2007 about 287 MW was installed (Figure 1-1).

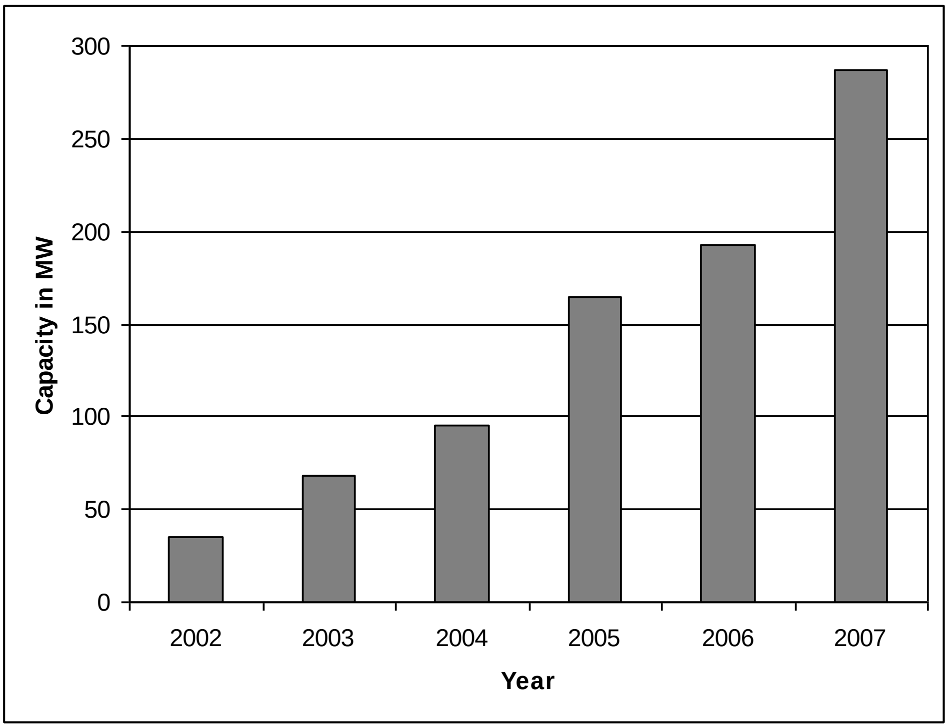

Figure 1-1: Evolution of wind power capacity in Belgium between 2002 and 2007

Figure 1-2 shows the spatial pattern of the built or licensed turbines in Belgium at the end of 2007.

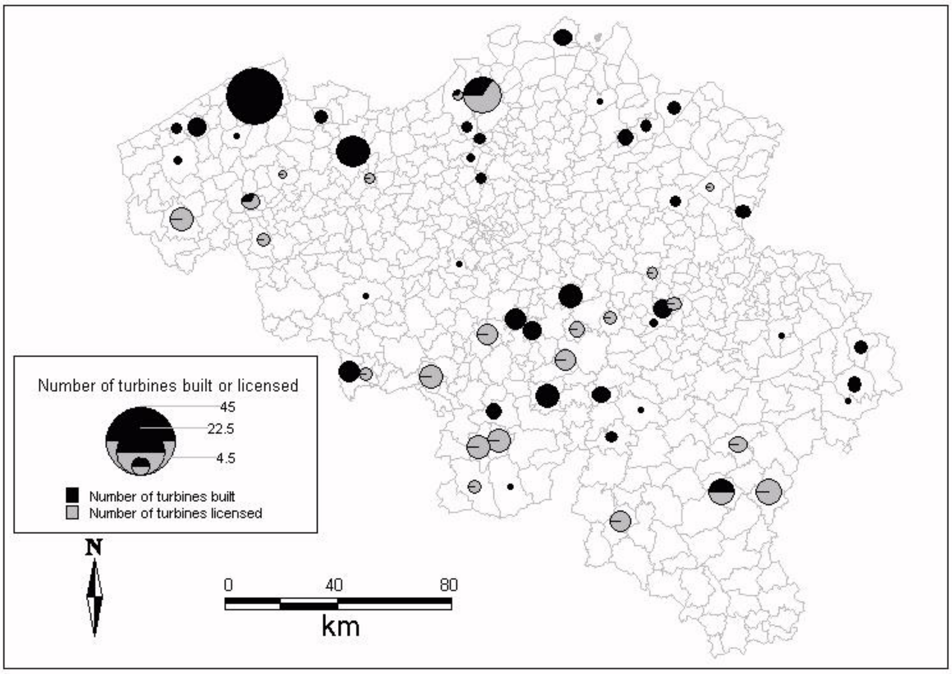

Figure 1-2: Number of built and licensed wind turbines in Belgium at the end of 2007

1.3. Methodological framework

In the LACSAWEP project a mixed methodology is used that combines quantitative and qualitative research methods. The use and applicability of both the quantitative and the qualitative research methods in social sciences is the subject of a constant debate among social scientists. Recent publications plead for the use of the so-called "combined" or "mixed methods" (Brannen, 2005, 1992; Bryman 2001; Onwuegbuzie & Leech, 2005; Denzin, 1970) in order to address multifaceted research questions.

The research activities of the LACSAWEP project are grouped in two research lines – the first quantitative, the second qualitative – which are combined through an integrated analysis in research line 3. In the early stage of the project the two lines were developed rather independent while results were exchanged at later stages of the project on order to obtain a better understanding of the outcome of the research outcome in both research lines.

The foundation of this kind of research setup lies in the "grounded theory" and the concept of "triangulation" (Denzin & Lincoln, (2005); Glaser & Strauss (1967)). Grounded theory as a social research method is characterized by its vivid openness. There's a constant interaction between the gathering of data, the analysis of data, and the production of theory. This implies that results from former data are used to inform the way on how to collect new data, and what to collect. The research informs itself and gains depth and meaning through this process.

This triangulation method is mainly used in the second research line (RL2) – the qualitative research of five case studies – but is also used to combine RL1 and RL2. Both research lines gain depth through the process of informing and refining each others results. Indeed both lines (as they are both depending on quite different ontological assumptions) can be used as a meta-frame for each other. The divergence in ontological stance is by this means used in a very transparent way – instead of being ignored through the choice of one method.

A triangulation approach of the studies was also used, from the point of view of the methodologies, from the case studies as well as from the point of view of the researchers. For instance the interviews were analyzed by at least two researchers (CRANG M., 1998)

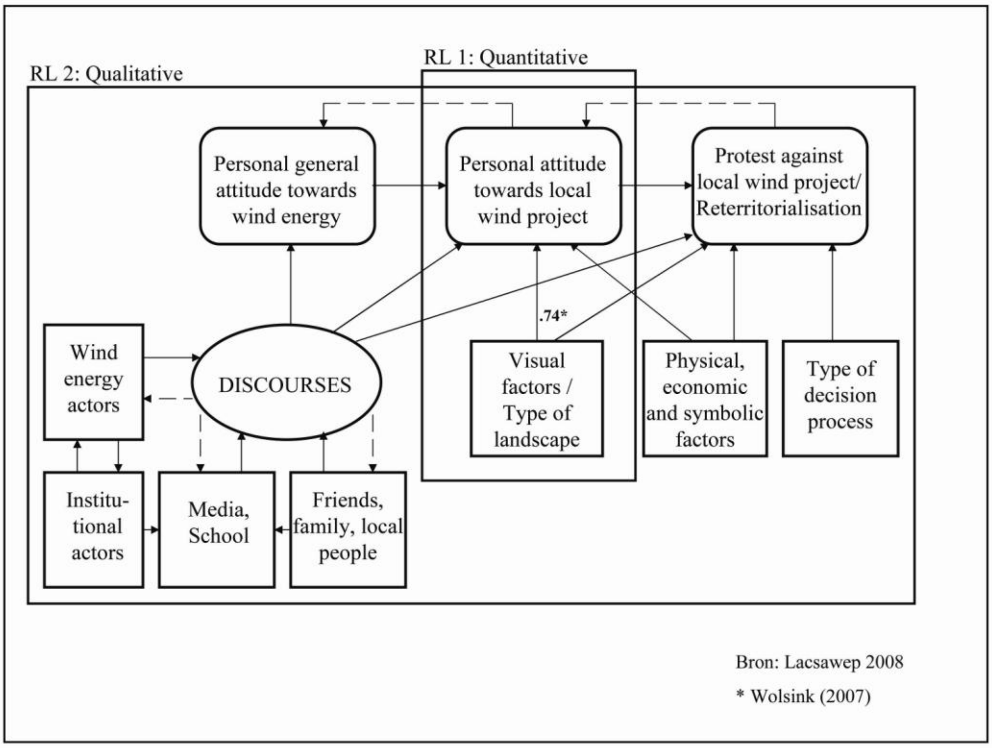

Figure 1-3: Integration of quantitative and qualitative research

An important starting point for our methodological choice is the finding of Wolsink (2007) that visual factors – foremost "type of landscape" – have a very strong influence (.74) on attitudes towards local wind projects – by far more than nimby-ism, physical annoyance factors and others. This finding supports the project setup of doing a quantitative research on the relationship between the visibility of a landscape and attitudes towards wind projects (RL1).

Because there is more to attitudes and resistance than visual predictors, a qualitative research was also set up by which it was wanted to gain insight in the multiplicity of factors and social mechanisms that help to create attitudes and foster protest actions towards local wind projects (RL2). The integration of both RL1 and RL2 will be discussed in a separate chapter.

1.4. Development of social attitudes towards local wind projects

It is widely recognized that public acceptance of local wind projects is problematic in a lot of cases all over the world. Scholars already wrote on this topic since the early 1980s, and up to today the debate is still ongoing. In this chapter, the most significant findings for the research will be summarized.

From the 1970s until now, many international opinion polls show a very strong public support for renewable energy sources at the general level. In contradiction with this finding, many local projects suffer from a lack of acceptance by local residents. The concept of "Akzeptanz" given by German social psychologists can take here into account. This meaning of "acceptance" is used to characterize the level of acceptance by local people towards spatial structures imposed by global policies. "Akzeptanz" implies a higher level of acceptance towards the new structure (Depraz 2005). This concept can be applied to wind energy parks.

Following the cases the level of acceptance will be different. In a lot of cases strong resistance in the form of local protest actions is taking place. Literature shows us that this contradiction between the general and the local level is influenced by a lot of factors. A lot of factors are in play and shape the attitudes towards wind projects which lead directly to active or passive support or protest. The most significant factors according to the literature are discussed in this chapter. They can be classified in two broad groups: (physical and symbolical) annoyance factors and (institutional and local) process factors.

A first obvious set of factors that influence the attitudes towards local wind projects are **annoyance factors**. The most common types of annoyance are noise, flickering shadow, visual intrusion, perceived unreliability, high cost and impact upon birds and wildlife (Devine-Wright, 2005).

Although noise used to be a factual problem for many residents living near wind turbines, newer technologies have now in many cases reduced this problem to quasi-non-existing. In relation to this, a legal distance (250 meters in Flanders, 350m in Wallonia) has to be kept between the dwellings and the turbines. When a sufficient distance is held, factual noise annoyance is mostly very little to inexistent. Different researchers found that – in contrast to factual noise –perceived noise annoyance is more strongly related to the visual impact of wind turbines than to the real sound pressure (Wolsink, 2007). Therefore, with a reasonable distance to the dwellings, noise should not be a factual problem. As far as perceived noise annoyance is concerned, the visual impact should be investigated, rather then the problem of noise itself. In the following discourse analysis, it will also be shown how the problem of noise is sometimes used to mobilise local residents.

A second annoyance factor is flickering shadow. Large wind turbines are throwing a shadow on the landscape, and because the turbine blades are turning, the shadow is also moving constantly. When the moving shadow is passing the windows of a house, inside the effect of turning the lights constantly on and off is got. As with noise, this sort of annoyance can be easily neutralized. The other annoyance problems – perceived unreliability, high cost and impact upon birds and wildlife – are understated in scientific literature[1].

[1] Most literature analyses annoyance from a technical point of view. The LACSAWEP project focuses on consequences of annoyance for the development of social attitudes.

Although these are each existing factors which influence the attitudes of local residents, most scholars focus upon other factors. In our view, the problems of high cost and unreliability have a lot to do with discourse production and reception. In the discussion of the present research, it will be elaborated on these further. The problem of the impact upon birds and wildlife is also significant in that it is used by many opponents as an extra argument to protest. Nevertheless, if the focus is made on residents, and not on animal action groups, this argument is mostly a secondary one – an extra ace up their sleeve. Also on this problem more insights will be given in the research.

The last annoyance factor that is discussed is the one that is most highly debated, and which seems to be the most influencing factor on social attitudes towards local wind projects: visual intrusion. In an extended analysis on existing large-scale structured datasets from 1986 to 2002, Wolsink (2007) shows that the visual evaluation of the impact of wind power on the values of the landscape is by far the dominant factor in explaining why some are opposed to wind power implementation and why others support it.

Moreover, it is shown that it is particularly the *type of landscape* which is important. Other annoyance factors like noise seem to be dominated by the visual landscape factor. The visual component *type of landscape* can thus be seen as the prime mover for local protest or support. It is also found that military domains and industrial areas are overall accepted for wind turbine placement. Also along the side of line-structures like rivers, highways… wind turbines are mostly accepted – as long as the visual factor is considered.

Next to the findings of Wolsink, there are consistent results in literature showing that smaller wind farms are more accepted than large ones (Lee et al., 1989; Daugard, 1997; Wolsink, 1989; Devine-Wright, 2005). This is contradictory to the trend in policy that favours large scale wind farms (Devine-Wright, 2005). Indeed, as Pasqualetti (2000, 2001) points out, the shift from traditional to wind energy is a shift from centralized, invisible energy production to a visible, decentralized production of energy that literally confronts us at the local level. In this sense, the problem of visual intrusion is cultural, but even more historically bound. The shift to a local and visual production of energy reminds people of their own needs of energy – a consciousness that diminished over the years because large-scale centralized energy production was apparent.

Although Wolsink (2007) suggests that local investors in wind energy must take the visual landscape features/characteristics into account, Pasqualetti (2000, 2001) reminds that the upcoming culture of decentralized energy production will also need a change of mind, to an awareness of *the visual necessity* of energy production. In line with this, the international literature is a little biased on the side of negative visual intrusion. It must be noticed that it can also be spoken of visual interest, visual improvement or visual enhancement (Devine-Wright, 2005). In some studies people actively speak of the beauty of wind turbines, and one study mentions that 51% to 63% of the respondents chose the word *interesting* to describe the physical appearance of wind turbines (Devine-Wright, 2003; Lee et al., 1989). Also it must be taken into account that a lot of people have a lack of awareness on the issue of visual landscape preferences. In a study by Lee (et al., 1989), 30% of the respondents showed no preference at all in choosing between landscape types.

To conclude on the factor of visual intrusion, the importance of the concrete visual aspect has to be nuanced. Thayer and Hansen (1988) point out rightly that the perceived visual impact of wind turbines is only partly determined by their physical appearance (size, colour…). A part of the visual perception is also influenced by other perceptions and judgments. In particular they speak of a *symbolic aspect*, when wind turbines are seen as the visual expression of a higher concept or idea. The visual evaluation people make is clearly shaped by different factors, and can be equally positive, when higher concepts like ecological sustainability, or decentralized energy production are working.

On the point of symbolic visibility, other factors like communication and discourses become relevant. These will be discussed later in this research.

A second distinct and important group of factors which influence the attitudes towards local wind projects are the (**institutional and local) process factors**. In a broad perspective, Pasqualetti (2000, 2001) states that the political culture of centralized top-down planning worked for the traditional energy sources, but will be insufficient for the planning of the new decentralized energy production processes. It must be clear that a decentralized production system has a lot more stakeholders at the local level, and these are traditionally not included in the institutional planning process.

This creates tensions and undermines the support at the local level towards local wind projects. This problem is widely debated in literature and is referred to mostly as a *problem of the decision making process* (Wolsink, 2007; Enzenberger et al., 2002; Breukers & Wolsink, 2007; Gross, 2007; Bell et al., 2007; Jobert et al., 2007; Devine-Wright, 2005; Pasqualetti, 2000, 2001). Although the problems with the decision making process are very broad elaborated in literature, most of them are derived from Pasqualetti's observation that top-down centralized planning isn't working for wind energy. When local wind projects are planned, a lot of stakeholders are showing up, and they all need to be satisfied in a way.

Therefore the top-down institutional planning system must be converted to a decentralized, bottom-up, collaborative, fair and trustful system that is taking all stakeholders into account. Indeed Breukers and Wolsink (2007) found for example that local ownership (or a cooperative) guarantees local economic benefit, which in turn lessens the local protest. But even more general, the contradiction between the high general public acceptance of wind energy and the low acceptance of local wind projects points to a democratic deficit, where a minority of opponents controls the outcome of a wind project (Bell, 2007). This democratic deficit can only be countered by a change in the institutional process from confrontation to collaboration.

The collaborative approach shifts the emphasis from competitive interest into consensus building, and tries to waken the silent majority to participate in decision making. As many other scholars, Bell found that this participatory process is also needed to create trust. A lot of projects seem to lack trust by the people in the institutional process, or in the project developers. Gross (2007) concludes from her research in Australia that there is need for procedural and distributive justice and equity in the elaboration of wind projects. A perceived lack of fairness in the process or outcome is in many cases fostering protest towards the whole project. Interviewees pointed out that the ability to be heard, adequate information, being treated with respect, and unbiased decision-making is very important for them through the process. In a research-summarizing paper by Devine-Wright (2005) it is found that there is internationally much interest by local residents to participate in local wind projects.

He concludes that negative attitudes towards wind turbines may be motivated not only by negative evaluations of physical impact but also by a sense of lack of control over development processes. In another study on five case studies in France and Germany, Jobert et al. (2007) show also that local ownership, trust, participation, and transparency of the process are very important in the cases. The problem of acceptance for the wind projects had almost always to do with one of these factors. To conclude on the influence of the decision making process, it must be stressed the need for a change in approach from top-down centralized planning to a system where all the stakeholders are heard, and where there is trust through a participatory bottom-up planning system.

Another much debated explanation for the low acceptance of local wind projects is now widely criticized as too simplistic, but it is discussed nevertheless because it gives more insight in the above discussed findings.

It is the explanation called NIMBY, or "not in my backyard", which says that people oppose local wind projects for selfish reasons with a purpose to free-ride. Wolsink (2007) tested the NIMBY-explanation on different large-scale datasets and found that NYMBY only had very little influence on attitudes towards local wind farms. Moreover, Wolsink states that the NYMBY-explanation is problematic as long as it is not further investigated. Indeed, the NYMBY-explanation "*attributes* (egoistic) *motives to people that can only be confirmed by investigation*" (Wolsink, 2007, p.1199).

In this perspective, the explanation leaves the cause of the problem unexplained. Further in his research, Wolsink shows how the application of the NYMBY-concept leads to the conclusion that the residents don't have strong intentions to shift the burden to others, but they consider it unfair that others, or the decision makers, shift the burden to them. In this perspective, it is not selfish reasons or other personality traits which cause the problem, but it is the decision making process and particularly the perceived fairness of it.

Bell (2007) goes a little further in the justification of the NIMBY-explanation and starts from the observation that there is a social gap, which means that in general the public accepts renewable energy, but at the local level there is public protest in many cases. This social gap can be explained by three different reasons: a democratic deficit, qualified support, or self-interest (NIMBY). The democratic deficit is already discussed above, and points at the problem of a minority of opponents who control the process because the majority is *silently* accepting. This is a consequence of the top-down decision making process which can be described as "decide-announce-defend". Bell aims for a move to an approach of "consult-consider-modify-proceed" which is in line with the above mentioned collaborative and participative approach. Bell's second explanation for the social gap states that people do not support wind projects without qualification, they have only *qualified support*. They are in favour for the development of wind energy, but they also believe that there are general limits and controls that should be placed on its development.

Therefore, general opinion polls miss these qualifications and give a very simplistic view of the degree of acceptance. The lack of participatory options for local residents also creates a gap between people's qualifications and the ones that are used by project developers. This leads to distrust, and finally to the social gap. The third explanation for the social gap is the notion of self-interest, and is very hard to distinguish from the notion of qualified support. The notion of self-interest is token from the multi-person prisoner's dilemma and states that people use collective rationality (or concern for the public good) when it costs them nothing (for example in opinion polls) but change to individual rationality (self-interest) when is does cost them something. Bell acknowledges that there is much criticism towards the use of rational choice theory as a model of environmental behaviour.

On the other hand, some studies show that the qualified support hypothesis is used by some people as a false argument to cover their real egoistic motivation. O'Donnell (in Kahn, 2000) for example found that people who used environmental arguments to oppose a wind project, not always truly accepted broader environmental ethics. Further research on this is necessary, but it is already clear that real selfish motives (NYMBY) only make up a very small part of the total attitude formation process. Literature up to date makes clear as it has been seen that the most significant factors that explain the social gap are the visual intrusion (physical but also symbolical) and everything that is related to the decision making process (particularly the top-down approach, the perceived fairness, the lack of trust and democratic equity).

1.5. Landscape capacity towards wind energy

Our first research question was to determine to what extent some landscapes are more suitable for wind energy development, taking into account to their intrinsic value before and after the installation of wind turbines. Two steps are necessary to reach that target. Firstly the value of a landscape had to be assessed and next the impact of wind energy on this value. A range of methods has been developed to evaluate landscape qualtity: from an expert to a participative paradigm (Lothian, 1999) and from direct experience to substitute of landscapes (paintings, photographs). As one of the project objectives was to quantify a subjective landscape quality a participative assessment method was adopted.

Photography is the most widely applied technique to assess landscape preferences of a wide target group (Fairweather & Swaffield, 2001; Scott & Canter, 1997). A series of comparative evaluations have confirmed the general viability and validity of using photographs as surrogates for land experience (Shafer & Richards, 1974, Shafer & Brush, 1977; Shuttleworth, 1980; Sheppard, 1982; Coeterier, 1983; Zube & Pitt, 1981, Zube et al., 1987). The evidence suggests that respondents correctly interpret photographs presented to them as indicators of the 'real' landscape, and make their evaluation on that basis (Fairweather & Swaffield, 2001).

But nevertheless, Scott and Canter (1997) give the following remark: "However, although photographs can be validly used as representations, their use and any conclusions which are drawn need to be done in the full knowledge that they are just representations and not the real experience." Furthermore, Palmer and Hoffman (2001) draw attention on the fact that the use of photographs must be validated by means of a comparison with in field evaluation. Verifying the validity of perception-based landscape aesthetic quality assessments is constrained by the lack of consensus (or an accepted theory) on what landscape aesthetic quality is.

The largest number of relevant studies has addressed the more limited question of representational validity of photographs used as surrogates for actual landscapes in perceptual assessments (Daniel, 2001). Daniel (2001) found form literature review that for the most part, when visual aesthetic quality of natural (or near natural) landscapes is assessed, assessments based on colour-photographic representations have closely matched assessments based on direct landscape experience (*e.g. Daniel and Boster, 1976; Hull and Stewart, 1992; Kellomaki and Savolainen, 1984; Shuttleworth, 1980; Stamps, 1990; Stewart et al., 1984*).

On the other hand, photo-questionnaires are the best way to reach a broad public. Another advantage is the low cost of production. Photographs permit better control by the researcher of the conditions under which the landscapes will be perceived (atmospheric and light conditions, number and type of elements present, etc.). With photographs it is also possible for a given subject to simultaneously compare several photographs (Real et al., 2000). And last but not least, photographs can be easily edited. In our case, it gives the opportunity to show the same landscapes with and without wind farms.

After having decided to work with photographs, the question was which type of photograph could be the closest possible from real experience. It is acknowledged that photographs taken with a 50 mm lens are closer to the actual experience of the landscape *(Institute of Environmental Assessment and Landscape Institute, 1995)*. However Wherrett (1998) examined the differences between pictures taken with a focal length of 35 mm and a focal length of 50 mm and found them negligible.

The next step is to determine how to collect people's assessments. Landscape assessment is often based on attitudes scales. There are many scaling methods, the most used are:

- Ordinal ranking : people order the photographs according to their preferences
- Likert scale : people specify their level of agreement on a statement
- Q-sort and free-sort methods : people class photographs in some piles according to some criteria

Stamps (2000), has compared different scaling methods in a meta-analysis of nine studies. He found a size effect of r = 0.99. It indicates that all methods seem to be equivalent.

Methods	r	n	Source
Ratings and rank orders	.92	8	Zube *et al.* (1974)
Ratings and qsort	.89	8	Zube *et al.* (1974)
Ranks and qsort	.97	8	Zube *et al.* (1974)
Ranks and ranks of ratings	.89	12	Shuttleworth (1980)
Ranks v. place on table	.97	21	Buhyoff & Arndt (1981)
Raw score v. comparative judgment	.99	900	Schroeder (1984)
Raw score v. true score	.93	80	Schroeder (1984)
Raw score v. signal detection	.99	113	Schroeder (1984)
Total:		1150	

Table 1-1: Comparison of different scaling methods (Source: STAMPS III, A.E., 2000)

In Table 1 1 ratings are raw semantic differential scores; ranks, Q-sort, comparative choice, and ranking provide ordinal data; and true score and signal detection are post processing of raw semantic differential data. The results are listed as a correlation r over n objects. It is clear that all the correlations are very high (.89 ≤ r ≤.99). These very high correlations indicate that all of these methods produce the same estimates of intensity of pleasure (Stamps, 2000).

The Likert Scale was developed by Likert in 1932 and seems to be the most widely used scale to rank photographs in photo-questionnaires. With a Likert Scale, the respondents must specify their level of agreement to a statement.
A 5-point Likert Scale was used by amongst other Ryan (1998, 2002), Asakawa et al. (2004), Hagerhall (2001), Bogner and Wiesman (1997). Ryan (1998) asked respondents to indicate their preferences for scenes as being places near which they wanted to live (5=very much), in a second section, respondents had to rate areas as places to show to guest. A 7-point Likert Scale was used by amongst other Wherrett (2000), Kaltenborn and Bjerke (2002), Rogge et al. (2005). Kaltenborn and Bjerke (2002) measured place attachment with a 7-point scale.
A disadvantage, mentioned by Tahvanainen et al. (2002) is that the scale used is ordinal or interval. According to *Moser and Kalton (1979)*, the Likert-scale appears to be ordinal because no conclusions can be drawn about the meaning of distances between scale positions. However, many researchers often used parametric statistical methods with such scales (Karjalainen,1996).

