Towards multifunctionality of rural natural environments? - A social evaluation of the extended buffer zones along Danish rivers, streams and lakes

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Foreword

The work done in connection with this report is financed by the Danish AgriFish Agency under the Ministry of Food, Agriculture and Fishery of Denmark and the University of Southern Denmark. The Danish Centre for Rural Research would like to thank the Agency for expressing a keen interest in the research in the field of social use evaluation of rural space and the potential of value creation for the traditional rural trades as well as in the social values for those who live in the rural areas. The buffer zones along the rivers, streams and lakes are primarily an environmental measure, but there is an increasing recognition of the broader issues connected to the buffer zones and the need to make scientific inquiries to build up new knowledge.

The research has benefitted not only from the commitment of the Agency, but also from a range of individuals who were selected for interviews and others who were consulted. We would like to thank former realtor Henning Kruse (Ribe) in particular for the assistance and inspiration. The authors are also indebted to the colleagues from IME for their helpful suggestions (especially Villy Søgaard, Stefan Borsky and Jacob Kronbak).

The practical work of the study was undertaken by a team of researchers connected to the Department of Environmental and Business Economy, under which the Danish Center for Rural Research belongs. The composition of the team reflects the need to combine competences in the field of applied quantitative modeling and qualitative inquiry.

The Social evaluation of natural resources and environmental measures is not only a Danish phenomenon. Internationally, there is growing interest in research in the field, and this report can be seen not only as a contribution to the Danish knowledge base and debate, but also as being current an international research trend, to which the Department of Environmental and Business Economy and the Danish Centre for Rural Research would like to add on the Danish perspective. This is also the main reason for the report being published in English.

Sammenfatning

I de seneste årtier har der været en voksende opmærksomhed omkring beskyttelse af vandmiljøet. Den danske regering har løbende og konsekvent implementeret EU-lovgivningen på området. Et af initiativerne er at udpege randzoner omkring åer, vandløb og søer, hvor landmænd ikke længere kan dyrke, plante eller sprøjte. I 2012 blev der introduceret en generel randzone på 10 meter for at forstærke de positive miljømæssige fordele.

Der har været megen debat omkring randzonerne, og der er rejst mange spørgsmål, især omkring dokumenterbare miljømæssige fordele vejet op mod de omkostninger og det produktionstab, som landmændene eventuelt måtte opleve. Randzonerne kan give andre effekter såsom nye muligheder for de, som bor i nærheden, eller for de som benytter disse naturressourcer til rekreative udfoldelser. Man taler i forskningen om, at der er en "social" værdi af naturen, og her henføres til en bred vifte af velfærdsgevinster, som måske ikke altid lader sig måle i økonomiske termer. Indtil nu har denne kategori af spørgsmål kun i begrænset omfang været emne for forskning, og der er endnu ikke solid viden omkring rekreative og sociale effekter hverken i Danmark eller internationalt.

Formålet med denne rapport er at indlede forskningen inden for rekreative og sociale fordele med Danmark som eksempel. Mere specifikt ligger der to hovedantagelser til grund for denne rapport: Antagelse 1): De udvidede randzoner tilfører betydelig værdi i form af mere areal til rekreative formål, og denne ekstra værdi anerkendes og værdsættes af interessenterne. Antagelse 2): Randzonerne med potentielt forbedrede æstetiske værdier af naturen og landskaberne har effekt for de, som bor i nærheden i form af et plus på ejendomsværdierne. Med disse to antagelser ligger denne rapport på linje med en række internationale forskningstiltag, der dokumenterer en almindelig værdsættelse af og miljømæssige værdier som noget, der bidrager til velstand og gode levevilkår i landdistrikter.

International forskning inden for social værdiansættelse af miljømæssige tiltag leder bestemt ikke til entydige konklusioner. Litteraturgennemgangen, der er grundlag for rapportens metodevalg og diskussioner af resultaterne, tyder på, at der må tages forbehold omkring social værdiansættelse. En del forskning indikerer, at lokale respondenter når adspurgt direkte (såkaldt "*stated preference metode*") sætter meget stor pris på tilgængeligheden til rekreative værdier og naturens herligheder. Det står i nogen grad i modsætning til deres handlinger og opførsel, når dette observeres. Denne indirekte evaluering (kaldet *"revealed preference method"*) afslører, at folks virkelige præferencer er forskellige fra

deres udtalte værdiansættelse. Det betyder en nedjustering af værdien af miljømæssige tiltag og adgang til naturområder. Der er med andre ord forskel på, hvad folk siger, og hvad de faktisk i praksis gør.

Denne rapport er metodemæssigt inspireret af international litteratur. Den består både af en kvalitativ (stated preference metode) og en kvantitativ del (revealed preference metode). Den kvalitative del er gennemført ved interviews med repræsentanter fra organisationer med ansvar for rekreative aktiviteter og friluftsliv. De er adspurgt omkring medlemmers brug af naturen, deres bevidsthed om randzonerne, samt om deres vurdering af værdien af disse i forbindelse med deres egne aktiviteter. Den kvantitative del modellerer data på huspriser i sammenhæng med nærheden af randzonerne, andre rekreative faciliteter og bymæssige faciliteter. Herved undersøges, om og i hvilken grad borgerne er villige til at betale for adgang til og udsigt over disse naturarealer. To områder i det sydvestlige Danmark er valgt som studieområder nemlig området omkring Ribe og området omkring Skjern-Tarm.

De kvalitative interviews demonstrerer, at organisationerne bruger naturområder forholdsvis meget som omgivelser for deres aktiviteter, og at de sætter pris på tilgængeligheden. De er også meget bevidste omkring debatten om randzonerne, dog mest fra medierne. De fleste af de interviewede anser randzonerne som en fordel for dem, deres organisationer og institutioner. Der argumenteres for, at bedre adgang til randzonerne er altafgørende for, at offentligheden vil benytte sig af områderne. I øvrigt vil information omkring disse områder skabe mere opmærksomhed og anspore offentligheden til at benytte de nye naturarealer. Et tema af speciel interesse i forbindelse med denne rapport er de interviewedes bevidsthed omkring randzonerne kombineret med deres brug af områderne. Man må konstatere, at forudgående erfaringer og institutionelle traditioner får de interviewede til at holde fast i brugen af nuværende ruter og områder, og de er i mindre grad tilbøjelige til at tage nye lokaliteter i brug. Som nogle af dem nævner, ville mere information om randzonernes lokalisering og betingelserne for at kommer der måske få anvendelsen til at stige.

I den kvantitative del af rapporten anvendes en indirekte evalueringsmetode (*revealed preferences*). Herved undersøges, om de direkte udtalelser fra de interviewede interessenter også kan bakkes op af deres faktiske præferencer. Huspriserne er den afhængige variabel i en regressionsmodel. De uafhængige variable er karakteristika ved boligerne, lokale økonomiske faciliteter, omgivelsesulemper, naturherlighedsværdier eller det modsatte, samt fragmenteringen af det omkringliggende landskab. Husprisdata er tilgængelige fra de omfattende offentlige databaser med salgspriser og ejendomsvurderinger.

Den kvantitative model viser sig i undersøgelsen at være meget robust. Den demonstrer, at huse i nærheden af 10-meters randzonerne siden 2008 er steget relativt mere i værdi end sammenlignelige huse andre steder. Imidlertid er denne effekt ret beskeden. Vurderingen kan anfægtes af, at de brede randzoner kun har eksisteret i ret kort tid. Resultatet er dog stadig statistisk signifikant og kan betragtes som en afspejling af den sociale værdi af randzonerne. Konklusionen understøtter den kvalitative vurdering.

Det er interessant at se, at den nye lovgivning med de udvidede randzoner fra 2008 tilsyneladende har flyttet offentlighedens holdninger. Før 2008 var sammenhængen mellem pris og nærhed til randzoner ikke positiv på samme måde.

Sammenfattende peger konklusionerne fra den kvantitative og den kvalitative analyse på, at randzonerne i det danske landskab vurderes til at have en social værdi, men den er ret begrænset. Rapporten kan ikke på det foreliggende grundlag give konsistente forklaringer. Dog er der indikationer fra den kvalitative del af rapporten og fra den supplerende litteraturgennemgang på følgende begrundelser for den begrænsede sociale værdi:

Problemer med adgangsforholdene: Randzonerne ligger primært i landbrugszoner og ejes af landmænd. Økonomisk randzonekompensation og EU-støtte (enkeltbetaling) forudsætter en vis pleje af arealerne. På arealer og bedrifter, hvor der ikke søges om landbrugsstøtte, er der en såkaldt rydningspligt i driftsloven, som skal sikre mod tilgroning. Landmænd har således ikke en pligt og muligvis heller en motivation til at etablere og vedligeholde stier og andre faciliteter. Der er også en mangel på kortmaterialer og guides, som kan fungere som vejvisere i adgangen til randzonerne. Der er først offentlig adgang, når randzonearealet er udyrket i naturbeskyttelseslovens forstand. Det er ikke enkelt at afgøre, om et areal er udyrket, da det forudsætter en alsidig plantevækst. I praksis kan det tage flere år, fra dyrkning ophører til at et areal er ”udyrket” efter naturbeskyttelsesloven. Derudover kan det være svært at afgøre, hvorvidt et græsareal udnyttes og hvornår det kan betragtes som udyrket.

Konkurrerende landskaber: Områderne, som undersøges i denne rapport, ligger i yderområderne, og beboerne og besøgende kan her også vælge at benytte en lang række andre landskaber og naturområder i deres fritid. Det er områder, som måske adgangsmæssigt og æstetisk leverer en højere brugsværdi, og hvorom der findes mere tilgængeligt materiale. Skovene, vadehavet og fjordene repræsenterer en højere grad af landskabsvariation end randzonerne.

Mange randzoner er præget af mere eller mindre vild bevoksning, og de er måske ikke inviterende på samme måde som andre landskabsformer.

Normer og traditioner for friluftsliv: Organisationerne er opmærksomme på, hvilken slags landskaber der bedst opfylder deres behov. De er vant til at færdes i bestemte områder, hvor de kender faciliteter og sikkerhed. Det virker som en barriere for fritidsorganisationerne at genoverveje lokaliteter for deres aktiviteter.

Formaliteter i ejendomsret: Friluftsinteressenter anerkender generelt landmændenes ejendomsret og landmændenes behov for at opretholde et økonomisk vigtigt potentiale og rationel drift. Der er derfor en tilbageholdenhed med at benytte områderne uden klar accept og tilladelse fra grundejerne.

I en række nyere internationale landdistriktspolitiske dokumenter peges på det ønskelige i en udvikling i retning af mere multifunktionelle landskaber, hvor landbruget kan sameksistere på en bæredygtig basis med rekreative aktiviteter. Denne rapport antyder, at der i forhold til multifunktionelle randzoner stadig er langt mellem ideelle intentioner og virkelighed. De samlede økonomiske og sociale værdier mangler stadig at blive identificeret og udviklet af interessenterne.

Når man ser på bevidstheden om og interessen for randzonerne som mulige fremtidige rekreative områder, er en række skridt er nødvendige i forhold til at komme nærmere en bæredygtig multifunktionalitet:

Formidling er et hovedtema. Der er mangel på viden omkring randzonernes nøjere beliggenhed, muligheder og eventuelle begrænsninger i adgangsforholdene. Randzonerne er en relativt ny foranstaltning, og de enkelte randzoners status kan ændres over tid, hvilket vanskeliggør en konsistent og opdateret formidling. Derudover har brugerne måske behov for at kende til ruter og stier tilpasset forskellige forudsætninger og behov, deriblandt potentielle udfordringer og sikkerhedsspørgsmål. Formidling handler også om flora og fauna og om naturfænomener samt regler for adfærd.

Udvikling af infrastruktur: Randzonerne er ikke velorganiserede, for eksempel med stier og skiltning, og dette kan være en situation, som nogle grundejere ikke ønsker ændre på. Dog er nogle kommuner og andre ejere begyndt at planlægge og anlægge stier, broer og andet infrastruktur til fordel for den rekreative brug, og for at forbinde randzonerne med andre naturområder. Hermed gives en mulighed for at udvide målgruppen for randzonerne. Forhandling og fastlæggelse af ny rekreativ infrastruktur er en del af planlæg-

ningsprocessen for kommunerne. Frilufts- og turismeorganisationerne kan opfordre kommunerne til at arbejde med en mere holistisk tilgang for at styrke både sociale, rekreative og økonomiske værdier.

Udvikling af oplevelser: Friluftsorganisationer og brugere af naturområder er temmelig traditionsbundne, og derfor har de tendens til at foretrække andre områder end randzonerne til deres aktiviteter. Der er behov for at sætte gang i processer med kreativ "oplevelsesdesign" for at udvikle nye typer af fritids- og rekreative aktiviteter, som passer med de fysiske rammer og de miljømæssige krav for randzonerne. Oplevelsesdesignet kan måske også inkludere landskabsdesign, som forstærker de æstetiske værdier og biodiversiteten.

I debatten har der været stor bekymring for, at landbrugsområder bliver invaderet af rekreative brugere, og at de økonomiske muligheder for landmændene måske lider skade som en konsekvens af for eksempel ødelæggelse af afgrøder, forstyrrelser for dyrehold og tilsvining med affald. Rapporten viser at der næppe er risiko for dette, idet randzonerne tilsyneladende (endnu) ikke er særligt meget anvendt som rekreative faciliteter trods det, at de anerkendes for potentielle rekreative og sociale værdier. Dog illustrerer rapporten også et behov for at fokusere på et bredere perspektiv omkring naturressourcer og naturarealer og af randzonerne som del af bæredygtige, multifunktionelle landdistrikter.

Summary

In recent decades, there has been increased emphasis on the protection of the aquatic environment, and the Danish government has consistently implemented the EU regulations on water protection. One of the measures to improve the surface water quality is to dedicate buffer zones at rivers, streams and lakes, where farmers are not allowed to plant, grow or fertilize. In 2012 buffer zones of 10 meters are introduced around water bodies in order to enhance the positive environmental effects.

There has been a significant debate about the buffer zones, and questions have been raised, particularly about the demonstrable environmental effects compared to the costs and production loss that farmers may experience. Questions have also been raised about other impacts such as social and recreational benefits for those who live nearby or use the in principle enlarged natural resources for recreational purposes. Up until now, the latter categories of questions have received more limited research attention, and there is not any solid knowledge about the impacts in either Denmark or internationally.

The purpose of this study is to initiate the research into the field of social benefits with Denmark as a case and example. More specifically, there are two guiding assumptions of the study: 1) The extended buffer zones add significant value in terms of open space for recreational use, and this value is recognized by stakeholders; and 2) The buffer zones are enhancing aesthetic values of nature/landscape for those who live nearby and hereby positively affect the property values. In accordance with these two assumptions, the study aligns with a range of international research results which document a popular appreciation of amenity and environmental values for the prosperity and good living conditions in rural areas.

International research in the field of social valuation of environmental measures leads to less uniform conclusions. The literature review, which has informed this study methodologically and in terms of results, comes up with reservations about the social valuation, and quite a few studies suggest that when asked, local respondents give the amenity values a high priority (*stated preference methods),* while when their actions and behavior are studied, their real preferences are different with less value put on the environmental and amenity values (*revealed preference methods).*

Methodologically, this study is inspired from the international literature. It consists of qualitative and quantitative parts. The qualitative part consists of interviews with representatives from organizations that are in charge of outdoor recreational and leisure activities. They are asked about members' use of

nature, their awareness of the buffer zones, and their appreciation of the value of these for their own activities. The quantitative study models data about house prices and the relationship with the proximity to buffer zones, other amenity values, and urban facilities, thus investigating whether and to what extent the citizens are willing to pay for easy access to and views of nature areas. Two areas in southwestern Denmark are chosen as study areas: The Ribe area and the Skjern-Tarm area.

The qualitative interviews demonstrate that the organizations use natural resources quite extensively as the scene for their activities, and they appreciate the accessibility. They are also well aware of the debate on the buffer zones, albeit mainly from the media. Most of the interviewees consider buffer zones to be a benefit to them, their organizations and institutions. It is argued that easy access to the buffer zones is essential if the public is to use these areas. Moreover, information on the areas may create knowledge and awareness, spurring the public to make usage of these new areas. A theme of special interest in regards to this report is the interviewees' awareness of the buffer zones combined with their usage of the areas. Though the interviewees are aware of the political debate and implementation of the buffer zone areas, not many have made use of them. Knowledge trajectories, prior experience and institutional traditions spur the interviewees to maintain the usage of current hiking paths, fields and areas. As some of them mention, more information on where the buffer zones are located and how they can be used may lead to an increased future usage.

In the quantitative part of the study, a revealed preference approach is applied in order to be able to generalize the findings and examine in more detail whether these stated opinions of the interviewed stakeholders are backed up by the revealed preferences. The dependent variable in a regression model is house prices. The independent variables are house characteristics, locational economic (dis-)amenities, natural (dis-)amenities, and surrounding landscape fragmentation. Housing data are made available from the comprehensive official databases with sales prices and assessed values of property. The quantitative model, which is found to be robust, points to the conclusion that the proximity to the 10 meter buffer zones, as they are defined in the 2012 regulation, has led to an increase in house prices since 2008. However, this effect is low in impact and rather hypothetical in nature as actual use of the zone was up until then seldom possible due to the recent implementation of the 10 meter buffer zone; the result is still significant and shall be considered as a reflection of the social value given to the buffer zone by inhabitants of the area. However, it is interesting to see that the new regulation has shifted the attitudes of the citizens from a mainly negative one according to the media discourse to a more positive appreciation regarding this study.

To conclude from the quantitative and the qualitative analyses, at the present stage of implementation, the buffer zones in the Danish landscapes are found to have a limited or low social value. The study does not deliver any immediate and consistent explanations. However, evidence from the qualitative part of the study and supplementary literature reviews provide some tentative reasons for the limited social value:

Access issues. Maintenance of the buffer zones is mainly the responsibility of the farmers, and only within certain limits as determined in the buffer zone and agricultural regulations. The motivation to establish and maintain trails and other facilities may be limited. There is also a lack of materials, such as maps, that can guide the access to the buffer zones. Due to the recent implementation of the regulation, access is only allowed for uncultivated areas. It will take some time until a buffer zone evolves into a habitat, which is regulated by the Nature Protection Act, which in turn allows access into this area. Until now, access and use of the buffer zones are uncertain for citizens and knowledge rarely available.

Competitive landscapes. The areas investigated in this study are rural, and the citizens and visitors have access to a wide range of landscapes and landscape types which may, from accessibility and aesthetic points of view, deliver a higher user value and better interpretation. Forests, the Wadden Sea, and the fjords represent a higher extent of variation. Many buffer zones are "rough" and perhaps uninviting compared to other landscape types.

Norms and traditions in outdoor recreation. The organizations refer to those types of landscapes that best serve their needs and what they are used to from a convenience and safety point of view. It seems to be a barrier for leisure organizations to reconsider the locations and environments.

Formalities of property rights. The other stakeholders generally recognize the property rights of the farmers and the need for the farmers to withhold an economically feasible management of the holdings. Thus, there is a reluctance to intervene too much by allowing access into the buffer zone without proper consent of the land owners.

In a range of recent policy documents, there is a clear plea for a development in the direction of more multifunctional landscapes, where agriculture can coexist on a sustainable basis with recreational activities. This study suggests that, in terms of multifunctional buffers zones, there is still quite a distance between the ideal intentions and reality. The combined economic and social values remain to be explored and developed by the stakeholders. When taking into

account the awareness of and interests in buffer zones as potential future recreational areas, there are a range of steps that need to be taken to approach a situation of higher multifunctionality:

Interpretation is a key issue. There is a lack of knowledge about the locations and the possibilities and restrictions of access to only uncultivated areas due to, among others, the recent introduction of the buffer zones. In addition, users may need to know about routes and trails that are adapted to different kinds of user preconditions, including potential accessibility challenges and safety issues. Interpretation also has to do with the flora and fauna as well as with natural phenomena which are going to develop in the next years together with codes of conduct.

Infrastructure development. The buffer zones are not well organized, for example with trails and signs, and this might be a situation that some land owners do not want to change. However, some municipalities and other landowners have started to plan and establish trails, bridges and other infrastructures for the benefit of recreational users, and to link the buffer zones to other nature areas. Thus, there is an opportunity to widen the target group for the buffer zones. Negotiating and planning infrastructures is part of the planning process of municipalities, and leisure and tourism organizations tend to encourage the municipalities to ensure a more holistic approach in order to enhance social and economic values.

Invention of experiences. The recreational organizations and the users of nature areas are found to be bound to traditions to quite some extent, and therefore they tend to prefer other nature areas than buffer zones for their activities. There is a need to initiate processes of "experience design" in order to invent new types of leisure and recreational activities that may fit with the physical conditions and the environmental requirements in buffers zones. The experience design might also include landscape designs that enhance aesthetic values and biodiversity.

In the debate, there has been a concern that agricultural areas might be invaded by recreational users and citizens, and that economic opportunities for farmers may suffer as a consequence due to, for example, disturbance of crops and animals and littering. The study shows that there is hardly such a risk. However, the study also demonstrates that there is a plea for a broader perspective on the natural resources including the buffer zones as part of a long-term development of a sustainable rural multifunctional land use.

1 Introduction

To fight the deterioration of water quality, Denmark has since the 1980s attempted to address the negative impacts of agriculture on water quality through the Action Plans for the Aquatic Environment (APAE's). In the latest APAE III (2005-2015), which was already replaced by the Agreement on Green Growth in 2009 and the Agreement on Green Growth 2.0 in 2010, these goals are harmonized with the European Water Framework Directive (WFD) as well as with the requirements for Natura2000 sites as stated in the Birds and Habitat Directives. Hence, the Danish government has bound itself legally in the "Miljømålsloven" to reach a goal of approx. 90 % of the water bodies showing "good ecological status" by 2015 (Liefferink et al., 2011). Current government regulations are referring to 'Green transition'. In 1992, it was decided to implement a 2 meter buffer zone for natural streams (§69 vandløbloven). Farmers are forbidden to cultivate within this zone. Water streams in city areas or summer house areas were excluded from this regulation. On September 1, 2012, a new regulation for 10 meter uniform buffer zones was implemented for all water streams and lakes of more than 100m^2 (lov om randzoner). Accordingly, all water steams, regardless of e.g. water quality, receptive capacity or integration within a stream network, are now objects of the buffer zone regulation. The goal of the regulation is to reduce eutrophication of the water streams efficiently and with a rather minimal administrative burden and complexity compared to regulations adapted to local characteristics. Figure 1 illustrates the implementation of the 2 meter and 10 meter buffer zones and points out the differences between these two regulations.

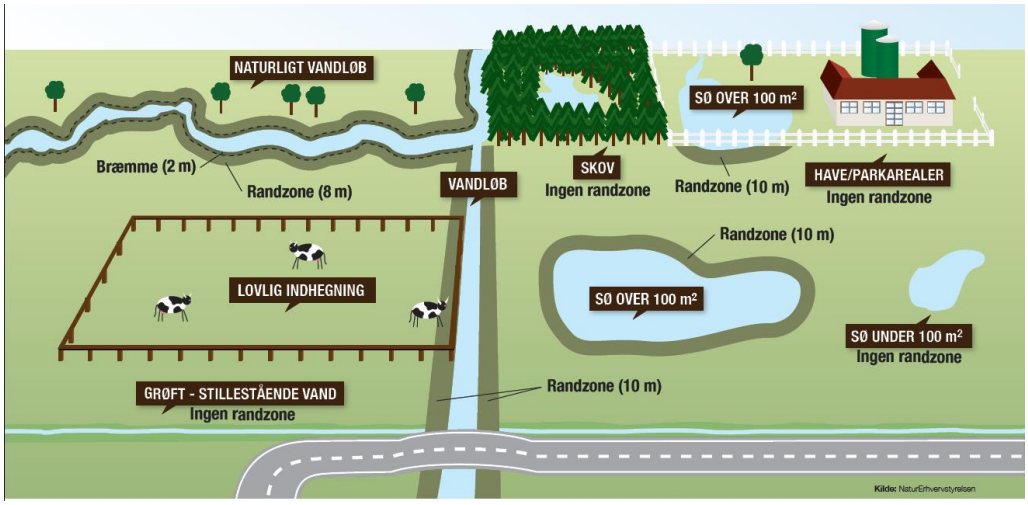

Figure 1: Graphic display of the buffer zone regulation.
Source: Ministeriet for Fødevarer, Landbrug og Fiskeri/NaturErhvervstyrelsen

Based on fairness considerations, farmers could also apply for the reduction of the 10 meter buffer zone if the assigned area exceeds 5% of the farm's total arable land. Although farmers are not obliged to mow the buffer zones according to the regulation directly, in order to get subsidies from the EU for this area, however, they should mow at least every second year for maintenance. The same holds for non-farming areas according to the existing Danish law. Although agricultural usage is generally forbidden in the area, farmers are allowed to use the area as permanent grassland ('vedvarende græs') for up to seven years or as storage of materials (e.g. straw bales, building materials and machinery) for up to 8 or 28 days depending on the season and provided no fertilizers or pesticides have been applied. Moreover, if there is a direct access to the buffer zones and it does not interfere with the Nature Protection Act, the buffer zone area can also be used for social and cultural events, riding, hunting, and other sports or scouts activities.

Although the implementation of uniform buffer zones in all rural areas and on all water streams might ease the legislative and administrative costs compared to a locally adapted solution, their effectiveness is highly debated. Arguments have arisen as to whether buffer zones in general are able to retain nitrate and phosphorus. Storage capacity tends to be subject to local geographic conditions (Balana et al., 2012). In particular, there is high uncertainty about the release of phosphorus. Due to seasonal variation of precipitation and other local influences (e.g. construction work on a bridge), even a net phosphorus increase in water bodies might be found (Hoffmann et al., 2011; Rasmussen et al., 2011). So, the effects of buffer zones on water quality in general tend to depend on exogenous variables.

In addition the uniform and comprehensively implemented first 2 meters, and in the later regulation, 10 meter zones have been extensively debated in the press and in a variety of organizations. These discussions mainly focus on practical farming issues and on the economic costs and impacts for farmers and landowners of the regulation, in other words whether production loss for landowners/farmers outweighs the benefits for nature conservation and water protection (Frandsen, 2012; Jacobsen, 2006; Navntoft et al., 2009). From a social welfare perspective, it was pointed out that benefits of the extended buffer zones may lie not only in the environment, but also in the potential contribution to new, continuous nature walking paths and recreational areas (Jensen/Caspersen, 2011; Kronvang et al., 2010). Therefore, besides the environmental effects (providing habitats and niches for biodiversity and serving as buffer for phosphor and nitrate input into the water bodies), individual utility may be created through recreational use, as well as through the areas possibly experiencing an increase in landscape quality, which should contribute to

social welfare and nature conservation efforts (Brandt et al., 2012; Primdahl et al., 2010), and through a development towards economically, socially and environmentally sustainable multifunctional rural landscapes (OECD,2006; Maier and Shobayashi, 2001; Marsden and Sonnino, 2008). If, however, the buffer zone regulation were to be evaluated, all ecosystem services need to be considered, in particular if social and natural benefits possibly outweigh the economic losses (Bateman et al. 2013).

Generally, there is a lack of a coherent and broader insight into the effects of buffer zones on social and broader socio-economic issues. This is the case both in Denmark and internationally. The aim of this study is to initiate a wider perspective on environmental regulation in rural areas and the relations with the social benefits for those who live and work in the areas and for those who use the landscapes for recreational purposes. Thus, the study seeks to:

- Broaden the discussion on the social value of the buffer zones and include other values than those presented in the Virkemiddelsudvalg's reports (Schou et al., 2007; Jensen et al., 2009)
- Investigate stakeholders' viewpoints on the values of the chosen local areas with different locational and landscape characteristics

Accordingly, the main assumptions that have guided the research are as follows:

- The extended buffer zones add significant value in terms of open space for recreational use, and this value is recognized by stakeholders.
- The buffer zones are enhancing aesthetic values of the nature/landscape for those who live nearby and hereby affect the property values positively.

This study rests on the foundation provided above, but attempts to increase the scope in the case of the two Danish locations with an address to the substantial international literature on economic valuation methods for the environment. The areas Ribe and Ringkøbing-Skjern are chosen as locations for an empirical investigation. After introducing the basic literature and research done in this field, both municipalities are introduced briefly. This section is followed by a summary of the guided interviews held with stakeholders in the project area. In section five, the hedonic price method is used to calculate revealed social preferences in general. The report finishes with a conclusion and discussion of the results.

2 Literature review

2.1 Valuations methods

Besides Cost-Effectiveness Analyses, Cost-Benefit Analyses are often demanded in order to evaluate the implemented or proposed policies from an economic view point. In order to carry out such Cost-Benefit Analyses, the benefits of the measure need to be determined. In the case of the buffer zone, the evaluated measure is the bundled good "nature", which not only depends on the definition of the content, but also provides different use options and therewith social values. Thus, besides the direct use option (e.g. recreation area, access to water streams), people may also derive social value from indirect use (e.g. ecosystem services in general, cleaner water in particular) and/or non-direct use (e.g. aesthetic value, option for future usage). For most of these social values there is no observed market price, so no direct value which one could use for estimating the cost-benefit of a given policy instrument. Therefore several valuation techniques have been developed over the years to provide decision makers with specific numbers indicating the price people are willing to pay (WTP) or are willing to accept (WTA) in order to(not) be provided with the good 'nature' (Dixon, 2008). WTA studies are generally applied to approximate the level of compensation to be paid to e.g. adjacent communities in case of natural deterioration (e.g. here the questions is how much one has to pay an individual for the loss of nature to be as well off as before). WTP studies, in contrast, seek to evaluate the amount people are willing to spend on the improvement of nature. These valuation techniques, which will provide decision makers with concrete numbers, can be roughly divided into *revealed preference methods* (i.e. observing the action taken by individuals) and *stated preference methods* (ask individuals directly about their preferences). The travel cost method and the hedonic price method are both examples of widely applied revealed preference methods. With the help of the travel cost method, the WTP is calculated by relating the expenditure (money and time) individuals bear in order to visit e.g. a specific site. The hedonic price method seeks to identify the effect of a change (positive or negative) in the area on the adjacent property values.

Stated preference methods are mainly based on the Contingent-Valuation Method (including the Choice Experiment method). Within this method, various scenarios are described to the respondents who are then asked to (in-)directly indicate their WTP for improvements in natural quality. Based on the individual WTPs, an average social value (expressed in monetary terms) can be derived, which indicates the benefits of a given policy.

Travel cost and the stated preference method are mostly employed if a specific area or good is the subject of the research. Thus, it is necessary to have a clear definition of the good (e.g. national park, endangered species or oil spill) which can be easily related to by the respondent. Contrariwise, the hedonic price method seeks to disentangle the WTP from the purchase of a bundled good in a more general setting.

Regarding potential drawbacks of these techniques, the stated preference methods are often criticized as being hypothetical in their nature (i.e. "cheap talk", neglects budget constraints of respondents), biased in favor of 'cute' endangered species (e.g. WTP for Panda bears is higher than for insects), providing a lump sum rather than an absolute number to be spent on nature conservation as well as having results that are restricted towards location, culture, situation, and therefore hardly transferable. In contrast, revealed preference methods can be employed more broadly if data is available, but are also based on some crucial assumptions (e.g. demand meets supply, demand is constant over time and linear). Hence, in the optimal case, both approaches should be jointly applied if feasible and suitable (Brookshire et al., 1982; Tietenberg/Lewis, 2011).

2.2 Valuations studies in Denmark

In the Virkemiddelsudvalg's reports, the cost-effectiveness (Schou et al., 2007; Jensen et al., 2009) and cost-benefits (Hasler et al., 2007) of different measures to be applied in the Danish River Basin Management Plans were evaluated. These reports base their calculation of the social costs and benefits of the discussed instruments on either experience values or stated preference methods carried out in the past on a specific location (e.g. Dubgaard, 1996 on "Recreation in Mols Bjerge") in Denmark rather than on general environmental improvement or degradation.

Regarding the social benefits of water mitigation measures, Danish studies encompass, for example, projects evaluations like the Skjern-River restoration (Dubgaard et al., 2001), the Randers Fjord (Atkins and Burdon, 2006) and the Odense River restoration (Jørgensen et al., 2012). These studies seek to assess the value the Danish population sets on water quality improvement by using stated preference methods. The latter found that the WTP for river restoration declines with spatial distance to the river in question. Moreover, trust in the given information on the water quality may drive the response in the former choice experiment (Kataria et al., 2012).

These studies consider specific cases and not a national policy. To measure the social benefit of the uniform buffer zones, a hedonic price approach (based on house prices) seems to be more suitable. One of the few and the first applications of the hedonic price approach in Denmark according to Møller et al. (2000) is Hjorth-Andersen (1976) on the effect of noise emission on house prices. He analyzed the effect of a new motorway on the value of 49 houses in a suburb of Copenhagen and reveals that house values decrease significantly with increasing noise emission. Another study on the relationship between noise emission and apartment prices in Copenhagen is conducted by Bjørner et al. (2003). By combining the hedonic price method with the contingent valuation method (i.e. revealed preference with stated preference method), they confirm that noise emission significantly reduces house prices, irrespective of construction measures (e.g. noise prevention) or full information of the buyer. Regarding natural amenities, Præstholm et al. (2002) investigate the Danish house owners` willingness to pay for proximity to forests with the help of a hedonic price method. This study concludes that Danish house owners are willing to pay a premium for being close to a recreational "forest" area (see also Ravn-Jonsen, 2005 for a similar argument on the drivers for the volatility of forest prices). A more recent hedonic price study for the city of Aalborg and the effect of green space on house prices is conducted by Panduro and Veje (2013). By differentiating between types of green space, this study finds that green buffer areas as such are unattractive, while lake view and proximity to parks are increasing house prices in the area.

However, to our awareness, no hedonic price approach for water quality improvement or riparian buffer zones has been conducted in Denmark so far.

2.3 International valuations studies

In an international context, the hedonic price approach has been widely applied and methodologically improved over the years in order to accommodate spatial effects and the non-linear function of house prices. One of the first empirical studies applying the theory of Griliches (1967, 1971) and Rosen (1974) was the one of Anderson and Crocker (1971), who observed a negative relationship between air pollution and property values/rentals. This early study is followed by intensive empirical research on the effect of close-by water streams or lakes on property values. Most of these studies differentiate between the aesthetic value, the recreational value and the value of improved water quality. In respect to the aesthetic value and recreational value, several studies have so far found that in general, view and proximity to lakes or rivers increases property values (e.g. Knetsch, 1964; d'Arge/Shogren, 1989; Kulshreshtha/Gillies, 1993), whereby Knetsch (1964) pointed out that the level of the effect of the proximi-

ty to water reservoirs on sales prices for land depends on the proximity to population dense areas and the amount of similar reservoirs nearby. Thus, prices generally underlie the principals of supply and demand of the recreational good "land close to water", but may also be subject to land management, sales policy and public access (Knetsch, 1964).

In order to derive the WTP for the recreational and aesthetic value of water bodies, different approaches have been taken. For example, incorporating spatial information, Cho et al. (2011) calculated that residential housing pricing in Knox County, Tennessee (USA) increases on average by about USD$491 when located 1 mile closer to a water body. However, this effect only holds true in their study for large water bodies that may offer beautiful scenic views (in particular in connection with parks), while small creeks or even lakes are calculated to create no or negative effects on house prices. Thus, distances as such only matter if recreational and aesthetic value is generated by the water body at the same time. An attempt to disentangle the aesthetic from the recreational value is provided by Lansford and Jones (1995). Based on a Box-Cox transformation of the house prices as well as differentiating between the distance to the waterfront (i.e. direct access to lakes) and bluff (i.e. no direct access due to cliffs, but best panoramic views), they estimate that in the Highland Lake area, Texas (USA), house buyers are willing to pay a premium of USD$59,826 for waterfront properties with direct access. This premium is reduced by about ten percent if no direct access exists (i.e. Bluff location); thus the view cannot totally offset the lack of access. Moreover, the premium for direct waterfront properties falls rapidly with distance until a distance of approx. 2,000ft., where the price drop slows down (i.e. hyperbolic price function). By comparing an actively managed lake reservoir in Indiana (USA) and a passively managed lake in Connecticut (USA), Muller (2009) reckoned that waterfront access provides a higher value than waterfront views or adjacency to a river area. Yet these values also differ between both regions such that one may assume that water management practice drives the results in his case. An opposite effect is detected for water streams by Netusil (2005), who estimated that a private stream within 200ft. of the property decreases sales prices by 2.8%, while being located within ¼ to ½ mile from a private stream raises sales prices by 1.84%. However, this result does not hold true for publicly accessible water streams.

One of the first empirical researches which incorporate the spatial dimension into the hedonic price estimation was Leggett and Bockstael (2000). Using sales prices of waterfront property in Anne Arundel County, Maryland (USA), they calculated the impact of the improvement in water quality on house prices and observed that a change of 100 fecal coliform counts per 100 mL (which is

their environmental indicator) is estimated to depress property prices by about 1.5%. Poor et al. (2007) performed a similar hedonic price study on residential property sales occurring within the St. Mary's River watershed in Southern Maryland (USA). For their study, annual averages for dissolved inorganic nitrogen and total suspended solids served as an environmental indicator. According to their estimation, an increase in total suspended solids of 1 mg/l reduces the sales price of a house within the watershed on average by about $1086, while an increase of 1 mg/l of dissolved inorganic nitrogen on average leads to a reduced house price of about $17,642.

So far, most studies only consider the proximity or quality of water bodies and in particular lake or beach regions, but do not consider the value riparian buffer zones may create. One of the few studies which seek to address this valuation created by riparian buffer zones is Mooney and Eisgruber (2001). Using market-assessed valuation data for single family residences and the proximity to riparian protection measures within the Mohawk watershed, western Oregon (USA), they estimated that although houses closer to water streams are on average 7 percent more highly valued, riparian buffer zones (on average ca. 9m wide) decrease the market value of the property by about 0.06 percent/foot. In other words, a buffer zone on the river which is 50ft. wide would reduce the market value of an average house by USD$ 4,650. They explain this result by the fact that these buffer zones are normally treed and therefore the visibility of the water stream is reduced. A second study which seeks to evaluate riparian buffer zones is Netusil (2006), who used sales prices for single-family residential properties close to the Fanno Creek Watershed in Portland, Oregon (USA). Differentiating between the kinds of wildlife habitat provided by the buffer zone and their riparian class, this study estimated a positive (decreasing) valuation for large forest patches, wetland areas, and large contiguous patches in uplands. The proximity to forest patches with low structure connector patches along streams and rivers, as well as semi-developed rivers accompanied by low structure vegetation and a forest canopy is, in contrast, estimated to decrease the sales price of the property. Hence, the coverage of the riparian buffer zone in this study seems to determine the valuation of the buffer zone. Bin et al. (2009) compared the effect of the introduction of a mandatory riparian buffer zone with data for the Neuse River Basin in North Carolina (USA). By disentangling the valuation for the pre- and post-buffer zone riparian area, this study concluded that although riparian properties achieve a premium on the housing market, the mandatory buffer zone implemented in 1997 had no significant impact on the value of the property in the researched time period (1992-2002).

In addition to studies of natural amenities and quality, Geoghegan et al. (1997) detect that individuals value the diversity and fragmentation of land use around their homes; open space in particular seems to be evaluated highly (Acharya/Bennett, 2001; Geoghegan, 2002). Kuminoff (2009) emphasizes the decreasing effect farming areas could have on house prices. However, this effect depends on the kind of houses and type of agricultural usage. Thus, open space as such, as well as environmental amenities do not necessarily raise house prices in any cases.

So far, all studies have been conducted for US cases, but no Danish application is known to the authors. This study seeks to disentangle the Willingness-to-Pay for the proximity to a water body and the area surrounding the water (riparian buffers as well as buffer zones around lakes). Therefore, the study is in the realm of research on riparian buffer zones, but also draws on the hedonic price approaches on the valuation of aesthetic and recreational values of water bodies. Moreover, this study is not restricted to a specific water basin but rather uses all property sales in the chosen Postal code area in the respective time period. Hence, the variation in environmental amenities surrounding the houses is increased while at the same time a potential selection bias is reduced. Additionally, the studies for riparian buffers mostly neglect the clustering of natural coverage. Thus, if the spatial autoregressive factor is considered at all, it is restricted on the independent variable sales prices but not extended on the independent variables. This might bias the results and will be considered in more depth in this study.