Then the landscapes that would be shown had to be chosen.

Wherrett (2000), Fairweather & Swaffield (2001) selected photographs that contain a wide variety of topographies and land covers. Fairweather & Swaffield (2001) based the selection upon a sampling frame of landscape categories derived from previous studies of landscape perception and experience.

Three broad dimensions of the physical landscape emerge consistently from the literature as generic variables in landscape perception: landform and relief (including water), landscape cover (land use and vegetation), and cultural features *(Schauman, 1988; Amadeo et al., 1989; Bishop & Hulse, 1994; Palmer, 1997)*. Pictures should be selected to contain these three categories of elements. Arriaza et al. (2004) classified the area of study into relatively homogenous landscape units, using geographical information system techniques. Photographs were intended to cover the most important land uses within each unit. Rogge et al. (2005): study area divided in rasters of 500 by 500m. In each raster, several pictures have been taken. They used the standard procedure of *Puschmann & Dramstad (2002*). Although those methods are attractive to gain more objectivity, it becomes more ineffective when the area is wider.

To evaluate the impact of a specific landscape change, many researchers use simulations of photographs (Swaffield & Fairweather, 1996; Tahvanainen et al., 2002; Rogge et al., 2007). Lothian (2008) used Photoshop to simulate wind turbines in photographs. When measuring the impact of the installation of wind turbines in a landscape, the distance of the turbines to the viewer and the nature of the background and the landscape between the viewer and the turbines is important (Bischop and Miller, 2007). Of importance is also the amount of wind turbines simulated and the fact that turbines are rotating or not. Bishop and Miller (2007) found a less negative response to moving than to static turbines. As a possible argument they say that moving turbines are seen as being 'at work', producing energy. Stationary turbines are only an intrusion with no evident purpose. This effect of the symbolic aspect of wind energy will be developed further.

1.6. State of the art of wind energy development in Belgium and Europe

A cross-country comparative study between Denmark, Spain, Germany, Scotland, the Netherlands and England determined four institutional variables that have a crucial influence on the development of wind power (Toke, Breukers, Wolsink, 2008). These are:

- The level and the procedures of planning systems and decision-making
- The attitudes towards landscape and nature (protection organisations)
- The financial support system for wind power projects
- The ownership and involvement patterns

1.6.1. Level and procedures of planning systems and decision making

Planning systems and the way decisions are made with regards to wind power projects have a crucial impact on their outcomes. Several aspects of these planning systems can be determined.

1.6.1.1 The initiative

Who is responsible for the planning of wind power projects and the designation of suitable areas for wind turbines? In Germany, municipalities are required to designate suitable areas for wind development. Where municipalities haven't indicated these areas, developers are free to develop a wind power scheme anywhere outside the build-up area (Toke, 2008). In Denmark, local municipalities have also been obliged to allocate zones for wind power development. During this planning phase, regional authorities, local nongovernmental organizations and utilities have to be involved.

By contrast, in the Netherlands, wind power schemes require pro-active decisions from local authorities because very often the zoning scheme has to be changed. All is dependent on the personal opinion and initiative of the local councillors. This is similar to the Belgian situation where no federal or regional wind power schemes exist, but very much is dependent on the opinion of the political and administrative authorities of municipalities and higher levels of governance.

1.6.1.2 Actors involved in planning and decision-making

Planning regimes can support collaborative practices of decision making. These collaborative practices where a large number of partners are involved are important since the degree of planning acceptance is largely a function of the degree of local acceptance. The involvement of local interests from the community aids to avoid opposition from qualitative local oppositional groups through discussion and adaptation of the project characteristics and helps to improve local trust in the projects proposed (Toke, Breukers, Wolsink, 2008). A cross-country analysis of the wind power achievements of the Netherlands, England and the German state of North Rhine Westphalia found that recently neither of these cases fosters collaborative approaches in their formal planning institutions (Breukers, Wolsink, 2007).

The general trend in planning is to prioritize the idea of the "common good" (fighting climate change) over and above local concerns. This results in an increase of opposition, for example in the German case. A successful strategy for the development of wind power is to implement wind power by institutionalizing collaborative approaches in the project planning and through facilitating local ownership.

A remark made by Wolsink (2007) is that the implementation of modern, clean technologies, such as wind power, is not easily possible without institutional changes. Planning regimes and decision-making practices that really enhance the implementation processes of renewable energy require a 'strong' ecological modernization. This policy shift where environmental concerns are deeply incorporated in institutions is characterized by open, democratic decision-making rather than technocratic and corporatist-style decision-making, enhanced participation and involvement of all relevant actors rather than planning and decision-making being carried out by scientific, economic and political elites and by open-ended project approaches that allow multiple views rather than the imposition of single, closed-ended proposals by wind project developers following a Decide-Announce-Defend-strategy (Wolsink 2007).

Let us now examine the existing procedures in the different regions of Belgium with regards to wind power developments (Table 1-2). Indeed, in Belgium, the Regions are in charge of the permitting processes for onshore wind energy[2]. In **Flanders**, two permits have to be obtained for wind turbine projects: an environmental permit and a spatial planning permit. If the capacity of the project is not higher than 5 MW, the municipality can decide whether an environmental permission will be granted. Aspects such as sound, safety, blade shade and light reflections of the wind turbines will be examined, together with a public inquiry. If a project is well prepared and communicated to the community and the political decision makers, this permit is likely to be granted without major obstacles.

The second spatial planning permit is the most difficult permit to obtain. Higher administrative institutions such as the regional administration for spatial planning will evaluate the spatial impact of the wind project as examined in the localization or site note prepared by the wind project developer. For this evaluation some guidelines are developed in a recently adapted advising legal document of the Flemish government: "Omzendbrief 2006 Afwegingskader en randvoorwaarden voor de inplanting van windturbines" (Vlaamse Regering, 2006).

[2] Federal authorities are in charge of offshore wind energy development, but the impact and social attitudes towards offshore wind farms are not analyzed within the LACSAWEP project

An important guideline for this spatial evaluation is the principle of spatial concentration or the clustering principle. This is explained as either the concentration of wind turbines close to already existing centres of industrial activity, proportional to the size and importance of these centres, also called *site sharing*, or the spatial clustering of wind turbines with existing large, linear infrastructures such as rail roads, motorways, canals, rivers, high voltage power lines which already have important spatial and visual impacts on the landscape, also called *visual impact sharing*.

According to these guidelines, the most suitable areas for wind turbine projects are industrial areas and harbours, areas for small businesses and areas of public utility. Agricultural areas are only possible if there is already a significant interference of the original spatial functions of these areas by other existing structures such as roads or canals and the wind turbine project can be clustered with these structures.

To make these areas suitable for wind power projects their locations have to be defined in special spatial plans on a municipal, provincial and sometimes even regional level, a procedure which can take several years. Areas with special landscape or natural features are also excluded from possible locations. An interdepartmental regional wind commission (with representatives of the administrative authorities) can advice project developers on the feasibility of their project before the start of their licensing procedure. It also formulates advices on the requested permits during this procedure and has a third duty to make a pro-active selection of suitable sites for large scale wind turbine parks in Flanders.

The realisation of wind power projects **in Flanders** is subject to complex political and administrative procedures with just a limited role for the public communities where these projects will be realized. This has caused the realization of wind power projects by mainly larger companies or utilities. Some smaller cooperatives, such as Ecopower, BeauVent and Wase Wind, have nevertheless been able to develop wind power projects with more participation by the local community resulting in higher local support for these projects. This will be discussed further when the involvement and the ownership of wind power projects in Belgium will be examined.

In the **Walloon Region**, the environmental and town-planning permissions are combined into one building and environmental permit called "permis unique". The first step in this procedure is the organisation of an information meeting for the general public of the municipality where the wind power project will be realized. Important environmental issues for the future environmental impact assessment will be presented during this meeting as well as possible solutions to overcome these potential environmental problems.

Finally, the public can express its opinion and suggestions with regards to this project. In a second step, one document containing all the elements for the spatial planning and environmental permit, such as the environmental impact assessment, has to be sent to the regional administrations where the project will be evaluated according to the existing guidelines. These guidelines are found in the Walloon legal document 'Cadre de référence pour l'implantation d'éoliennes en Région Wallonne' of 2002.

The principles are also based on the regrouping or clustering principle, as in Flanders, but the principle of site sharing is also explicitly possible for agricultural regions and rural housing areas if the wind turbine park has no significant negative impact on these other rural functions. Because of these possibilities, most of the future wind power projects in the Walloon Region are planned in large agricultural areas.

The second principle of visual impact sharing makes the clustering of wind turbines with existing large, linear infrastructures possible as well. This integration of wind turbine parks in the landscape has to be examined in an environmental impact assessment where the characteristics of the landscape involved have to be described, as well as the vulnerability of the landscape to wind turbines and the possible effects of wind turbines in this landscape.

This impact on the landscape can be minimized according to the characteristics of this region. In more urbanised regions, the existing infrastructures can be underlined by the geometrical formations of wind turbine parks. In more natural regions, wind turbines should be placed in more 'natural', organic formations, without the use of clear linear formations. An interadministrative and pluridisciplinary regional wind cell had to serve as a consulting authority to assure the coherence in the deliverance of the permits. However this regional wind cell disappeared in 2004.

Belgium		
	Flanders	Wallonia
Initiative for planning spatial planning	Pro-active decisions of local, provincial and regional authorities, dependent on personal opinion and initiative (e.g. Eeklo) + wind commission	Pro-active decisions of local and regional authorities, dependent on personal opinion and initiative
Actors involved in planning and decision-making	Administrative + political local (environmental permission) + regional authorities (Planning Permission)	Administrative + political regional authorities (EL + PL) (Permis unique)
Spatial guidelines	Spatial concentration/clustering: site sharing + visual impact sharing	spatial concentration/clustering: site sharing + visual impact sharing + agricultural areas
Local participation	Public inquiry (EL)	Information and consultation meeting + public inquiry

Table 1-2: Overview of planning regimes and decision making in Belgium

This procedure seems to create more clarity and possibilities for wind power projects due to the construction of the 'permis unique'. The involvement of the local community from the beginning of the project also forces wind power project developers to communicate openly to the local communities.

These collaborative, consulting practices nevertheless haven't resulted in the development of more locally owned wind power projects set up by farmers and cooperatives, except for some small initiatives such as Vents d'Houyet and Energie 2030. In the nearby future large wind turbine parks will be realized by large to medium-large companies and utilities mainly in agricultural areas in the Walloon Region. Apparently, some important incentives for community owned wind power projects are still lacking.

To help those planning and decision-making processes, some maps have been drawn for some regions of Belgium.

A first wind map is the 'Windplan Vlaanderen' which has been developed in 2000 by the Vrije Universiteit Brussel and the Organisatie voor Duurzame Energie Vlaanderen. This map is developed through a spatial and meteorological analysis of Flanders (Cabooter Y., Dewilde L., Langie M., 2000).

The results are two maps: a map with an overview of the average wind speeds at different hub heights (50 and 75 m) and a map with the Flemish territory classified according to 4 classes of suitability for wind power development.

- Class 0 zones are unsuitable for wind power development. These are housing areas and natural areas where the impact of wind turbines is deemed to be very negative.
- Class 1 zones are very suitable for wind power development and have the highest priority. These are industrial areas or areas with communal purposes where wind turbines can be situated without any extra impact on the environment.
- Class 2 zones are suitable for wind power development but with some limitations with regards to visual and environmental impacts. These zones are agricultural or recreational areas.
- Class 3 zones are also still suitable for wind turbines but only if the environmental and visual impacts of wind turbine have been thoroughly analyzed because of the vulnerability and the importance of the landscape of mainly agricultural areas.

This 'Windplan Vlaanderen' is an interesting, policy supporting tool to make a first assessment of the suitability of a specific area for the development of a wind power project.

A **second wind map** is the "Inpasbaarheidskaart windturbines West-Vlaanderen". This wind map was developed by Aeolus and 3 E for the Flemish administration of economy, department natural resources and Energy in 2002 (Aeolus, 3 E, 2002). It is the result of a landscape study by experts for the province of West Flanders where the interaction between these landscapes and wind turbines is examined.
The result is a map of West Flanders with potential locations for wind turbine parks. Here, wind turbines can be tolerated or adapted in the landscape, some wind turbine parks can even accentuate certain landscape features or renew or modernize these landscapes.

First, landscape structure areas were determined which have typical landscape features which favour the allocation of wind turbine parks.These features are:

- Flat, hard infrastructures which have a large-scale, rational and technical character, with a high intensity of use for work or living such as regional industrial areas and harbours
- Linear, hard infrastructures which have a large-scale, linear and artificial character such as motorways, railroads and canals
- Positively affirming relief where the spatial structure of abiotical landscape features can be accentuated by wind turbines
- Rational, large-scale polder landscapes where the horizontal, rational pattern can be emphasized by wind turbines

The next step in the development of the wind map for West Flanders was the exclusion of veto-areas because of their visual and landscape protection status and the exclusion of the class-0 areas that can be found on the Windplan Vlaanderen because of legal spatial restrictions. In a third step, a perceptual analysis of the allocation of wind turbines on the resulting potential locations was executed.

A third wind map is named "Carte des contraintes paysagères et environnementales pour l'implantation des éoliennes en Région Wallonne". This map with the visual and environmental restrictions on wind power developments in the Walloon Region was developed in 2004 by the Faculty of Agronomic Sciences from Gembloux (Laboratoires d'Aménagement du Territoire et de Géomatique). It was financed by the Walloon Ministry in charge of land use planning, urbanism and environment (Cuvelier M., Schaar C., Feltz C., Lejeune P., 2004). In the first phase of this project a list of criteria and indicators was developed to assess the environmental and visual impacts of wind power projects in the Walloon Region.

For every non-visual, environmental criterion, restricting indicators were found primarily in legal documents to represent the impact of wind turbines on these features: ecological indicators, 3 aeronautics indicators, 1 acoustical indicator, 1 shade indicator, 3 security indicators, 3 spatial indicators (exclusion of nature areas, park areas and green areas), 5 geological and hydrographical indicators and 1 telecommunications indicator.

For the landscape criteria 15 indicators were determined which were adapted to the scale of the landscape: 2 indicators referring to the patrimonial value of macro-landscapes, 3 indicators referring to specific uses of forests, 2 indicators to represent the value of nature parks and large agricultural landscape units, 6 indicators assessing the visual impact on landscape units which have special urban, (proto-)industrial, rural, structural and monumental patrimonial value and 2 indicators determining the visual importance of local sites (Zones d'Intérêt Paysager ZIP, Périmètres d'Intérêt Paysager PIP).

According to the importance of these indicators, 3 classes of restrictions on wind power developments in specific areas are created:

- Locations with absolute restrictions where wind turbines should be excluded
- Locations with high sensitivity to wind turbine projects where projects normally are not possible but additional studies can reassess the impacts of wind turbines
- Sensitive areas where extra attention should be paid to impact assessment analyses

In the second phase, these indicators and their restrictions are translated into maps which reflect the sensitivity of a region to wind power developments with regards to these indicators. In the third phase: a synthesizing wind map is developed which represents the 3 classes of restrictions of locations to wind power developments combined for all the indicators.
Although this wind map is used by authorities to assess the sensitivity of a region to a specific wind energy project, this information has to be complemented by the Environmental Impact Assessment of each wind turbine project. This map is kept confidential by Walloon authorities to avoid speculations on land prices.

The Lacsawep project focuses on the landscape perception. A map of landscape sensitivity will not be drawn but a methodology will be given to assess landscape preferences towards wind energy.

After this first, political, institutional key factor for the explanation of the success of wind power projects, the influence of a second, more social, institutional factor will be examined: the attitudes towards the landscape and nature protection and the organization of their expression. This factor will be studied more into detail in the second research line of the LACSAWEP-project.

1.6.2. Attitudes towards the protection of landscape and nature

The appreciation of landscape and nature is primarily rooted in the cultural values that have been attached to it, and in the existence of grass-roots initiatives. In the United-Kingdom, the countryside is an important part of the national identity. Strong groups exist that have landscape protection as a key priority and that can set up national campaigns that are sceptical of or opposed to wind power such as the Campaign to Protect Rural England (CPRE) and the Campaign to Protect Rural Wales (CPRW). Also, groups exist that are specifically dedicated to campaigning against wind power development, locally and nationally (Toke, 2008).

The opposite situation can be found in Spain where little value is placed on living in rural areas which results in little landscape protection activity for these areas. In Denmark, Germany, the Netherlands and Belgium organisations set up to protect environmental resources are primarily oriented towards protection of nature rather than landscape (Toke, 2008).

These are generally supportive of wind power, also following on from a tradition of grass-roots initiatives that campaign against coal and nuclear industries (Toke, 2008). An example of these organisations supportive of wind power in Belgium are the regional and local Flemish climate coalitions formed between environmental, nature, youth and other socio-cultural associations to fight climate change by opting for renewable energy technologies such as wind power. Only when important local natural areas are threatened to be seriously affected by wind power projects, opposition can be organised by these groups, as has happened for the Wadden Sea in the Netherlands.

A Belgian example of an organisation that is protecting landscape rather than nature, and which especially opposes wind projects, is Vent De Raison. The impact of the opinion of local, provincial and regional administrative and political authorities in the licensing procedures in Flanders and the Walloon Region is also not to be underestimated and will be examined in more detail in the next chapters. Next to these larger groups, authorities or organisations there is an important influence from local residents. In a survey carried out in 2003 for the Flemish Administration of Natural Resources and Energy (ANRE, 2003) on the energy attitudes of the Flemish households some questions were asked about the attitude towards wind power projects. 49 % of the respondents would accept new wind turbine parks in their neighbourhood. This is 13 % less than a similar survey in 2001.

An explanation is the fact that wind turbine projects are more concrete, bigger and more mediatised. The process of attitude formation around this topic has also started in Flanders. There was also a significant difference in this attitude between the province of Limburg (69 % in favour of wind power projects) and the province of Oost-Vlaanderen (only 38 %). Locations which are estimated as suitable for wind turbine projects are platforms in the sea, industrial areas, locations by the coast and locations close to highways with a significant more restrictive attitude of urban respondents compared to other groups.

Another survey was carried out by the facilitator for wind power in the Walloon Region (Apere). It states that 64 % of the respondents would accept a wind turbine park located at less than 1000 metres from their house. Of the respondents already living in the vicinity of wind turbines 72 % affirms that they don't experience any impact of these turbines. A last conclusion was the need of all respondents for objective and extensive communication and information about the local implications of wind turbine projects.

The better this information is dispersed, the easier wind turbines will be accepted in the local communities (Apere, 2005). A look at the driving forces behind opposition against wind power projects, logistical regression analyses of factors that influence wind power planning outcomes in the UK suggest that the main driving force behind opposition is extremely local in nature, associated with the parish where the wind power project is planned. Discourse analysis in this same study demonstrated how campaigners managed their opposition in order to dispel accusations of 'NIMBY-ism' and to universalize their support by gaining the legitimacy of landscape protection and by upholding different environmental values (Haggett, Toke, 2006).

The importance of different factors which influence attitudes towards wind energy in general, and towards the building of local wind projects will be further explained in the last chapter of this literature study. Also the second research line of the Lacsawep project is totally set-up to investigate this for Belgium.

In the following section, a third key institutional factor for wind power developments is the financial support system. This influences the actors that can be involved in wind power projects as shown in the fourth factor of local involvement and community ownership.

1.6.3 Financial support systems

A third key institutional variable affecting wind power development is the financial incentive regime for wind power which makes it a profitable investment. The type and the stability of this regime are crucial elements in this system.

1.6.3.1 Type

Two basic types of financial support systems are used to promote investments in wind power: 'feed-in' tariffs and more 'market based' schemes such as tender systems and tradable green electricity certificates.

The system of **renewable energy 'feed-in' tariffs (REFIT)** is used in Germany, Spain and was used in Denmark until 2001. Fixed prices are paid for a given amount of electricity and guaranteed for a long period. This ensures predictable stable outcomes for wind power projects and possibilities for investments for longer time in the wind power market. The main criticism of this system is that it maintains fixed price levels that don't conform to the traditional market prices (Meyer, 2003).

In the German Renewable Energy Sources Act of March 2000 the choice for this system was re-affirmed by referring to three reasons.
First, it referred to the polluter pays principle with regards to external costs where most of the social and ecological follow-up costs associated with conventional electricity are currently not borne by the operators of such installations but by the general public. The system of feed-in tariffs merely reduces this competitive advantage of 'cleaner' renewable electricity.
Second, conventional energy sources still benefit from substantial government subsidies which keep their prices artificially low. The tariffs paid for electricity from renewable energy sources is only a fraction of this still existing conventional government support.
Third, this system attempts to break the vicious circle of high unit costs and low production volumes typical of the first development phase of technologies for the generation of electricity from renewable sources.

This system led to the formation of the wind power market in Germany, to the entry of firms and the establishment of an advocacy coalition for the further development of positive institutional changes for the wind power market (Jacobsson, Lauber, 2006).

By the end of 2001, the wind power capacities of Denmark, Germany and Spain comprised around 84 % of the EU total. To make this system more dynamic, tariffs should and are being adjusted at frequent intervals to take into account the technological learning curves of renewable energy technologies.

The second type of more **'market based' schemes**, at least at first sight, involves extra elements of competition between projects designed to bring down the price of wind power. A system of **renewable portfolio standards of tradable green electricity certificates (RPS/TGC)** is currently in use in England, Scotland, the Netherlands and Belgium. Electricity suppliers have to prove by means of certificates that a specific percentage of the electricity supplied has been produced from renewable energy sources.

These certificates can be pursued from the producers of electricity from these renewable energy sources for a specific market price. The uncertainty about these prices increases the risks of investors and tends to reduce investments in renewable technologies. These uncertainties can be limited by defining minimum and maximum prices (fines) for these green certificates adapted to the stage of the development of these technologies, as in Denmark and Belgium.

A second very important element of these financial support systems is the political stability and the consistency of these regimes.

1.6.3.2 Stability and consistency of incentive regime

A major factor in investment regimes is the stability of the financial conditions, especially for wind power projects which are highly dependent on external financial support regimes. In the Netherlands, frequent changes in these regimes have undermined their reliability considerably with lower investments in wind power.

In Denmark, new onshore wind power developments have almost ceased after the termination of the support due to growing uncertainty among potential investors about future incentive regimes. The German government has supported, also forced by a stronger wind power market with its advocacy coalition, the existing incentive regime, with small adaptations to the level and consistency of financial support.The results are well known.

In England, Wales and Scotland a first 'market based' tendering system for wind power projects was not successful because of unviable, unrealistic, offers for wind power developments. The second system of tradable green certificates was launched in 2002, the Renewable Obligation (RO), and has resulted in a great increase in the volume of projected wind power schemes. In Belgium, renewable energy projects are stimulated primarily by a system of tradable green certificates with guaranteed minimum prices for different types of renewable energy technologies.

This has stimulated investments in renewable energy technologies, such as wind power projects. This number of green certificates is coupled to the regional targets for electricity production from renewable energy sources. In Flanders, this target is 6 % by 2010. The minimum price for certificates from onshore wind power projects is 75 euro/1 000 KWh and a fine of 125 euro for every missing certificate has been determined. In the Walloon Region, 7 % of the electricity had to be produced from renewable energy in 2007, and would be 12 % in 2012 with a fine of 100 euro for each missing certificate. There also exist other forms of financial support systems in Belgium such as extra investment support systems for companies. Due to recent reforms of the Flemish investment support system, this currently leads to increasing uncertainty and instability with regards to investments in these future renewable energy projects.

This economic institutional factor is closely related to the fourth and last key institutional factor determining wind power developments: the patterns of ownership and involvement.

1.6.4 Patterns of ownership and involvement

The ownership by an involvement of local partners can have an important influence on the support of these local partners for wind power projects in their municipality. Several types of ownership with regards to wind power projects exist:

1.6.4.1 Corporate ownership

These are mostly non-local types of ownership by traditional utilities, independent power producers and non-power large corporations. The financial, technical and legal aspects of wind power projects are dealt with by the corporate partners. The only input of the local community is to give its consent to the plans, if needed.

1.6.4.2. Co-operative ownership

This type of ownership is more participative and locally based. The local communities are involved through local decision-making and financial involvement can be assured through public shares in the wind power projects. These locally inspired and owned projects may counteract some possible objections to wind power schemes because of the higher rate of planning acceptance. They can help improve the prospects of schemes being given planning consent (Toke, 2008).

1.6.4.3. Individual owners/farmers

This type of ownership is less participative than co-operatives because of the individual ownership of the projects but it is highly locally based since these projects are realised on the land of farmers who use the wind turbine as an extra source of income. In Germany, early wind power policies supported a practice of locally based project planning with wind projects representing concrete local political, economic and environmental goals.

The resulting public-participative style of ownership has greatly improved the political profile of wind power because many individuals that invested in local wind power schemes became ‘energy experts’ resulting in a strong lobby for good conditions for wind power in the future (Toke, 2008). In 2004 50 % of the total wind power capacity of 16 000 MW was owned by individual farmers who were organised into informal local co-operatives. 40 % of wind power had been established by development companies offering public shares to high-income earners, less participative than truly public co-operatives, and 10 % of the wind power capacity was owned by local people owning the shares in public, local wind farm co-operatives or ‘Burgerwindparks’ (citizen wind farms), onshore and offshore.

A crucial factor in this evolution was the availability of an abundant amount of information about setting up commercial wind power schemes by local enthusiast, of low cost consultants and of locally based agents of wind generator manufacturers (Toke, 2007). Currently, these locally owned citizens’ projects are replaced by companies and investor groups with less local involvement, leading to increasing local opposition in Germany. In Denmark, the same evolution has taken place. Wind power co-operatives developed by wind enthusiasts initiated the large deployment of wind power with currently more than 100 000 Danish families having shares in wind power cooperatives.

This type of ownership was quickly followed by farmer-owned wind power projects which currently represent the majority of wind power projects. This tradition of local energy activism in both Germany and Denmark grew from the anti-nuclear movements of the 1970's and 1980's when environmental NGO's and other grass-roots movements organised mass based populist movements to react against further nuclear developments.
These movements also encouraged interest in alternative energy projects, such as wind power (Toke, 2008). In the Netherlands 60 % of wind power is owned by farmers, 5 % by co-operatives and 35 % by utilities and larger companies. Much of the wind power development that has taken place was favoured by the introduction of community ownership to reduce planning resistance in densely populated areas.

Other EU-countries such as the UK and Spain have little experience with these local energy actions and the resulting locally owned renewable energy projects. Wind power development in these countries is largely a matter of large utilities or power producing corporations that invest in economically, and not socially or ecologically, interesting projects.

In Belgium, the wind power market is dominated by projects of large utilities, large power producing corporations and other companies. The largest wind power project developers are Aspiravi Plus and Electrawinds, both intermunicipal renewable energy project developers with over 50 wind turbines and a wind power capacity of over 88 MW, followed by the utilities and power producing corporations of Electrabel and SPE.

These 4 actors have developed a total wind power capacity of 150 MW or 62.5 % of the total wind power capacity. The other power producing corporations such as Airenergy, Greenwind and RPC (Renewable Power Company) and other non-power producing companies such as Colruyt and Bobbejaanland have a total wind power capacity of over 70 MW and a share of 30 % of the total wind power capacity.

This means that 92.5 % of the wind power projects in Belgium are owned by private, mostly non-local economic organisations. This could be a disadvantage with regards to the future development of the political profile and the local acceptability of future wind power developments. Only 8 % or 18 MW of wind power capacity is owned by co-operative organizations such as Ecopower, Wase Wind, Vents d'Houyet and Energie 2030, with public shares open to local and non-local shareholders.

Currently, there are no any wind power projects in Belgium who are organized and owned by farmers or co-operative organizations of farmers.

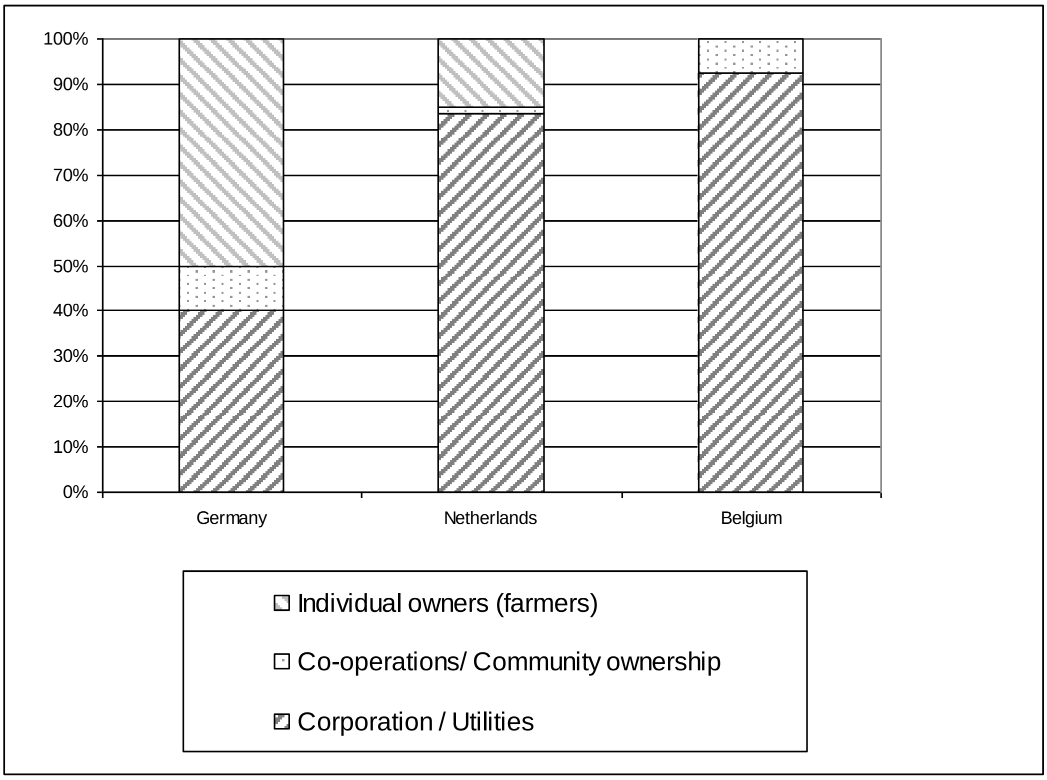

Figure 1-4: Types of ownership and their share in the total wind power capacity in Belgium and neighbouring countries

An important conclusion of the type of wind power ownership in these different countries is that locally inspired and owned projects improve the planning environment for wind power. It also improves the prospects of planning consent and the political profile of wind power.

Extra local benefits can be achieved by share-holding of the municipality or individuals in the project, by local taxation of wind farms by local business taxes, by offering incentives to local energy consumption by means of more readily and more cheaply green energy provision to locals, by means of economic regeneration where profits from wind farms are used to stimulate local job creation in sectors other than electricity generation and by environmental regeneration where these profits are used to improve the ecological quality of the surrounding land (Szarka, 2006).

To stimulate these co-operative wind power schemes started by local enthusiasts, knowledge and confidence about wind power technology has to be disseminated as widely as possible, as this has led to success in Germany and Denmark (Toke, Community Wind Power in Europe and the UK, 2007). What is needed in these communities to develop community-owned wind power schemes are skills, resources, time, access to information, liaisons with other organizations, money and funding, strategic planning, flexibility, knowledge of these communities and a clear project identity (Hinshelwood, 2001).

2. Modeling the impact of wind turbines on the perceived visual quality of landscapes

2.0. Abstract

In this chapter the results of the first research line of the project: "Modeling the impact of wind turbines on the visual quality of landscapes" are presented. The objective of this research line was to develop, validate and implement a quantitative landscape appreciation model that allows assessing a possible change in landscape appreciation after the installation of a wind turbine.

Firstly, a representative photo collection of representative Belgian landscapes was compiled. Next, by means of advanced photo manipulation techniques wind turbines were simulated on a set of selected landscape photos. Both the original and the manipulated photos were used in an extended photo questionnaire. Respondents were asked to score the visual quality of the presented landscapes on a scale from 1 to 7. A statistical analysis of the respondent scores were used to calibrated and validate a landscape appreciation model that allows to assess the visual quality of a landscape (with or without a wind turbine) by means of quantifiable landscape parameters (e.g. % of visible green, % of built-up area, presence of water surfaces, …).

Finally, an advanced extrapolation technique is proposed that allows applying the landscape appreciation model at larger scale levels by means of a sophisticated viewshed analysis.

The results of this part of the research are presented in the form of two scientific papers that were submitted to international peer-reviewed journals:

- Peeters, K., Vanderheyden, V., Van Rompaey, A., Schmitz, S., subm. Modeling the impact of wind turbines on the visual appreciation of landscapes: a case study in Belgium. Landscape and Urban Planning.
- Peeters, K., Van Hemelrijck, H., Van Rompaey, A., Celis, M., Gulinck, H., subm. Predicting the scenic beauty of landscapes through the use of viewshed analysis. International Journal of GIS.

2.1. Modeling the impact of wind turbines on the visual appreciation of landscapes: A case study in Belgium

2.1.1. Introduction

In Europe the total wind power capacity installed by the end of 2007 reached a level of 56.535 MW (Megawatts) (EWEA, 2008). This installed capacity will avoid about 90 million tonnes of CO_2 annually and produce 119 Terawatt hours in an average wind year, equal to 3.78 % of EU power demand (EWEA, 2008). The goal of the European Council to generate 20% of the energy consumption from renewables is, however, far from reached (Baban, 2001). Therefore an exponentially increasing number of wind farms are being developed in various regions of the EU.

One of the major factors that slows down the installation of new wind turbines is the lack of social acceptance at the local level. (Agterbosch et al, in press). Opposition against wind turbines is based on a combination of aesthetic, bird-kill, noise and flicker concerns but in general the loudest voices are those arguing for protection of the scenic qualities of landscape (Bishop and Miller, 2007). Wolsink (2007) found visual influence of the impact of wind power on landscape values by far the dominant factor in explaining why some are opposed to wind power and others are supporting. Toke (2005) points at ownership, location and the value placed on the countryside.

This lack of community acceptance at the local level or opposition to wind turbine siting has often been explained by the Not-In-My-Backyard (NIMBY) syndrome, meaning that people are in favour of wind power in general, but are opposed to wind turbines in their own area (Krohn and Damborg, 1999). The explanatory validity of 'Nimbyism' has been refuted however in a number of studies (Devine-Wright, 2005; Wolsink, 2006; Wolsink, 1996). Devine-Wright (2005) presents a multidimensional framework that goes beyond the NIMBY-label and integrates previous findings with social and environmental psychology theory.

A key-issue in the possible acceptance of or opposition against the installation of wind farms is the way people assess and take into account the visual quality of landscapes. A better insight in the mechanisms that control visual landscape quality assessment is therefore necessary in order to select appropriate sites for the development of new wind farms. Lothian (1999) describes two major paradigms that are used to assess visual landscape quality: the expert-based approach on the one hand and the perception-based approach on the other hand.

The expert-based approach starts from the objectivist paradigm that regards quality as inherent in the physical landscape, while perception-based approach starts from the subjectivist paradigm that regards quality as a product of the mind.
The subjectivist approach is according to Lothian (1999) replicable; its findings can be taken to reflect the community and hence can be defended politically and applied with confidence. The results are likely to provide a reasonably permanent assessment of the landscape quality. In contrast to the expert approach, perception-based assessments have generally achieved high levels of reliability (Daniel, 2001). Systematic studies of the consistency of individual expert assessments have largely concluded that the resulting landscape aesthetic quality measures may vary as much between different experts assessing the same landscape as between different landscapes (Daniel, 2001).

Although the costs and efforts involved in a perception-based landscape analysis are much higher, this study adopted a subjectivist approach in which a large number of respondents were asked to evaluate the visual quality of a set of landscapes by means of a photo questionnaire.

The aim of the questionnaire is to link the perception based landscape quality with measurable landscape indicators. In this study landscape indicators from three broad dimensions of the physical landscape as defined by Fairweather and Swaffield (2001) were analysed: (1) landform and relief (including water), (2) landscape cover (land use and vegetation), and (3) cultural features.

2.1.2. Materials and Methods

The methodology that was adopted in this research consists of five steps:

1. A set of Belgian landscapes was photographed in order to compile a representative but sufficiently diverse sample. The original photographs were manipulated by adding simulated wind turbines in the panoramas.
2. Each photographed landscape was described by means of a set of categorical and quantitative indicators.
3. The visual quality of each photographed landscape was measured by means of photo-questionnaires.
4. Finally, the regression model was applied to quantify the impact of a wind turbine on the visual landscape quality.
5. A multivariate regression model was developed that allows predicting visual landscape quality based on the available landscape indicators.

2.1.2.1 Study area

The study area comprises Belgium, which has an area of 30528 km^2 and 10 584 534 inhabitants (347 inhabitants/km^2). More than half of the area is used as agricultural land (arable land and pasture). Built-up area, terrains and residential areas make up around 18% of the land use (Table 2-1, Source: Calculations of 'Algemene Directie Statistiek en Economische Informatie' on the basis of data of the 'FOD Financiën (Kadaster)' and the 'Algemene Directie Statistiek en Economische Informatie')

At the end of 2007, 287 MW wind power capacity was installed in Belgium (EWEA, 2008). With this installed capacity, 0.67 % of the Belgian electricity demand of 2007 came from wind energy (EWEA, 2007). Because of its high population density the development of new wind farms often encounters public resistance in Belgium. The visual impact of these wind farms seems to be one of the major obstacles to their public acceptance.

Land use type	Area (km²)	% of total
Agriculture	17352	57
Forests	6059	20
Residential area	2439	8
Other built-up area and terrains	3068	10
Recreation area and other open space	451	1
Pools, swamp, heathland, rugged land, rocks, beaches, dunes	908	3
Water surfaces	250	1
Total	30528	100

Table 2-1: Land use in Belgium

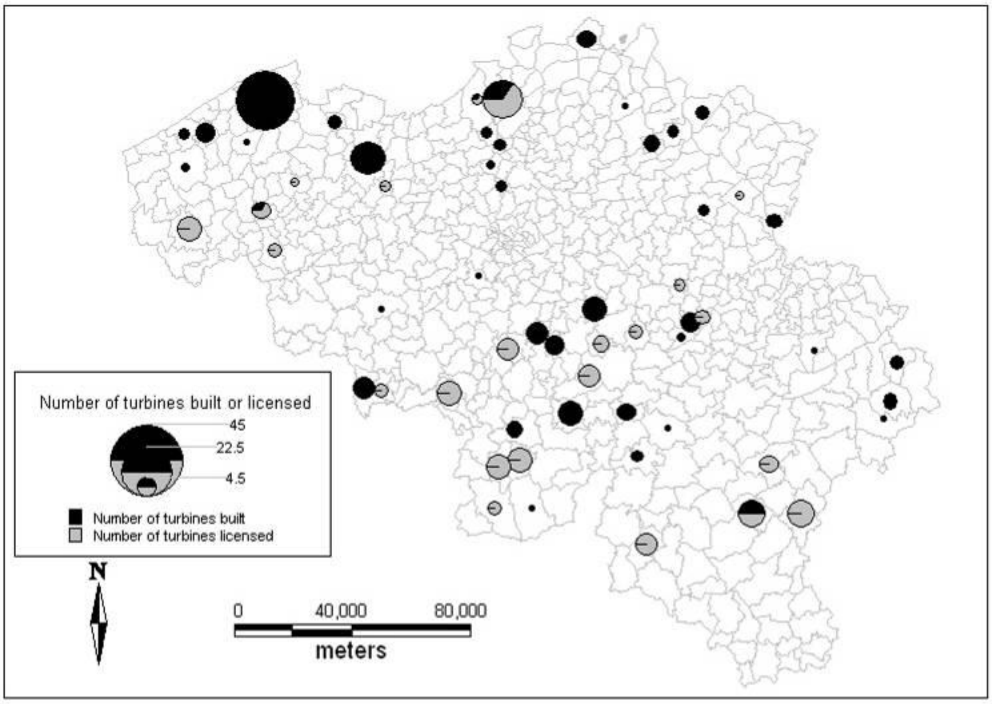

Figure 2-1: Number of built and licensed wind turbines in Belgium at the end of 2007.

2.1.2.2 Field photography

Around 250 panoramic photographs of rural landscapes in different regions of Belgium were constructed. Panoramic photographs were compiled from 6 or 7 individual photographs taken with a Canon Digital Camera EOS 300D with a zoom Lens EF-S 18-55 mm f/3.5-5.6.

All pictures were taken with a focal length of 35 mm which is equivalent to around 56 mm of a 24x36 analogue camera. Photographs were taken at eye level and stitched together with the photo editing software Autostich (Brown, 2008). Each compiled panoramic photograph covers a horizontal observation angle of around 120°.

Out of the total database of 250 panoramas, 54 photographs were selected for the photo questionnaire. The selected photographs cover a large variety of landscape types in the Belgian lowlands, the Belgian Loess Plateau and the Belgian Ardennes including forested, suburbanised, traditional, open and 'bocage' landscapes with or without disturbing elements. Figure 2-2 shows the locations of the selected photographs.

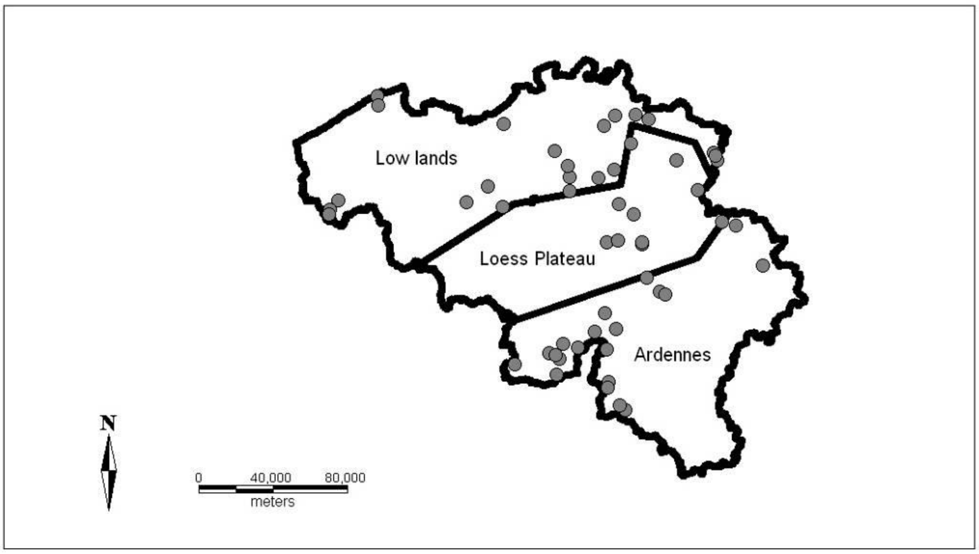

Figure 2-2: Location of the selected photographs

Next, by means of photo manipulation techniques wind turbines were simulated on each of the 54 selected landscape photos using the photo editing software Photoshop (Photoshop, 2008). Figure 2-3 shows an example of a landscape photograph with and without simulated wind turbines. Various spatial configurations of simulated wind turbines (solitary, line, arc) were simulated. Finally, a database of 108 panoramic photographs (54 with and 54 without wind turbines) was created.

Figure 2-3: Landscape photograph with and without simulated wind turbines

2.1.2.3. Description of landscapes with categorical and quantitative indicators

Each photographed landscape was described by means of a set of categorical and quantitative parameters. The quantitative parameters that were used in this study are the area percentages of the different land use types (Table 2-2).

Variable (acronym)	Type	Definition and scoring
Woods (Wo)	Quantitative	Wood elements; percentage
Green elements (GE)	Quantitative	Vegetation elements like gardens, streetsides,…; percentage
Water (Wa)	Quantitative	Still and streaming water bodies; percentage
Agricultural land (AL)	Quantitative	Agricultural land; Percentage
Urbanisation (U)	Quantitative	Buildings, roads and other paved surfaces …; Percentage
Topography (T)	Categorical	For the analysis of the topography present in the panoramas the classification of Wherret(2000) was followed: 1. flat land – land which has no undulations or slopes, such as arable fields. (T1) 2. Low hill- land which has minor undulations or a small slope, not considered to cause any difficulty to a person walking over it. (T2) 3. Steep hill – land which has either major undulations or a significant slope, might cause some breathlessness in a person walking over it. (T3) 4. Mountain – all land over 600 meters and any other land significantly steeper than previous landform types. (This category was not present in any photographed landscape.)
Vista (V)	Categorical	1. Wide view: without or with very few objects in the field of view. (V1) 2. Open view: some elements limit the field of view. (V2) 3. Restricted view: the field of view is limited by elements of which most are in the background and only a few are in the foreground. (V3) 4. Closed view: The field of view is limited by elements in the foreground. (V4)
Anthropogenic point elements (APE)	Categorical	Elements like pylons, street lighting … 1. Anthropogenic point elements are present. (APE1) 2. No anthropogenic point elements are present. (APE2)
Weather (We)	Categorical	This parameter indicates the amount of clouds in the sky. 1. no clouds (We1) 2. few clouds (We2) 3. cloudy sky (We3)
Historical-cultural elements (HCE)	Categorical	Presence of historical elements like churches, chapels and typical farms 1. Historical element present (HCE1) 0. No historical element present (HCE2)

Table 2-2: Numerical and nominal parameters that were used to describe the selected photographs

For each selected photograph the area of the following land use types was assessed by means of digitalisation: woods, green elements (non-wood and non-agricultural), urbanised area, water surface and agricultural land. For each land use type a relative area proportion was calculated. For reasons of comparison the area on the photographs that was covered by sky was not taken into account.

The categorical parameters that were derived for each selected photograph were the following: vista type, topography type, weather type, the presence of historical-cultural elements and the presence of anthropogenic point elements (Table 2-2).

2.1.2.4. Photo-questionnaire

People were asked to score the visual quality of a set of 18 photographed landscapes on a 7-point Likert scale (1 = very low visual quality, 4 = neutral, 7 = very high visual quality) attractive) which is often used for landscape appreciation research (e.g. Wherrett (2000), Kaltenborn and Bjerke (2002), Rogge et al. (2007)). In total 1542 respondents evenly distributed over Belgium were interviewed door by door, at market places or in front of shops. Respondents were not explicitly informed about the possible presence of wind turbines on the landscape photographs.

The following sampling strategy was adopted in order to generate sets of 18 photographs: All the selected photographs (108) were divided into 18 piles of 6 photographs (9 piles of photographs with wind turbines and 9 piles of the same photographs without wind turbines). The compilation of the piles was done in such a way that as many as possible different landscape characteristics were present in each pile. The piles were combined into 9 sets of 18 photographs. Each set contains 6 photographs with wind turbines and 12 photographs without wind turbines, of which the order was determined randomly.

In order to make the scoring of the respondents comparable the scores of each individual respondent were standardized by calculating z-scores. In this way the mean of scores of each respondent is 0 and the standard deviation is 1. This procedure eliminated the arbitrary differences between observers in how they use the rating scale, both in terms of tendencies to use only the high or low end of the scale and differences in the extent or range of the scale used, can be eliminated (Daniel & Boster, 1976).

2.1.2.5. Evaluating the impact of wind turbines on the visual landscape quality

The results of the questionnaire were use to calculate an average visual quality score for each of the selected 108 photographs (54 original and 54 simulated). This resulted in an average visual quality score (VQ-score) for each of the landscapes. Next, the impact of wind turbines on the visual quality of the selected landscapes (VQ) was quantified by calculating for each photo-pair a D-VQ-value. A D-VQ-value is the difference in visual quality between the original landscape and the landscape with simulated wind turbines. A positive D-VQ-value implies that the visual quality of a landscape decreases after the installation the wind turbines. A negative D-VQ-value implies that the visual quality of a landscape increases after the installation the wind turbines.

Finally, the relation between VQ-values and the calculated D-VQ-values were explored by means of regression analysis. The relation between VQ and D-VQ can be use to assess D-VQ if VQ is known.

2.1.2.6. Predicting visual landscape quality

In order to assess VQ-values (i.e the visual quality of a landscape without wind turbines) a predictive model was calibrated. Univariate regression analysis was used to identify quantitative landscape parameters that are significantly correlated with visual landscape quality. By means of T-tests significant categorical landscape parameters were identified.

Next, a multivariate linear regression model was calibrated in order to predict the mean visual landscape quality by means of a linear combination of the assessed landscape parameters (both categorical and quantitative). The developed model was validated using a Jackknife validation procedure.

2.1.3. Results and discussion

The door-to-door questionnaires resulted in a database with 18*1542 photo-evaluations. The characteristics of the respondents are shown in Table 2-3.

Gender	Males	45,8%
	Females	54,2%
Region	Flemings	60,0%
	Brussels	4,9%
	Walloons	35,1%
Type of municipality	Urban	38,4%
	Rural	61,6%
Age group	24 years or less	11,8%
	25 - 49 years	44,7%
	50-64	27,0%
	65 years and more	16,5%
Education Level	Low	22,6%
	Middle	56,3%
	High	21,1%

Table 2-3: Characteristics of the respondents of the photo questionnaire

In order to evaluate the impact of wind turbine on the visual landscape quality, a Pearson's chi-square test of homogeneity was carried out in order to compare the average appreciation of a landscape with an a landscape without a wind turbine.

The resulting χ_o^2-value was = 260.49 which implies a significant difference. Non-parametric Kruskal-Wallis test showed, however, that in 4 (out of 54) cases the landscape appreciation increased significantly after the installation of a wind turbine. In 35 cases the landscape appreciation decreased and in 15 cases no significant effect could be detected. .

A similar statistical test was carried out to detect possible differences in landscape appreciation between respondent groups. Statistically significant differences between the following groups were detected:

Between Flemish and Walloons: the Flemish seemed to appreciate undisturbed rural landscape relatively more than the Walloons and are relatively more negative towards the appearance of a wind turbine in an undisturbed landscape.

Between males and females: males appeared to be less tolerant towards wind turbines in an undisturbed landscape than females

Between groups with high and low education: highly educated people appeared to be very critical towards wind turbines in landscapes, while the group with the lowest education level was significantly less negative towards wind turbines.

Between age groups: young respondents appreciated undisturbed landscapes the most and were the most negative (in terms of decrease in landscape appreciation) towards the installation of wind turbines.

General linear model fitting and regression analysis were used to detect landscape parameters that have a significant impact on landscape appreciation.

The relation between each landscape indicator and the appreciation of the photographs was analysed using general linear model fitting and regression analysis. The following table gives an overview of the landscape parameters analysed and their influence on the appreciation.

Landscape parameter	categorical/ quantitative	significance parameters	significance level
Wo	quantitative	+	0.05
GE	quantitative	O	
U	quantitative	-	0.05
AL	quantitative	O	
Wa	quantitative	O	
V	categorical	O	
T	categorical		0.05
T1		-	
T2		O	
T3		O (r.c.)	
HE	categorical	O	
APE	categorical		0.05
APE 0		+	
APE 1		O (r.c.)	
We	categorical	O	

r.c. = reference category in general linear model

Table 2-4: Significance level of the landscape parameters

From Table 2-4 we can conclude that landscape appreciation is significantly influenced by the percentage of wood and urbanisation visible in the panoramic photograph. Also the type of topography and the presence of anthropogenic point elements will have a significant impact on the overall appreciation. In contrast with other research, the percentage of water present in the photographs did not influence the appreciation in a significant way.

This can be explained by the low number of photographs with water present on it (9 photographs). In two of these photographs, the water surface was a canal with industry on the walls.

These four indicators were used to construct the following landscape appreciation model:

$$VQ = -0.1183 + 0.9427\ Wo - 1.6817\ U - 0.1847\ T1 + 0.0002\ T2 + 0.2386\ APE0$$

A comparison of the modelled with the predicted values is given below. A jack-knife procedure was used to validate the model.