Due to resource and time constraints, this study uses guided interviews with potential stakeholders instead of stated preference methods in order to identify potential benefits and barriers towards the buffer zones in the social preference structure. These insights of the guided interviews are taken up specifically in the hedonic price method (i.e. revealed preference method) carried out for the two study areas in order to calculate the WTP for the policy instrument buffer zone.

3 Project area

It has been essential for this study to address the buffer zone situation in specific locations as there is a distinct lack of empirical evidence in the broader valuations. This is a combined study of guided interviews with stakeholders together with quantitative methods, and in order to undertake a feasible inquiry, it was decided to address and compare two study areas. As buffer zone regulations apply to nearly all municipalities in Denmark, any places outside the urban municipalities could have been selected. The Ribe area in Esbjerg Municipality and the Skjern-Tarm area in the Municipality of Ringkøbing-Skjern in the western part of Denmark were selected for the empirical part of the study. Figure 2 shows a map of the location of the study areas within Denmark (including rivers wider than 2.5m, main streets, and nature protected areas of importance in our study area).

It is essential that the two areas are similar enough in size and natural surroundings to be studied side by side, but still some differences prevail in structural characteristics. Both municipalities, and in particular the selected sub-areas, are regarded as peripheral (Ministeriet for By, Bolig og Landdistrikter, 2013). The population density is low. In terms of demography, the areas are to some extent disadvantaged with lower average incomes and levels of education. The employment is, however, favorable, and the areas have not been burdened to any significant degree by declining public and private services in the period since 2008. I might be considered a limitation that the study does not include case areas in the proximity of larger, urban areas, but the resources available for the study have not allowed a wider study. Such areas can be included in further research.

In terms of outdoor recreation it is essential to notice that both localities are on the west coast of Denmark, which is an area of considerable touristic importance. On the coast there are many summer cottages, which is of great important to tourism (Hjalager et al., 2009). Studies of tourism on the west coast demonstrate that tourists appreciate the seaside, but that they also look for experiences in the hinterland (Center for Kystturisme, 2013). Hiking and bicycling are popular activities (Larsen, 2010).

Over the years, both municipalities have worked intensively on improvements of the touristic and recreational infrastructure in the areas. Trails have been built, and many facilities have been established to increase the attractiveness and the functionality in nature areas.

Figure 2: Approx. location of study area within Denmark

The study areas in Ringkøbing-Skjern are located close to the Skjern River. This river is known as the largest river in Denmark, and in the 1960s, the lower 19 km were straightened and approximately 40km^2 of river valley wetlands were claimed for agricultural cultivation. Between 1999 and 2002, a large restoration project of this river valley was carried out, which was scientifically and publicly discussed in regards to its costs and benefits (see e.g. Dubgaard et al., 2001 and Pedersen et al., 2007). This restoration area is at the moment a Natura2000 site and was designated to be developed into Denmark's 4th National Park, Skjern Aadal (see Figure 3). Hence, this area has a history of publicly discussed land use conflicts, in particular between farmers and National Park developers. The designation as a National Park has not taken place, but the authorities have nevertheless worked on the provision of touristic infrastructures where possible. There is an ongoing discussion about the development of the area, which brings attention the natural attractions.

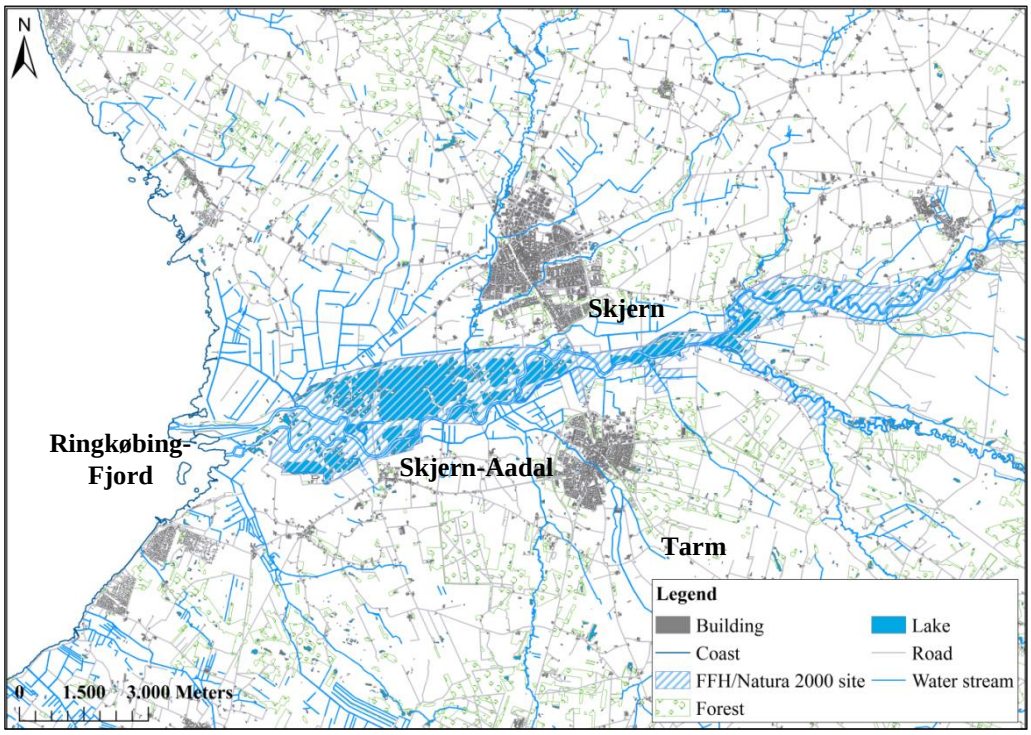

Figure 3: Map of Skjern and Tarm

Ribe is the second study area (incl. the Mandø Island), and it is also the location of distinctive natural advantages. Ribe is adjacent to the Wadden Sea National Park (see Figure 4), which is today a UNESCO World Heritage Site, the administration of which is shared with Germany and The Netherlands. There is an increased touristic interest in the Wadden Sea area, and the Ribe municipality is keen on exploiting this through the development of new facilities, guided tours, etc. Ribe's location in the flatland is spectacular, and there are to some extent trails developed that connect the town with the natural resources of the west.

In terms of tourism and habitation, Ribe and the towns in Ringkøbing-Skjern have somewhat different characteristics. Skjern and Tarm are small towns which had a role as railway towns and centers of some mainly local commerce. Both have experienced a significant development in manufacturing industries over time, and they are characterized by favorable living conditions. In terms of tourism, they are of minor importance, although they are locations where tourists go shopping on a rainy day.

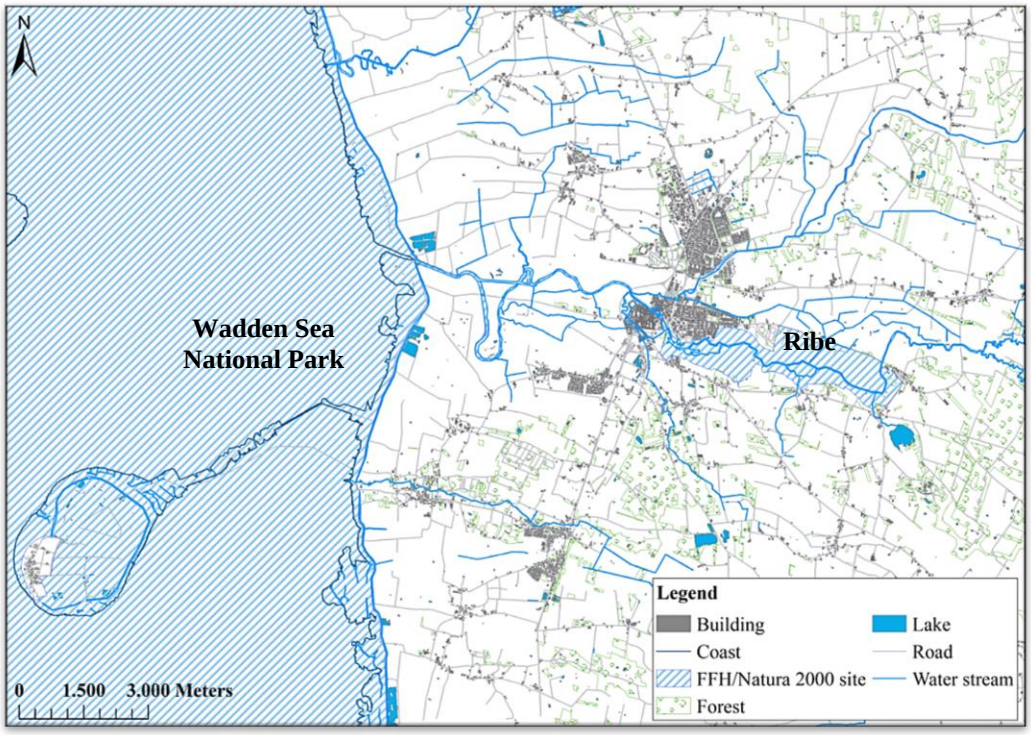

Figure 4: Map of Ribe

Ribe, in contrast, is Denmark's oldest town, and it has a medieval cathedral of significant importance and an attractive and well preserved medieval town center. Ribe has been a regional administrative center for decades and the location of some educational facilities. Due to the composition of job opportunities, Ribe has attracted a population of people with higher educations and higher incomes than Skjern and Tarm, among others, also due to its proximity to Esbjerg, the fifth largest city in Denmark, which also serves as employment opportunities for the inhabitants of Ribe. Additionally, Ribe is a popular tourism destination. In more recent years, Ribe has suffered from a decline in jobs in the public sector and there has been stagnation in the economic development.

4 Stakeholders' attitudes towards awareness and use of buffer zones

4.1 Introduction

The purpose of this section is to present the findings of the qualitative part of the study. As indicated in the introduction, interviews are used to acquire information for the valuation. As previously mentioned, Geoghegan (2002) concludes that individuals highly valuate open spaces around their homes. This inspires the qualitative approach of this study as it may be assumed that the implementation of buffer zones, and with this access to more open space, is regarded as beneficial by the individuals. Interviewing stakeholders provides an insight into their attitudes towards and awareness and use of buffer zones, which confirms or disconfirms the assumption.

Firstly, the method for the qualitative study is outlined. Secondly, the findings of the study are presented. In the last part of the section, a conclusion is drawn. The arguments of the conclusion create the base for the quantitative part of the study.

4.2 Methodological Framework

This section accounts for the methodological framework of the qualitative part of the project. It addresses the selection of interviewees, the formulation of the interview guides and the process of carrying out the qualitative study.

The qualitative study entails 11 interviews, carried out with actors representing various organizations between February and April 2013. Regarding the selection of stakeholders, 11 interviewees were chosen representing the following organizations: Danish Hiking Association[1], Danish Orienteering Association[2], The Danish Scout Association[3], Danish Ornithological Association[4], Denmark's Association for Nature Preservation[5], Denmark's Sports Fishing Association[6] and one kindergarten: Børnehuset Borris. The organizations were picked based on their profile of being active outdoor organizations, with the exception of the kindergarten. However, as kindergartens organize outdoor trips and activities, these are represented in this study as well. The assumption

[1] Dansk Vandrelaug
[2] Dansk Orienterings-Forbund
[3] Det Danske Spejderkorps
[4] Dansk Ornitologisk Forening
[5] Danmarks Naturfredningsforening
[6] Danmarks Sportsfiskerforening

is that the organizations' current usage of nature may be positively affected by the implementation of buffer zones as these constitute new areas for potential use. The stakeholders representing the organizations are chairmen, board members, group managers and one kindergarten nurse. The kindergarten nurse has the primary responsibility at Børnehuset Borris of arranging outdoor trips and activities. By inviting these different organizations, the study aims to provide a diverse response to stakeholders' perception of buffer zones and their potential.

The main findings of the 11 interviews are introduced below to present the reader with an overview of the results of the qualitative study.
Interviewees were not selected very specifically to represent the two areas in this project, but rather to identify which barriers exist in general for social acceptance and use.

Thus, the purpose of this part of the project is to outline the potential usage of buffer zones among different categories of actors. Organizations and institutions that focus on outdoor activities were thus selected and interviewees from these were identified by examining the organizations' structure through online research and thereby identifying relevant stakeholders. Board members and chairmen were prioritized as the assumption is that these persons are involved in both the outdoor activities as well as in the functioning of the organization, such as the planning of activities and political initiatives that may affect the organization.

After identifying the stakeholders, letters were sent with the purpose of inviting them to participate in the study. The benefit of using letters is multiple: The interviewees had time to read it whenever it was best for them and time to reflect upon participation. The letters were followed up by a phone call, asking the interviewees whether they would be interested in participating in the study. All recipients of letters agreed to participate. Then, a time and date for a phone interview was agreed upon and later carried out, structured around a semi structured interview guide. The interviewees are not anonymous, which was a decision made with the consent of the interviewees. Instead, abbreviations were used, e.g. RW, which are the first letters of the first and last name of the individual interviewees. This was done in order to be able to identify which organization the interviewee represents. When quotations are presented in this report, they are followed by the initials of the interviewee. See section 4.1 and further.
The choice of using phone interviews was made for practical reasons: The interviewees represent various organizations and are spread out over a rather large area: Viborg, Haderslev, Copenhagen; therefore much time would be used on transportation. The reason why the area is larger than the initial postal

areas is that some of the stakeholders are located in Copenhagen, though they represent organizations also located in the postal areas. This is the case, for example, with the organization Danish Hiking Association, where an interview was carried out with the national chairman, who resides in Copenhagen. As the object of the interviews was to examine attitudes towards buffer zones and to outline factual information on e.g. use of natural resorts, it was assessed that observing the physical expressions of the interviewees was not relevant. Rather, recording and transcribing their uttered statements would form a sufficient basis for this study. The interviews were all recorded with the consent of the interviewees and then transcribed.

Valuation studies in Denmark on the Danish population's valuation of water quality improvement have shown that proximity to the water areas and information on water quality are factors of importance (Kataria et al., 2012). Inspired by this, and by discussions among colleagues, the interview guide is semi structured around the following aspects: 1) Current use of nature, 2) Awareness of buffer zones (and regulation), 3) Attitudes towards buffer zones (and regulation), and 4) Actual use – or potential use – of buffer zones. These aspects are considered to be of relevance to all stakeholders, and they are thus incorporated into all interview guides. The interview guides were then adjusted to each stakeholder and were formulated differently, according to the interviewees' background and organizational/institutional belonging.

4.3 Main findings

The findings presented in the following are structured as follows: 1) Use of nature, 2) Awareness of buffer zones, 3) Attitudes towards buffer zones, and 4) Use of buffer zones. This structure is consistent with the framework for the buffer zone interview which is described in section 4.2.

4.3.1 Use of nature

The interviewees selected for this project all represent organizations/institutions with activities based in nature, e.g. orienteering, hiking and ornithology. Accounting for the current use of nature among the actors is relevant to understand the actors' approach to nature, their view on buffer zones and thoughts on using buffer zone areas for their respective activities. One of the interviewees, RW, uses nature in her daily work as a kindergarten teacher, as outdoor trips are arranged for 16 children and two kindergarten teachers each day – except Fridays (RW). Interviewees from Dansk Orienterings-Forbund (Danish Orienteering Association) and Dansk Vandrelaug (Danish Hiking Association) make use of natural resorts on an average of once

per week. They use different kinds of natural resorts as the interviewees from the Danish Orienteering Association primarily arrange orienteering in forests and plantations whereas hikers also use other areas such as fields (NA).

Danish Ornithological Association is represented in this project as well as two interviews were carried out with actors from the association. According to the interviewees, they use natural resorts of various kinds, e.g. lake areas, and once per month, a counting of different bird species is carried out (JL). When rare bird species are being observed, it may result in visits by up to 500 ornithologists to the areas in just a few days (JL). Interviews were also carried out with The Danish Scout Association and Denmark's Sport Fishing Association, where the results indicated that they use nature on a regular basis, whenever the weather allows. The Scout Association also arranges weekend and hiking trips (MH).

The interviewee from Denmark's Nature Preservation Association was not specific on the actual usage of nature but stressed the fact that one purpose of the Association is to suggest walking paths in nature areas (VK). Examining the website of the Association, it is evident that information on climate, the environment and nature are essential parts of the work of the Association. Links to outdoor activities are provided as well, yet they appear after links to environmental and climate related issues, demonstrating that the specific usage of nature may not be the first priority of the Association[7].

4.3.2 Awareness of buffer zones

The interviewees were asked if they had heard of buffer zones and if so, how, with the purpose of outlining the level of awareness among actors of outdoor activities. With the exception of RW, the interviewees had all heard of the implementation of buffer zones, mostly through the media, and some of them had also searched for information on the subject on the website of Naturstyrelsen (JL), and through their voluntary work in the organization (MB). During the interview, RW mentioned that she had discussed buffer zones with her neighbor, a farming assistant, indicating that she was aware of the subject:

> Altså, vi har i hvert fald ikke hørt det herude ved os. Når du nu siger, hvordan det er, så har jeg hørt lidt om det, fordi min nabo han er landmand, eller landbrugsmedhjælper og sådan noget, så jeg har det nok lidt fra hans side, at han synes, det er noget træls noget, hvor jeg så siger 'arj, det kan altså godt være godt nok'. (RW)

[7] http://www.dn.dk/

Well, we have definitely not heard about it around here. Although, now that you've explained it, I have in fact heard a bit about it because my neighbor is a farmer or an agricultural worker or something like that, so what I know I have from his perspective and he thinks that it's irritating, to which I reply 'ah, it's probably a good thing after all'. (RW, free translation by authors)

One of the interviewees had also discussed it with farmers (MH), another received information on buffer zones from his organization (KS) and one through Friluftsrådet (the Outdoor Council) (OB). For some of the interviewees, the debate on buffer zones is a subject they had heard of but which had not caught their interest as they do not consider themselves to be affected by it since they presently do not practice their sport in buffer zone areas:

Ja, det er mest dér i avisen, ja (…) det berører nok ikke orienteringsløb så forfærdeligt meget, fordi vi løber kun i skovene. Og vi laver ikke løb ude på nogen marker eller et eller andet tilfældigt sted. Fordi inden vi kan lave et løb, så skal vi jo have kortlagt området, og det er alt andet lige, sjovere at løbe i en skov, end det er at løbe på en mark. Det er altid skov, man anvender til orienteringsløb. (JA)

Yes, it is mostly there in the newspapers, yes (…) It doesn't affect orienteering very much because we only run in the forests. And we don't run in the fields or other random places. Because, before we can arrange a run, we have to map out the area, and besides, it's more fun to run in the forest than to run in a field. It is always forest that is used for orienteering. (JA, free translation by authors)

In addition, one of the interviewees is aware of the fact that the implementation of buffer zones is a result of complying with the EU Directive 2000/60/EU. However, she was the only one of the 11 interviewees to mention this dimension of the buffer zone discussion:

(…) sådan som jeg har forstået sagen, så er det et spørgsmål om at få nogle gødningsfri zoner, der kan hjælpe med til rensningen af det vand, der siver ud i vandløbet, sådan at vi ikke får så mange sprøjtegifte ud i vandløbet, ja, beskyttelse af vandløbet, ikke. Og det.. Hvis ikke vi gør det her, så får vi altså en retssag fra EU, der er ikke noget at gøre andet end at se at få dem implementeret eller finde på noget, som er endnu bedre. Og som det er nu, så er der ikke nogen bedre forslag på banen, så det er bare om at få dem lavet, altså. Så må man finde noget andet til erstatning for dem, hvis det er det, man vil, ikke, men i første omgang skal de være der. Det er min helt klare holdning. (VK)

(…) as far as I understand the issue, it's a question of having some fertilizer-free zones that can help to purify the water that seeps into the streams so that we don't have so many pesticides in the streams, yes, protection of the water, yes. And, if we don't do that, then we will be faced with a lawsuit from the EU. There is nothing we can do but to implement [the directive] or come up with a better solution. And as of now there aren't any better alternatives, so we just have to do it. A different solution needs to be found, if that's the route we want to take, but for now they just have to be there. That is certainly my opinion. (VK, free translation by authors)

4.3.3 Attitudes toward buffer zones

Examining the interviewees' attitudes toward buffer zones offers an indication on how these actors of outdoor activities perceive nature, nature preservation and the usage of natural resorts. The interviewees are all positive towards the implementation of buffer zones as they consider the zones to be a means to improve and preserve the environment. Others also stress the potential of using the buffer zones for outdoor activities:

Jeg synes, det er en god ting, at det er kommet. Det giver os nogle muligheder for at komme lidt mere på kryds og tværs af naturområder, hvis vi har en randzone, vi kan følge også. Vi ville jo også meget gerne have lov til at gå langs med levende hegn, men det må vi ikke, som det er. Det kunne være en dejlig ting. (OB)

I think it's a good thing that it's here. It gives us an opportunity to move around more in the nature areas if we have a buffer zone that we can walk along as well. We would also like to be able to walk alongside the hedges, but we are not allowed to do so as things are now. That would be a nice thing. (OB, free translation by authors)

Altså, generelt vil jeg sige, at jo flere steder, man må færdes i naturen, jo bedre, set fra mit synspunkt. Og jeg kan ikke se, at der er den diskussion af hensyn til miljøet, om det er en fordel eller ej, det har jeg svært ved at afgøre. (EJ)

Well, generally I would say that the more places one can enjoy nature, the better, in my opinion. And I cannot see that there is a discussion of considering the environment, whether or not it's an advantage it is difficult for me to decide. (EJ, free translation by authors)

Others consider the buffer zones to be a plausible way to preserve nature, yet they argue that 10 meter buffer zones constitute a large area of farmers' land and express an understanding for a negative attitude among some farmers:

> Lige det dér med randzoner, der har jeg nok lidt et ben i begge lejre, fordi, jeg synes, vi skal jo også passe på et af de erhverv som vi alligevel har, der har en vis indtjening og. Og så alligevel, ikke, så skal vi også passe på vores natur. (JA)

> *Concerning the buffer zones, I am probably a bit torn because I think we should also take care of those trades that we already have which have certain earnings. And then again, we also need to protect our nature.* (JA, free translation by authors)

> Det er faktisk kun nogle dage siden, hvor vi var ude og gå, og så sagde jeg 'det er godt nok også et stort område, kan man sige'. Ti meter, det er alligevel meget, det er jo meget jord, der pludselig ikke må dyrkes mere. Det er egentlig det, man ligesom har diskuteret, og man forstår jo egentlig godt, at landmændene sådan prøver at protestere, ikke. Altså, fordi dem som jo har meget jord, så bliver det jo meget i det hele taget. (NA)

> *Actually, just a few days ago we were out walking, and I said 'it's a fairly large area'. Ten meters, that is actually a lot of land that can't be cultivated anymore. And that is actually what has been discussed and it's understandable that farmers are trying to protest. Well, because for those who have a lot of soil it adds up to a lot.* (NA, free translation by authors)

> Sådan som jeg husker det, så er det jo både noget med at få beskyttet vandløb og så netop muligheden for, at man kan komme rundt på arealer, der ikke er så nemt tilgængelige, og det synes jeg, det er jo rigtig, rigtig fedt. Man kan så sige, at hvis det er rigtig sådan med at det er alle, også mindre vandløb, hernede i vadehavsområdet, der har vi nogle udfordringer, fordi der er mange af de her gravede kanaler for netop at afvande marsken. Så der kan man faktisk risikere, at det meste af landmændenes jord forsvinde. (MH)

> *As I remember it, it has something to do with both protecting the water streams and the opportunity to get around in these areas that are not easily accessible, and that is really, really great, I think. One could also say that if it's really all streams, even smaller ones here in the Wadden Sea area, then we are facing some challenges as there are many of these dug out channels to drain off the marsh. Then the farmer's actually risk losing most of their land.* (MH, free translation by authors)

The aspect of nature preservation versus the usage of natural resorts was also touched upon by one of the interviewees:

> (…) det er helt fint, at man laver en dyrkningsfri zone, som er med til at begrænse forureningen og udvindingen af næringsstoffer og alt det der, det er der i høj grad brug for (…). Men det er et stadigt slagsmål, som kører mellem de to fænomener, der hedder naturbenyttelse og naturbeskyttelse. Fordi der er ingen tvivl om, at sådan nogle randzoner, for eksempel langs vandløbene, vil give nogle fremragende spredningskorridorer for dyr, både fugle og andre dyr, insekter, planter og så videre. Og så kommer spørgsmålet om graden af forstyrrelser så ind i billedet, jo. Det er altid en balance. (JL)

> *It is fine to create a cultivation-free zone which would help limit pollution and the extraction of nutrients and all that, which is highly needed. But it is still a struggle between two phenomena, which are the use of nature and the protection of nature. Because there is no doubt that such buffer zones, for example alongside the water streams, would create some great growth corridors for animals, birds and other animals, insects, plants and so on. And then the question of the degree of disruption comes into the picture. There's always a balance.* (JL, free translation by authors)

> Ja, altså, vi er positive over for det her initiativ og bakker op om randzonerne, det gør vi. (…) vi er også af den holdning, at færdsel for en hver pris alle steder, det kan også være et problem. Altså, for eksempel nu med alle de havørnepar, vi har fået rundt omkring i landet de sidste 15 år, der yngler langt hovedparten af dem i privatskov. Og det er simpelthen fordi, eller det kunne man foranlediges til at tro, at i private skove, der skal du gå langs veje og stier (…). Og i statsskove, der kan man gå over det hele, ikke også, og det kunne det her mønster omkring havørnenes vaner godt være et tegn på, at det betyder altså noget, at vi sådan har fri fladefærdsel, som det hedder. (MB)

> *Yea, I mean, we are positive about the initiative, and we support the buffer zones, we do. We are also of the opinion that traffic at all costs everywhere may also be a problem. For example, with all the couples of white-tailed eagles that we have had in the country for the last 15 years, the majority of the couples breed in private forests. And that is simply because, or you could be led to believe that it is because, you have to follow roads and paths in private forests. And in state forests, you can walk anywhere, right? And this pattern of the white-tailed eagles might indicate that having free access, as it's called, does matter.* (MB, free translation by authors)

The quotes above reflect various aspects of the buffer zone discussions, indicating that though the interviewees generally agree that buffer zones help to improve the water quality, they prioritize the potential of buffer zones differently. Some consider it to be a benefit for their organization, others argue that the discussion of nature usage and nature preservation must be had in order to preserve wild life, and some argue that farming as an occupation must be protected.

4.3.4 The use of buffer zones

In the following, the interviewees' viewpoints on the potential use of the buffer zone areas are outlined. Some consider it to have great potential, others are more reluctant and argue that the buffer zones may have no or very limited significance due to the nature of the interviewees' outdoor activities. Firstly, the potential of buffer zones according to the interviewees is outlined.
Being introduced to the physical dimensions of the extended buffer zones (10 meters), RW responded positively as she considers them to constitute increased security for doing outdoor activities near lakes and rivers with the kindergarten children:

> Det der er, at så bliver det mere legalt at tage en tur rundt. Altså, der er mere plads. Vi skal heller ikke.. Hvis nu.. Altså, man kan jo næsten ikke engang gå langs en å i dag, vel. Men hvis der bliver det, og man alligevel kan trække noget væk, at man ikke lige skal gå én meter derfra, så bliver det jo nemmere, og man er mere tryg ved at gå langs åerne. (RW)

> *The thing about it is that it will be more legitimate to take a walk around. I mean, there is more room. I mean, you can barely even walk along a stream today. But, if it becomes possible and you can move a bit away so that you don't have to walk only a meter from [the stream], then it will be easier and you would feel safer walking along the streams.* (RW, free translation by authors)

MH, leader of the scout group in the Ribe area stated that the buffer zones may lead to an increased area for field trips. Others expressed similar considerations on the potential usage of buffer zones:

> Det kunne jeg godt. Vi laver jo af og til ture rundt omkring, vandreture og sådan noget lignende, og man kan sige, at hvis mulighederne er større for at gå igennem et område, hvor man normalt ikke kan gå, hvor man skal uden om, jamen, så kunne det jo give nogle spændende oplevelser at gå nogen steder, hvor man ikke sådan lige naturligt kommer. Så på den måde

kunne det sagtens blive en del af planlægningen om, hvor man lægger vandreture, weekendture, hike og lignende. (MH)

I could. Every now and then we plan trips, hiking trips and such, and one might argue that if the possibilities increase for access to areas where one normally cannot hike, well, then it provides for some exciting experiences to walk where one does not normally walk. So in that respect it could easily be part of the planning of where to arrange the hikes, weekend trips and the like. (MH, free translation by authors)

Jo, men jeg kan ikke se andet, end at det giver en mulighed for os. Hvor meget man så vil bruge det rundt omkring, det. Jo, men det vil man garanteret, for vores turledere, de leder altid efter nye muligheder. Vi har 500 turledere i hele landet. Vi laver en 1700-1800 vandreture om året i Vandrelauget, så der er da rigtig meget. (OB)

Yes, I cannot see that it should be anything but a possibility for us. How much one might use it, well. I'm sure people will because our trip organizers, they are always looking for new opportunities. We have 500 trip organizers in the country. We organize 1700-1800 hiking trips annually in the Hiking Guild, so that is quite a lot. (OB, free translation by authors)

Ja, men jeg har altid syntes, det var en god idé, det må jeg sige. Specielt, at der gives offentlig adgang, fordi det vil være noget, vi kan bruge som vandreorganisation (…). Jamen altså, vi vil jo gerne kunne gå så mange steder som muligt, og jeg kommer jo her fra Viborg, hvor der er mange statsarealer, som vi kan gå på. Men det er jo ikke alle private lodsejere, som er interesserede i at vi går i deres områder. Og det ville da være dejligt, om der blev flere og flere muligheder for at gå rundt i naturen. (EJ)

Yes, I can say I've always thought it was a good idea, especially that the public be granted access because that will be something we as a hiking organization can make use of. Well, we would like to be able to hike as many places as possible, and I am from around Viborg where there are many state areas we can make use of. But not all private land owners want us walking in their areas. And it would be nice if there were more opportunities for walking in nature. (EJ, free translation by authors)

Yet, as mentioned, some of the interviewees are more reluctant as to the potential usage of buffer zones. NA, vice chairman of Ribe Orienteering, argued that buffer zones may have no relevance to orienteering as they mostly plan orienteering in forests and plantations:

> Nej, det kan jeg ikke tro, fordi, altså, det foregår jo mest i plantager og skove, og det vil sige, at hvis vi bruger en mark, kan man sige, så er det jo mest til dét, vi kalder en stævneplads eller til parkering, så vi kommer jo slet ikke i karambolage med det, hvis man kan sige det sådan. (NA)
>
> *No, I don't think so, because, well, it mostly takes places in plantations and forests, and that means that if we use a field, you could say that it is mostly for what we call a gathering area, or we use it for parking, so we wouldn't really ever be involved in it, if you can say it that way.* (NA, free translation by authors)

Though MH is positive towards the potential usage of buffer zones, she also pointed to the fact that lack of knowledge and awareness of the buffer zones may lead to people sticking to the areas they are familiar with, thus limiting the potential use of buffer zones:

> Jeg tror ikke, det bliver den store forskel, og jeg tror, det skal være noget, vi skal være bevidste om for at vi kan bruge det, for ellers er det jo tit, at så bruger man de kendte stier og kendte områder. Så det er noget med, at hvis man skal ud i lidt mere ukendt område, at så tænker man, hvad er mulighederne her? (MH)
>
> *I don't think it will make that big of a difference and I think it's something we need to be aware of if we are going to use it, otherwise it's often the known paths and areas we use. So it's something like if you want to go out into a more unknown area, you think "what are my options here?"* (MH, free translation by authors)

Other interviewees pointed to the fact that physical access to the areas is of importance, .i.e. that, for example, walking paths are necessary in order for them to use the areas:

> Jeg ved ikke, jeg tror simpelthen ikke, i hvert fald herud omkring, at det ville blive meget brugt. Vi vil jo alle sammen gerne ud i naturen, men hvis vi selv skal kæmpe os frem på nogle stier, så er vi måske ikke så villige til det, og vi har jo masser af skov og steder langs vandløb, man kan gå på stier, som er der i forvejen. (KS)
>
> *I don't know, I simply don't think, at least not around here, that it will be used much. We would all like to be in nature, but if we have to fight our way through some of the paths, then we are not as inclined to do so, and we already have tons of forests and other areas alongside streams where we can walk on already existing paths.* (KS, free translation by authors)

(…) altså, nu har de lavet en bro nord på, og dér har de lavet en vandresti ind i randzonen, så vidt jeg kunne forstå, og så kunne det måske godt, men det ved jeg ikke om man må (…). Så kunne det jo godt være opløftende, hvis man kunne lave stier i det. Hvis vi ikke kan gå i det, så har jeg jo ikke ret meget hverken (…) lystfiskerne bruger allerede randzonerne til at gå på, og det gør de i meget stort omfang, og det gør de også i Skjern Å. Og de kan slet ikke undvære den. Og det er endda sådan nede ved Skjern Å, at nogen af lystfiskerne, og det er nemlig problemer med de randzoner, de vokser til. De springer i skov. Og staten har en meget stor del af arealerne i Skjern Å, og det vil sige også åbredderne, og der kommer faktisk nogle af Naturfredningsforeningsfolkene, de går faktisk og fjerner vækst, altså fjerner skove, træer og så videre for at man overhovedet kan komme ned til vandløbet. … Altså, der er en problemstilling omkring, at det springer i skov. Det er den ene ting, og den anden ting er, at der er en problemstilling omkring hegning. Vil folk så gå langs med åløbet, hvis ikke der er et hegn, sådan at de kan gå uden for hegnet? (VK)

Well, now they have built a bridge up north, and they have made a hiking path in the buffer zone there, as far I understand, so it might be possible, but I do not know if you're allowed to. It might be exciting if you could make paths there. If we cannot walk there, then I don't have much… The anglers use the buffer zones for walking and they do it quite a bit, also in Skjern Å. And they cannot do without it. And it is also like that by Skjern Å that some of the anglers.. and that is the problem with the buffer zones, they sprout up. And the state has quite a lot of the areas at Skjern Å, including the stream banks, and some nature preservation people come and they actually remove some of the plants, so that they remove forests, woods and so on so that it is even possible to come down to the water stream. Well, that is a problem, the sprouting. That is the one thing, and the other thing is that there is a problem concerning fencing. Will people then walk alongside the small stream if there is not a fence so that they can walk on the outer side of the fence? (VK, free translation by authors)

I mange tilfælde vil det her være ret ufremkommeligt, ikke? Altså, hvis ikke, der bliver græsset af eller slået hø helt ned til bredden, så bliver det ikke verdens nemmeste terræn at færdes i. Så sagt med et glimt i øjet, så Hr. og Fru Danmark, de vil ikke gå søndagstur dér, vel. Men i det øjeblik, at der er nogen, der etablerer en sti og sådan noget på jorden, jamen, så ved man jo også, at så bliver folk jo også der. Det fungerer ganske fint. Og i det øjeblik, der så er truede ynglefugle på jorden, jamen, så kan man jo lave nogle foranstaltninger. Det gør man jo også andre steder. (MB)

In many cases it will be pretty impassable, right? So, if it will not be grazed or cut down, then it will not be the easiest terrain to get around in. Said with a twinkle in one's eye, then Mr. and Mrs. Denmark will not go out for a Sunday stroll there. But in that moment that someone establishes a path and such on the land, well then you also know that people will stay there. It works out quite well. And in that very moment that endangered breeding birds are on the land, then precautions must be taken. But that is also done other places. (MB, free translation by authors)

Jeg ville da håbe, at kommuner ligesom ville tage den til sig og så sige, jamen måske i samarbejde med nogle lokale interesser, at nu kunne man måske lave en sti her fra A til B langs den å, som vi ikke har kunnet før. Der er mange muligheder, og der er jo også mulighed for at søge penge til at få det gjort, det ved jeg. Der er flere fonde og ting og sager, der godt ville sponsorere sådan noget, så det vil jeg da nok håbe, at det går den vej rundt, at der ligesom officielt, måske bliver lavet nogle steder, hvor det også i praksis kan lade sig gøre at komme hele vejen fra et sted til et andet, for man skal jo hjem igen. Vi vil jo gerne lave nogle ture, hvor man ligesom kan gå frem og rundt og ikke skal tilbage samme vej. (EJ)

I would certainly hope that municipalities would embrace it and then say, well maybe in cooperation with local interests that now one might be able to make a path from A to B alongside this stream, which we haven't been able to do before. There are so many opportunities, and there is also an opportunity to apply for funding to get it done, that I know. There are several funds and such which would be happy to sponsor something like that, so I would certainly hope that it will progress in that direction so that officially, paths will be built where it is possible to go all the way from one place to another because you need to get home again. We would like to make t some trips where it is possible to go all the way around so that you don't have to go back the same way. (EJ, free translation by authors)

JA from Haderslev Orienteering also expressed that buffer zones constitute a limited resource for activity:

Det er selvfølgelig svært at sige, altså, det vil i hvert fald have meget minimal indvirkning på vores aktivitet. Det kan jeg sige med sikkerhed. Og det er slet ikke noget, vi har haft oppe og drøfte over hovedet, fordi det berører os stort set ikke. (JA)

It is of course difficult to say, well, in any case it will have minimal effect on our activities. That I can say for sure. And it is definitely not something

that we have discussed as it doesn't have anything to do with us. (JA, free translation by authors)

He further argued that the nature experience of walking in buffer zones may be rather trivial:

> Jeg kan jo også bare se for mig enormt mange områder, hvor det bare vil komme til at ligge hen. Der vil jo aldrig komme et øje. De kæmpestore markområder vi har hernede i det sønderjyske, det er jo så fladt, og du kan jo se ti kilometer i hver retning, der er ikke et træ eller en knold på jorden. Altså, det er jo ikke sådan et sted, hvor det er spændende at lave en vandretur. Det ville da være lidt trivielt. (JA)

> *I just imagine an enormous amount of areas where it will just be left to be. No one will ever come there. Those giant fields we have down here in southern Jutland, it is so flat that you can see ten kilometers each direction; there isn't a single tree or knoll. So, it is not such a place where it would be exciting to organize a hike. That would be a bit mundane.* (JA, free translation by authors)

4.4 Summary

Most of the interviewees consider buffer zones to be a benefit to them, their organization and institutions. It is argued that easy access to the buffer zones is essential if the public is to use these areas. Evidently, this positive appraisal is a consequence of the nature of outdoor activities represented by the respondents, and the view may not be fully and uniformly shared by persons who are not into outdoor sports and activities. However the respondents can be considered "first movers" for leisure and tourism trends.

Thus, the respondents claim that information on the areas may create knowledge and awareness, spurring the public to make use of these new areas. A theme of special interest in regards to this report is the interviewees' awareness of the buffer zones combined with their usage of the areas. Though the interviewees are aware of the political debate and implementation of the buffer zone areas, not many have made use of them. Knowledge on existing hiking paths and fields spurs the interviewees to maintain the usage of current paths, fields and areas. As some of them mentioned, more information on where the buffer zones are located and how they can be used may lead to an increased usage.

5 Revealed Social Preferences

5.1 Introduction

In the first part of the study, guided interviews were conducted with potential stakeholders (see chapter 4). Most of the interviewees formulated positive attitudes towards the introduction of the extended buffer zones, although they had not used them up to that point or to any considerable extent. One barrier to the potential usage was the limitation of access due to knowledge or geographic restriction, the latter due to the fact that there are often simply no paths or trails into the buffer zones.

In this chapter, a revealed preference approach is applied in order to be able to generalize the findings and examine in more detail whether these formulated opinions of the interviewed stakeholders are backed up by the publicly revealed preferences. One may assume a difference in attitude between organized stakeholders and private inhabitants of the area. After describing the hedonic price approach in more detail, the data used for calculation is introduced. In section 5.4, the regression results are presented and discussed. The section concludes with a brief discussion on the limitation of the results.