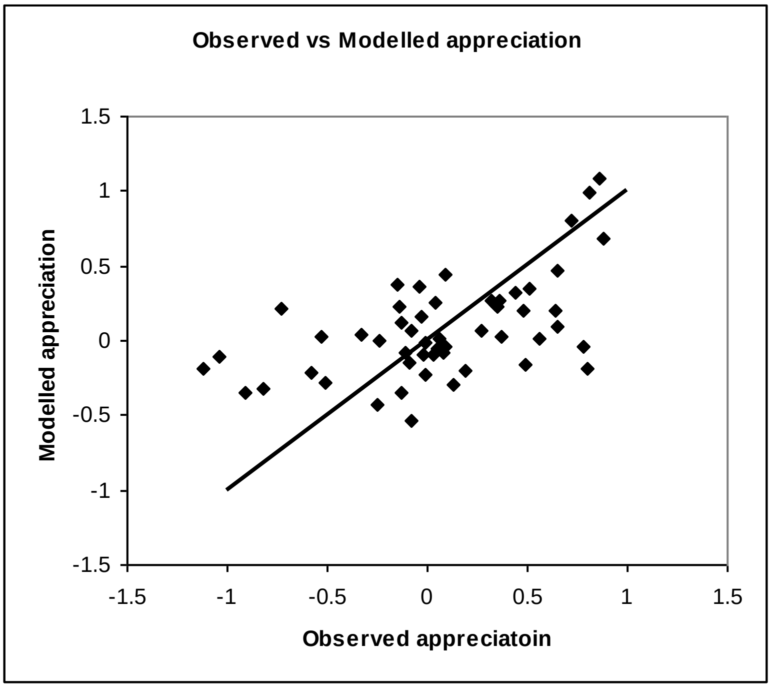

Figure 2-4: Observed versus modelled landscape appreciation

The line visible in the plot is the 1:1 line. The RMSE of the jack-knife procedure is 0.41, the RMSE of the model is 0.38.

The methodology used to create the landscape model can be extended to other types of landscapes. The present landscape model can be used for rural Belgian landscapes. As Wherrett (2000) indicates, predictive models will never be able exactly to determine relative landscape preference. They can however give a useful guide to a general level of appreciation.

In a second step of the analysis, the following hypothesis was tested: The installation of wind turbines makes non-attractive landscapes more attractive and attractive landscapes less attractive, or in a formula:

$$D\text{-}VQ = a + b^{*}\ VQ \text{ (with } b>0)$$

With: D-VQ= Delta Visual Quality = $VQ_{\text{original landscape}} - VQ_{\text{simulated landscape}}$
VQ = visual quality of the original landscape.

A plot of VQ versus D-VQ values is shown in Figure 2-5. The plot shows a positive relation between both variables with an R^2 of 0.31 which is significant at a 5% confidence interval.

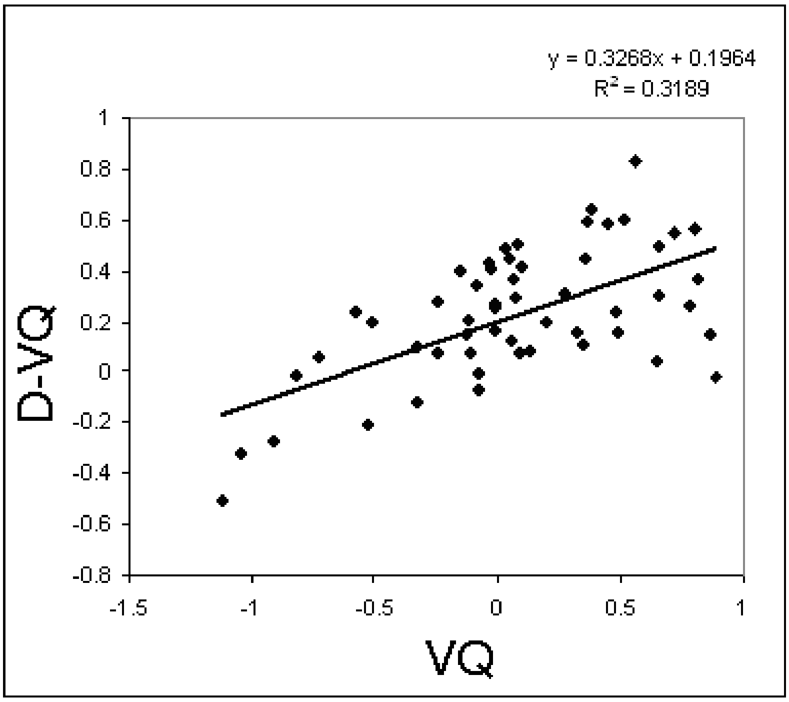

Figure 2-5: Observed correlation between VQ- and D-VQ-values

Figure 2-5 shows that the installation of a wind turbine in has a positive impact on the perceived visual landscape quality in low-quality landscape and a negative impact in high-quality landscapes. This finding, which was drawn from a selection of Belgian landscape (mostly rural or semi-rural landscapes), is in agreement with the results reported by Lothian (2008) who evaluated inland and coastal landscapes in South Australia.

A limitation of photographs is that certain important properties of wind farms cannot be taken into account. Blades are not moving on the photographs. Factors as light reflection and shadow formation by the moving blades cannot be taken into account just as the fact of moving blades on itself. Bishop and Miller (2007) found that the negative visual effects when turbines had moving blades were consistently lower than when the blades were stationary. A possible explanation can be that moving turbines are seen as being 'at work', and as a consequence are productive for the community.

Negative effects in real situations can thus be less than as predicted by the above model based on static landscape photographs.

2.1.4 Conclusion

A perception-based approach was used to construct a subjective landscape appreciation model of non-urban Belgian landscapes. A questionnaire among the 1542 inhabitants of Belgium resulted in a model of rural landscape preference and information about the change in landscape appreciation after the implantation of a single wind turbine or wind turbine park. The main concern of the study was to provide a tool for spatial planners in order to evaluate future wind power landscapes.

A first finding is that landscape appreciation can be predicted using a set of quantifiable landscape indicators. In this study the following landscape parameters were found to be significant: the percentage of forest, the percentage of built-up area, the topography type and the presence of anthropogenic point features. The methodology used to create the landscape model can be extended to other types of landscapes, if a sufficient number of new respondents are interviewed with photographs from new landscapes. The landscape model parameters presented in this study are only valid for rural and semi-rural landscapes in Belgium.

A second finding is that after the installation of a wind farm the appreciation of high-quality landscapes decreases and the appreciation of low-quality landscapes increases.
This implies that the change in landscape appreciation after the installation of wind turbines can be quantified.

An important limitation of the developed methodology based on photo questionnaires is that dynamic landscape properties such as movement of blades of a wind turbine, reflection, shadowing and flickering effects can not be taken into account. Bishop and Miller (2007) found that the negative visual effects when turbines had moving blades were consistently lower than when the blades were stationary. A possible explanation can be that moving turbines are perceived as being 'at work'.

2.2. Simulation of landscape photography through the use GIS-based viewshed reconstruction

2.2.1. Introduction

The application of quantitative landscape quality assessment models as described in section 2.1 is only possible if for each location in the area of interest the necessary and significant landscape parameters are quantified. For Belgian landscapes that were studied in this research project these significant landscape parameters are: visible % of forest, visible % of built-up area, topography type and the presence of anthropogenic point features (see Table 2-4). The assessment of these parameters could in principle be carried out by taking landscape pictures on a regular grid of each 5m*5m in an area of interest.

Since such solution is from practical and financial point of view not possible an alternative approach is proposed in which the landscape photo is reconstructed by means of a GIS analysis in which the pixels within the viewshed of a certain location are reprojected in order to be able to derive visible percentages of land cover types. The principles of this method are mathematically described and applied and validated for a study area in central Belgium.

2.2.2. Materials and methods

2.2.2.1 Study area and field survey

The study area, which covers 60 km², is situated in the central Belgium and includes the municipalities of Herent and Bertem. Landscapes in the area are rural to semi-urban with an alternation of arable land, pasture, forest and built-up area on a rolling topography.

During the field survey, 50 view points were selected on a grid with a 1500 m resolution. Observation points with a very limited vista such as forests were excluded. At each view point overlapping pictures were taken at eye-level (1.4 m above the earth's surface) with a Canon Digital Camera EOS 300D.

The pictures were stitched together automatically into 360°-panoramas with the photo-editing software Autostich © (Brown and Lowe, 2003; Brown, 2008). For each 360° panoramic landscape photograph the visible area of the following land cover categories were quantified by means of digitalisation: forest, grassland, building, arable farming, garden, water, shrub and sealed surface (Figure 2-6).

Figure 2-6: Principle of digitalization of panoramic landscape photographs

All the viewpoints were plotted on a high resolution land cover map provide by the Belgian National Geographic Institute (NGI, 2004; resolution 0.66 m). In order to make the land cover map compatible a digital elevation model with a 5m*5m spatial resolution a resampling procedure was carried out.

The original 35 categories of the land cover map were reclassified into 8 categories: forest, grassland, building, arable farming, garden, water, shrub and sealed surface. For each of the 8 land cover categories an average height was assessed by means of a laser hypsometer (Impulse 200 LR Laser Technology). The original surface of the digital elevation model was corrected by adding the assessed heights for each land cover type.

2.2.2.2. Reconstruction of landscape photographs by means of viewshed analysis

Based on the DEM that was corrected for the height of the different land cover types a viewshed was calculated for each viewpoint using the module 'VIEWSHED' of the GIS-software Idrisi Andes 15.0 © (Clark Labs, 2006). All visible pixels within a search distance D of 1200 meter at an observation height of 1.4m above the surface were detected.

This viewshed can, however, not be used directly for the calculation of the relative size of visible land cover types on a panoramic photograph. The following corrections need to be carried out:

- Correction for distance: pixel relatively nearby the observation point will
- Correction for slope gradient and aspect: pixels on steeper slopes oriented towards the observation point will occupy more area on a landscape photograph than a relatively flat pixel.

These corrections were implemented by calculating for each visible pixel within a viewshed a relative weight according to its relative size on a landscape photograph by applying the following procedures

- Step 1: Vertical projection of a pixel

Consider a target pixel as visible and the observation direction perpendicular to the pixel's surface. The surface area of a pixel with a slope $\alpha = 90°$, for example a building's wall, is fully seen. The visible surface area of a sloped pixel with $\alpha < 90°$ equals the surface area of a perpendicular projection (Figure 2-7)

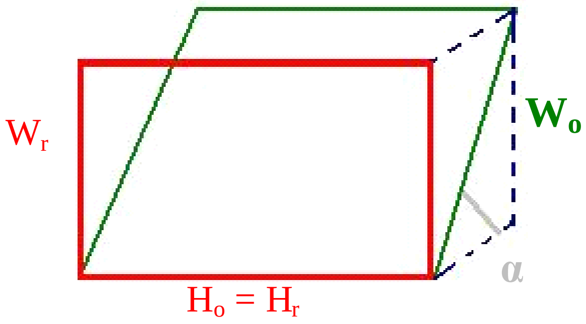

Figure 2-7: Principle of a vertical projection of a pixel

Therefore:

$$\text{Cos}\,(90° - \alpha) = H_1 / H_0 \rightarrow \sin\alpha = H_1 / H_0 \rightarrow H_1 = \sin\alpha * H_0$$

With: H_0 the real height of the pixel and H_1 the projected height. The width of the pixel stays equal ($W_0 = W_1$).

- Step 2: Horizontal projection of a pixel

The first step supposed the observation direction perpendicular to the pixel's slope; the pixel's aspect is complementary to the observation direction compared to the north. However, the pixel's aspect can be different from the complement of the observation direction. The visible surface of for example a wall ($\alpha = 90°$) with a non-perpendicular observation direction is observed as a horizontal projection as shown in Figure 2-8.

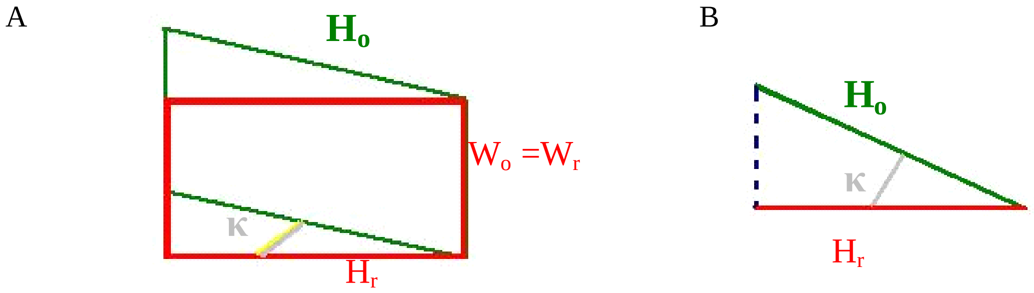

Figure 2-8: Principle of a horizontal projection of a pixel

Take a view angle as the angle between the view and target pixel and the north, and kappa as the difference between target pixel's aspect and the view angle. The horizontal width W_2 of the projection can then be calculated as follows:

$$\text{Cos } \kappa = \cos(\text{aspect} - \text{view angle}) = W_0 / W_2 \rightarrow W_2 = \cos \kappa * W_0$$

With W_0 the real width of the pixel and W_2 the projected width. The height of the pixel stays equal ($H_0 = H_2$).

- Step 3: Projection of a pixel on a sphere

Steps 1 and 2 adjust the visible pixel as a vertical object. This adjusted pixel is projected on a sphere and is part of the panorama. The radius D equals the maximal view distance, in this case 1200 m.

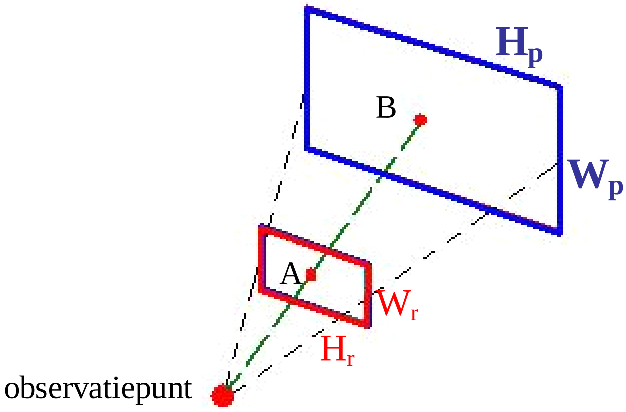

Figure 2-9: Principle of projection of a pixel on a sphere

The projected height H_p and width W_p of the pixel can be calculated as:

$$H_p / H_1 = D / d \rightarrow H_p = H_1 * D / d = \sin \alpha * H_0 * D / d$$
$$W_p / W_2 = D / d \rightarrow W_p = W_2 * D / d = \cos \kappa * W_0 * D / d$$

- Step 4: Integration of all corrections

An integration of steps 1, 2 and 3 results in the following correction equation:

$$\text{Weight} = H_p * W_p = D^2 / d^2 * \cos \kappa * \sin \alpha * H_0 * W_0$$

With: d the distance between the view pixel and the target pixel, and D the distance between the view point and the projected pixel (1200 m). H_0 and W_0 are the dimensions of DEM pixel, in this case 5 m.

This correction equation was applied to all pixels of the viewsheds of all 50 observation points. By applying this procedure the relative area percentages of 8 different land cover types were simulated.

2.2.3. Results and discussion

Table 2-5 shows the measured heights of the different land cover categories in the study area.

Land use class	Examples	Height (m)	Standard Deviation (m)
Forest	Deciduous forests, poplar cultivation, …	22	12
Grass	Pasture, meadows, …	6.6	2.1
Building	Houses, industrial buildings, …	0	-
Arable farming	Horticultural and arable land	0.7	0.5
Garden	Gardens	12	5
Water	Rivers, ponds, …	2	-
Shrub	Ruderal vegetation, orchards, …	0	-
Sealed surfaces	Roads, railways, parking, …	0	-

Table 2-5: Measured heights of the different land cover categories

The reconstructed relative areas of each land cover type were compared with the digitised areas on the land cover map. Figure 2-10 shows a plot of measure (X-axis) versus modelled (Y-axis) percentages of the visible land cover types.

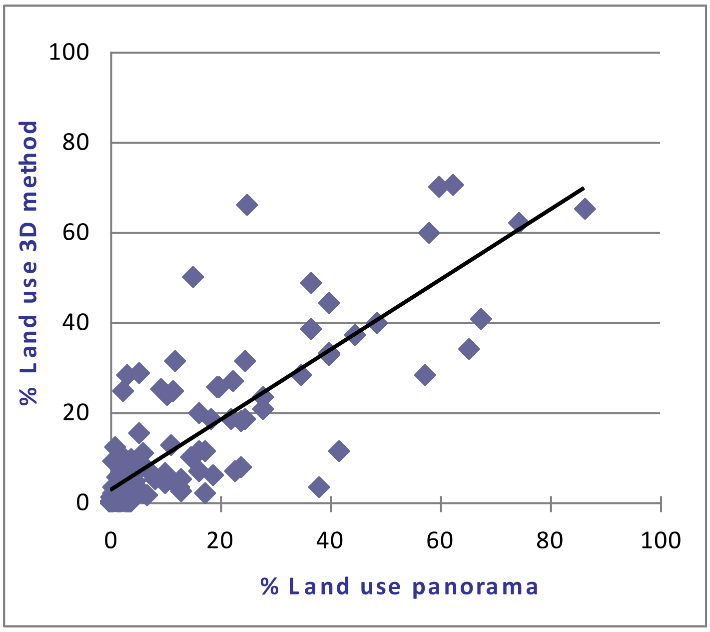

Figure 2-10: Measures versus modelled % of visible land cover types

The R^2-value between measured and modelled percentage of visible land cover types is 0.7 which is slightly lower than a similar analysis carried out by Grêt-Regamey (2006) who reported an R^2 of 0.8. In the latter study, however, only 2 land cover types were taken into consideration in a relatively open landscape.

Table 2-6 shows R^2 values for individual land cover types. The results show that the area percentages of forest, grassland and arable land are relatively well simulated. It is not possible to predict the relative area of the land cover type 'sealed' surface ($R^2 = 0$).

This can be explained by the fact that this land cover type (mainly roads) is not well represented on the land use map. In most cases the map depicts a standard road width in stead of the actual road width. Since, most pictures were taken from roads the algorithm is highly sensitive for this land cover type since nearby pixels have a very high weight.

Land use classes	R^2-value
Forest	0.82
Building	0.50
Grass	0.77
Arable land	0.74
Shrub	0.81
Garden	0.84
Sealed surface	0
Water	0.63

Table 2-6: R^2-values for individual land cover types

2.2.4. Conclusions

The validation of the developed procedure for the calculation of area percentage of different land cover types taking into account the relative weight of the different pixels shows a relative good agreement between the measured and the modelled values. Some land cover types are, however, relatively difficult to predict. Future research should focus on a sensitivity analysis of the developed procedure in order to detect the major error sources (DEM or land cover map).

2.3. Application in a case study

In order to illustrate the models developed in sections 2.1 and 2.2. they will be applied in a case study in the municipality of Sint-Truiden. Figure 2-11 shows the hypothetical location of a wind turbine in the selected municipality.

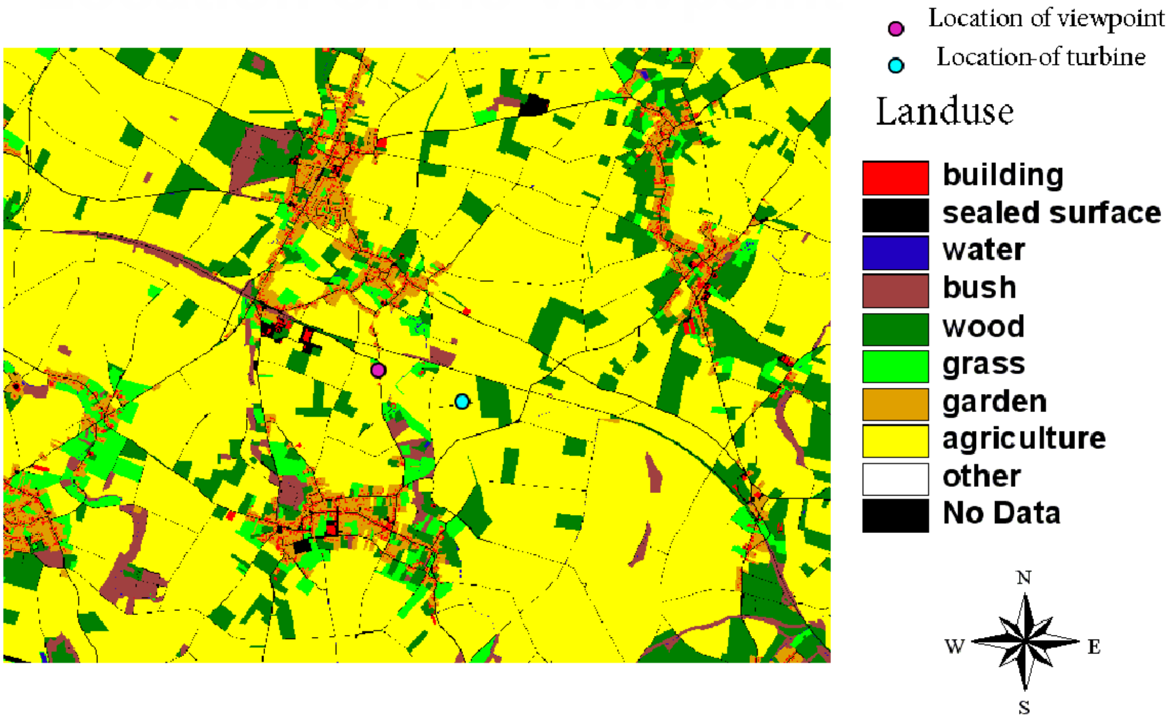

Figure 2-11: Hypothetical location of a wind turbine in the municipality of Sint-Truiden

The impact of a possible installation of a wind turbine on the perceived visual quality of the surrounding landscape was evaluated in one observation point from which the turbine could be seen. We assumed a turbine with a hub height of 100m and a rotor diameter of 80m.

Firstly, pixels that can be seen from this observation point were selected by means of a viewshed analysis (Figure 2-12). Next, a relative weight for all visible pixels was calculated by means of the equations presented in section 2.2. In this way the relative area percentages of each land cover category as they would appear on a landscape photograph were simulated. The results of this procedure are shown in Table 2-7.

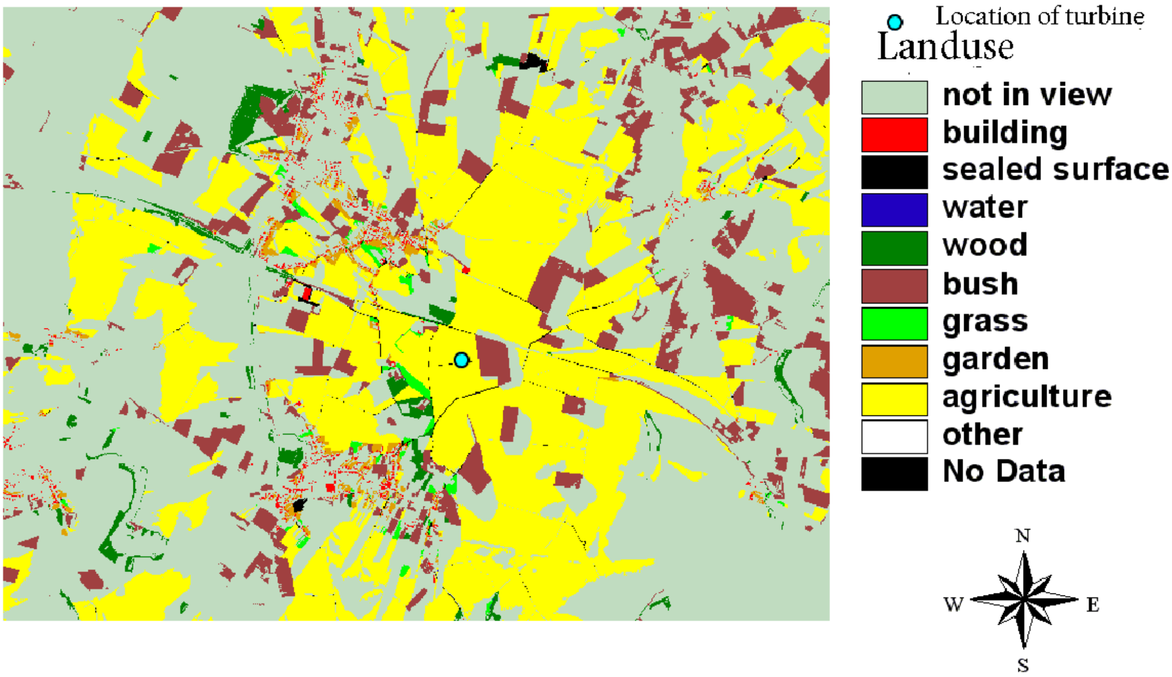

Figure 2-12: Visible pixels from the viewpoint

Land use classes	Percentage in view (%)
Forest	5.7
Building	4.9
Grass	5.3
Arable land	65.5
Shrub	5.6
Garden	0.5
Sealed surface	12.2
Water	0.05

Table 2-7: Relative area percentages a simulated with a viewshed analysis

Finally, in order to assess the visual landscape quality (VQ) the results from the viewshed analysis were used to parameterize the following equation:

$$VQ = -0.1183 + 0.9427\,Wo - 1.6817\,U - 0.1847\,T1 + 0.0002\,T2 + 0.2386\,APE0$$

From Table 2-7 we can derive that: Wo = 5.7%, U = 17.1% = 4.9% + 12.2% (building + sealed surface). From the digital elevation model we can derive that: T1 = 0, T2 = 1 (topography type = 2). Furthermore we assume that APE0 = 0 (anthropogenic point features are present). Putting these parameters into equation results in:

$$VQ = -0.24$$

In order to evaluate impact of a possible wind turbine on the perceived visual quality (VQ) in the observation point the following equation can be applied:

$$D\text{-}VQ = a + b^* VQ \text{ (with } b>0)$$

Parameterization of this equation based on Figure 2-5 gives:

$$D\text{-}VQ = 0.19 + 0.32^* VQ$$

In the selected study-case this results in:

$$D\text{-}VQ = 0.11$$

This means that after the installation of a wind turbine on the proposed location the visual quality will decrease with 0.11 units (z-scores of a 7-point Likert scale). In order to evaluate the total impact of the wind turbine the analysis should be integrated over all the pixels from which the wind turbine is visible.