5.2 The hedonic price theory and method

The hedonic price approach draws on the theory of revealed preferences – revealed in the activity of buying e.g. a house. A house is in this sense a good with a bundle of characteristics (e.g. size, material quality, age, design). Besides these 'individual' characteristics of the house (*S*), additional surrounding factors may also support the decision of the individual to buy this specific house for this price. As mentioned above (section 1.4), these additional surrounding factors may be (1) economic/social (*L*): e.g. positive: distance to place of employment, public transport facilities, and/or negative: closeness to street noise/emission, crime; (2) natural (*N*): e.g. positive: distance to beach and recreational areas, negative: closeness to waste site, windmills (not in my backyard); and (3) aesthetic value (*F*) which is created by the natural fragmentation of the surrounding area.

$$P = P(S, L, N, F) \tag{1}$$

As a house is a bundle of goods, the buyer always faces a trade-off between these different characteristics. The actual buying decision should reflect the preference ordering of the different characteristics within the price (i.e. WTP).

The hedonic price method seeks to disentangle sales prices for houses on the market into WTPs for different characteristics of the houses as well as neighborhood characteristics and if possible, controls for the individual characteristics of the buyer (e.g. income, age, family status). As the individual buyer data are not known here, we use a simplistic version of the method by disentangling the prices of houses with the help of a linear regression model on the form (based on Gibbons et al., 2011):

$$P_{it} = \alpha + \beta_1 S_{it} + \beta_2 L_i + \beta_3 N_i + \beta_4 F_i + \beta_5 T + \varepsilon \quad (2)$$

where the dependent variable (P_{it}) is the sales price of house *i* at the *t* time of sale, while S_{it} is the vector of the structural characteristics of house *i* at the time of sale (e.g. building size, number of rooms, number of bathrooms, age); L_i indicates the locational characteristics of house *i*, such as distance to economic variables - e.g. transport infrastructure (public transport, motorway etc.), distance to service provisions – e.g. hospitals and schools, and distance to a labor market, etc.; N_i denotes the vector of the neighborhood characteristics, in our case: the natural amenities (e.g. proximity to recreational facilities and buffer zones); while F_i captures the aesthetic value derived from the natural fragmentation around the house. *T* is a time dummy which captures exogenous unobserved developments in the housing markets in the respective year of sale and β_1, β_2, β_3 and β_4 are the coefficients for the structural, locational, natural and aesthetic attributes. Finally, the unobserved components are included in the error term ε.

Based on the assumption that the supply of houses meets the demand of houses in the given area, and at the same time the house purchaser maximizes his utility in this purchase given the available budget and the range of choice available, the partial derivative of the estimated price function (2) will yield the marginal implicit price of the attribute in the estimation. Hence, $\beta_b = \frac{\partial P}{\partial b}$, which is the marginal willingness to pay (MWTP), i.e. the benefit of a one-unit change in the distance towards the buffer zone (*b*), ceteris paribus (Mooney and Eisgruber, 2001).

To derive the average WTP for the implementation of the buffer zones, the marginal implicit price is derived from the following under the assumption of a constant WTP function:

$$WTP = \frac{\partial P}{\partial b} \bar{P}_{it} \quad (3)$$

One critical point in this approach is the underlying form of the price function assumed in the regression model. While some authors claim that a Box-Cox transformation would lead to a more appropriate estimation (e.g. Lans-

ford/Jones, 1995; Mooney/Eisgruber, 2001), the majority of studies use the natural logarithm as the functional form to be estimated as it is simpler to interpret, mostly reflects the price function as well as the Box-Cox transformation, and disturbances due to spatial autocorrelation can be corrected (Muller, 2009; Cho et al., 2011). Regarding spatial autocorrelation, while Acharya and Bennett (2001) found in their dataset no significant spatial autocorrelation which might bias the estimation results (Anselin, 2001), Kadish and Netusil (2012) detected within their dataset some spatial autocorrelation which, according to tests, are captured best by a spatial error model. Bin et al., (2009) do not report any test results for spatial autocorrelation but rather apply the spatial error correction in their estimation. Examining our dataset (explained in detail in the next section), the test for global spatial correlation (in detail: Moran's I & Geary's C) displayed significant results. Hence, the sales price of house *i* is influenced by the sales price of the neighboring house *j*. Given these high z-scores of Moran's I, the likelihood that this clustered pattern could be the result of random chance is less than one percent. Thus, the above mentioned simplistic hedonic price approach needs to be extended towards a spatial regression model and should also incorporate the natural logarithm of the price function.

Following Elhorst (2010), further tests were undertaken to specify which spatial model would best reflect the detected spatial correlation in our sample data. Applying the robust LM-tests (see Anselin et al., 1996), the simple linear model (i.e. Ordinary-Least-Square [OLS]) as described in equation 2 was rejected in favor of a spatial lag or spatial error model. After Estimating the spatial Durbin model as well as calculating the likelihood ratio (LR) test the spatial lag and spatial error model were rejected in favor of the spatial Durbin model. This model is computed as follows:

$$Y = \rho WY + \alpha\tau_N + X\beta + WX\theta + \varepsilon \tag{4}$$

where Y denotes the dependent variable (i.e. natural log of sales price), WY is the spatial lag of the dependent variable, ρ is the spatial autoregressive coefficient, τ_N refers to the constant term, α,β are the associated estimated coefficient vectors, and X denotes the exogenous independent variable. For simplicity in display, X here is the combined vector of the above mentioned independent vectors S_{it}, L_i, N_i, F_i and T. WX are the spatially lagged independent variables, θ the fixed but unknown parameters, and ε the error term.

In order to estimate the effect of the introduction of the buffer zone on house prices, two additional dummy variables are implemented: (1) D^r shall capture the time-invariant effect of having a water stream on the property, and (2) $D^b_{>2008}$ shall capture the effect of the introduction of the buffer zone if the buffer zone is on the lot and the property sold after 2008 (see Bin et al., 2009).

All independent variables enter into the regression as a natural logarithm (except the dummy variables). Therefore, coefficients here need to be interpreted as change in percent. Variables were regressed step by step if was to be expected that multicollinearity would bias the estimation (i.e. if the Variance Inflation Factor scores above six following Hill and Adkins, 2007). Moreover, heteroskedasticity is controlled for by estimating the robust standard errors.

As the spatial Durbin model incorporates a spatial weighting matrix on the dependent and independent variables, estimation is time and computational capacity consuming. In the following, both municipalities will be calculated separately based on the assumption that there is no or at least a negligible interdependence between the house prices in Ribe and Skjern/Tarm. Thus, the size of the weighting matrices will be reduced significantly and with this, the computational effort. As spatial weight matrix (W) serves an inverse distance matrix (i.e. $W = 1/d_{ij}$ with d as distance between house i and house j), which is row standardized (i.e. takes the interval $(w_{min}^2, 1)$). Thus, it is assumed that the price of house i has an impact on the price of house j, and the other way around. This impact is declining linearly with increasing distance between houses i and j.

Due to this imposed spatial interaction, the MWTP cannot be derived directly from the estimation coefficient but needs to be adjusted for the spatial multiplier effect, i.e. direct and indirect impacts created by the spatial autocorrelation (following LeSage/Pace, 2009).

5.3 Data

As mentioned above, postal code areas were employed in the quantitative analysis instead of restricting data to a water basin area. Thus, data was collected in the municipality Ringkøbing-Skjern for Skjern (Postal code 6880) and Tarm (Postal code 6900), and in the municipality of Esbjerg for Ribe (Postal code 6760). Using postal areas allowed us to exploit wider variations in house and natural characteristics (see Figure 5-7). Moreover, a potential selection effect of people with distinct preferences for being close to a river and therefore migrating into a specific river basin can be ruled out, as houses far away from the big rivers were also included. Thus, a more general evaluation of buffer zones shall be enabled. This seems to be the most promising strategy as the buffer zone regulation is also not focused on specific rivers but rather applied uniformly in Denmark.

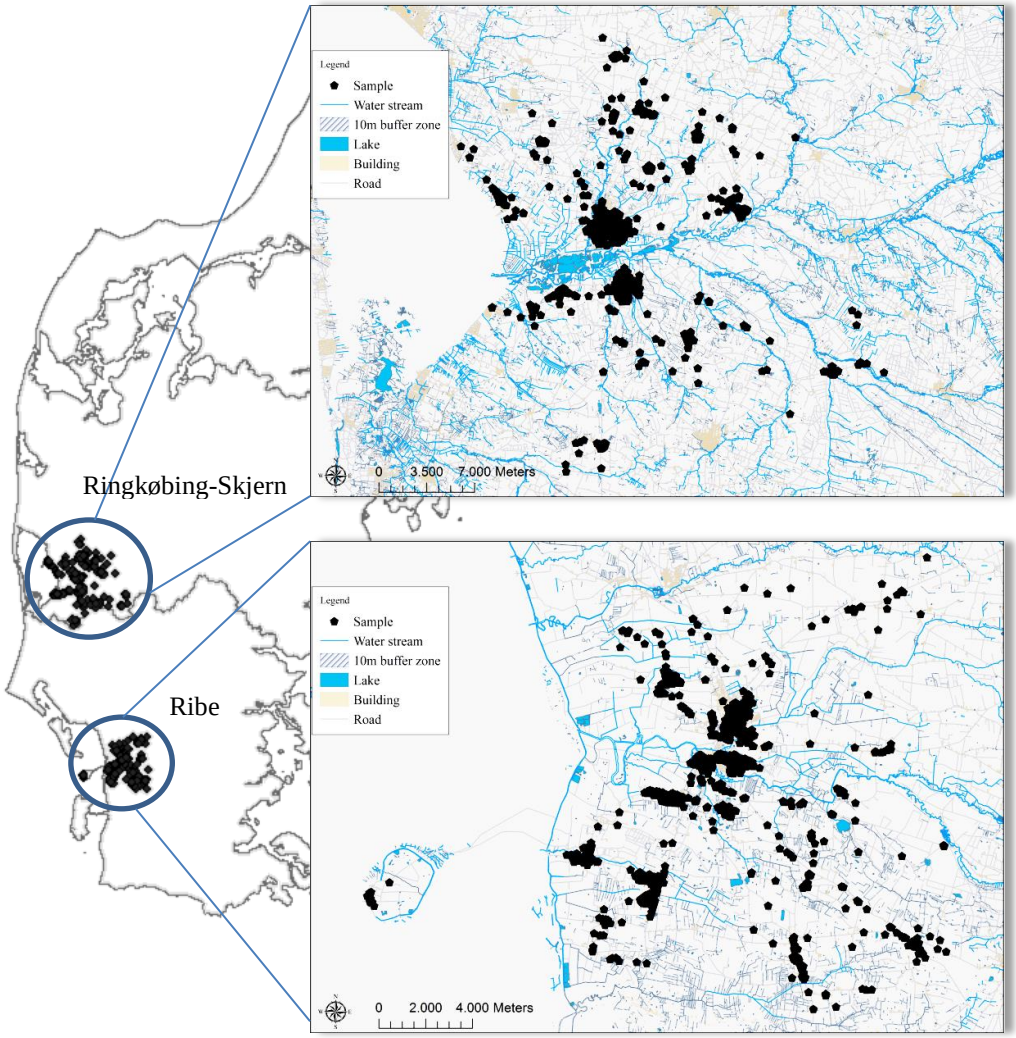

Figure 5: Map of the Location of the Dependent Variable in the Sample

The dependent variable is a vector of sales prices for houses (in DKK). For our study, we limited this variable to detached single-family houses sold on the free market, i.e. auctions, family transfers, etc. are excluded, as well as to houses with different purposes than for private use. Moreover, farm houses and holiday houses were not included as one may argue that these houses belong to a different property market segment, as well as the fact that the effect of buffer zones on farm land (economic effect) has already been discussed by Jensen et al. (2009) and Schou (2007). We obtained sales data from 1996-2013 provided by KMD (ESR- sales data) for properties (i.e. land price is not included). Sales prices for the houses were deflated by the Consumer price index as provided by Statistics Denmark (2013).

Summarizing the dependent variable per area (see Table 5, **Fejl! Henvisnings-kilde ikke fundet.**), the average sales price in Skjern/Tarm is lower than the one in Ribe. A two-sample t-test with unequal variances confirmed that the average sales price in Ribe is significantly higher than the one in Skjern/Tarm (see

Table 7, Appendix). Based on a distinct difference in house price level, the separate estimation for each area seems to be appropriate.

According to our information, the 10 meter buffer zone had been discussed since 2007, but eventually implemented in September 2012 (information from NaturErhvervstyrelsen per E-mail from 12th April 2013). Due to data availability, this study addresses the impact on house prices of the 10 meter buffer zone regulation. A focus is laid on the houses sold between 2008 and 2013. The interviews indicated that people are aware of the discussion on the extension of the 2 meter buffer zone into the 10 meter buffer zone. Therefore, one can expect to find an effect on the house prices before the actual implementation of the extended buffer zones as a potential threat/chance which would already affect the decision of buying a new house. With the introduction of the buffer zone, 134 private properties in our sample are affected by the regulation by having a buffer zone on the lot. Out of these 134 properties, 37 have been sold since 2007 (see **Fejl! Henvisningskilde ikke fundet.**). In order to measure the effect of the regulation, a dummy variable ($D^{b}_{\geq 2008}$) was integrated into the regression which measures the effect of the introduction of the buffer zone for the properties which have at least one buffer zone on the lot and was sold after 2008 (see Bin et al., 2009).

No of detached single-family houses	Ribe	Skjern/Tarm
Sold in 1996-2007	1013	1723
Sold in 2008-2013	516	750
Thereof have buffer zone on the lot	19	18
Total	**1529**	**2473**

Table 1: Number of house in our sample per municipality

According to section 5.2, the independent variables to be integrated into the regression model shall be divided into house characteristics (S_{it}), locational economic (dis-)amenities (L_i), natural (dis-)amenities (N_i), and surrounding landscape fragmentation (F_i). For the categories (S_{it}) and (L_i), we followed Osland (2010) as far as suitable for our case. The house (S_{it}) is described by the variables: *age* of the building, *squared age* of the building, an interaction term between the incident of crucial *renovations* (rebuild)-dummy and the age of the building, the *size* of the building, and the number of water flushed *toilets* in the building. This housing data includes data that is extracted by KMD from the databases SoegEjendom (main characteristics of the building), and BBR (use of the houses and specific characteristics, e.g. heating and building material). For ease of interpretation, the variables age and age^2 (year of construction and

its square) are demeaned. Both were integrated into the estimation simultaneously, although they are highly correlated.

To capture economic (dis-) amenities (L_i), the Euclidean distance from the respective house to the *city center* as well as to the next *street* (wider than 3m) were calculated based on maps provided by Geodatastyrelsen (2013). Additionally, the Euclidean distance towards *parking* lots was integrated. Parking lots are partly within in industrial areas (i.e. work and shopping facilities) as well as in city centers (i.e. employment, shopping, and cultural/social facilities). Hence, this variable shall capture the distance to the next employment and shopping options.

The core of the analysis is to measure the WTP for natural amenities (N_i), in particular for the creation of buffer zones along lakes and rivers. Therefore, the Euclidean distance was measured between house *i* and the closest *water stream, lake,* and the *10 meter buffer zone*. As pointed out in section 2.3, small water streams may not have the same effect as larger rivers. To control for this, the Euclidean distance to the next *river above 2.5m* was measured as well. These variables are meant to capture the aesthetic values of the stream as well as the WTP for being close to a water body. The data for the location of river and lakes are based on maps provided by Geodatastyrelsen (2013). The locations of buffer zones were taken from compensation maps as published by NaturErhvervstyrelsen (2012). We further controlled for the Euclidean distance to the closest *beach* and *forest* to capture additional recreational value based on data provided by Geodatastyrelsen (2013). To capture potential natural disamenities created by the proximity to the agricultural-urban edge or to windmills, the Euclidean distance to the closest *farmland* and *windmill* was integrated into the regression. Data on the location of these natural (dis-) amenities were taken from NaturErhvervstyrelsen (2012) and Miljøportalen (2012).

As we learned from the guided interviews, the proximity to the buffer zone as such is not the decisive factor for the use and social value of the buffer zone but rather the access to them. In order to capture this argument, the closest *access* to the buffer zone was calculated, i.e. the distance from house *i* via roads and pathways towards the nearest buffer zone as mapped by NaturErhvervstyrelsen (2012). An access point into the buffer zone is defined as the intersection point of a pathway/road and the 10 meter buffer zone, hence direct access to the zone is given.

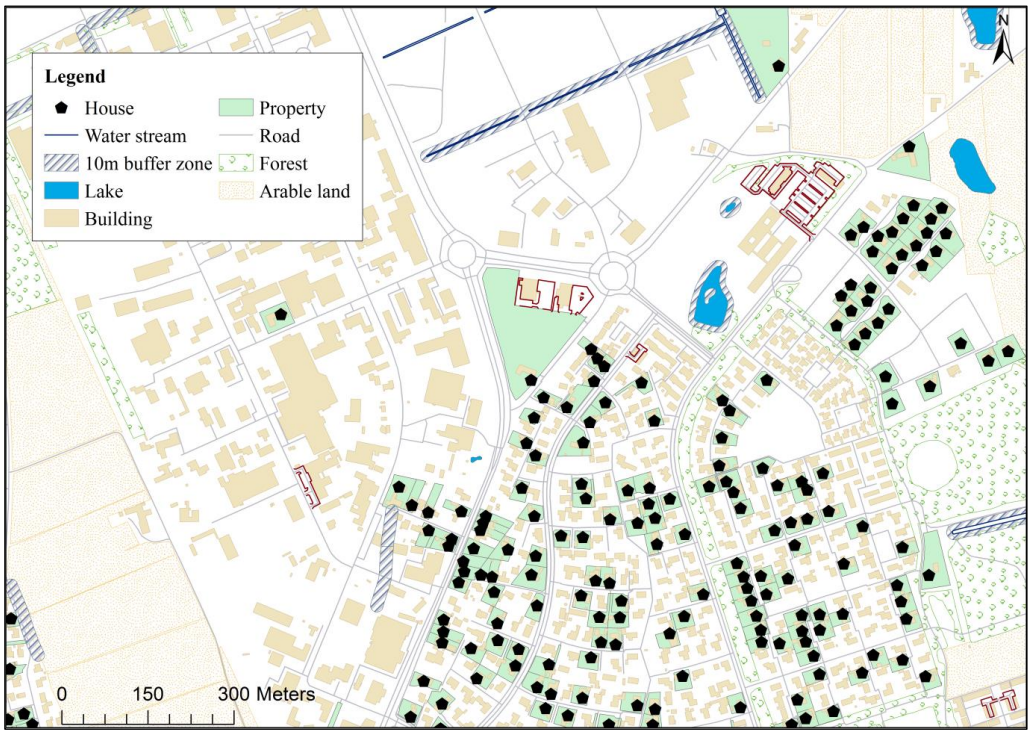

Figure 6: Example of distributional characteristics of L_i and N_i for houses in Ribe close to city center

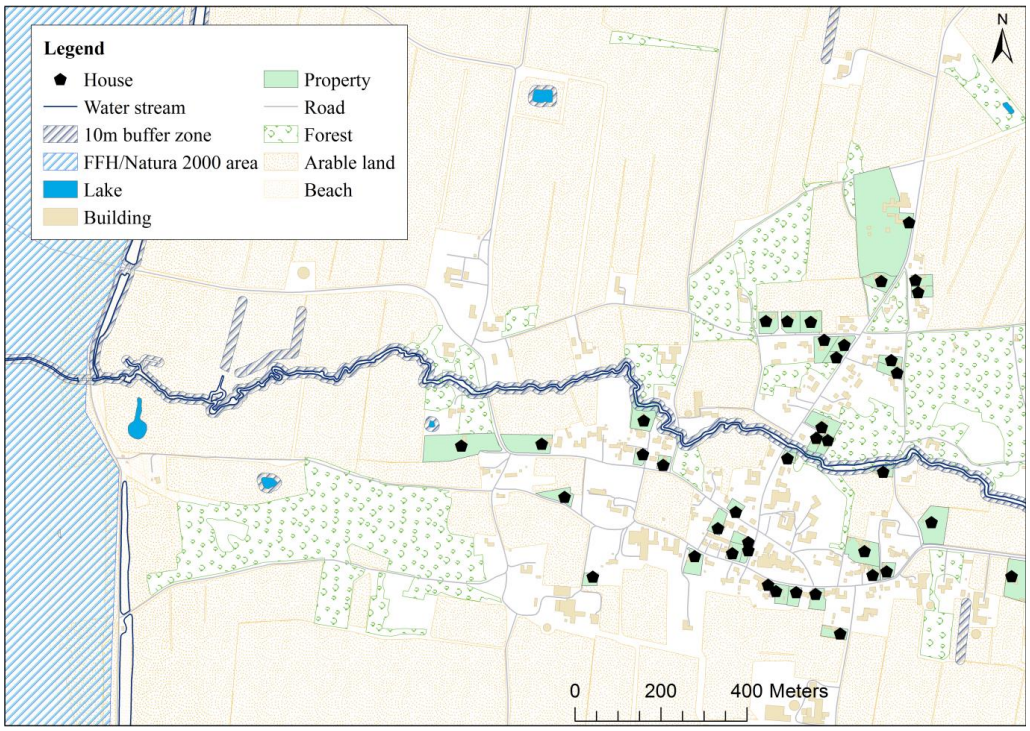

Figure 7: Example of distributional characteristics of L_i and N_i for houses in Ribe close to Wadden Sea National Park