2.4. Extrapolation of the model to a regional scale level

In order to demonstrate the applicability of the VQ and D-VQ models at regional scale levels the algorithms described above were implemented in a prototype application for Flanders. The application was coded in Delphi Borland and implements the principles described in section 2.2. and 2.3 as follows:

Firstly, the application reads a raster digital elevation model as input layer. For the prototype application in Flanders a high quality DEM based on LIDAR scanning with a resolution of 20m x 20m was made available by the Flanders Geographical Information Agency (NL: Agentschap voor Geografische Informatie Vlaanderen). Secondly, the application reads a rasterized land cover map as an input layer. For the prototype application in Flanders a high resolution land cover map with a spatial resolution of 20m x 20m was made available by the Flanders Geographical Information Agency.

The digital elevation model which represents the elevation of the soil surface is corrected by adding the estimated mean elevation of the various land cover types. Mean elevations were assessed by means of representative field sampling. Table 2-8 gives an overview of the elevation estimates for the various land cover types.

Land cover type	**Mean elevation estimate (in meters)**
Forest	22
Built-up area	6.6
Arable land	0.7
Grassland	0
Paved surface	0
Garden	2
Water surface	0

Table 2-8 Mean elevation estimates of land cover types for correction of the DEM

Next, the prototype application processes the input data as follows. For each 20m x 20m pixel a viewshed at a observation height of 1.7 meter is calculated. Such a viewshed is a delineation of all the pixels that are visible from the observation point taking into account obstacles such as buildings, trees and gardens. All pixels within the viewshed are projected on an 'observation sphere' using equations introduced in section 2.3.

After projection the relative percentages of each land cover type are calculated. This allows to assess the visual quality (VQ) of the landscape that can be observed from of each pixel. The results of the prototype application for Flanders are shown in Figure 2-13. Pixels at less than 1.5km from the border are not processes because of a lack of data outside of the Flemish territory.

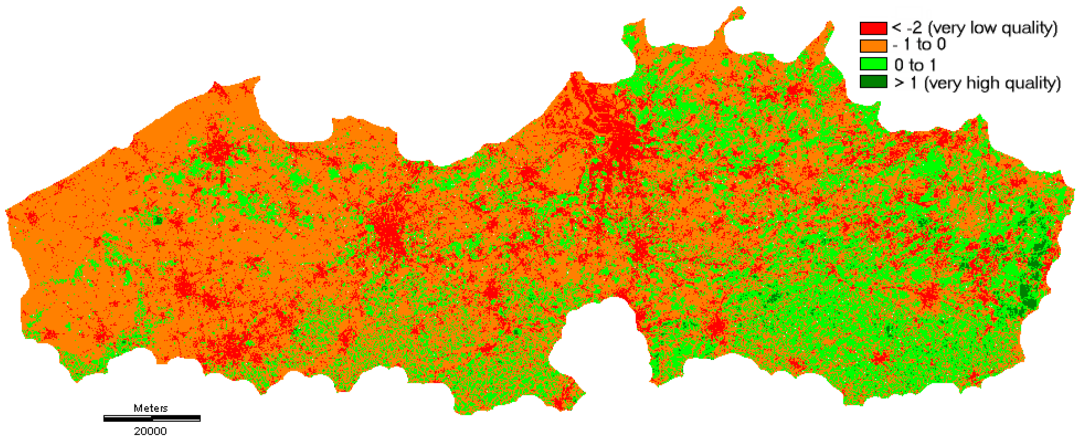

Figure 2-13: Visual quality map of Flanders. VQ-values are standardized z-scores.

Next, for each pixel the possible impact of a wind turbine on the visual quality is assessed as follows. For each pixel the viewshed of a standard windturbine with a hub height of 100m and a rotor diameter of 80m is calculated. Next, for each of the pixels in the viewshed of the wind turbine D-VQ-values ($VQ_{original\ landscape} - VQ_{simulated\ landscape}$) are calculated on the basis of the equations in section 2.3. In many cases the same wind turbine has a positive effect on the visual landscape quality in some places and a negative effect in other places. Therefore for each windturbine an overall effect is calculated by averaging all the D-VQ values in the viewshed of a wind turbine. The result of these calculations are shown in Figure 2.14.

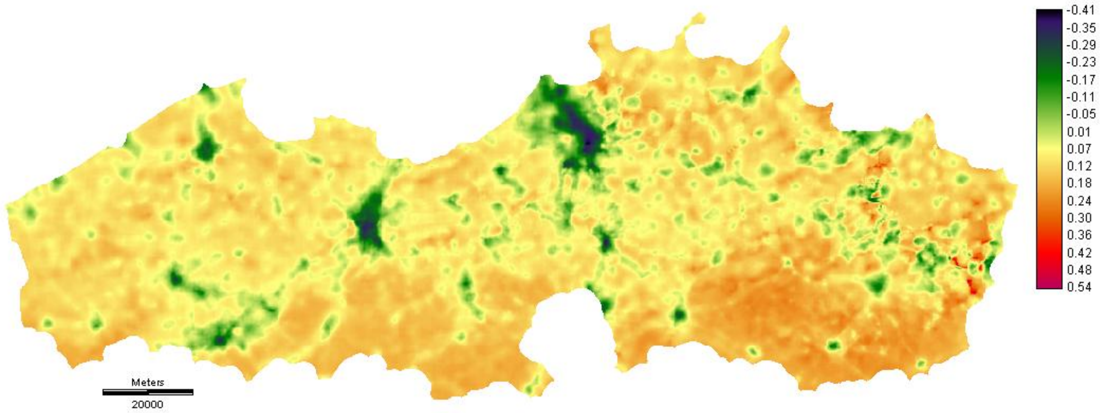

Figure 2-14: Potential impact of windturbines on the visual quality of landscapes in Flanders expressed in D-VQ-values.

Negative values indicate places with a potential increase of the visual landscape quality. While positive values indicate places with a potential decrease of the visual landscape quality.

2.5. Recommendations for policy makers and developers

The presented case-study shows that it is possible to quantify the impact of a wind turbine on the visual quality of the surrounding landscape by linking three different models: a landscape preference model based on a photo-questionnaire, a D-VQ model that links the change in landscape visual quality with the original visual quality of the landscape and a viewshed analysis to produced the necessary parameters for the landscape preference model. A prototype application for Flanders shows that is possible to extrapolate the developed procedures over larger areas by producing VQ and D-VQ maps at regional scale levels. This model approach could in principle be applied in site selection procedures when for example a set of possible locations is in consideration. Nevertheless, developers and site modellers should be aware that the proposed methodology involves a significant amount of uncertainty.

The explained variance of the landscape model is about 60%, the R^2 between D-VQ and VQ is only 30% and extra uncertainty is introduced in the model parameterisation by means of the viewshed analysis (see Table 2-6). Moreover, errors on both the digital elevation model and the land cover map that are used as an input for the extrapolation of the model equations will augment the uncertainty involved in such application.

We therefore recommend that the models in their present stage are only used for exploratory analysis. Future research should aim at a further decrease of the uncertainty involved in the quantitative modeling by expanding the photo-questionnaire using new landscape photographs and by refining the viewshed algorithms in order to make them more robust and accurate.

3. Analysis of social attitudes towards wind energy parks in Belgium

The methodology used for the second research line is qualitative. Devine-Wright (2005) has reviewed most previous research on the topic of attitudes towards wind turbines. In his conclusion, he states that many quantitative studies have been done from a deterministic view of human psychology. Although previous research could have been conducted on large scale data-sets, the questions posed are clearly determined by the methods used, and focus mainly on technical rather than social aspects. It is thus clear, states Devine-Wright, that there is need "*for greater recognition of the socially constructed nature of public perceptions*" (Devine-Wright, 2005).

It is in this field that the second research line was elaborated. More concretely, the research strategy adopted for this part, enabled some openness for new views and insights (explorative dimension), and yet combined this with the knowledge accumulated through former research (deductive dimension). In line with the search for new views and perspectives, case studies geographically scattered throughout Belgium were analysed.

The choice for case study research is evidently justified by the opportunities to carry out in-depth research. Through semi-structured in-depth interviews with local people, project developers and institutional actors, information was gained and it could be seen how different factors interacted and influenced the formation of social attitudes towards local wind projects. After a short introduction about the theoretical framework used to approach attitudes, the selection of the cases, the choice of the respondents and the methodology and interview questions will be discussed and finally, the results of the analysis will be considered.

3.1. Theoretical base: Discourse analysis

To gain insight in the multiple mechanisms and strategies of attitude formation in a way that is equally explorative and deductive, the use of discourse analysis is well suited. Discourse analysis in social science is used as a means to interpret and explain certain social phenomena behaviour.

The concept of "discourse" has been brought up by the French social scientist Michel Foucault, and was used "to describe the regulated order of talk, including the concept of chains of statements, institutionalized statement processes, and the historically and culturally determined rules that regulate the form and content of the order of talk" (Andersen & Kaspersen, 2000).

Discourse is the concept which tries to capture a totality of knowledge, which is created primarily by the production, and transmission of texts (talk, written text, views, perspectives, internet, television…) and which is seen to be an essential structure which creates power through the exclusion of certain other knowledge, views, perspectives, etc…

The discourse is thus a totality of meanings that create together a unity of knowledge. This knowledge creates power over the people who believe this knowledge, who live towards this knowledge, and who act towards others from the perspective of that knowledge. In the terminology of Foucault it could be said that those people become *disciplined* as *subjects* by that *discourse*.

Discourse analysis in social sciences covers many different approaches, theoretically and methodologically. In this research, Critical Discourse Analysis (further CDA) will be used. It specifically aims at uncovering discursive mechanisms of power and social inequality contained in discourses (Wodak, 1995).

Fairclough (1992) has devised a methodology of discourse analysis to investigate the quality and interplay of different discourses, by making a useful distinction between text, discursive praxis, and social praxis. *Text* appeals to the rules of grammar, vocabulary, cohesion and text structure, and shows how different ways of speaking create different meanings, and differentials in power and structuring[3]. *Discursive praxis* appeals to the context in which the text is produced and received.

A private discussion between two wind power developers is a total different setting than a speech by that same developer towards local residents at an opening event of newly installed wind turbines. The same text could have a totally different impact, but also a totally different intention in terms of the discourse that is spread. The discursive praxis makes clear that the meaning of texts is context-bound. *Social praxis* is the third dimension of discourse and refers to the ideology that is concealed inherently in every production and reception of discourse. Every text is structured on a certain level by a larger discourse. This discourse always implies certain believe about reality, about society. The social praxis remembers us that every production and reception of discourse is bound to ideology. Mostly, the very aim of a well-produced discourse is to reveal itself as natural – in other words, to hide itself from reflexive reception.

To grasp a discourse in its totality, the society in its entirety must be analysed. Therefore, the use of discourse in our research is a means to analyse as much information as possible, and to create a comprehensive view on the attitude formation process towards local wind projects.

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[3] "Text" in terminology of discourse analysis refers to written and spoken text, but also to images, perspectives, views, etcetera.

The usual quantitative research method focuses on a few core explaining factors and tries to measure them. The literature study at the beginning of this report made clear that this type of research can not take a series of crucial factors into account, like symbolical meanings, influences of family and friends, media, etcetera.

To fill up this void, a comprehensive analysis of the different collected discourses around wind energy and turbines at various social and geographical scales is performed, taking the text, discursive praxis and social praxis as heuristic tools. Such a multiscalar approach is necessary, because the acts of the many actors in, around, and outside a wind turbine project produce the discourses about that project (bottom-up). Moreover, these discourses enable in turn some actors to gain power upon others (top-down).

In this realm of dialectic interaction between discourses, we focus on the resulting attitude formation of residents towards local wind projects. Such an approach does not allow measuring exactly the amount of influence the different factors. Rather, it explains how these factors gain influence, and how certain of them interact to shape attitudes.

3.2. Methodology

3.2.1. Selection criteria of cases

The qualitative research considers a set of wind energy projects in Belgium. Some constraints and selection criteria had to be taken into account to choose suitable case-studies, First of all, the duration of our research project made it impossible to follow a project "live" from the beginning to the end. Nevertheless, the cases could not be too remote in history in order to get reliable accounts. The choice was thus restricted to recently started up, in the running, or build projects, so that they were relatively fresh in the memory of the people concerned and that the interviewees could easily retrace the evolution of their perceptions and attitudes during the development of the project.

Moreover, there had to be considerable variety in the cases, in terms of physical characteristics of both the wind turbine parks (number and size of turbines) and the landscape (perceived "quality" of the landscape), in terms of the process (did the development occur in phases or at once). Attention was also paid to how the participation process was organised, how the municipal government did react (active-passive, positive-negative), Another source of variation between the projects was the actors involved (did the municipal government participate, was there a resident committee agitating against, what type of developer was involved – cooperative vs. classical firm/developer or 'intermunicipal' agency. Finally, it was crucial to select cases in both Flanders and Wallonia, because of the different involvement of the Flemish and Walloon regional governments.

To start, key-informants were searched for to help us with the selection of cases.

Therefore, there was a need in people who had a helicopter view on the projects in Flanders and Wallonia and who could assess whether our criteria fitted the cases selected.

For the selection of cases, the focus has therefore primarily be made upon the knowledge gathered in the regional organisations of the Interdepartmental Windworking group and the Windplatform in Flanders, and Apere in Wallonia. At least two respondents in each region have been interviewed, not just about the goodness of the selection, but also – already – on what they know about the cases and what their role has been in relation to it.

3.2.2. Selected cases

Five cases were chosen: three in Flanders and two in Wallonia. To offset the lack of information at the regional scale, some key-persons who had a larger sphere of action were interviewed: members of regional authorities, environmental lobbies, and opponents who have a regional sphere of action. Both Walloon parks were already built when the interviews began. In Flanders, one was built, one was half way, and one was planned when the interviews started.

	Houyet	**Mettet-Fosses**
Chronology	Announced : 2003 Build : 3 turbines (2004, 2006, 2007) Planned : 5 (2010)	Announcement : end 2002 (61 WT in 4 municipalities : Mettet – Fosses – Profondeville – Anhée) 2004 : 11 WT allowed 2007 : 11 WT build 2008 : 4 WT planned and announced
Developer	Vents d'Houyet ASBL (non-profit organization) Cooperative	MESA (at the beginning) MESA + Air Energy (for building) Air Energy (now) Not cooperative
Height of turbines	70m + rotor (600 or 800 kW)	100m + rotor (2,5 MW)
Localisation	Agrarian area High quality landscape	Agrarian area Average (Fosses) to high quality landscape
Local Government	Strong support	Strong support in Mettet – Fosses Average support in Profondeville – Anhée then rejection
Local protest	Few protest	Strong protest except in Fosses

Table 3-1: Selected cases in the Walloon Region

	Kruibeke-Beveren	**Kortrijk**	**Lombardsijde - Middelkerke**
Chronology	Announced : 2005 Already build : 3 (2005) To be build: 2	2003: announced but whitdrawn. 2006 : announced 100 meters further 2008 : building started	1999 : announced Build : 2 (1999 and 2003) + recently 3th built in 2007
Developer	Fortech - Wase wind (cooperative)	2003: Aspiravi 2006: Intercommunale Leiedal (intermunicipal agency) + Electrawinds (partially cooperative project developer)	First Middelwind (cooperative) for first two turbines until 2004, then sold to Aspiravi (not cooperative). Recent third turbine by Electrawinds
Height of turbines	140 m incl. rotor (2 MW)	108 m excl. rotor (2 MW)	78.5m (660 kW), 86m (900 kW), and 80m (800 kW)
Localisation	Area planned for Wind Energy Near E17	Industrial area Near highway E17 Near residential area	Agrarian area Near seashore Near secondary and primary residence
Local Government	Kruibeke: very pro. Beveren: - Former government: negative advice first, but Provincial government pushed it through. - Current government in Beveren: pro	Neutral in 2003 Pro in 2006	Pro before. Now pro for the existing turbines, but not wanting more of them
Local protest	In Kruibeke: none In Beveren very strong protest from one quarter. => two build instead of the three planned.	2003: very strong (to close to homes – not build) 2006: no protest (turbine placed further but still close).	Some protest but only from some individuals

Table 3-2: Selected cases in Flanders

Mettet-Fosses was chosen because it was the only case where so many turbines were announced and where the protest was so strong and well organized. Houyet was the first cooperative park in the French-speaking community. Kruibeke-Beveren was interesting because it is a cooperative, but also there was a difference in the attitudes and overall approach between the two municipalities involved.

Middelkerke is near the seashore. There are thus some secondary residences near the turbines, and it could be possible that these residents develop their attitudes in a different way.
Finally Kortrijk, where a first park had been refused because of strong protest, was chosen. A second one has been finally accepted and the building is running now. The park will be situated in a small soft-industrial area near a motorway and near a residential area.

3.2.3. Selection criteria of respondents

Respondents were selected to meet a series of criteria.

First, respondents were needed as starting point to find local respondents: they needed to have a good view on particular cases to help us select further respondents. Secondly, there was a need for respondents who were able to tell us the history of the project, the discourses they produced or received, and the associated production and changes of attitudes. Both producers of discourse (actors in the process who try to spread their discourse on the issue, either through social networks or the local or supra-local media) and the receivers of discourse (in this case, potential local protesters were interesting, in particular nearby residents) were looked for. Snowball sampling was not chosen. Indeed, with such a sampling method, the risk was too high that all the respondents came from the same social network.

To complement the respondent base, some local residents who lived near the parks were also chosen randomly for interview. This happened as much as possible in such a way that the socio-geographical area around the wind turbines was well represented.

Thirdly, also people who had a regional sphere of action were searched for, to know more about the bigger story on wind energy, and how this relates to the local realities.

3.2.4. Selected respondents

For each selected case, the project leaders or the developer(s) have been interviewed, together with the responsible officials and politicians possibly involved at the local level, primarily on the process and the discourse they produced. Of course they were also considered as prime sources to find crucial respondents, as it is expected that they – together with the developer of the project – have the best knowledge about who has been involved in the process (possibly even lists of participants in information sessions or petition signatories).

Secondly, about 15 residents have been interviewed per case as 'discourse receivers and/or producers'. In the case of protest, both activists who joined the protest and 'regular' residents (randomly chosen) have been interviewed.
In the case of cooperatives, residents who became shareholders alongside 'regular' residents were interviewed, but also opponents were searched for.

In the case of projects across different municipalities, or at the municipal border, residents from both sides of the border have been interviewed to assess the influence of local discourse production by the municipal governments.

Thirdly, the media were covered in order to get an insight on how they interact with other actors, and how they reflect the different discourses from relevant actors in the project.

3.2.5. Main question-guidelines for the analysis of in-depth interviews

In a first round, the analysis of the discourses and their influences on shaping and developing attitudes was organised around the following question:

- Who are discourse producers?
- At what scale level do they produce it?
- In which stage of the process do they produce it?
- What are their arguments and motivations?

In a second round, the questions were:

- How were these discourses perceived?
- What were people's fears?

Finally, the development of attitudes and the reasons behind it were analysed in the respondents' interviews.

In order to avoid a long analytical reporting, the results of this questioning of the interview material are summarised under three headings: discourse production and its influence on attitudes; attitude formation and a comparative analysis of social attitudes in the case-studies.

3.3. Analysis and results

3.3.1. The production of discourse and how this shapes attitudes

To analyse the production of different discourses and how it shapes people's attitudes towards local wind projects, a distinction will be made between different scale levels. Indeed, a discourse that is created or received on an international level is something quite different from a discourse that is created and received on the local level. Therefore, the international level, the national level, the regional level, and the local level will be discussed.

To start on the broadest scale level, **the international scale**, although different discourses are apparent, mainly one discourse is becoming dominant that communicates the need for an ecological revolution. The most dominant discourse that is spread through most international media, and that is communicated by most international actors is a combination of visions and perspectives which all point to the need for a change towards a sustainable ecological equilibrium (the ozone layer hole, the global warming process, pollution, …).

Although scientists and human environmental movements are already working on this discourse for years, most international actors with political power turn rather slowly towards this direction. The old optimistic modernist discourse, which is based on the ideas from the enlightenment, and which states that humans can conquer nature, that history is a straight positive curve, and that technology is our saviour when things go bad, is still prevalent in many traditional institutions and it needs a big change of mind to let the new discourse really come through (Seidman, 2004). Even more important, the new discourse gives humans much more responsibility towards their own actions on this planet.

When this responsibility is taken seriously, it becomes clear that the new discourse will require many efforts from people, and will needs to take on a quite different lifestyle. A temporary explanation for the social gap, which states that people are in general in favour of renewable energy, while at the local level they often try to avoid its implementation, is offered by taking the international scale and individuals into account: the new discourse is already known to be important for our future, but to really act on behalf of it is sometimes still one step too far. Because the new discourse on sustainability is pretty recent in our history, a big part of the people living in Belgium today grew up with the old modernist discourse.

Most people who are now forty years or older grew up in a time where economic growth (especially in the late 1950s and 1960s), industrialization (through the knowledge of their parents and grand parents), and prosperity were apparent. This discourse which has at its core the vision of a human being who masters the world through technology and optimism, is socialized into a great part of the people still living today in Belgium. Therefore, the coming of a new discourse, which alters this vision at 180 degrees, cannot be implemented in one day, one week, or one year. On the other hand, the new discourse did not arrive yesterday. Although its worldwide recognition is very recent, the discourse is fighting for its existence since the early 1970s.

The progression from one dominant discourse to the next is a gradual evolution, so the story stated here must not be viewed as a black and white opposition. The two discourses must also be viewed as generalized observations, in that they are not clearly two fixed entities. In general, they can be observed as such, but in reality there are a lot of intermediate stories, views and perspectives.

Nevertheless, the struggle for power between the two primary "knowledges" in our world is a fact that cannot be ignored. Besides these nuances, the international discourse analysis makes overall clear that the implementation of renewables on the local level in Belgium has to deal with the effects of a slow shift into a new environmental discourse.

In 1994, the *United Nations Framework Convention on Climate Change* was set up as an international framework for intergovernmental efforts to tackle the challenge posed by climate change. "*It was recognized that the climate system is a shared resource whose stability can be affected by industrial and other emissions of carbon dioxide and other greenhouse gases. The Convention enjoys near universal membership, with 192 countries having ratified*.[4]" After this, the Protocol of Kyoto was ratified in 1997, to become operational in 2005.

This Protocol is designed to implement the reduction of emissions with flexible adaptations in internal national policies. With the recent events like the global promotion of Al Gore's documentary "An Inconvenient Truth", the worldwide increasing political recognition for the need of more sustainable technologies, etcetera in mind, it could be thought that the negative effects from the former modernist discourse are fading away in time.

As a discourse is only effective through the spread of a totality of knowledge and vision, the new discourse on sustainability will only gain its power and effects through the persistent actions of many. It is also necessary to keep in mind that the United States and Australia – two big industrial countries – did not recognize the Kyoto protocol for a long period. Until now, Europe is clearing the path for an ecological sustainable world. Obviously, the shift to a new global discourse is not finished, and older – read *less sustainable* – discourses still wield their power.

The next scale level discussed is **the national Belgian scale**. On this scale level, the same story was largely encountered as on the international (mainly European) scale. The Belgian government is totally following European policy rules on the ecological discourse. The decision to follow Kyoto-norms and to reduce emissions with 7 percent by 2012 compared to 1990 is derived from international (European) decisions.

In addition, the Belgian media (radio, television) are spreading mainly the same discourse as other international media. In Belgian national media, some information on protest actions against local wind projects can be found, but the line that is held is mostly positive towards wind energy. Indeed the biggest problems that evolve around wind energy are situated at the local implementation level.

[4] Source: www.UNFCCC.int (2008)

This means also that on a national and international level there is very little information spread on the possible (local implementation) problems of wind projects – information that is truly necessary if the authorities want to implement as many wind projects as possible in a sustainable manner. This lack of information must be nuanced by the fact that the national government is funding research (particularly the LACSAWEP-project) which aims at a better understanding and at policy recommendations for the problems on the local implementation of wind energy. Through this knowledge, a more nuanced spread of information on the national scale could be possible in the future.

The third scale level that is analyzed is the regional one. On **the regional level,** the discourses of two different regions are discussed: the Flemish and the Walloon Regions. It must be said that on the policy side, the regional and national level are much interconnected. The division of competences between the federal and the regional level means that the federal government is working on taxation and product policy, while the regions are in charge of efficient energy use, renewable energy, and environmental legislation and climate aspects in the fields of mobility, housing policy, industry and agriculture.

At the regional level, both Flemish and Walloon authorities hold a line that is the same as on the national and international scale. The advised policy terms are directly derived from the national level and follow the prevailing discourse on climate change.

Through their Climate Policy plans, both regions promote the need for a change in our habits of producing and consuming energy. However, some flexibility is left to the municipalities (the local level). It creates some freedom to decide which development fits their environment. For example, both Regions have set up a mechanism of green certificates to promote the development of renewable energy. Those certificates are not real subsidies but a mechanism of balance between renewable and classic sources of energy based on the *polluter pays principle*. In terms of the content of those policies, all policies are stated with arguments from the international (scientific) discourse on global warming. In further chapters, it will be said that these arguments are not always most suitable to convince the local level. Until now, there is very little or no information spread on the regional level about possible problems on the local implementation or the use of renewable – especially wind - energy.

It is known at the regional policy level that there are problems with the implementation of wind projects and further sections will elaborate on the fact that regional level authorities can help to overcome this (to give one example) by the use of different arguments which apply more to the local level.

The discourses of the regional media differ according to the target public. In the national pages of newspapers and in news broadcastings, they refer to the global aspect of renewable energy while the local pages and news relate more the different oppositions against local wind energy projects. For the opposition groups, making their discourse appearing in the national media is an aim, because it gives some recognition or legitimacy to their actions. The media play also a role of transmitting public and experts' opinions through their readers' letters. Sometimes, the public make no difference between this part of their newspaper and the pages from journalists.

Besides the regional media and governmental actors, Belgium has a third important producer of discourses at the regional level: ODE–VWEA[5] in Flanders and APERE (Wind Energy facilitator) and Edora[6] in Wallonia en Brussels. Those organisations unite the different actors from the wind, and renewables, energy sector. They are therefore of course spreading a pro wind energy discourse. They act to promote renewables and to raise public awareness in this matter.

On the other hand, some associations hold another line, moderately or even radically opposed. Among the moderates, "*Inter-environnement Wallonie*" can be cited. It is a federation of Walloon environmental associations. Those associations have sometimes totally opposed views on wind energy development. They mainly play a role of lobby in the field of environment. Their discourse aims for a better thought-out use of wind energy. They ask for example to take into account the results of research as ours. They speak up for more respect of landscape and biodiversity when installing a park.

There is also an association called "Vent de raison" (Wind of reason) who holds a radical discourse against wind energy in Wallonia. It started from a local opposition group that federated different local opposing groups. The network reacts also at the regional scale, even if it still mainly acts at the local level. Their main discourse goes about the poor contribution of wind energy in the reduction of carbon dioxide emissions. They also claim that wind energy development in Wallonia is anarchic. They act as a real lobby against wind energy at the regional scale. Moreover, they present themselves as a regional platform against the anarchic development of industrial wind energy. They claim that the only suitable wind energy development is the offshore one.

On the regional level, Flanders has no such wind opposition groups until today. There is one man though, who is actively protesting all wind projects in Flanders for political reasons – he states that European policy is wrongly interpreted in Belgium, which makes us implementing more wind energy than necessary.

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[5] Organisatie voor Duurzame Energie – Vlaamse Wind Energie Associatie

[6] Fédération de l'Energie d'Origine Renouvelable et Alternative

One of the most interesting and diverse scale levels in this research is **the local level**. Because the wind projects onshore are implemented at this scale, most actors who actively receive and produce different discourses operate at this level. This is not to say that different discourses and actors are not encountered on higher levels. However, from the residents' point of view (who are the subject of this research); the diversity in discourses at the local level is much more apparent because of their closeness to daily life. The following producers of discourse will be discussed in this order: local authorities, project developers, protest groups, local media, and local culture.

The production of discourse about wind energy by *the local authorities* is very divergent and dependent on many factors like the political affiliation, the local type of landscape, local traditions, and etcetera. Because the factual decisive power for wind projects lies with the regional authorities, municipalities only give advice, positive or negative, about a planned project[7]. However, in Wallonia, municipal authorities give permits for the other works linked to the wind turbines park (new roads, electric the cable). If those works are not allowed, the building of the park is impossible. De facto, it is a real veto right. This right was not used in our case-studies. But in the press, some example can be found (not the majority) where the municipality holds a line against the project.

Nevertheless, through the spread of a certain discourse, municipalities have the power to influence local attitudes, which in turn have an effect on the actual project outcome. This is very blatant in the case of Kruibeke-Beveren, where the local authorities of Kruibeke are very much pro wind energy, while the authorities in Beveren are rather neutral. The authorities in Kruibeke have set up a communication campaign, which was aimed at the support of wind energy. They used tradition in the sense that in the past, a windmill stood at the place where the new wind turbines would come, and they actively communicated this, in order to gain legitimacy for the project. In addition, the information spread by the local authorities told a positive story about "*a green municipality which welcomes the new turbines to start a better future*."

Because the leading political party was supporting the wind turbines, and perhaps because the project developer is connected to the biggest opposition party, there was no protest against the turbines on the political level. In Kruibeke, only one man was signalled arguing against the project for reasons of visual intrusion. Nevertheless, according to the mayor, he saw quite early that the majority was supporting the project, so he did not protest actively.

[7] This is not the case when the wind turbines produce less than 500 kW, but in most cases the production is more than 500 kW.

This makes clear that the residents did not get any negative information from the local authorities, which could alter their attitude. In Beveren, the case was different because some people within the municipal department of environmental issues were actively against the project, and supported a protest group in their actions. The collective response to the project from the mayor and the council members was rather neutral to positive, which made them not spreading information as positive and active as it was the case in Kruibeke. Because of this, the strongest information stream could come from elsewhere, namely from the people of the department of environmental issues, which were opposed to the project and had the most influence on the residents' attitudes. The interviews reveal much more negative attitudes in Beveren compared to Kruibeke.

In the case of Mettet-Fosses, the discourse of the authorities played a huge role. In Mettet, the former mayor was very pro and more or less involved in the project. He presented the project as *already accepted* and was not really open to negotiation. His discourse probably had an impact on the radicalization of the opposition. Concerning the same project, it can be noticed that other mayors have not followed the same line. For example, in Anhée, where the local part of the project was rejected, the discourse was more transparent and neutral*: "I do not hide that the financial fallouts interest our municipality. Nevertheless I will listen to everybody and only after this, I will take my decision."*

The discussion on the discourse production of *project developers* is another story. As they are the active trigger for local wind projects, they spread a mainly positive discourse about wind energy. Although some developers give insights in some possible problems residents can have with the turbines, most of them speak only in terms of the positive aspects about it (giving green energy to a certain number of households, helping fighting global warming, lessening pollution, making use of a free natural renewable source, creating jobs…).

To make their discourse work at the local level, they sometimes try to cooperate with local residents through the use of shares. These shares tell the people at the level of discourse that they will (or can) also gain direct economic profit out of the wind turbines through buying these shares. As project developers are the owners of the wind turbines, their discourse is always on the supporting side, and following the bigger discourse on sustainability.

Local protest groups are in most cases one of very influencing actors on the attitudes of local residents. Their great influence is mainly derived from their active discourse production system. Local protest groups are in most cases set up by a little group – sometimes only one person – who has a strong negative attitude towards the planned wind project.

One of their first strategies consists in monopolizing the floor during info meetings. This strategy has been used in at least one of our cases. Those people collect and spread, in order to stop or alter the project outcome – as much negative information as possible. As seen in the case studies, the arguments used to create a negative discourse about a local wind project are very divergent, and picked up out of different sources (internet, other protest groups, local landscape concerns, traditional culture…).

In a next step, the protest group actively informs other local residents with the negative discourse in order to broaden their base. By the use of flyers, house-to-house visits, and local media they actually bomb the local area with their contra-discourse. Where the positive discourse from authorities at all scale levels is mostly vague and only appealing to the global discourse on ecological sustainability, the contra discourse from local protest groups is in most cases very much to-the-point, with many connections to the local culture, local identities and other insiders-perspectives and concerns.

For example in the case of Kortrijk, one man, who lived nearest – too close in legal terms as it would later become clear – to the planned wind turbines, set up a whole communication campaign in the neighbourhood, through the use of flyers, interviews in local media and house-to-house visits. By shouting loud, his voice was heard through the whole area and lots of local residents joined him. Also in Beveren, only two opponents started the action, which created in no time a local protest group, sufficient in number to gain power in the decision process. In Mettet, the opposition has started from a small group of villagers who where quickly met up by a group of opponents from the Condruzian nobility.

Both groups merged. They took each developer's arguments or behaviour and tried to go the opposite way. The way the discourse of protest groups is created and spread is very effective because of their relation to the local level. Their arguments are very appealing towards local people, and make clear that attitude formation is mostly influenced by concrete daily life arguments and concerns, rather than references towards international discourses.

The international discourses are heard indeed, but local and personal concerns prevail when attitudes are made effective through social acts. At the scale level, it is very interesting to see how the local scale in this respect has some power over the larger scales.

While political matters mostly gain in power as they got up in higher scale levels, the implementation of decentralized energy sources – particular wind energy – seems to hold a different logic, where local protest groups can have a bigger influence and power than larger scale-level organizations or actors.

A fourth group of actors, which are spreading discourse on the local level, are *the local media*. Of course, they do not produce discourse in real terms, but they choose to translate and spread different existing discourses. In most local cases, the media is used by authorities, project developers, or protest groups to spread their own discourse. At this level, media are giving voice to diversity of discourses, much more than on the regional, national or international level.

A last group of discourse producers is a less visible one: *the local cultures*. By local culture a local way of life is meant (a collection of traditions, perspectives, uses and so on) which can have an influence on the thinking process towards local wind projects. These prominent discourses do not deal directly with wind energy issues, but they can have an influence on their perception through the connection of perspectives. For example in Kortrijk, local entrepreneurs discovered a lack of trust in local authorities. This culture of distrust was easily converted to the wind project, even if the local authorities had actually not so much to do with the wind project. The permission for the project was given on the regional level, but the primary idea for the project comes out of private entrepreneurs themselves. The local cultures must be seen as the existing local communities, friend networks, or associations.

3.3.2. Influencing arguments on attitude formation

3.3.2.1 Physical disadvantages: what are they and how do people talk about them?

One of the clearest and most visible groups of arguments that have an influence on attitude formation towards wind energy parks are the physical disadvantages. Although they are very clear in their appearance, their relative influence on attitude formation is still debated in literature. Our in-depth research aimed to contribute positively to this discussion through a profound understanding of these physical annoyance factors.

The factors that were discovered in our interviews are – in descending order of prevalence through the interviews – visual landscape disturbance, noise, flickering shadow, possibility of breaking wings, disturbance of bird routes, disturbance of radio and television signals, loss of agricultural harvest, and a lack of uniformity between wind turbines that stand next to each other. However, depending on local conditions, noise can become the top of the list while landscape impact could be meaningless.

The visual landscape disturbance factor is highlighted as a very determining factor on negative attitudes and protest towards wind turbine projects in the literature (Wolsink, 2007). More concretely, Wolsink shows that particularly the 'type of landscape' is very determining. Indeed a scan of the interviews shows interesting material when compared per case (or per type of landscape).

However, before developing more, it has to be pointed out that when the notion of landscape was brought up with our interviewees, they were not always well informed on the meaning of this word.

In the case of Kortrijk, the landscape is industrial and close to residential zones. People mostly are more against the coming of the new industrial park, compared to the wind turbines that are planned in the park. Of all respondents, more than half of them don't bother the visual aspect, some even like the view of it. Others suggest "people will become used to it, as they did with windmills several decades ago". The visibility of the wind turbines is overall not a very disturbing factor in Kortrijk. When looking at the existing landscape, this is not surprising.

The landscape is already densely built, with a combination of (soft) industry and a nearby residential area which is located at the city border. In combination with a nearby highway (E17), this landscape is mostly not chosen for its particular beauty when people choose to live in it. However, the park was not built when the interviews were done. This may have had an influence on it. In contrast to this, the case of Mettet looks like a textbook case. We are in the Condroz, a region that is considered as one of the most beautiful of Belgium (Christians and Daels, 1988)[8]. The argument of landscape depreciation was thus largely used by opponents. Nevertheless, it was noticed that this argument was more present in the nobility or with more educated people than in other groups. This landscape argument played the greatest role in the refusal of the biggest part of the project.

The case of Kruibeke-Beveren has also more people agitating against the visual hindrance. Although the landscape is also spoiled by the nearness of the E17 highway, we are in the Waasland region, which is still more an agricultural, farming landscape with open views on nature. This difference in prevalence of the visual factor is clear in terms of landscape type. A possible misunderstanding of this information is the statement that "less attractive landscapes will provide a better implementation and less agitation with residents". As noticed in Kruibeke, Beveren and Kortrijk, people are using the argument also the other way around: "We already have so many negative aspects in our landscape (passing highway, industry…) that we don't want another one (e.g. wind turbines) extra. We don't want to be the garbage trunk of the region!" This argument, which was heard several times during the interviews, makes clear that each case has to be checked on its own *local* characteristics.

Although the type of landscape is an influencing factor on a larger scale, the specific local characteristics and the local history are very important to the way a change in landscape attractivity is perceived and accepted by residents.

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[8] Belgium: a geographical introduction to its regional diversity and its human richness in *Bulletin de la Société Géographique de Liège*, 1988, N24, 24e année, 180 p.

To make our argument very clear, the relation of "type of landscape" to attitudes and protest towards wind energy parks is in quantitative large scale terms a very correct one. On the other hand, this knowledge may not lead to blindness towards local characteristics. A deeper investigation for each local project is indeed very favourable.

Another factor that popped up frequently during the interviews is the problem of **noise**. From neighbours living near the parks and not familiar with the meaning of landscape, that argument was even prevalent.

According to the interviews, the whole problem of noise seems to be more an argument for mobilizing people against wind turbines, than a real issue. In the worst case, one can hear the blades but this is not loud actually. Of course, with older models, noise seemed to be a bigger problem, but with the new technologies up to date wind turbines should deliver no problems in terms of noise. Nevertheless, some neighbours pointed out that the noise did not have to be loud to be heard and disturbing.

This was noticeable when people had chosen their habitation for the quietude of the place. During our interviews, one or two people per case reported to hear the wind turbines, and to have troubles with it. Half of the others said one really has to listen to hear them, and it's not disturbing at all. The other half did not hear them at all. It is important to notice that noise is therefore almost never a direct trigger to protest. It is more a useful argument for those people who already wanted to protest. The cases where noise is a direct trigger are those cases where noise is factually disturbing – mostly because the wind turbines are too close to residential houses.

Another important disturbing factor that came up frequently during the interviews is **flickering shadow**[9]. Although the debate on this goes very broad in terms of what is acceptable, the very solution to this problem is as easy as with the noise. It is all about distance. The higher a wind turbine is, the further its flickering shadow goes.

Therefore, if turbines are getting bigger, the normative distance to residents should be enlarged with it – some people actually present this proposal themselves during the interviews. If it is the case that a wind turbine is really causing flickering shadow into houses, it needs to be undone. If distance is a problem, another solution is a system that turns of the wind turbines during times of possible flickering shadow. Instead of giving residents several hours of flickering shadow during the year, the company just turns them off during those periods and takes the "negative effects" for themselves. In terms of the possibility of protest, the interviews point out very clearly that flickering shadow can be a strong factor.

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[9] Flickering shadow can be viewed on some videos through www.youtube.com (type "flickering shadow" and search) and is a for sure a real disturbance.

When the project developer makes sure there is no flickering shadow (or at least the maximum of 30 hours/year is not overdone[10]) they disable a possible factor for local protest. In Wallonia, this flickering shadow must be taken into account by the developers. It may not be present more than 30 hours a year and 30 minutes a day.
Another related problem due to shadow is the lost in productivity for farmers. This is not a problem in Wallonia, but it can become a true one in Flanders[11]. It is especially true for greenhouses farmers. In this case, a reward for farmers who lose a certain percentage of their harvest can be a help to diminish the shadow problem.

A fourth physical problem that was heard of during the interviews is **the possibility of braking rotor blades**. Although there have been accidents in the past with rotor blades that loosened and fell down in residential areas, these kinds of situations are very rare, and not in proportion with the influences they have on peoples attitudes. Most people in our interviews did not speak of it, probably because they did not hear of it. People who spoke about it, were mostly opponents, who found this information on the internet.

Those people were afraid of the possibility of braking blades. The fear that is apparent here is comparable to the fear some people have of flying in an airplane. Subjectively it can appear as really dangerous, but statistically it is much safer than driving a car. Of course, if the fear is there, opposing the installation of a wind turbine through protest is a direct strategy for people. For local residents, the choice is not between driving a car or flying an airplane, it is between the risk of braking rotor blades, and no risk at all. As the possibility of braking rotor blades is small but real, wind developers should try to minimize it as much as possible. Authorities should develop a policy, which demands a proper technical test phase for every new model on the market.

A fifth physical problem, which is discussed by quite some people, is **the negative effect on bird migration areas and routes**. It is not so much the effect wind turbines can have on bird migration areas and routes that is contested, but the policy that regulates it. Most of the people accept that wind turbines can have a negative impact in areas where birds migrate. Even more, when those routes are above their houses, they use this as an extra argument against the placement of wind turbines. But the problem noticed the most during our interviews had more to do with the fact that wind turbines for example in Kortrijk should keep a distance of several kilometres meters towards a bird migration place, while the suggested distance to residential housing is only 250 meters.

[10] Source: Omzendbrief EME/2006/01 – RO/2006/02: Afwegingskader en randvoorwaarden voor de inplanting van windturbines. P14)

[11] The farm structures in the two regions are very different. While Wallonia has mainly an extensive agriculture, Flanders has more an intensive one.

The reason why the wind turbines are so close to residential houses is for a part determined by the fixed minimum distance to bird migration places. Although in reality such distances can be well thought out (birds are actually flying around and through the wind turbines, while people just live under it), they seem very much unfair to many local residents. It is as if birds are "more important than people".

To end this section, two more physical problems came up just once during the interviews: **The disturbance of radio and television signals**, and **the lack of aesthetical uniformity between wind turbines that stand next to each other**. The first problem here is a purely technical problem, and should be left open to correction. With a little effort, things like this must be easily solved. The second problem is in our view a little more relevant. The problem here is that in some wind energy parks, several project developers are involved over time and that they build totally different turbines next to each other (for example the Lombardsijde case). When many wind turbines are close to each other with different looks (model, colour, height…) it can be viewed as an incoherent landscape. One man mentioned this as his "only" problem with the wind turbines next to his house. He was pro wind energy and even pro local wind turbines.

The lack of uniformity made him nevertheless complain about them. When we know that the visual factors may be important in the formation of attitudes, the uniformity is certainly a part of this. The importance of visual factors may not be underestimated. To avoid this type of problems, local wind projects should be thoroughly planned in long term perspectives with a clear view on the future planning.

To conclude on physical factors of annoyance, it can be stated that these are the most detectable and concrete factors that are affecting attitudes towards wind turbines. Although there are some disputes, the physical nature of those problems makes sure that they can be surmounted in the (near?) future. In the latest policy statements on wind energy in Flanders (Omzendbrief 2006), the physical factors are very well evaluated and that government is trying to eliminate them as much as possible through different norms and rules. It is for a regional government hard to create fixed rules – like fixed minimal distances, maximal noise outlets… – for the implementation of wind turbines. As every case is very complex with its own local characteristics, such general rules are mostly irrelevant and inefficient when created for a large geographical region.

Therefore, Flemish policy on wind energy implementation is rather suggestive, with a great accent on the local responsibility. Although the physical factors of annoyance seem to be very easy to solve, it is in their local context that they create different meanings and substance – hence their status as a "problem". Because of the complexity and variety of characteristics that make up a geographical site, the project developer is locally responsible to "work around" the physical factors of annoyance.

Further, in this report, we will discuss on how the physical annoyance factors are being (mis-)used and how they can be overcome on the local level.

3.3.2.2 Economic arguments

Besides the real physical factors, three economic arguments that are playing in the formation of attitudes were also discovered. A first argument is **the devaluation of property**. As far as people perceive the coming of a local wind turbine as possibly negative, they almost immediately fear a devaluation of their own property. Many respondents start talking about it right away, without us making them alert on it. Only a few persons do not think it will have a negative influence on their property value.

With the wind turbines next to their homes, most people assume that immigrating residents will try to avoid such locations, just because they still have the choice of living there or not. The real extent of property devaluation is not clear in Belgium, but different sources (court judges, real estate agents, scientific researchers) speak of 15 to 50 percent devaluation in a radius of 500 meters around a wind turbine. In our view, attitudes about wind turbines are not fixed over time.

Therefore, it seems to us that this 15 to 50 percent devaluation is not an enduring fact, more a number to overcome. When people start seeing and experiencing wind turbines on the local level as something positive, the *real* devaluation can become none to negative (more value). The problem of devaluation is for those reasons very dependent on the other local factors, like the amount of annoyance, the degree of decisive rights, etcetera. When a local project can become part of a community, with benefits for all parties, devaluation should become non-existent as far as local wind turbines are concerned.

A second economic argument that determines the attitudes of people towards local wind turbine projects is **the amount of economic gain one can have on behalf of the project**. It is very clear (and obvious) during the interviews that people were never opposing a local wind project when economic benefits could be derived from it.

The **first** and most direct form of economic benefit is when people get money for making their land available to build a wind turbine on it. It is clear that this benefit only falls in the hands of a few property owners. The reality can seem very harsh when your neighbour gets lots of money to let a project developer build a wind turbine on his lands, while this turbine is standing equally close to your house. In fact it is the whole neighbourhood who has "to deal with" a new wind turbine in its landscape, while one person is generously paid for it.

This argument was prevalent in the discourse of a landowner who didn't have any turbines on his land[12]. For the same reason, we did not find a landowner with turbine on its property who accepted to meet us. In one of the two Walloon cases, the owner even denied that he was in this case and told us a phoney excuse. The developer of the cooperative park in Houyet was conscious that there was a real problem to solve with this.

This sort of situations flows out of market principles and the principle of "private property" – which are beyond our scope here. Nevertheless, they give insights on some reasons that can motivate opposition.

The **second** form of economic benefit that can be derived from a local wind project is through a cooperative system. This form of benefit is interconnected with the decision making system and will be discussed as such below.

A third economic argument that is working in the attitude formation process is the question of **the economic efficiency of wind turbines**. Although this argument is significant in the attitude formation of some of the residents, the question of the economic efficiency of wind turbines is going deep. As it is (part of) a possible solution to ecological disasters, the price paid cannot be just set against the energy it produces. On the other hand, it is known that wind energy needs huge numbers of turbines to produce a significant amount of the energy needed. For some people, the gain does not compensate the price, and therefore they do not agree with the way things are going in the wind energy sector.

Otherwise, in combination with other sources of renewable energy, the wind turbines can help to create a healthier climate and lessen the dependency of foreign energy suppliers. The significance of this debate will be made clear in subsequent sections of this report. Nevertheless, it cannot really be our aim to decide this debate. Our aim is to show how it is related to the formation of attitudes towards local wind projects.

3.3.2.3 Symbolic arguments

The symbolic aspect of wind energy played a role in both research lines. Wind turbines are seen as energy for future generations. In our world energetic and climatic context, wind turbines are thus seen at least as a necessity. One respondent said, "It is a way to pay our ecological sin".

[12] When a turbine is built somewhere (and thus it yields a rent for the landowner), it prevents the neighbouring landowner to build a turbine on his own land. As the rent for placing a turbine is not negligible (around 5000€ a year), it can become a prevailing argument against the turbine.

The notion of *reterritorialisation* is introduced here. Pasqualetti (2000, 2001) stressed the shift from a centralized energy production (classic power plant) to a decentralized one (renewable).
Indeed, wind energy is locally produced and often locally used. It cannot be relocated. In the mind of people, it can thus be seen as something working in their environment but for their own needs. "Our small turbine will produce our own energy," said a neighbour in Houyet. This can also partially explain why the size of the park plays a role on acceptance. If the park produces more energy than the needs of its neighbours, they will see it like other power plant. The arrival of turbines causes a feeling of "landscape expropriation".
In the cases of cooperative development, this aspect is rubbed out. Neighbours can (re)appropriate it literally and figuratively: a part of their landscape that works for them.

3.3.2.4 Type of decision making process

The problems with the type of decision making process are very clear and apparent in our interviews. From the literature review, it became very clear that there is a great need for more collaboration in the planning system of local wind projects. Residents and other stakeholders need to be involved, by which means there can be created institutional trust, a feeling of equity and fairness, and a lower degree of dissatisfaction towards the project. In terms of collaboration, the case studies reveal that many companies are already making work of this. Nevertheless, it will become clear that the way in which collaboration is implemented is very crucial. Three different systems, which are found in the case studies, are discussed. The three systems are not static or definitive.

Therefore, they will be shown as "models" which help us to get grip on the advantages and disadvantages of different approaches towards participation.

The **first** – most common – system gives residents the possibility of becoming a stakeholder in the wind turbines. In the interviews, we could not found one example of shareholders who opposed the wind turbines, and in this perspective, it is a good mechanism to overcome protest. Nevertheless, the system creates in some cases an in-group/out-group effect, with the risk of a group of non-participators dissatisfied who could become opponents just because of their out-group status. In Kortrijk for example, some people laugh away the possibility of becoming a shareholder with the argument that this only applies to the richer people, and that they do not have the money to do this. Although one share costs 125 euro, which is not extremely expensive, the act of "investing" itself suffers from social and cultural barriers – especially for the poorest.

For a wind project to become a community-based system, the act of investing in shares must be made very accessible, especially for those groups who have no experience with it.

In Houyet for example, the local wind company created a system of saving money in a collector box, which makes people shareowner in a manageable time by spending 5 euro per week. A poor person who has become shareholder by this way was found and interviewed. The system of shareholding is a good start to create a social acceptance for wind projects, but it is not the most horizontal system. People still have to invest something of their own in the project, with the risk of losing it – this risk being higher for lower incomes.

A **second** – more direct and equal distributive – system that was not found in the cases is where people who live close to the turbines get a reduction for the energy they buy. This system is sometimes difficult to install because the project developer or the owner of the wind turbines usually does not sell the energy directly to households, but to an external energy supplier. Nonetheless, this can be taken into account when the contract between both producer and deliverer is drawn up.

Secondly, the reduction may not be linked to one energy supplier, because this makes a system of conditional sale, which is illegal in Belgium. Nevertheless, based on the many complaints heard during the interviews, a system with energy reduction costs could be a very effective mechanism to overcome protest on the local level. Very little people who get a discount on their monthly energy bill will oppose the cause of it. It could directly change attitudes towards local wind projects in a positive way, and erase the inner contradiction of being opposed to the local, but positive on the general implementation of sustainable energy.

Also the problem of property devaluation can be reduced with it. It must be admitted that this perspective can be viewed as simplistic because people are assumed to be very dependent on economic rationality for their behaviour and attitude formation.

Nevertheless, the capitalist society and the socialized patterns of thinking and behaving are for a big part structured by a market-driven, economic base. People are aware of this logic and – conscious or not – they behave for at least a part in line with it. Without making the mistake of reducing the attitude formation process to a pure economic debacle, the fact must be stressed that a wind project – which is by its private character based on profit-making – creates opponents when it produces direct economic profit for the developer and only long-term ecological profit in combination with certain direct annoyances for the surrounding residents. Again, it's the unfairness of the process, which is at stake here, not the direct annoyances of wind turbines which can be overcame through efforts.

A **third** system tries to avoid the negative annoyances for the residents, while it does not specifically aim at monetary profits for the surrounding residents. It is the system of a collaborative decision making process, which aims especially at collaboration and consultation between all local stakeholders, including the local residents.