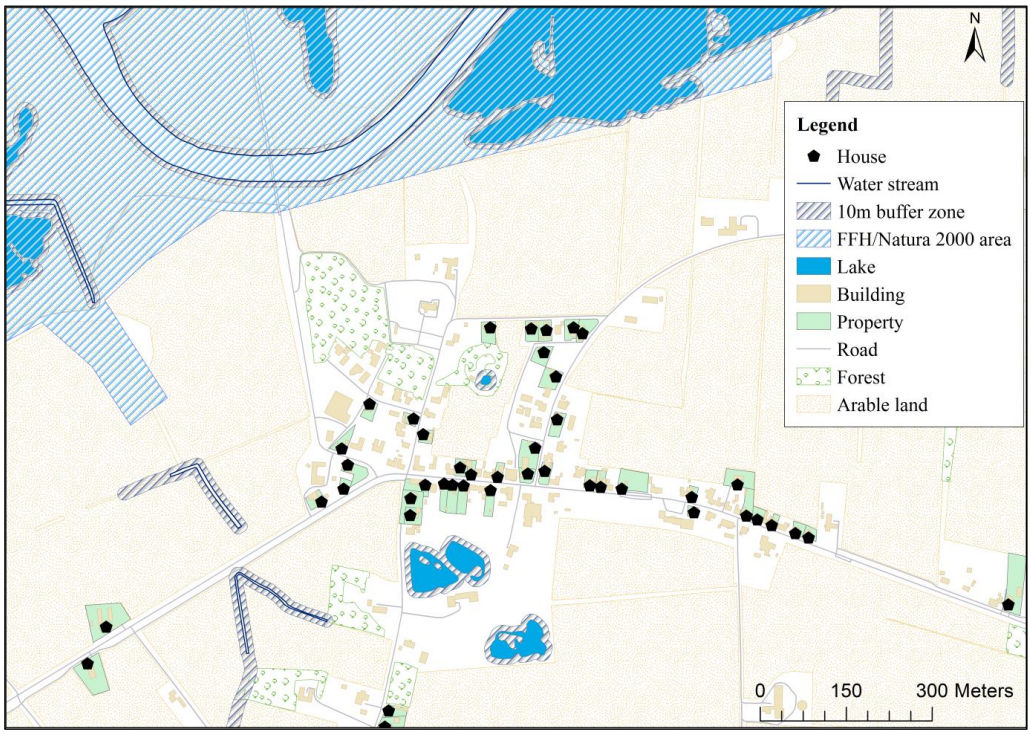

Figure 8: Example of distributional characteristics of L_i and N_i for houses in Skjern close to Skjern Aadal

Figure 9: Example of distributional characteristics of L_i and N_i for houses in Skjern close to the North Sea

To determine the value created by open land, a fragmentation index, the mean patch fractal dimension (*MPFD*), was calculated (Raines, 2002). As the average lot is 140 meters long, it was decided to calculate the fragmentation of an

area of 150 meters around the house. Landscape elements like water streams, lakes and fields served as open space elements. This index measures the shape complexity, which equals 1 for shapes with simple perimeters and approaches 2 when shapes are more complex; thus, more space is taken up by the natural open space elements. Regarding our sample, it becomes obvious that some houses are closer to the city center and with this surrounded by buildings (e.g. Figure 6) while others are in rural areas with hardly any neighbors but plenty of open space (e.g. Figure 9), or somewhere in between both extremes (Figure 7 and Figure 8). Thus, fragmentation of the surrounding landscape needed to be integrated into the analysis to control for the social value which might influence the sales price of the houses.

One assumption in the hedonic price method is that the demand is constant over time, thus time was not considered in particular, but controlled for with the help of time dummies *T*. Although Bin et al. (2009) propose to use a dummy denoting houses sold after the implementation of the regulation, it was decided instead to include yearly dummies instead of one single time dummy. The yearly dummies capture the fixed effects of the housing market since 1996, and are thus a broader approach than the 2008 dummy. As it is assumed that the regulation had no effect on the prices of properties distant from the rivers, the yearly dummies seemed to be more appropriate.

In addition, in the estimation for the dataset Skjern/Tarm, a dummy was included which shall capture systematic differences between both municipalities.

5.4 Results & Discussion

Estimations were based on a Spatial Durbin model (SDM, see description above) and were conducted separately for the areas Ribe and Skjern/Tarm for the time period 1996-2013. Results of the estimations are displayed in Table 2. In general, our variables describing the house qualities and characteristics showed expected signs and were mainly significant. Hence, houses older than the average were more expensive, especially in Skjern/Tarm. The effect of age, however, was decreasing. With increasing building areal and/or lot size, houses increased in price. Accordingly, it can be concluded that the quality and size of a property is quite significant in determining house prices. This is consistent with findings for summer houses in Hjalager et al (2009).

	Ribe		Ringkøbing-Skjern	
	Dependent Variable: Ln(Sales price)			
Age (demeaned)	0.000452	0.000256	**0.00771*** **	**0.00775*** **
	(0.000725)	(0.000729)	(0.00143)	(0.00146)
Age^2 (demeaned)	-1.90e-07	-1.11e-07	**-0.000136*** **	**-0.000134*** **
	(3.65e-07)	(3.66e-07)	(2.56e-05)	(2.59e-05)
Rebuild x Age (dem.)	**8.84e-07***	**8.84e-07***	**1.31e-06** **	**1.28e-06** **
	(4.89e-07)	(4.86e-07)	(6.09e-07)	(6.15e-07)
Ln(toilet)	0.000721	0.000693	0.000688	0.000690
	(0.000533)	(0.000523)	(0.000608)	(0.000578)
Ln(building size)	**0.265*** **	**0.250*** **	**0.545*** **	**0.542*** **
	(0.0542)	(0.0542)	(0.0422)	(0.0422)
Ln(lot size)	**0.237*** **	**0.234*** **	0.00216	0.00217
	(0.0551)	(0.0557)	(0.00136)	(0.00136)
Ln(parking)	**-0.0728** **	**-0.115*** **	-0.0258	-0.0151
	(0.0337)	(0.0361)	(0.0239)	(0.0241)
Ln(street)	-0.0177	-0.0220	**0.0426***	**0.0505***
	(0.0252)	(0.0251)	(0.0255)	(0.0259)
Ln(city)	-5.34e-05	-9.40e-05	-9.89e-05	-0.000109
	(0.000225)	(0.000228)	(0.000286)	(0.000283)
Ln(river)	**0.0788** **		-0.0389	
	(0.0388)		(0.0373)	
Ln(river>2.5m)		0.0101		**-0.0718***
		(0.0377)		(0.0387)
Ln(lake)	-0.0608	-0.0539	0.0389	0.0363
	(0.0458)	(0.0473)	(0.0394)	(0.0395)
Ln(10m buffer)		**-0.000258***		**-0.000503*** **
		(0.000155)		(0.000114)
Ln(access 10m buffer)		**-0.000369** **		0.000242
		(0.000176)		(0.000194)
Ln(beach)	-0.203	-0.164	-0.00923	-0.00611
	(0.128)	(0.124)	(0.0750)	(0.0764)
Ln(forest)	-0.0167	-0.0335	**-0.000935*** **	**-0.000991*** **
	(0.0273)	(0.0279)	(7.63e-05)	(6.79e-05)
Ln(farmland)	-0.00427	0.0161	0.0326	0.0368
	(0.0367)	(0.0352)	(0.0277)	(0.0272)
Ln(windmill)	0.0601	0.0341	**0.102***	0.0898
	(0.111)	(0.109)	(0.0600)	(0.0597)
MPFD	**0.933** **	0.650	0.270	0.286
	(0.412)	(0.401)	(0.193)	(0.194)
D(riparian property)	0.136	0.0553	-0.0430	0.0522
	(0.112)	(0.107)	(0.113)	(0.128)
$D^{buffer}_{sold>2008}$		0.0646		**-0.335** **
		(0.101)		(0.135)
D(ZIP 6900)			-0.0865	-0.0932
			(0.175)	(0.174)
Year-Dummies	Yes	Yes	Yes	Yes
Constant	-4.238	-5.965	-3.627	-3.125
	(6.981)	(7.315)	(4.833)	(4.997)
Rho	**0.913*** **	**0.891*** **	**0.570*** **	**0.618*** **
	(0.0797)	(0.0949)	(0.169)	(0.164)
Sigma	**0.585*** **	**0.583*** **	**0.551*** **	**0.551*** **
	(0.0153)	(0.0153)	(0.0121)	(0.0121)
Observations	1,529	1,529	2,473	2,473
Squared corr.	0.483	0.490	0.483	0.483
Variance ratio	0.480	0.485	0.488	0.488
Wald test Rho=0	**131.1*** **	**88.19*** **	**11.32*** **	**14.20*** **
Wald test WX=0	**119.3*** **	**126.2*** **	**115.7*** **	**117.6*** **

Table 2: Spatial Durbin Model Estimation

Robust standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1; The same models as reported in table 2 were calculated including the squared distance to river, 10 meter buffer zone and access to the 10 meter buffer zone. However, none of the models showed a significant effect. Calculations are therefore not further reported.

Regarding economic amenities, sales prices in the area of Ribe reflected a significant WTP for the proximity to parking areas (i.e. shopping facilities), while in Skjern/Tarm people were willing to pay a premium to live farther away from busy roads (source of noise, emissions etc.); in both areas, proximity to city center was not assessed as significant. Thus, city centers with all their amenities (i.e. culture, shopping, employment opportunities or access for commuting [i.e. train station] to the place of employment) were not valuated highly in the study area.

The valuation for natural amenities, however, is apparently more complex. The estimation for Ribe pointed towards a positive evaluation of distance to rivers. Hence, people in this area were significantly willing to pay a premium for a house which is further away from all kinds of water streams. However, this effect vanished if only the distances to the main rivers (more than 2.5m wide) are considered. In contrast, house prices in Skjern reflected a (weak) positive valuation of being close to the main rivers, but no significant avoidance of water streams on the whole. These results seem to be in line with the findings of Cho et al. (2006) that the proximity to small water streams may create a negative social value. Cho et al. (2006) explained this effect with the lack of aesthetic values of a small water stream, in particular if this stream is not managed properly. Thus, aesthetic values are created by natural topography also by a proper land management regime and access. Another argument to explain this result might be that the WTP to avoid risks (due to e.g. kids drowning in the stream, diseases transmitted by mosquitos breeding in the small water streams etc.) overrules the recreational and aesthetic benefits of such small water streams. In our sample region, some home owners with basements have also had problems with incoming water and moisture. This may also create a preference for having some distance from a river in order to avoid basement damages.

The main focus of the study was to evaluate the social value of the buffer zone. Regarding the estimation above, being close to the 10 meter buffer zone were assessed positively in both areas. The coefficients were significant for the distance to the buffer zone, and in Ribe, even close access to the buffer zone led to a price increase for houses. Based on the coefficients of the Basic Spatial Durbin Regression (SDM), the WTP shall be calculated. In order to measure the total average impact of the distance on the house price, the direct effect along with the indirect effects need to be considered. Existing feedback-loops (i.e. the effect of house *i* on house *j*, and in return, also called spatial multiplier effect) as considered in the estimation within *WY* and *WX* need also to be incorporated in the coefficient if it shall be interpreted as MWTP (see

LeSage/Pace, 2009). The average MWTP adjusted for the spatial multiplier are displayed in Table 3.

	Ribe			Ringkøbing-Skjern		
	Direct Effect	Indirect Effect	Total Effect	Direct Effect	Indirect Effect	Total Effect
Distance to 10m buffer zone	-0.0005158	-0.1846688	-0.185185	-0.0006088	-0.053925	-0.054534
Next access to 10m buffer	-0.0003874	-0.0134979	-0.013885			
$d^{buffer}_{sold>2008}$			-0.3555813			

Table 3: Average MWTP of the buffer zone

Interpreting the marginal effects, including the spatial multiplier for the area of Ribe, it can be shown that being one meter further away from the 10 meter buffer zone would on average decrease the sales price of house *i* by about 0.05 percent. This impact seems low, but due to the indirect effect of the sales price level which house *i* has on the neighboring houses *j*, including feedback loops, the total effect of this one meter change in distance may add up to an 18.5 percent decrease in total sales price level. In monetary terms, if the average sales price is taken into consideration, the average direct effect for the first meter closer to the 10 meter buffer zone would lead to a price premium of approx. DKK 1123 (see Table 4).

	Ribe		Ringkøbing-Skjern	
Average sales price	DKK 2,177,132		DKK 1,664,133	
	Direct Effect	WTP	Direct Effect	WTP
Distance to 10m buffer zone	-0.000516	DKK -1122.99	-0.00061	DKK -1013.11
Next access to 10m buffer	-0.000387	DKK -842.31		

Table 4: Average WTP for being one meter further away from the 10 meter buffer zone

Note: This calculated effect holds only for the first meter. Due the spatial multiplier one cannot interpret this coefficient in linear terms. This calculation therefore only serves as example.

Most of the other natural variables integrated in the estimation surprisingly turn out not to be significant in the Ribe area. Open space, measured here as the fragmentation of natural elements in 150 meters around the house, was valuated positively in the area of Ribe. Thus, the combination of landscape elements like rivers, lakes and fields raised sales prices for houses in this region. However, this effect did not hold true for our sample in the area of Skjern/Tarm. In these estimation models, the proximity to the forest increased, while the proximity to windmills slightly decreased the sales price of the property.

Regarding the result that in Ribe the distance to river was evaluated positively while at the same time the proximity to buffer zones increased house prices, one can argue that there is a positive evaluation of water streams close to the house when managed properly, and as long as these streams are not too close. Thus, the positive evaluation of the 10 meter buffer zone may additionally reflect a kind of threshold of the optimal distance to water bodies. In other words, houses too close to rivers yield lower sales prices then after a specific distance (e.g. security buffer). This effect cannot totally be ruled out. A nonlinear effect of this distance decay between water bodies and houses, however, could not be statistically significantly established.

In contrast to Bin et al. (2009), riparian properties in our sample areas did not yield a premium in sales price, either in Ribe or in Ringkøbing-Skjern. On the contrary, the 18 private properties in Ringkøbing-Skjern which are directly affected by the buffer zone regulation were sold for a approx. 35 percent lower sales price (see $D^{buffer}_{sold>2008}$, Table 3). Hence, the 10 meter buffer zone is in this area positively evaluated as long as it is not on one's property. The buffer zone regulation might here interfere with the private property rights of the owner. Allowing access to the buffer zone may in fact be perceived as an intrusion of privacy for the owner. Direct access to the buffer zone on one's own property allows other people to walk on one's property. Hence, public access to the private property on the riverside could have a negative impact on the prices of these houses/properties and a positive impact on the prices of houses in the rows behind them, an effect hardly to be controlled for. People may be willing to walk a few extra meters to access such a recreational area of the buffer zone rather than to have it directly in their backyard in order to avoid unknown people on their property.

Taking up the argument that proper management only creates aesthetic and recreational values for water bodies (Cho et al. 2006), one may assume that this argument can be equally true for buffer zones. According the buffer zone regulation, farmers are obliged to mow the buffer zones at least every second year for maintenance. Thus, it is up to the farmer to take care of the buffer zone area. Dependent on the effort of the farmer (or in some cases the municipality), a buffer zone as shown in Figure 11 might be created which assumingly creates a lower aesthetic and recreational value than the one shown in Figure 10 or Figure 12. Thus, the observed social value is locally dependent on the management of the buffer zone.

Figure 10: Picture of buffer zone with recreational infrastructure added, Lolland.
(May 2013, Photo: Søren Rosenberg and Philip Rasmussen)

Figure 11: Picture of buffer zone in Himmerland
(Immediately in the outskirts of a village, September 2012, Photo: Anne-Mette Hjalager

In addition to management, access to the buffer zone was also shown above as a major determinant for social value. Access here is only measured as the opportunity to enter the buffer zone (connected by a path). However, due to management of the buffer zone, access might be restricted. Although a path to the buffer zone may exist, walking within the buffer zone and enjoying this recreational area is dependent on the management of the buffer zone as well. So, for example, if paths are created within the buffer zone (see Figure 11), a higher social value might be expected than if no entrance into the area is available (see Figure 13).

Figure 12: Picture of buffer zone close to Ribe under different land management regimes
(August 2013, Photo: Annette Aagaard Thuesen)

Figure 13: Picture of buffer zone close to Ribe without access
(August 2013, Photo: Annette Aagaard Thuesen)

With respect to the difference in estimation results between both areas, one may, on the one hand, point to the history of fierce debate over the Skjern Aadal, which may create a more careful evaluation of the potential use of the

extended buffer zone, therefore showing no significant effect in our estimation regarding the proximity to access of the buffer zone.

One the other hand, a stream of literature which is based on the work of Tiebout (1956) proposes that people with similar preferences select themselves into those local communities that best satisfy their demands regarding the level of public-good provision (i.e. provision of natural public goods such as beaches, forests as well as local services such as school quality, but also crime rate, tax level, etc.). Thus, to some degree, homogenous communities will be created within this selection process. An overview on the research on this selection dynamic can be found in Kuminoff et al. (2010). Using migration patterns instead of house prices, the positive impact that, for example, the availability of parks, recreation facilities, and higher temperatures have on immigration, was already demonstrated by Graves (1980) or Cebula (2005). In contrast, factors, such as crime rate, have distinct impacts for different income groups. Households with higher incomes react more strongly to crime rates (especially violent crime) by emigration than middle-income households do, while a positive relationship is found for low-income households and crime rates (Tita et al., 2006). Thus, income was estimated to be a strong selection mechanism in most of these studies carried out in the USA. Unfortunately, income levels of the house buyers were not available for this study to control for this kind of effect here. But, one can argue that differences in house characteristics and surrounding factors lead to such selection effects, which is reflected in the differences in WTP for e.g. nature conservation measures (such as the buffer zone regulation).

Taking a closer look at the data set, it is shown that although less observation is included for Ribe in the estimation than for the estimation of the Skjern/Tarm-models, the necessary variation is still given. Moreover, the distribution of sales prices in both sample data reflects the distribution of sales prices of houses in Denmark in general if compared to ‘Boligsidens popularitetsindeks’ (The popularity index of a popular Danish house sales website). Thus, a potential bias with regard to the dependent variable can be ruled out.

Considering the differences with respect to the independent variables, a two-sample t-test was employed to see if differences in variance between the samples are significant (

Table 7, Appendix). According to this test, the sold houses in Ribe in our sample are significantly older and larger in building size. As the effect of age on sales price is decreasing, this difference in age of the houses may explain the fact that the estimation for Skjern/Tarm shows a significant negative effect for the variable age on house prices while for the Ribe sample, no significant effect could be found. Our two sample communities are also distinctively different in most of the natural attributes integrated in the estimation (see

Table 7, Appendix). But, as a rather wide region (Postal code) is examined, a distinctive selection effect for people with a preference for living close to a specific natural amenity should be very low, if one exists at all. This lack of a specific preference or non-preference, in turn, may also explain the fact that in the estimation nearly no natural (dis-)amenities showed a significant effect, although in previous studies, distinctive effects could be pointed out (e.g. Danish studies including: Ladenburg and Lutzeyer, 2012 for windmills, Præstholm et al., 2002 for forest proximity).