This system tries to work bottom-up instead of top-down in its planning processes because it is there that concerns and complains can be worked around to create a community supported wind project. The interviews show us very clearly that the minimal collaboration through an information gathering for residents is not enough. The information gathering in most of the cases is organized after the real planning has been made, and is therefore too late for residents to collaborate. In most of the cases, the only option residents have is to accept totally or to protest, while collaboration from the beginning of the process could create intermediary results that make both parties satisfied.

The case of Kortrijk makes this especially clear. In 2001, a project was planned near the E17 at a quarter called "De Lange Munte". The information gathering made clear that a few people really had problems with the turbines, because of the close distance, and other annoyances. Those people mobilized a bigger protest group, and got the project rejected.
In 2006, a new project was announced about 100 meters further. The same decision making process was used, but nobody protested. The interviews with the surrounding residents made clear that they were not against wind turbines in their neighbourhood from the beginning of the first project. All they wanted was a reasonable distance, so they would not have direct daily annoyance of it.

The attention has to be drawn to the change of context towards sustainable development. In the time gap of 5 years, the awareness of the need of renewable energy had considerably increased. It seems therefore that a bottom up process could have made this clearer in the first project, with the result of today, a few years earlier. Another important aspect in this case is the fact that the project developer now is a different one than in the earlier 2001 case.

The project developers who lead the project now were interviewed, and they had used a clear worked out communication plan. They had experienced in the past that trough communication towards residents is crucial and essential. The project developer who led the first project in 2001 is the same from the Middelkerke case, and was not willing to be interviewed. Nevertheless, a great convergence can be seen with the case in Middelkerke where residents were informed on a minimal base about the process. Also in Middelkerke, protest was apparent – and it still is (although it is not played out anymore, but some people want to sell their house and to move).

These two cases make clear that the project developer has a lot of influence on the outcome of his own project.

3.3.3. Development of social attitudes towards local wind projects: discussion from the case studies

In the previous sections, the discourses were described as produced at various scales. At the national level, the discourse is mainly focused on global impact (climate warming, common good), while on the local level it works more on direct impacts.
The discourse was also presented as combining different items: materiel, economic, symbolic, and decision-making processes. This part aims to see the weight of those items on attitudes in the different case studies and how they are varying through time. In this part, a summary of the five case studies that are analyzed is given. The arguments, the discourses and their producers and receivers are brought together to show how all this interacts, and shapes the attitudes towards local wind projects. The map below shows the geographical distribution of the cases in Belgium. Per case, a scheme shows the main interactions. Finally, the schemes are discussed to show the dynamics of discourse and attitude formation.

3.3.3.1. Case studies

Figure 3-1: Location of the selected cases

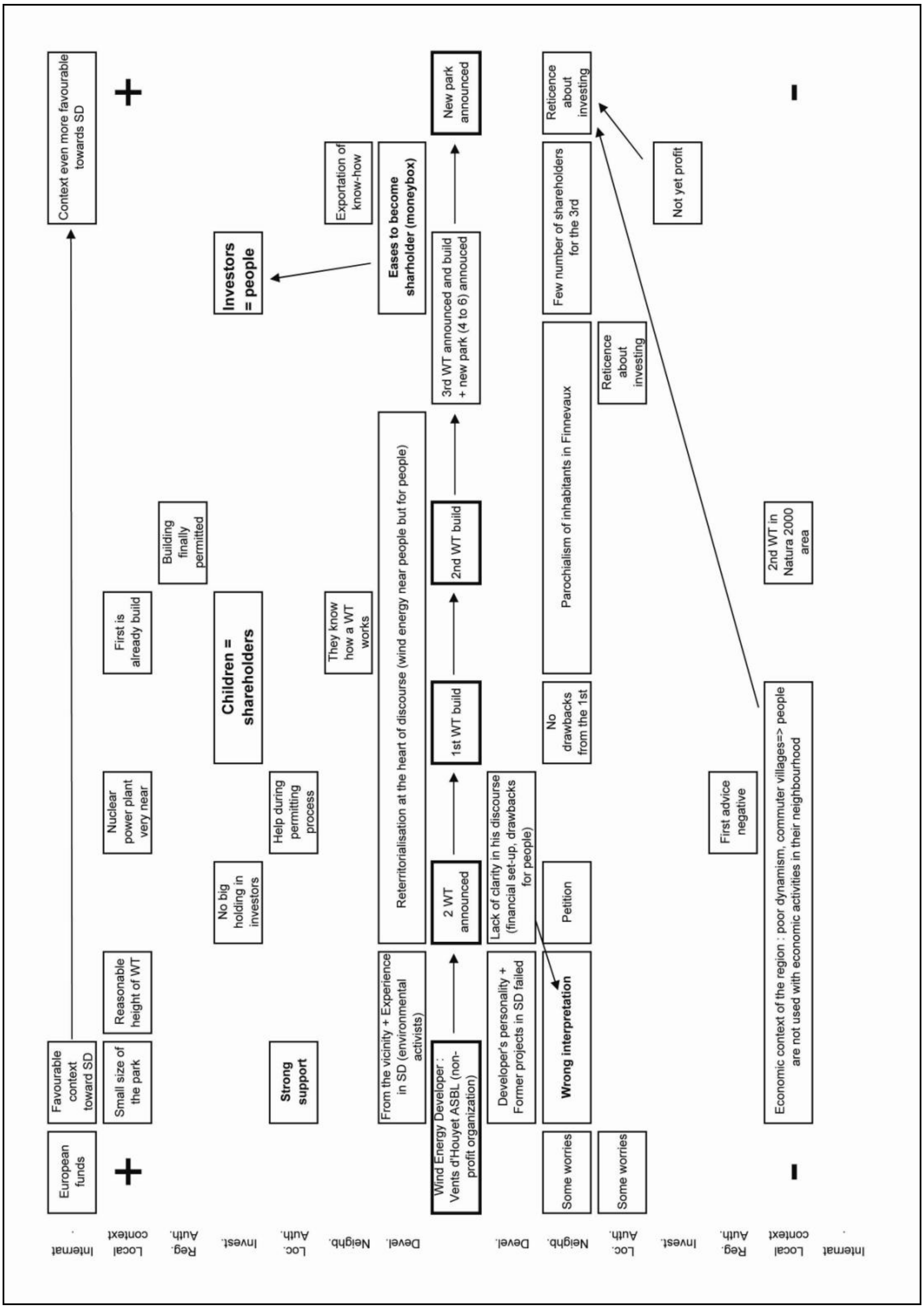

Figure 3-2: Summary diagram for the formation of attitudes in Houyet

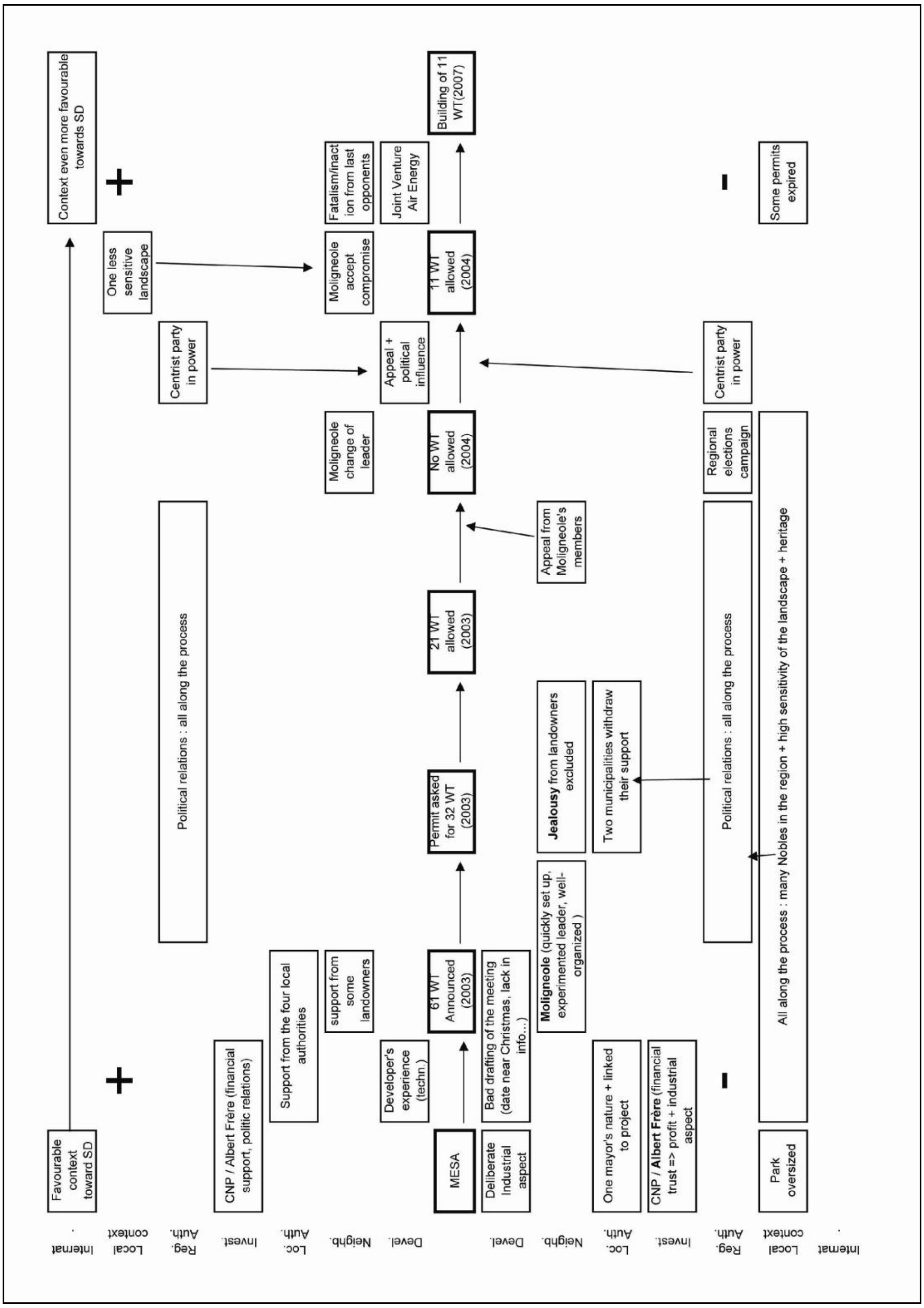

Figure 3-3: Summary diagram for the formation of attitudes in Mettet-Fosses

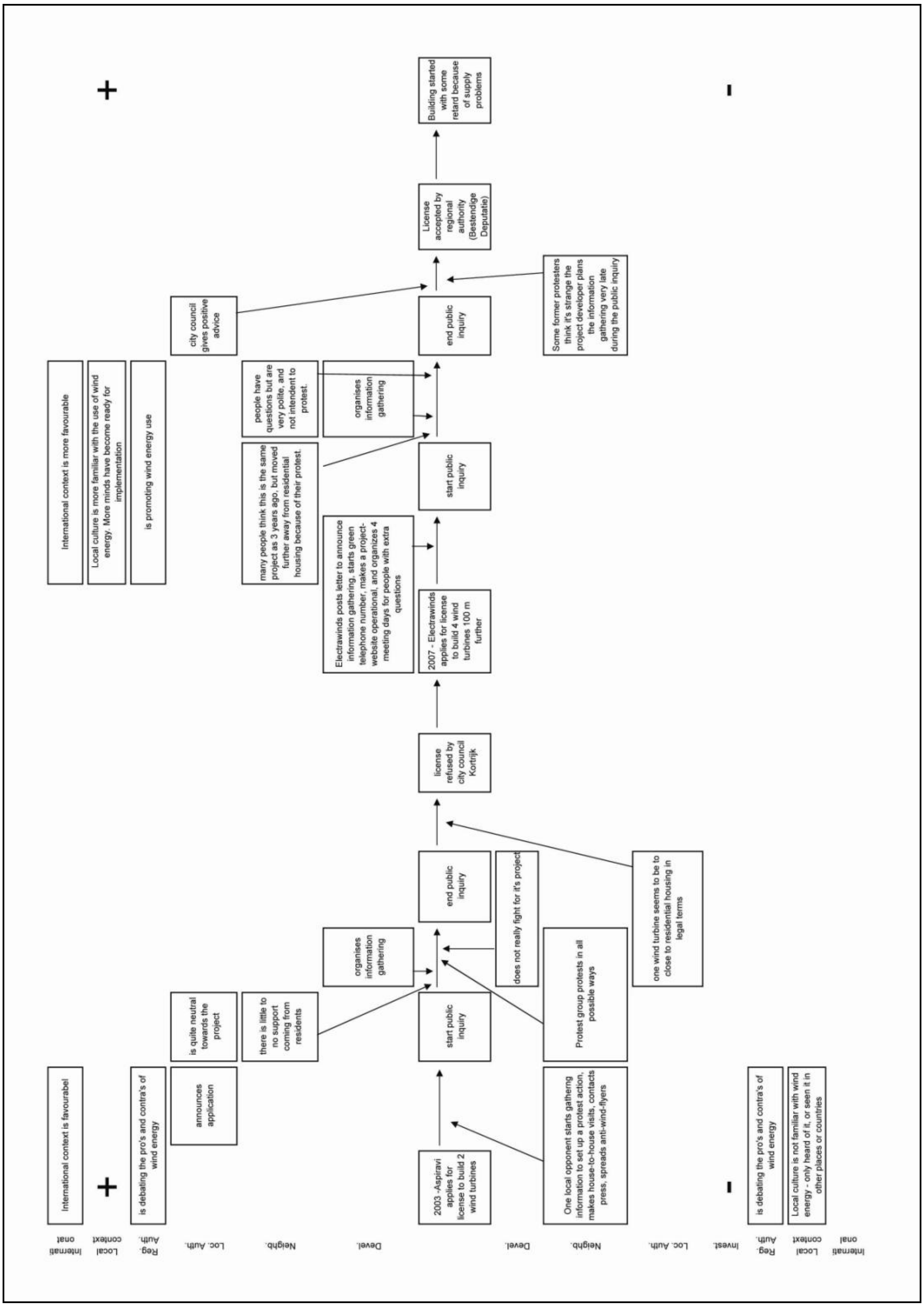

Figure 3-4: Summary diagram for the formation of attitudes in Kortrijk

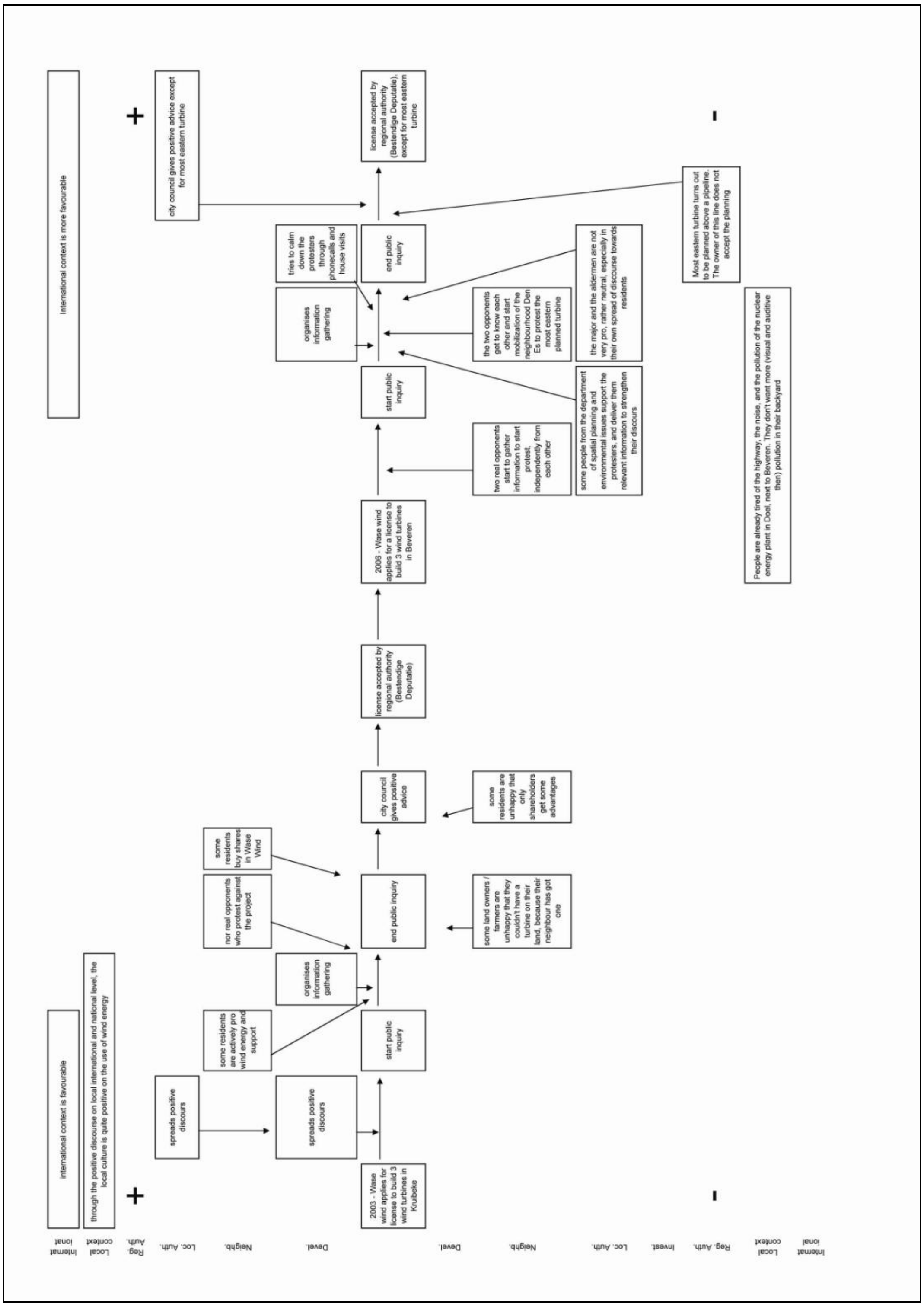

Figure 3-5: Summary diagram for the formation of attitudes in Kruibeke-Beveren

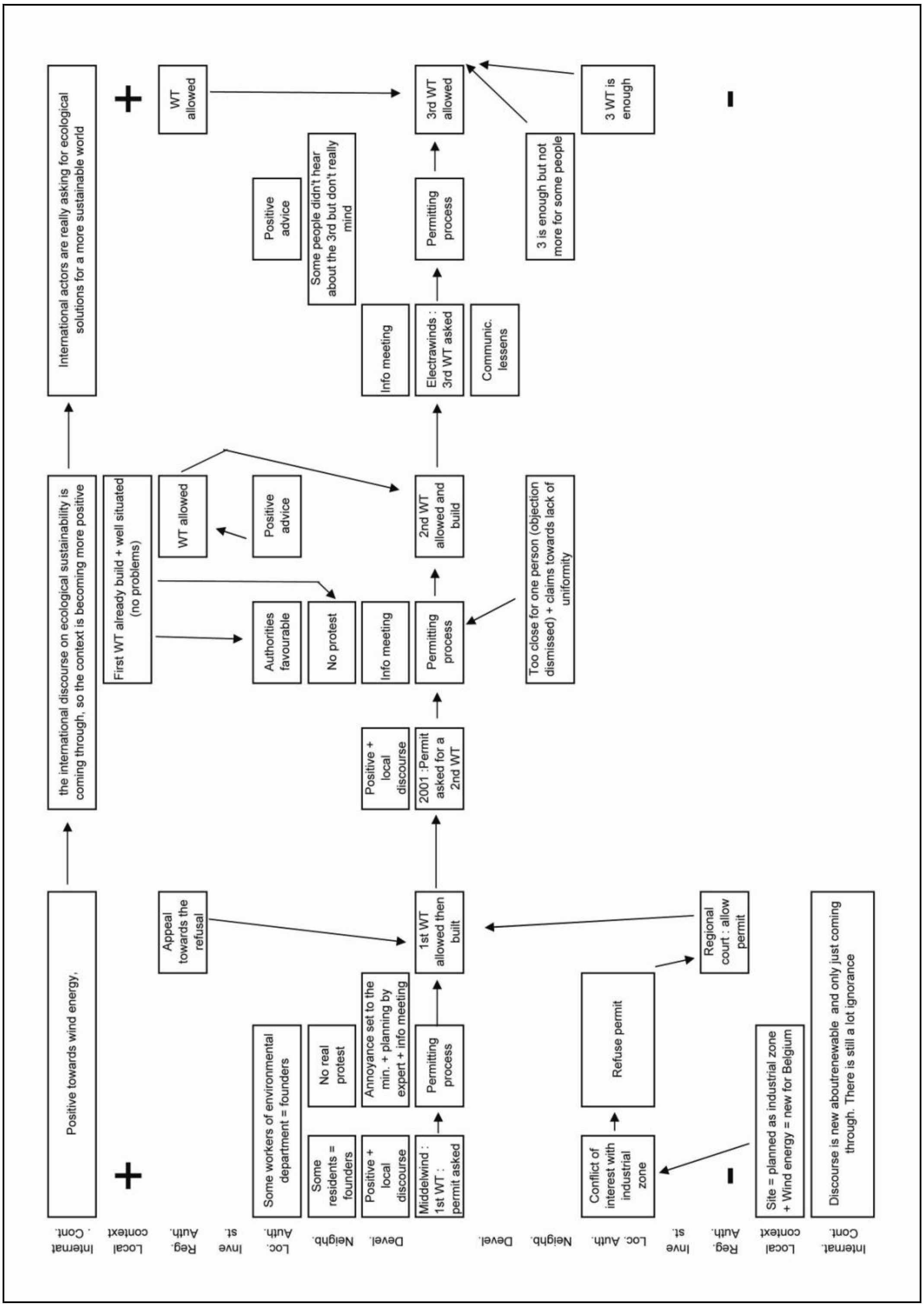

Figure 3-6: Summary diagram for the formation of attitudes in Middelkerke-Lombardsijde

3.3.3.2. Discussion

When all the former information on different discourses, different arguments, and different actors is brought together, some social dynamics can be observed in the attitude formation processes towards local wind projects in Belgium.

A **first** and very important point that has not been discussed yet is the temporality or **timing of the discourse** that is spread.
Through the five case studies, and especially the ones who knew some protest, it is clear that the moment of announcement is very important. It is the proper announcement of a new wind project in the local vicinity that triggers all other discourses (even if they were already present before) to become active in the mind and actions of the local residents. In the cases of Kortrijk and Beveren, it was right after the announcement that some local opponents started to mobilize the neighbourhood. By the time the information gathering took place, the whole neighbourhood was already filled with anxiety against the project.

Despite the spread of some informational flyers by the project developers, most people were convinced by the discourse of protest. Why is this?
A closer look at the cases reveals the importance of the **content and shape of the discourse**. The discussion on the content reveals the overall importance of **locality**. The discourse of protest groups is totally informed by local concerns – concerns for "us" as a neighbourhood, "what could be wrong with that?" In contradiction to this, a project developer is known as a private investing company, who primarily wants to gain profit out of his investment. In this respect, project developers have to deal from the offset with negative prejudices in relation to local protest groups.

To overcome this problem, developers need to think and act more locally, not only to "avoid protest", but to make a project community-based which is a necessity if they want their project to be truly "sustainable". Through the case studies, it becomes clear that the spread of an international discourse on sustainability, ecological debt, etcetera by a project developer in combination with the neglect of local and concrete possible annoyances for local residents does not pay out well to their credibility. From the moment the project is announced, people become sponges who inhale the different discourses that reach their neighbourhood. In this respect, the short time in between the announcement of a project and the information gathering is most important for the attitude formation.

A screening of the locality before planning a wind turbine could be a solution to this. In addition, the active and elaborate spread of a true, local and just discourse on renewable energy can help to better inform local residents and make them decide more consciously towards their attitude. The importance of timing and locality makes also clear that the strategy by developers of planning an information gathering as late as possible during the public inquiry to minimize the protest is not a good choice.

Actually this only gives protest groups more time to mobilize, and in case of no existing protest groups, people mostly feel overlooked through this type of planning, which in turn fosters a negative attitude towards the project (even if they are positive towards renewable energy). A second strategy (conscious or not) discovered among some developers is to communicate very little on the project – to keep it quiet which should help avoiding protest.

This strategy is clearly not helping both sides, developers and residents, to create a sustainable project. Through the analysis of discourses, it becomes clear that the information local residents receive or not, really makes their attitude. In this respect, project developers, authorities and other relevant actors should try to communicate as much, and as clearly as possible.

The form of their discourse must be well thought-out, and have a real body, which is perceptible. It is only through the spread of texts (in a broad sense, images, views, perspectives...) that a discourse can really reveal itself and become active in the minds and actions of people. It is thus clear through this discussion that the actual spread of a discourse, its relation to local concerns, at the right timing are very important and decisive in the creation of attitudes towards local wind projects.

A **second** point to be discussed is actually connected to the problem of timing, but turns this totally upside down, namely **the decision making process**. Through the literature study, it became already clear that there is need for a shift from the "plan-announce-react" type of processes towards "consult-consensus-plan" type of processes. Although the real shift towards projects where residents are first consulted – and thus actually get some decisive and participative rights – in the planning of projects is seen as not realistic by wind energy developers and authorities, some insights from these processes should be implemented to gain more sustainable outcomes.

A real problem encountered during the interviews is that some people are not having negative attitudes towards local wind energy projects, but nevertheless are negative or protest against the project. A deeper analysis reveals that in this case, it is mostly the planning process, and the discourses that flow out of it which create resistance. Because the planning process is not designed to be participative, people have only the choice of opposing or accepting. In fact, it is not so much the discourses, but the perceived fairness of the process that is at stake here.

The discourses are important in the creation of an attitude towards wind energy, and in the decision that everybody makes towards the importance of it, the truth of it, etcetera. The negative attitudes towards a project when attitudes towards local wind energy are positive are posing another type of question, and reveal some institutional problems that cannot be simply made undone.

The negative attitudes towards projects, which play here, are stemming from distrust in private investing companies, in local authorities, and in political actors. This distrust is only made bigger when those companies or authorities decide to act alone, above the heads of local residents in the planning of a local wind park.

During interviews with this type of attitudes as object, negative attitudinal statements were heard about “the state”, “the politicians”, “the big companies”, etcetera, which seem to be revealing a deeper distrust towards structures which are operating on a larger scale than the resident’s local experienced world. As it was the case in Kortrijk, people really created a local group to oppose larger structures in society, which are seen to be overlooking them.

This problem is of course no result from the implantation of wind energy in Belgium. In fact, this sort of protest which local wind projects encounter is a manifestation of this larger scale-problem. Therefore, the protest of people who are not opposing local wind energy as such is mostly stemming from distrust in institutional large-scale decision making processes. As this is a political matter, the solution to this problem is political and lies beyond the scope of this research. Nevertheless, it is also clear that this type of protest group is formed and mobilized by a little few opponents.

The majority of the members of the protest group are not as radical as the founders, but they let the protest discourse determine their attitude. A big part of the protesters can thus be seen as blank slates that form their attitude upon the discourses, which arrive at them during the process.

A **third** point, which must be discussed, concerns **the multifaceted character of attitude formation towards local wind projects**. Thanks to the qualitative information gathered during the research of the five case studies, it becomes clear that no single factor is all-determining. Every project knows its own characteristics, embedded in the local context, which is very important.

Although some recurring annoyance factors were discovered, they are all played out differently in every case. The case studies make therefore clear that it is not so much the content of the process, but the way in which it is set up and communicated that decides the outcome. In this sense, it is also clear that the discourse is more important than the separate texts, which form the discourse. A clear insight in the formation of attitudes towards the local wind projects can be gained only by taking into account all proper stakeholders, all possible annoyances, and the local (social, cultural and environmental) characteristics.

Finally, the attitudes towards wind farms may change during the process. The opposition is often strong at the beginning of the process because of the fears of change and the opportunity to still change something.

However, in some cases, the feeling of powerlessness is already perceived by some people towards politics or big financial groups. The info meeting also affects attitudes because it is often a tribune for some opponents to be heard by a broad public. It's also the place where the first links between future opponents are created. Otherwise, the meeting is the key moment where a lack of information about one of the components (material, economic, symbolic and decision making process) plays the huger role. The things that are not mentioned are then perceived as the result of a deliberate will.

The different stages of the building work play a role on the nearest neighbours' attitudes.
On the one hand, it stirs up the curiosity on technological aspects. On the other hand, it can become negative by the nuisances induced for the local residents or the road networks' users.

It is also the first opportunity for local residents to realize the real size of a wind turbine and their intrusive nature. When the building work is finished, the keeping of the promises to repair the damages made to the road networks play also a role.
Las but not least, once the park is built, a new evolution of attitude is noticed. People put the nuisances into perspective and integrate the modification (Schmitz, 1997). For instance, the noise is no more perceived with such acuity. However, some people told that the coming of an interviewer to speak about the wind turbines sensitized them once again to a noise that they did not hear anymore. In a way, the local residents appropriate the wind turbine. For example, they are sometimes worried when they do not see them turning.

4. Integration of the qualitative and quantitative research lines

4.1. Introduction

In this chapter the results from the two research lines are integrated. The objective is to analyse to what extent landscape and landscape attractivity do interact with the development of attitudes and whether the role of landscape differs between social groups. A better understanding of the role of landscape should assist policy makers with the development of appropriated wind energy development schemes.

A crucial element in this type of analysis is the meaning of the concept 'landscape'. Among scholars many definitions of the concept "landscape" were formulated. At the European Landscape Convention in Florence [13] a consensus definition was formulated as follows: "*Landscape refers to an area, as perceived by people, whose character is the result of the action and interaction of natural and/or human factors*".

Nevertheless, it is not sure that all respondents of the photo-questionnaire and the interviewees of the in-depth interviews refered to the same concept when using the word 'landscape'. In research line 1 photographs of what scholars would call landscape were shown. In this case, people were thus familiarized implicitly with the concept. However, when during the survey additional questions were asked such as: *"How important is the landscape in your direct surrounding for you?" it became clear that many people interpreted the concept landscape in a different way". Answers such as: 'I like a well maintained garden' and* '*Landscape is very import for me, I like my neighbours and I feel happy if the streets are clean*' showed that people often have a very narrow view on the concept 'landscape'.

During the survey, many people were not able to recognize landscapes of their own environment (Dewarrat et al., 2003 and Schmitz, 2005). On the other hand, in some case landscapes from a completely different remote region were considered to belong to their own environment and people tried to identify recognizable objects (for instance farms, woods or wind turbines). These experiences indicate that a lot of people (i) do not know or understand the concept 'landscape', (ii) do not have an active mental map in which they can position landscapes from their own environment.

[13] http://conventions.coe.int/Treaty/en/Treaties/Html/176.htm [last date of search: January 2009]

Similar misinterpretations of the concept landscape complicated the interpretation of the semi-structured interviews in which the interviewees were asked to reflect on the quality of a landscape before and after the installation of a wind turbine.

In order to integrate the results from research line one (the large scale survey with photo-questionnaire) and research line two (the in depth interviews) the following research questions were addressed:

- Does the proximity of wind turbines has an influence on the landscape appreciation (with and without wind turbines)? This was examined by grouping the respondents of the photo-questionnaires according their proximity to existing wind farms. If respondents from nearby existing turbines are more positive towards wind energy landscapes this strengthens the hypothesis of initial resistance and acceptance when people get use to the landscape change.
- Do different social groups develop similar attitudes towards wind energy parks? This was examined by grouping the respondents of the photo-questionnaires according their socio-economic status. An insight in the appreciation of different groups may explain part of the discourse analysis that was reconstructed from the case studies.

4.2. Does the proximity of wind turbines has an influence on landscape appreciation?

This research question is related to the widely used NIMBY-concept (Not in my backyard) referring to the strong opposition of people to change in their immediate neighbourhood although they might support the general principle that induced the change. The use of the NIMBY-concept as an attitude type is highly controversial and according to Wolsink (2007) is too poor to explain how attitudes are developed. Attitudes or behaviour is often labelled as NIMBY in order to catalogue people that oppose to a certain change as being selfish.

Moreover, the application of a NIMBY-model is rather difficult since the concept of 'backyard' is not clearly defined. What is the size of a backyard? In the case of wind farms this question can be reformulated as: From what distance do people consider that wind farms are in their vicinity? Do people define their vicinity based on visual stimuli or for example also on detectable noise? The results from the qualitative research showed that the perceived proximity of a wind farm was in many cases not related to landscape or landscape depreciation but to a complex interaction of a lot of non-visual factors.

Therefore in order to evaluate the factor proximity on landscape appreciation the results from the survey were stratified according the answer on the question: 'Are there any wind turbines in your neighbourhood?' This implied that some respondents considered a wind turbine at 20 km form their house as 'in their neighbourhood' while others considered a wind turbine at 5 km from their houses as 'not in their neighbourhood'.

In order to evaluate the factor 'proximity of wind turbines a set of non-parametric Pearson X^2-tests were carried out to test the homogeneity of the Likert scale evaluations on each of the groups. The frequency distributions (over the 7 classes of the Likert scale) were compared with an expected frequency distribution (based on the whole dataset. X^2-values were considered to be significant at a 0.05 confidence level. Table 4-1 gives an overview of the results of the X^2-analyses.

The table groups the respondents according 4 possible answers:

- I don't know whether there are wind turbines in my neighbourhood
- There are no wind turbines in my neighbourhood
- There are wind turbines in my neighbourhood
- There are no wind turbines in my neighbourhood but they are planned

The results were stratified according 3 groups of landscape photographs:

- All photographs
- Photographs without wind turbines
- Photographs with wind turbines

		Landscape appreciation on a 7-point Likert-scale							Mean
WT in the neighbourhood ?		1	2	3	4	5	6	7	
All	I don't know	=	=	=	=	=	=	=	5,10
	No	=	=	=	=	=	=	=	5,03
	WT are planned	=	=	=	-	=	=	=	5,10
	Yes	=	=	+	=	+	=	-	4,89
No WT	I don't know	=	-	=	=	=	+	=	5,18
	No	=	-	-	-	-	+	+	5,12
	WT are planned	=	=	=	-	=	=	+	5,20
	Yes	=	=	=	=	+	=	=	5,01
WT	I don't know	=	=	=	=	=	=	=	4,96
	No	=	+	+	+	=	-	-	4,84
	WT are planned	=	=	=	=	=	=	=	4,90
	Yes	=	+	+	=	+	-	-	4,65

Table 4-1: Expected versus observed appreciation scores stratified according the perceived proximity of wind turbines

With: =: observed are not significantly different from expected at a 5% significance level
+: observed > expected
-: observed < expected

Table 4 1 shows that if all landscape types are considered (photographs with and without wind turbines) people that live nearby wind turbines are more critical towards the landscape quality and use significantly less the category 'very attractive landscapes' (= Likert score 7) than average. The mean appreciation for landscapes with wind turbines is (<5) on average lower than the mean appreciation for landscapes without wind turbines (>5).

Table 4 1 shows however that the decrease in landscape appreciation (D-VQ) after the installation of a wind turbine is higher for the group of people that lives nearby a wind turbine (- 0.28 vs. – 0.36). The group of people that live nearby a planned but not yet constructed wind farm takes an intermediate position (-0.30).

This finding is at first sight in contradiction with the theory of gradual acceptance after exposure. A possible explanation may be that people that live in the vicinity of wind turbines, detected wind turbines much easier on the presented landscape photographs, while people that are not used to wind turbines might not even have noticed the presence of the turbines.

The latter is in correspondence with the results from the in-depth interviews. In the case study Mettet, for example, it could be noticed that for the people that lived in the most scenic parts of the region, landscape spoiling was the keystone of the fight against the park. Moreover, the degree of opposition was in agreement with the landscape quality models that were developped in research line 1. The opposition against the development of a wind farm was the strongest in village Anhée in the Molignée valley which is characterized by a high percentage of woods, an undulating topography, the presence of heritage elements (abbeys and churches) and the absence of disturbing antrophogenic features.

The opposition was the weakest in the village Fosse-la-Ville which is characterized by a more open agricultural plateau land with very little forest. Moreover, the village Fosse-la-Ville is situated nearby the urbanized area of the Sambre valley. This shows that the application of quantitative landscape quality assessment can provide a better insight in the subjective sensitiveness of landscapes and the possible development of negative attitudes towards the installation of wind energy farms.

4.3. Do different social groups develop similar attitudes towards wind energy farms?

On of the findings of the qualitative research (research line two) was that stakeholders of wind energy park (neighbours, developers, local authorities) did react differently towards the implantation of the wind farms, according to their own interests but also following their social profile (gender, age, education level and job).

In order to test whether the results obtained via in-depth interviews are in agreement with the large-scale survey the results from the photo-questionnaires were analysed after stratification. Observed and expected frequency distributions over the 7 classes of the Likert scale were compared by means of a Pearson X^2 analysis. Frequency distributions were considered to be significantly different at a 5% confidence interval.

4.3.1. Attitude differentiation according the geographic regions

Appreciation scores in the following geographic regions were compared: Flanders, Wallonia and Brussels. The results of the X^2-tests are shown in Table 4 2.

		Landscape appreciation on a 7-point Likert-scale							Mean
Region		1	2	3	4	5	6	7	
All	Flanders	--	--	=	+	=	=	=	5,05
	Wallonia	++	=	=	--	=	=	=	4,99
	Brussels	=	+	=	=	=	=	=	4,90
No WT	Flanders	--	--	-	=	-	+	++	**5,17**
	Wallonia	++	=	-	--	=	+	=	5,05
	Brussels	=	+	=	=	=	=	=	4,95
With Wind Turbine	Flanders	=	+	++	++	+	--	--	4,81
	Wallonia	++	=	=	=	=	=	-	4,86
	Brussels	=	+	+	=	=	=	=	**4,80**

Table 4-2 : Expected versus observed appreciation scores stratified according the geographic region of the respondents

Table 4 2 shows that the Flemings are more positive towards the rural and semi-rural landscapes than average. This is especially pronounced for landscapes without wind farms. The Walloons, on the other hand seem to be more critical towards landscapes and often use the category “not attractive at all” (Likert scale 1).

An analyses of the mean appreciation of the decrease in landscape attractivity after the installation of wind turbines shows that the Flemings are highly more sensitive to wind turbines in a landscape that the Walloon (D-LQ-value of 0.36 for Flanders vs. 0.19 for Wallonia). Inhabitants of Brussels are even less sensitive to landscape disturbance (D-LQ = 0.15).

In order to find out whether these differences are related to a linguistic and/or cultural aspects or to urbanization rate a similar analysis was carried using a stratification based on morphological urbanization. All municipalities that were visited during the questionnaire were classified according the typology of the National Census Bureau of Belgium (NIS Belgium, Van Hecke et al., 2007)

But are those differences between groups only linked to the belonging to a linguistic region?

Some differences could also be related to the characteristics of the selected municipality. In order to quantify this effect the results of the questionnaire were stratified according the 'morphological urbanization' of the municipalities. Morphological urbanisation type defined following the typology of National Bureau of Statistics Belgium (Van Hecke E. et al., 2007). The results are shown in Table 4.3. Some differences between the groups are present on the landscapes without turbines.

The results show that **people from high urbanized areas are more critical towards the scenic beauty of landscapes.** This can be explained by the fact that urban people do not perceive rural landscape in the same way as rural inhabitants. Urban people see the rural landscape as a leisure place which should not be spoiled. This finding is accordance with the qualitative research findings in the case study Mettet: during the interviews it became clear that people from urban origins, even living now in rural areas, were more sensitive for the visual impact of the turbines in the landscape.

		1	2	3	4	5	6	7	Mean
All	Urb. A	=	=	+	=	=	=	-	4,92
	Urb. B	=	=	=	=	=	=	=	5,05
	Urb. C	-	=	=	=	=	=	=	5,06
	Urb. D	+	=	-	=	=	=	=	5,04
No WT	Urb. A	=	=	=	=	=	=	=	5,01
	Urb. B	=	-	=	=	=	=	+	5,16
	Urb. C	-	-	-	=	=	+	+	5,15
	Urb. D	=	=	-	-	=	=	++	5,14
WT	Urb. A	=	+	++	+	=	-	-	**4,74**
	Urb. B	=	=	+	=	=	-	-	4,84
	Urb. C	=	=	+	+	=	-	-	4,87
	Urb. D	+	+	=	=	+	-	-	4,84

Table 4-3 : Expected versus observed appreciation scores stratified according the degree of urbanisation of the selected municipalities

Legend:
Urb. A = urban agglomerations
Urb. B = municipalities with a strong morphological urbanization
Urb. C = municipalities with a moderate morphological urbanization
Urb. D = municipalities with a weak morphological urbanization

4.3.2.. Socioeconomic characteristics

Table 4.4 shows the results of an X²-analysis in which the following hypothesis is analyzed: women and men evaluate the attractivity of a landscape using the same criteria.

Gender		1	2	3	4	5	6	7	Mean
All	Male	=	=	+	+	=	=	--	4,94
	Female	=	=	=	-	=	=	++	5,09
No WT	Male	=	=	=	=	=	=	=	5,05
	Female	=	=	--	--	-	+	++	5,17
WT	Male	+	+	++	++	+	--	--	4,72
	Female	=	+	=	=	=	=	--	4,92

Table 4-4 : Expected versus observed appreciation scores stratified according the gender of the respondents

The results show **that gender does play a significant role in landscape appreciation** and the evaluation of the visual disturbance of the scenic beauty by wind turbines. Women are more positive towards undisturbed rural landscapes but more negative towards disturbances of the landscape by wind turbines. The difference in appreciation between landscapes with and without wind turbines was less pronounced among the male respondents.

Table 4.4 shows the results of an X²-analysis in which the following hypothesis is analyzed: Landscape appreciation is independent of education level. The results show that this hypothesis should be rejected.

The least educated people (no diploma or primary diploma) overrate landscapes (more "very attractive" than other groups, the most educated (university master or more) underrate them clearly. The contrast between the least educated and other is even more striking for landscapes with turbines. While the first ones overrated landscapes even with turbines, the more educated (from secondary school) underrated wind energy landscapes.

Education (grouped)		1	2	3	4	5	6	7	Mean
All	Low educated	+	=	=	-	-	=	++	5,08
	Middle educated	=	-	=	=	=	=	=	5,05
	High Educated	-	+	+	+	=	=	--	4,87
No WT	Low educated	=	=	-	-	-	=	++	**5,14**
	Middle educated	=	--	--	=	=	+	++	**5,16**
	High Educated	-	=	=	=	=	=	-	4,99
WT	Low educated	+	=	=	=	=	=	=	4,97
	Middle educated	=	+	+	+	+	-	--	4,84
	High Educated	=	+	+	++	=	-	--	**4,64**

Table 4-5: Expected versus observed appreciation scores stratified according the education level of the respondents

This conclusion which is drawn from the quantitative analysis confirms what was noticed in the discourse analyses in the selected cases. In the village of Mettet project the strongest opposition came from a better educated class: the nobility while supporters or rather non-opponents came from the working class.

But once again, the level of education cannot justify on its own how attitudes are developing. On smaller sized projects, this effect of the social stratification on attitudes has not been observed, either due to a better mixing of populations or other context elements.

Finally, the age of respondents was also significant. The youngest (under 25 year) globally underrated landscapes while older (from 50 years) gave more "very attractive" than expected. Nevertheless we found that for wind turbines landscapes, the underrating is quite the same independently of the age, except for the oldest ones who seem less severe towards wind energy landscapes.

As no young people were interviewed during the qualitative interviews, because they are seldom active stakeholders, it is not possible to make links on the aspect.

4.4. Conclusions

This part of the research highlighted the difficulties involved in participatory landscape research. Despite these difficulties some interesting conclusions could be drawn. Firstly, the analyses that were carried out confirm in an objective way that NIMBY is a rather poor concept to explain attitudes toward wind energy.

It stresses also that as landscape concerns are emphasized with the building of wind energy those landscape concerns have to be taken into account. It highlights that if attitudes towards wind energy are very dependent on the way the turbines are build, those attitudes depend also on people's profiles.

5. Conclusions and recommendations for developers and policy makers

A perception-based approach was used to construct a subjective landscape appreciation model of non-urban Belgian landscapes. A questionnaire among the 1542 inhabitants of Belgium resulted in a model of rural landscape preference and information about the change in landscape appreciation after the implantation of a single wind turbine or wind turbine park. The main concern of the study was to provide a tool for spatial planners in order to evaluate future wind power landscapes.

On the basis of extensive photoquestionnaires with original and manipulated landscapes it was tried to get a deeper insight in the factors that control the perceived visual quality (VQ) of a landscape and the possible impact of wind turbines on this quality (D-VQ).

A first finding is that landscape appreciation can be quantified and predicted using a set of quantifiable landscape indicators. In this study the following landscape parameters were found to be significant: the percentage of forest, the percentage of built-up area, the topography type and the presence of anthropogenic point features. The methodology used to create the landscape model can be extended to other types of landscapes, if a sufficient number of new respondents are interviewed with photographs from new landscapes. The landscape model parameters presented in this study are only valid for rural and semi-rural landscapes in Belgium.

A second finding is that after the installation of a wind farm the appreciation of high-quality landscapes decreases and the appreciation of low-quality landscapes increases. This implies that the change in landscape appreciation after the installation of wind turbines can be quantified.

Thirdly, a prototype application was developped that allows to implement the proposed impact evaluation methodology at a regional scale level. The prototype application reprojects the land cover configuration that can be seen from a certain viewpoint on a sphere similar to a panoramic phograph. On the basis of the reprojected land cover pattern VQ and D-VQ-equations can be applied. The results of an example application for Flanders are shown in Figure 5 1.

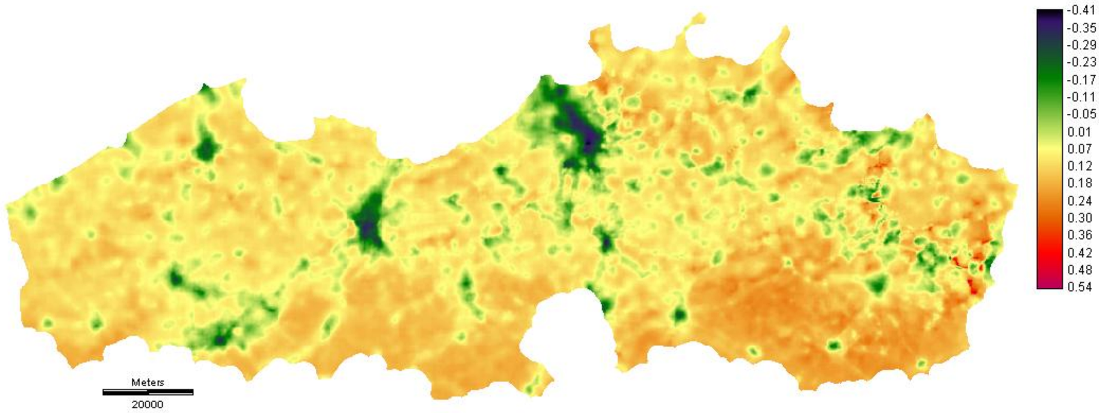

Figure 5-1: Potential impact of windturbines on the visual quality of landscapes in Flanders expressed in D-VQ-values.

Negative values indicate places with a potential increase of the visual landscape quality. While positive values indicate places with a potential decrease of the visual landscape quality.This model approach could in principle be applied in site selection procedures when for example a set of possible locations is in consideration. Nevertheless, developers and site modellers should be aware that the proposed methodology involves a significant amount of uncertainty. The explained variance of the landscape model is about 60%, the R^2 between D-VQ and VQ is only 30% and extra uncertainty is introduced in the model parameterisation by means of the viewshed analysis (see Table 2 6).

Moreover, errors on both the digital elevation model and the land cover map that are used as an input for the extrapolation of the model equations will augment the uncertainty involved in such application. We therefore recommend that the models in their present stage are only used for exploratory analysis. Future research should aim at a further decrease of the uncertainty involved in the quantitative modeling by expanding the photo- questionnaire using new landscape photographs and by refining the viewshed algorithms in order to make them more robust and accurate.

To gain insight in the multiple mechanisms and strategies of attitude formation in a way that is equally explorative and deductive a discourse analysis was carried out for a set of wind energy projects in Belgium. Some constraints and selection criteria had to be taken into account to choose suitable case-studies, First of all, the duration of our research project made it impossible to follow a project "live" from the beginning to the end.

Nevertheless, the cases could not be too remote in history in order to get reliable accounts. The choice was thus restricted to recently started up, in the running, or build projects, so that they were relatively fresh in the memory of the people concerned and that the interviewees could easily retrace the evolution of their perceptions and attitudes during the development of the project.

Eventually the following 5 case-studies were selected: Houyet, Mettet-Fosses, Kruibeke-Beveren, Kortrijk and Lombardsijde-Middelkerke. For each case-study attitude formation diagrams could be constructed. Despite the particularities of each case the discourse analysis revealed 4 different categories of arguments that may have a negative impact on the formation of social attitudes towards wind energy parks in Belgium: physical disadvantages, economic factors, symbolic factors and the type of decision making process.

A **first** and very important finding is the temporality or **timing of the discourse** that is spread. Through the five case studies, and especially the ones who knew some protest, it is clear that the moment of announcement is very important. It is the proper announcement of a new wind project in the local vicinity that triggers all other discourses (even if they were already present before) to become active in the mind and actions of the local residents.

A **second** point to be discussed is actually connected to the problem of timing, but turns this totally upside down, namely the decision making process. It became clear that there is need for a **shift** from the **"plan-announce-react"** type of processes towards **"consult-consensus-plan"** type of processes. Although the real shift towards projects where residents are first consulted – and thus actually get some decisive and participative rights – in the planning of projects is seen as not realistic by wind energy developers and authorities, some insights from these processes should be implemented to gain more sustainable outcomes.

A real problem encountered during the interviews is that some people are not having negative attitudes towards local wind energy projects, but nevertheless are negative or protest against the project. A deeper analysis reveals that in this case, it is mostly the planning process, and the discourses that flow out of it which create resistance. Because the planning process is not designed to be participative, people have only the choice of opposing or accepting. In fact, it is not so much the discourses, but the **perceived fairness** of the process that is at stake here.

A **third** finding concerns **the multifaceted character of attitude formation towards local wind projects**. Thanks to the qualitative information gathered during the research of the five case studies, it becomes clear that no single factor is all-determining. Every project knows its own characteristics, embedded in the local context, which is very important. Although some recurring annoyance factors were discovered, they are all played out differently in every case. The case studies make therefore clear that it is not so much the content of the process, but the way in which it is set up and communicated that decides the outcome.

Fourthly, the **attitudes towards wind farms may change** during the process. The opposition is often strong at the beginning of the process because of the fears of change and the opportunity to still change something.

However, in some cases, the feeling of powerlessness is already perceived by some people towards politics or big financial groups. The info meeting also affects attitudes because it is often a tribune for some opponents to be heard by a broad public. It's also the place where the first links between future opponents are created. Otherwise, the meeting is the key moment where a lack of information about one of the components (material, economic, symbolic and decision making process) plays the huger role. The things that are not mentioned are then perceived as the result of a deliberate will.

On the basis of the in depth discourse analysis in 5 case studies it became clear that here is a great need for more collaboration in the planning system of local wind projects. Residents and other stakeholders need to be involved, by which means there can be created institutional trust, a feeling of equity and fairness, and a lower degree of dissatisfaction towards the project.
Three different systems to increase the involvement of surrounding residents could be adopted:

- Offer residents the possibility of becoming a shareholder in the wind turbines: In the interviews, No example of shareholders who opposed the wind turbines could be found, and in this perspective, it is a good mechanism to overcome protest. Nevertheless, the system creates in some cases an in-group/out-group effect, with the risk of a group of non-participators dissatisfied who could become opponents just because of their out-group status.
- Installation of a more direct distributive system where people who live close to the turbines get a reduction for the energy they buy. A wind project – which is by its private character based on profit-making – creates opponents when it produces direct economic profit for the developer and only long-term ecological profit in combination with certain direct annoyances for the surrounding residents.
- Avoidance of the negative annoyances for the residents by collaboration and consultation between all local stakeholders, including the local residents implemented in a bottom-up planning process. The interviews show clearly that the minimal collaboration through an information gathering for residents is not enough. The information gathering in most of the cases is organized after the real planning has been made, and is therefore too late for residents to collaborate. In most of the cases, the only option residents have is to accept totally or to protest, while collaboration from the beginning of the process could create intermediary results that make both parties satisfied.

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