As a robustness check, instead of a Spatial Durbin Estimation, a Kelejian-Prucha model was estimated (see Appendix B2). Although some of the coefficients of the estimation above lose their significance while other gain significance, the main results stay stable. Hence, the proximity to the 10 meter zone and close access are still positively integrated into the sales price in both communities in the robustness estimation. Additionally, the negative effect of the buffer zone on houses sold after 2008 subject to the buffer zone regulation remains strong and significant. Thus, the major outcomes are confirmed with different assumptions in the estimation model.

5.5 Limitations of the results

In this study, areas have been selected which are peripheral and with an abundance of natural areas. Hence, results may not hold true for more urbanized and agglomerated areas in which the supply and demand for nature may interact on a different level. Moreover, the aim of this study was to measure the effect of a recently introduced natural conservation measure, i.e. buffer zones. Results shown here may only be of a short-term nature and may change in the long run. In particular, one may assume that the effect of the policy on nature will take some time until a direct effect can be observed in nature, thereby an effect which can actually be consciously integrated in the decision framework and in the price function, respectively.

Data was taken from 1996 to the beginning of 2013. Unfortunately, the buffer zone legislation coincided with the financial crisis. As a result of the crisis, the prices of the expensive houses on the riverside dropped sharply. Although yearly effects are controlled for in the estimation, it assumes that external factors have a uniform effect on all house prices and not simply on specific housing segments. Hence, the house market here was assumed to be constant and homogenous for detached single-family houses; a rather strong assumption if the variation in sales prices and house characteristics in our sample are considered.

The aesthetic value of a riparian area is often measured by its distance from the river; however, a better approach would be to measure the visibility of the natural element in question. Hence, by simply using distance, it cannot be ruled out that some effects other than simply the aesthetic value are captured. Moreover, in this study we measured hypothetical values of a regulation just recently implemented. Effects may change over time with increasing experience of the functionality of the buffer zone.

As mentioned earlier, a large amount of literature regarding the hedonic price approach discusses the functional form of the price function. Besides the price function (in our study assumed to be best represented by a natural logarithm), another crucial assumption is the linearity of the demand function. Hence, any form of 'saturation effect' (decreasing marginal utility) or even increasing marginal utility with increasing natural buffer zone supply was ruled out here. Although these assumptions on the functional form of the demand and price function might be justified in some sense, it should be kept in mind that the hedonic price approach tends to be sensitive to specifications (see Harrison and Rubinfeld, 1978).

Furthermore, in this study, we did not control for an income effect, but rather used a simplistic version. The hedonic price approach tends to be feasible only when the substitution effect (between private and public good) can be disentangled from the income effect (Bradford and Hildebrandt, 1977). Thus, results should be interpreted carefully before too far-reaching conclusions are drawn. Nevertheless, the estimation gives an indication of the preference structure for the study area in the time period considered, though it may not provide one with the full picture.

6 Conclusion

6.1 Main findings

This research project is guided by the main assumptions that (1) the extended buffer zones add significant value in terms of open space for recreational use, and this value is recognized by stakeholders; and (2) the buffer zones are enhancing the aesthetic values of nature/landscapes for those who live nearby and hereby affect the property values positively.

Regarding the first research focus, interviews with stakeholders showed that the extended buffer zone is appreciated if access and information for the potential usage is given. Many interviewees lacked the knowledge on where and how they are allowed to use the extended buffer zone. Although being aware of the establishment of the buffer zone as the result of an extensive public debate, the buffer zones are still not integrated in the recreational activity sphere. There is still unutilized potential for improving social benefits of the nature conservation measure 'buffer zone'. The interviewees also suggest that the organized recreational use of landscapes is concentrated in forests and other areas that have been open for access for a long time and where the infrastructure is well developed. It may take time for people to change their recreational habits, and relocate their activities to other types of landscapes.

Access and management seem to be the crucial part, in particular if we also add the results of the quantitative approach. The interviewees express an understanding for the situation of the farmers, who are the main property owners of the buffer zones. They also compare the accessibility issues of the buffer zone. Thus, the buffer zones are most often not equipped with pathways and may be muddy and there may be fencing trouble as well, and for these reasons, certain types of recreational activities will be limited. There are also issues related to safety and convenience, particularly when users are children or older people.

The interviewees also suggest that the streams and lakes are mainly located in the flat areas with relatively little variation in terms of landscape qualities. This is also an issue that leads to preferences for forests and other landscape types with a higher recognized aesthetic value. However, some of the interviewees nevertheless consider the experience value of the flat landscapes as exceptional, for example due to flora or fauna. Accordingly, an increased use of buffer zones for recreational purposes is linked with a dissemination of more distinctive knowledge about the areas.

Regarding the social benefit for those who live nearby (second assumption), differences in the social valuation between Ribe and Ringkøbing-Skjern could be shown. Due to historical facts or potential selection effects into the area, inhabitants tend to evaluate the amenities created by water bodies differently. While for the municipality of Ringkøbing-Skjern a positive assessment for larger rivers and a weak positive effect for the 10 meter buffer zone could be presented, in the municipality of Ribe, houses are sold at a lower price if close to water streams in general. However, although in Ribe the negative impact of the proximity to water streams is observable, a positive evaluation of the 10 meter buffer zone in general could be shown as well. In particular, the proximity to the access to the 10 meter buffer zone, which was emphasized in the stakeholder interviews, yields a higher premium in sales price for a house than only the distance alone. This contributes to the assumption that the change of regulation and the widening of the land potentially available for the development of amenity values and for recreational purposes are seen positively by the citizens, although the conclusions are still the subject of discussions and reservations.

The major discrepancy between both areas lays in the impact the discussion of the regulation has had since 2008 on the house prices if the property was subject to the regulation. In Ringkøbing-Skjern, the houses potentially affected by the regulation were sold for significantly lower prices, while the houses in Ribe yielded no significant change in sales price if the property was intended to be subject to the extended buffer zone regulation.

In general, the studies indicate that the level of the house prices is mainly driven by the size and standards of the house as well as the distance to the location of urban facilities. Not surprisingly, noisy roads have a negative effect on the values, while the proximity to shopping and employment facilities increases property price. Thus, the study suggests that house buyers give priority to the convenience of daily life, including easy access to shops, public services, jobs, transportation, and that the amenity values are “extras” where the inconvenience of some distance is accepted.

It could be shown that the amenity value created by the 10 meter buffer zone is valued positively by stakeholders as well as inhabitants. For the latter, this effect is rather weak and might be outweighed by perceived negative consequences of e.g. proximity to poorly managed rivers. Moreover, in contrast to the proposed difference in preference between representatives of a stakeholder group and civil society (here inhabitants) (Nyborg, 2000), our study shows that both spheres of social valuation can point in the same direction: the positive

assessment of the creation of recreational amenities by the implementation (including access and information) of the 10 meter buffer zone.

6.2 Discussion

The study shows that the amenity values of buffer zones are acknowledged to users, but not to such an extent that it affects behaviors of citizens and recreational users extensively. Negative consequences may overrule the positive effects of the regulation. Moreover, using the agricultural areas as a scene for a rural multifunctionality is still modest. Why is that the case, and is it likely to change over time?

There are a number of plausible reasons for the lack of practical use of the buffer zones and the low valuation of their qualities:

Access issues. Maintenance of the buffer zones is mainly the responsibility of the farmers. The extension of the zones from 2 to 10 meters has happened only recently, and their practices in terms of management of the wider areas is not grounded to any extent yet, and it is likely that many farmers are still considering how to ensure the required maintenance. Farmers' economic motivation to establish and maintain trails other facilities may be limited; as such, facilities require a continuous attention. A motivation to establish an infrastructure might occur if the farmers can gain additional income, for example related to farm holidays, angling, canoeing etc. Diversification of farm holdings into tourism and leisure is increasing, although still at a moderate rate (Nielsen et al, 2011).

Often, citizens and recreationalists experience an absence of proper access due to a lack of materials, such as maps, which can guide them to the buffer zones. This also includes interpretation as well as information about safety and conduct. No one is formally in charge of providing such materials, including farmers, visitor organizations, and municipalities. Recreational and sports organizations may provide materials themselves, but up until now, little has been accomplished.

Competitive landscape issues. The areas investigated in this study are rural and with a low population density. Citizens and visitors have access to a wide range of landscapes and landscape types which may, from accessibility and aesthetic points of view, deliver a higher user value: Forests, the Wadden Sea, and the fjords all represent a higher extent of variation. These areas have been the subject of intensive interpretation for many years and enjoy a recognition and positive appraisal for their qualities. Town planning has ensured trails that

efficiently link urban zones with recognized landscapes in the vicinity. Many buffer zones are "rough" and perhaps uninviting compared to other landscape types, and it is a greater challenge for visitors to not only make their way in, but also to understand the qualities of what they see and experience.

Those organizations that utilize nature as scenery for their sports and activities do not seem to experience a crowding that compromises their use. It is a question of whether buffer zones would represent a higher value for outdoor recreation in areas close to larger cities.

The areas chosen for the studies here are characterized as being mainly rural. There are many areas available for recreation and leisure activities, and they are generally not crowded for most parts of the year. People select a rural area for habitation mainly because of the access to natural amenities (Johansen and Thuesen, 2011), and it is important for them to be able to get out into nature and to be able to select their location for specific leisure activities. There is a favorable access to publicly owned and openly available nature reserves in the areas. It is a question of whether the assessment would be different in more densely populated areas.

Norms and traditions in outdoor recreation. In the study, the organizations refer to what types of landscapes serve their needs best and what they are used to from convenience and safety points of view. Some of them are "conservative" in the sense that they prefer areas that they are well acquainted with and where they know that the benefits they look for can be obtained. It seems to be a barrier for leisure organizations to reconsider the locations and environments, and it is partly an effect of the nature of these activities.

However, some organizations can change the location of their activities, in particular if the amenity values are augmented. If buffer zones become habitats of birds to a greater extent, the ornithologists might shift locations. This underlines the importance of both internal and external determinants for the use of nature areas for recreational purposes.

Formalities of property rights. The areas studied are distinct farming areas. There is a strong tradition in the region for farming, and although employment in farming is very low compared to other trades, everybody in the area is likely to have farmers among their acquaintances or relatives. The media attention suggests that there is a significant recognition of the interests of farmers, including the freedom to make dispositions on their own farmland. The interviewees would like to see that the buffer zones are managed in a way that

creates better access for recreational use, but they are careful about placing costly and demanding requirements on the farmers.

There may also be a conflict between nature protection and recreation, as seen by some of the interviewees. If buffer zones should contribute to the biological diversification, they should to some extent be left in peace for birds to thrive and plants to regenerate. Balancing access is a key issue for some nature areas, but this is still not addressed to any extent in the Danish buffer zones, and there is a lack of systematic inquiry.

7 Perspectives and future research

7.1 Perspectives for multifunctional use of agricultural resources

The implementation of buffer zones is an issue that has been intensively debated in Denmark. An evaluation from a social and economic point of view is still not conclusive, and this study delivers only a small picture of the jigsaw puzzle that needs to be assembled.

When taking into account the awareness of and interests in buffer zones as potential future recreational areas and amenity values, there are a range of steps that need to be taken to approach a situation of higher multifunctionality, where space is simultaneously used sustainably and in synergy for several purposes (Maier and Shobayashi, 2001; Marsden and Sonnino, 2008; OECD, 2006). The task is to approach a situation where the social as well as the economic values are recognized in a balanced way. There is also a need to efficiently recognize that Denmark is a country of spatial diversity in terms of amenity values and socio-economic composition, where the contribution of buffer zones to values differs from area to area. Leaning on the literature and addressing the findings of this study, there are three essential groups of measures that can be integrated into future policies:

Interpretation is a key issue. Citizens as well as recreational users lack the sufficient knowledge about the locations and the possibilities and restrictions of access. In addition, users may need to know about routes and trails that are adapted to different kinds of user preconditions, including potential accessibility challenges and safety issues. Interpretation is also about the flora and fauna and about natural phenomena and codes of conduct. Such interpretation can take place in many ways, for example through the use of pamphlets and handbooks, but apps and other modern interpretation and communication forms may be extremely appropriate for this type of nature area. Interpretation is also done through guided tours and by managed activities, where actors from sports and leisure organizations play a significant role. As buffer zones are dynamic in terms of regulation as well as in terms of amenity values, it is a significant challenge to plan and implement interpretation measures.

Infrastructure development. The buffer zones are not well organized and equipped with paths and trails, and this might be a situation that some land owners do not want to change. Wildernesses may be attractive for some categories of users, and of importance in terms of environmental diversity. Howev-

er, some municipalities and other landowners have started to plan and establish trails, bridges and other infrastructures for the benefit of recreational users, and to link the buffer zones to other nature areas. Thus, there is an opportunity to widen the target group for the buffer zones and to supplement the variety of local recreational resources with new types.

Negotiating and planning infrastructures is part of the planning process of municipalities, and leisure and tourism organizations tend to encourage the municipalities to ensure a more holistic approach in order to enhance social as well as economic values. There is still lack of evidence and practice in the planning of landscapes, and a lack of appropriate attention to the issue in general, both in Denmark and in other countries, although the issue has greatly caught the attention of the EU as a topic for future policy interventions (Bateman et al, 2013). Working with land owners for this purpose is a novel discipline for many municipalities.

Invention of experiences. The recreational organizations and the users of nature areas are found to be bound to traditions to quite some extent, and therefore they tend to prefer other nature areas over buffer zones for their activities. There is a need to initiate processes of "experience design" in order to invent new types of leisure and recreational activities that may fit with the physical conditions and the environmental requirements of buffers zones. In other countries, the outdoor sector is growing and launching new offers on a continual basis (Fredman & Tyrväinen, 2010), but a similar trend is not visible to the same extent in Denmark. Likewise, the reinvention of nature resources from a health and wellbeing perspective is also only emerging gradually (Godbey, 2009), and in Denmark new ways of farming practice and related production and interpretation are less often exploited by agriculture and visitor industries in collaboration. The experience design might also include landscape designs that enhance aesthetic values and biodiversity, including the use of crops and animal holdings that do not compromise the environmental objectives of buffer zones (Pettersson et al, 2013).

To conclude, in the debate, a concern has been raised that agricultural areas might be invaded by recreational users and citizens and that economic opportunities for farmers could suffer as a consequence, due to, for example, the disturbance of crops and animals and littering. The interviews indicated that there is hardly such a risk as an effect of the relatively low traffic and exploitation of the areas. However, the study also demonstrates that there is a plea for a broader perspective on the natural resources including the buffer zones as part of a long term development of a sustainable rural multifunctional land use.

7.2 Further research

This study addresses some aspects of the valuation of a particular fragment of the natural resources, the buffer zones along rivers, streams and lakes. The study attempts to align with an increasing valuation research tradition, and it contributes to the very complex evidence about economic and social value of natural environments. A range of further themes of exploration emerge from the study. In particular, and in a Danish context, the following issues may be of focus:

- The study assesses the potential social benefits of the recently implemented 10 meter buffer zone, and only in two rural case areas. Future research may repeat this study in other locations in order to check for the robustness of the results, including areas closer to larger cities. Moreover, in the quantitative analysis, only a few properties were subject to the regulation. Thus, within in due time, the actual benefits of the buffer zone regulation need to be assessed again with a broader database.

- A focus of the study has been the potential recreational value of the 10 meter buffer zone. However, future research may seek to differentiate between the various kinds of ecosystem services which are created by the buffer zone. In particular, the location of the actual ecosystem service compared to the social perception of the same may give deeper insights on future adaption and improvement of the so far uniform regulation.

- In its quantitative part, the study employs only distance measures instead of quality indicators. A differentiation between natural elements based on their quality and the therewith connected level of provided ecosystem service may lead to a deeper understanding of the driving forces behind the results.

- Moreover, the estimation assumed linear effects between house price and distance to the buffer zone as well as between houses (WY) and buffer zones (WX). As already mentioned in the discussion part, threshold effects may bias the results. Hence, future research may relax some of the underlying assumptions and focus on the reach of the positive effect of buffer zones on house prices, hence, seek to identify whether a threshold effect exist and if yes, which is the optimal distance of a house from the buffer zone.

8 References

Acharya, G., Bennett, L.L., 2001. Valuing open space and land-use patterns in urban watersheds. *The Journal of Real Estate Finance and Economics* 22, 221-237.

Anderson, R.J., Crocker, T.D., 1971. Air Pollution and Residential Property Values. *Urban Studies* 8, 171-180.

Anselin, L., 2001. Spatial effects in econometric practice in environmental and resource economics. *American Journal of Agricultural Economics* 83, 705-710.

Anselin, L., Bera, A.K., Florax, R., Yoon, M.J., 1996. Simple diagnostic tests for spatial dependence. *Regional Science and Urban Economics* 26, 77-104.

Atkins, J.P., Burdon, D., 2006. An initial economic evaluation of water quality improvements in the Randers Fjord, Denmark. *Marine Pollution Bulletin* 53, 195-204.

Balana, B.B., Lago, M., Baggaley, N., Castellazzi, M., Sample, J., Stutter, M., Slee, B., Vinten, A., 2012. Integrating Economic and Biophysical Data in Assessing Cost-Effectiveness of Buffer Strip Placement. *Journal of Environmental Quality* 41, 380-388.

Bateman, Ian J.; Harwood, Amii R.; Mace, Georgina M.; Watson, Robert T.; Abson, David J.; Andrews, Barnaby; Binner, Amy; Crowe, Andrew; Day, Brett H.; Dugdale, Steve; Fezzi, Carlo; Foden, Jo; Hadley, David; Haines-Young, Roy; Hulme, Mark; Kontoleon, Andreas; Lovett, Andrew A.; Munday, Paul; Pascual, Unai; Paterson, James; Perino, Grischa; Sen, Antara; Siriwardena, Gavin; van Soest, Daan; Termansen, Mette, 2013. Bringing Ecosystem Services into Economic Decision-Making: Land Use in the United Kingdom. *Science Magazine* 5, 05.07.2013, 45-50.

Bin, O., Landry, C.E., Meyer, G.F., 2009. Riparian buffers and hedonic prices: a quasi-experimental analysis of residential property values in the Neuse River basin. *American Journal of Agricultural Economics* 91, 1067-1079.

Bjørner, T.B., Kronbak, J., Lundhede, T., 2003. *Valuation of Noise Reduction– Comparing results from hedonic pricing and contingent valuation*. SØM Publication No. 51, København: AKF Forlaget

Bradford, D.F., Hildebrandt, G.G., 1977. Observable Preferences for Public Goods. *Journal of Public Economics* 8, 111-131.

Brandt, J., Christensen, A.A., Roar, S., Holmes, E., 2013. Landscape practice and key concepts for landscape sustainability. *Landscape Ecology* 28, 1125-1137.

Brookshire, D.S., Thayer, M.A., Schulze, W.D., d'Arge, R.C., 1982. Valuing public goods: a comparison of survey and hedonic approaches. *The American Economic Review* 72, 165-177.

Cebula, R.J., 2005. Internal Migration Determinants: Recent Evidence. *International Advances in Economic Research* 11, 267-274.

Center for Kystturisme, 2013. Kystturisterne I Danmark. Hvide Sande.

Cho, S.-H., Kim, S.G., Roberts, R.K., 2011. Values of environmental landscape amenities during the 2000–2006 real estate boom and subsequent 2008 recession. *Journal of Environmental Planning and Management* 54, 71-91.

D'Arge, R.C., Shogren, J.F., 1989. Okoboji experiment: Comparing nonmarket valuation techniques in an unusually well-defined market for water quality. *Ecological Economics* 1, 251-259.

Dixon, J., 2008. *Environmental valuation: Challenges and Practices a personal view*. Economics and Conservation in the Tropics: A strategic dialogue.

Dubgaard, A., 1996. *Economic valuation of recreation in Mols Bjerge*. København: AKF Forlaget

Dubgaard, A., Kallesøe, M.F., Petersen, M.L., Ladenburg, J., 2001. *Cost-benefit analyse af Skjern-Å-projektet*. Den Kgl. veterinær- og Landbohøjskole, Institut for Økonomi, Skov og Landskab, Sektion for Økonomi, København.

Elhorst, J.P., 2010. Applied spatial econometrics: raising the bar. *Spatial Economic Analysis* 5, 9-28.

Frandsen, J.N., 2013. Randzoner i en samtale. *inMomentum*, 3, 12-15.

Fredman, P., Tyrväinen, L., 2010. Frontiers in Nature-Based Tourism. *Scandinavian Journal of Hospitality and Tourism*, 10(3):177–189

Geoghegan, J., 2002. The value of open spaces in residential land use. *Land Use Policy* 19, 91-98.

Geoghegan, J., Wainger, L.A., Bockstael, N.E., 1997. Spatial landscape indices in a hedonic framework: an ecological economics analysis using GIS. *Ecological Economics* 23, 251-264.

Gibbons, S., Mourato, S., Resende, G., 2011. *The amenity value of English nature: a hedonic price approach*. SERC Discussion Paper Series 2011-03

Godbey, G., 2009, *Outdoor recreation, health, and wellness*. Washington: Report for the Outdoor Resources Review Groups.

Graves, P.E., 1980. Migration and Climate. *Journal of Regional Science* 20, 227-237.

Griliches, Zvi, 1967. Hedonic Price Indexes Revisited: Some Notes on the State of the Art, *Proceedings of the Business and Economic Statistics Section, American Statistical Association,* 324-332.

Griliches, Zvi, 1971. Hedonic Price Indexes of Automobiles: An Econometric Analysis of Quality Change, in Zvi Griliches (ed.), *Price Indexes and Quality Change*, Cambridge: Cambridge University Press.

Harrison, D., Rubinfeld, D.L., 1978. Hedonic housing prices and the demand for clean air. *Journal of Environmental Economics and Management* 5, 81-102.

Hasler, B., Birr-Pedersen, K., Martinsen, L., Schou, J., 2007. *Anvendelsen af cost-benefit analyser ved implementering af EU's vandrammedirektiv*. Danmarks Miljøundersøgelser, Aarhus Universitet.

Hill, R.C., Adkins, L.C., 2007. Collinearity. In: Baltagi, B.H. (Ed.). *A Companion to Theoretical Econometrics.* Blackwell, Malden, Mass. [u.a.], p. 256-278

Hjalager, A.-M., Staunstrup, J.K., Ibsen, R., 2009. *Udviklingsdynamikker i sommerhussektoren.* København: Center for Bolig og Velfærd.

Hjorth-Andersen, C., 1976. *Måling af vejstøjens påvirkning af parcelhuspriserne. Cykelafdelingen*, Økonomisk Institut, København: Københavns Universitet

Hoffmann, C.C., Kronvang, B., Audet, J., 2011. Evaluation of nutrient retention in four restored Danish riparian wetlands. *Hydrobiologia* 674, 5-24.

Jacobsen, B., 2006. *Randzoner langs vandløb og søer: potentiale, holdninger og barrierer.* København: Fødevareøkonomisk Institut.

Jensen, F.S., Caspersen, O. H., 2011. *Færdsel langs danske vandløb. En spørgeskemaundersøgelse blandt lodsejere.* København: Københavns Universitet.

Jensen, P.N., Hasler, B., Waagepetersen, J., Rubæk, G.H., Jacobsen, B.H., 2009. *Notat vedr. virkemidler og omkostninger til implementering af vandrammedirektivet*. Danmarks Miljøundersøgelser, Aarhus Universitet.

Johansen, P.H., Thuesen, A.A., 2011. *Det, der betyder noget for livet på landet ... - en undersøgelse af positiv landdistriksudvikling i form af befolkningsfremgang i et landsogn i hver af de fem regioners yderområder. Esbjerg: Center for Landdistriktsforskning.*

Jørgensen, S.L., Olsen, S.B., Ladenburg, J., Martinsen, L., Svenningsen, S.R., Hasler, B., 2012. Spatially induced disparities in users' and non-users' WTP for water quality improvements—Testing the effect of multiple substitutes and distance decay. *Ecological Economics* (forthcoming).

Kadish, J., Netusil, N.R., 2012. Valuing vegetation in an urban watershed. *Landscape and Urban Planning* 104, 59-65.

Kataria, M., Bateman, I., Christensen, T., Dubgaard, A., Hasler, B., Hime, S., Ladenburg, J., Levin, G., Martinsen, L., Nissen, C., 2012. Scenario realism and welfare estimates in choice experiments–A non-market valuation study on the European water framework directive. *Journal of Environmental Management* 94, 25-33.

Knetsch, J.L., 1964. The influence of reservoir projects on land values. *Journal of Farm Economics* 46, 231-243.

Kronvang, B., Wiborg, I., Heckrath, G. og Baattrup-Pedersen, A., 2010. Multifunktionelle randzoner for natur, miljø og friluftsliv. *Jord og Viden* 155, 12-15.

Kulshreshtha, S.N., Gillies, J.A., 1993. Economic Evaluation of Aesthetic Amenities: A Case Study of River View. *JAWRA Journal of the American Water Resources Association* 29, 257-266.

Kuminoff, N.V., 2009. Using a bundled amenity model to estimate the value of cropland open space and determine an optimal buffer zone. *Journal of Agricultural and Resource Economics*, 34, 68-90.

Kuminoff, N.V., Parmeter, C.F., Pope, J.C., 2010. Which hedonic models can we trust to recover the marginal willingness to pay for environmental amenities? *Journal of Environmental Economics and Management* 60, 145-160.

Ladenburg, J., Lutzeyer, S., 2012. The economics of visual disamenity reductions of offshore wind farms—Review and suggestions from an emerging field. *Renewable and Sustainable Energy Reviews* 16, 6793-6802.

Lansford, N.H., Jones, L.L., 1995. Marginal price of lake recreation and aesthetics: An hedonic approach. *Journal of Agricultural and Applied Economics* 27, 212-212.

Larsen, J.R.K., 2010. *A multiple-comparative case study of family experiences in a Danish Holiday Home–some reflections on research design*. Paper for Research Design, Research Methodology and Research Ethics, Aalborg University – September 2010, 15 pages

Leggett, C.G., Bockstael, N.E., 2000. Evidence of the effects of water quality on residential land prices. *Journal of Environmental Economics and Management* 39, 121-144.

LeSage, J:P:, Pace, R.K., 2009. *Introduction to Spatial Econometrics*. Boca Raton: Taylor & Francis Group.

Liefferink, D., Wiering, M., Uitenboogaart, Y., 2011. The EU Water Framework Directive: A multi-dimensional analysis of implementation and domestic impact. *Land Use Policy* 28, 712-722.

Maier, L. and Shobayashi, M. (2001), *Multifunctionality: towards an analytical framework*. Paris: Organisation for Economic Cooperation and Development. Paris: OECD.

Marsden, T. and Sonnino, R. (2008), Rural development and the regional state: Denying multifunctional agriculture in the UK, *Journal of Rural Studies*, 24(4), 422-431.

Ministeriet for By, Bolig og Landdistrikter, 2013. *Regional- og landdistriktspolitisk redegørelse*. København.

Møller, F., Andersen, S.P., Grau, P., Huusom, H., Madsen, T., Nielsen, J., Strandmark, L., 2000. *Samfundsøkonomisk vurdering af miljøprojekter*.

Danmarks Miljøundersøgelser, Miljøstyrelsen og Skov- og Naturstyrelsen.

Mooney, S., Eisgruber, L.M., 2001. The influence of riparian protection measures on residential property values: the case of the Oregon plan for salmon and watersheds. *The Journal of Real Estate Finance and Economics* 22, 273-286.

Muller, N.Z., 2009. Using hedonic property models to value public water bodies: An analysis of specification issues. *Water Resources Research* 45, 10 pages.

Navntoft S, Sigsgaard L, Nimgaard R, Esbjerg P, Kristensen K, Andresen LC & Johnsen I., 2009. *Buffer zones for biodiversity of plants and arthropods: is there a compromise on width?* Pesticides Research no. 127, Miljøministeriet, Miljøstyrelsen.

Netusil, N.R., 2005. The effect of environmental zoning and amenities on property values: Portland, Oregon. *Land Economics* 81, 227-246.

Netusil, N.R., 2006. Economic valuation of riparian corridors and upland wildlife habitat in an urban watershed. *Journal of Contemporary Water Research & Education* 134, 39-45.

Nielsen, N.C., Nissen, K. & Just, Fl. (2011). Landboturisme og innovation. Esbjerg: Center for Landdistriktsforskning.

Nyborg, K., 2000. Homo Economicus and Homo Politicus: interpretation and aggregation of environmental values. *Journal of Economic Behavior & Organization* 42, 305-322.

OECD (2006), *The new rural paradigm: policies and governance*. Paris: Organisation for Economic Cooperation and Development.

Osland, L., 2010. An application of spatial econometrics in relation to hedonic house price modeling. *Journal of Real Estate Research* 32, 289-320.

Panduro, T.E., Veie, K.L. 2013. Classification and valuation of urban green spaces—A hedonic house price valuation. *Landscape and Urban Planning*, 120, 119-128.

Pedersen, M.L., Andersen, J.M., Nielsen, K., Linnemann, M., 2007. Restoration of Skjern River and its valley: Project description and general ecological changes in the project area. *Ecological Engineering* 30, 131-144.

Pettersson Forsberg, L., Sandell, K. & Emmelin, L., 2013. Friluftslandskapets planering och tillgänglighet. I Fredman, P., Stenseke, M., Sandell, K. &. Mossing, A. (red) *Friluftsliv i förändring – rapport från ett forskningsprogram*. Naturvårdsverket, Stockholm.

Poor, P.J., Pessagno, K.L., Paul, R.W., 2007. Exploring the hedonic value of ambient water quality: A local watershed-based study. *Ecological Economics* 60, 797-806.

Primdahl, J., Vesterager, J.P., Kristensen, L.S., Vejre, H.M. Stubkjær, P., 2010, Den multifunktionelle udvikling af landskaber fortsætter. *Jord & Viden*,

3, 4-6.Præstholm, S., Jensen, F.S., Hasler, B., Damgaard, C., Erichsen, E., 2002. Forests improve qualities and values of local areas in Denmark. *Urban Forestry & Urban Greening* 1, 97-106.

Raines, G.L., 2002. Description and comparison of geologic maps with FRAGSTATS—a spatial statistics program. *Computers & Geosciences* 28, 169-177.

Rasmussen, J.J., Baattrup-Pedersen, A., Wiberg-Larsen, P., McKnight, U.S., Kronvang, B., 2011. Buffer strip width and agricultural pesticide contamination in Danish lowland streams: Implications for stream and riparian management. *Ecological Engineering* 37, 1990-1997.

Ravn-Jonsen, L.J., 2005. *Skovenes pris*. AKF working paper Juni 5: 2005, København: AKF Forlaget

Rosen, S., 1974. Hedonic prices and implicit markets: product differentiation in pure competition. *The Journal of Political Economy* 82, 34-55.

Schou, J.S., Danmarks Miljøundersøgelser., 2007. *Virkemidler til realisering af målene i EUs vandramme-direktiv udredning for udvalg nedsat af Finansministeriet og Miljøministeriet: Langsigtet indsats for bedre vandmiljø*. Danmarks Miljøundersøgelser

Tiebout, C.M., 1956. A Pure Theory of Local Expenditures. *The Journal of Political Economy* 64, 416-424.

Tietenberg, T.H., Lewis, L., 2011. *Environmental & natural resource economics*. Pearson, Boston.

Tita, G.E., Petras, T.L., Greenbaum, Robert, T., 2006. Crime and Residential Choice: A Neighborhood Level Analysis of the Impact of Crime on Housing Prices. *Journal of Quantitative Criminology* 22, 299-317.

Data is taken from:

Geodatastyrelsen (2013a). Kort10- landsdækkende, SHP, UTM32; www.gst.dk (downloaded 21.03.2013)

Geodatastyrelsen (2013b). Matrikelkortet - landsdækkende, SHP, UTM32; www.gst.dk (downloaded 21.03.2013)

KMD (2013). BBR, ESR, SoegEjendom, extracted 07.02.2013

NaturErhvervstyrelsen (2012). Kompensationskort, Shape, UTM32, https://kortdata.fvm.dk/download/index.html (version of 13.12.2012)

Statistics Denmark (2013). Consumer price index, series: Pris9, Base: 1900. (last access 01.08.2013)

Appendix A – Guided interviews

List of interviewees

Erik Jensen (EJ), Dansk Vandrelaug (Danish Hiking Guild), Viborg, chairman

Jens Jørgen Andersen (JA), Haderslev Orienteringsklub (Haderslev Orienteering), former chairman of the training committee

Jens Rye Larsen (JL), Dansk Ornitologisk Forening, DOF – Sydvestjylland (Danish Ornithological Union), chairman

Kaj Børge Simonsen (KS), Ringkøbing og Omegns Sportsfiskerforening (Angling Association), chairman

Marco Rohde Brodde (MB), Dansk Ornitologisk Forening, DOF-Central, Danish Ornithological Union), vice chairman

Mette Bøge Henriksen (MH), Dansk Spejderkorps (Danish Scouts), Ribe Trop, group charman

Niels C. Andersen (NA), Dansk Orienterings-Forbund, Ribe OK, (Danish Orienterring Union) vice chairman

Ole Bertelsen (OB), Dansk Vandrelaug (Danish Hiking Guild), national chairman

Rikke Wobeser (RW), Børnehuset Borris, Skjern, kindergarten teacher

Vagn Andersen (VA), Dansk Vandrelaug, (Danish Hiking Guild), Afdeling Ringkøbing-Skjern, chairman

Vibeke Kanstrup (VK), Dansk Naturfredningsforening, (Union of Danish Nature Presevation), DN Ringkøbing-Skjern, member of the board

Interview guideline

Question	Target information
1. What is your role in the organization?	Personal information
2. What do you know about buffer zones?	General knowledge, awareness of media discourse
3. Do you have a general opinion about this instrument "buffer zone"? Good or bad? a. If good, what specifically do you think is good? b. If bad, can you think about another way to improve the water quality	Attitude towards e.g. governmental regulation, nature conservation; WFD Control questions
4. Do you think buffer zones make a difference, e.g. cleaner water, flood protection, open space for biodiversity	Awareness of ecosystem services connected with buffer zones
5. Do you own land which is affected by the latest buffer zone regulation?	
6. Do you use the buffer zones? a. If yes, how often and what for? b. Privately or in the role as organizational representative? c. What must change so that you would use these areas more often? Do you know somebody (friends/family/colleagues) who use these areas on a regular basis?	Individual use value
7. Do you already recognize any changes due to these buffer zones? E.g. environmentally, or more people using these areas?	Hypothetical social value
8. Do you expect any changes due to these buffer zones? a. For whom? Yourself, family/friends, greater society b. What kind of changes in particular, e.g. cleaner water? c. Good or bad changes? d. Significant changes or just incremental?	Hypothetical social value

Targets of the interview:

- Main target: individual actual benefit

- Side targets:
  - Awareness of buffer zone: – not just media discourse but also how it affects their day-to-day life, where does it belong (legally, politically) & what does it aim to do
  - Ability to set this measure into context, not just politically/legally but also ecologically
  - Acceptance of this specific policy measure (if applicable compared to general attitude of political measures)

Appendix B

B1. Descriptive Statistics

Table 5: Descriptive Statistic - Municipality Ribe

Variable	N	Mean	Std. Dev.	Min	Max
Sales price (in DKK)	1529	2,177,132	3,038,950	33,000	89,700,000
House characteristics					
Year of construction	1529			1600	2012
Year of rebuilding	1529			-	2013
Building size (m^2)	1529	136.14	50.18	25	421
Lot size (m^2)	1529	1,828.13	16,327.27	73	633,336
No of toilets (water flushed)	1529	1.60	0.57	0	4
Economic (dis-) amenities					
Distance city center (in m)	1529	3,475.94	3,102.95	0	15,205.38
Distance parking (in m)	1529	902.41	1,484.39	6.16	9,343.71
Distance street (in m)	1529	108.62	113.91	6.86	846.26
Natural (dis-) amenities (in m)					
Distance river (in m)	1529	222.95	135.90	6.50	1,020.72
Distance river >2.5m (in m)	1529	546.15	446.92	8.01	2,585.12
Distance lake (in m)	1529	377.68	204.70	25.60	1,634.52
Distance forest (in m)	1529	231.64	215.89	5.60	1,612.81
Distance beach (in m)	1529	6,165.20	2,761.88	515.68	16,660.32
Distance farmland (in m)	1529	162.16	159.87	5.94	690.11
Distance windmill (in m)	1529	3,837.52	1,459.69	594.44	9,675.30
Distance 10 meters buffer zone (in m)	1529	206.67	125.52	0	1,009.75
Access 10 meters buffer (in m)	1529	351.67	210.86	0	1,158.82
MPFD	1529	1.68	0.08	1.23	1.79

Table 6: Descriptive Statistic - Municipality Skjern/Tarm

Variable	N	Mean	Std. Dev.	Min	Max
Sales price (DKK)	2473	1,664,133	1,249,934	17,000	20,200,000
House characteristics					
Year of construction	2473			1847	2013
Year of rebuilding	2473			-	2011
Building size (m^2)	2473	130.87	48.46	32	376
Lot size (m^2)	2473	1,304.64	10,090.06	-	497,631
No of toilets (water flushed)	2473	1.49	0.55	0	4
Economic (dis-) amenities					
Distance city center (in m)	2473	4,694.14	4,207.97	0	17,937.73
Distance parking (in m)	2473	770.97	1,319.02	8.37	6,633.08
Distance street (in m)	2473	30.99	47.17	5.08	825.93
Natural (dis-) amenities					
Distance river (in m)	2473	338.94	176.97	12.03	1268.80
Distance river >2.5m (in m)	2473	399.87	242.11	12.66	1,747.89
Distance lake (in m)	2473	389.15	202.24	18.10	1,367.44
Distance forest (in m)	2473	228.03	193.17	0	950.03
Distance beach (in m)	2473	8,954.72	4,335.60	65.73	27,724.13
Distance farmland (in m)	2473	257.89	212.30	6.31	842.62
Distance windmill (in m)	2473	2,676.00	1,036.70	42.99	4,928.17
Distance 10 meters buffer zone (in m)	2473	272.58	152.65	0	1,035.99
Access 10 meters buffer (in m)	2473	426.90	213.80	0	1,382.17
MPFD	2473	1.70	0.07	1.26	1.83

Table 7: Two-sample t-test: Difference between Ribe & Skjern/Tarm (unequal variances)

Variable	Mean-Diff*	Std. Error (Diff)	Ha: diff < 0; Pr(T < t)	Ha: diff != 0; Pr(|T| > |t|)	Ha: diff > 0; Pr(T > t)
Sales price (defl.)	-512,998.7	81,681.04	0.00	0.00	1.00
Age	-4.69	2.23	0.02	0.04	0.98
Building size (m^2)	-5.28	1.61	0.00	0.00	0.99
Lot size	-523.49	464.24	0.13	0.26	0.87
Distance city center	1218.20	116.01	1.00	0.00	0.00
Distance parking	-131.45	46.31	0.00	0.00	0.99
Distance street	-77.62	3.06	0.00	0.00	1.00
Distance river	115.99	4.97	1.00	0.00	0.00
Distance river>2.5m	-146.28	12.42	0.00	0.00	1.00
Distance lake	11.47	6.63	0.96	0.08	0.04
Distance forest	-3.60	6.75	0.30	0.59	0.70
Distance beach	2789.52	112.20	1.00	0.00	0.00
Distance farmland	95.73	5.91	1.00	0.00	0.00
Distance windmill	-1161.52	42.76	0.00	0.00	1.00
Distance 1st 10 meters buffer zone	65.91	4.44	1.00	0.00	0.00
Distance 2nd 10 meters buffer zone	65.26	4.72	1.00	0.00	0.00
Distance 3rd 10 meters buffer zone	321.58	262.65	0.89	0.22	0.11
Access 10 meters buffer zone	75.22	6.89	1.00	0.00	0.00
MPFD	0.015	0.003	1.00	0.00	0.00

* diff = mean(Skjern/Tarm) - mean(Ribe)

B2. Robustness Checks for the hedonic price models

Kelejian-Prucha model (KP)

Following Elhorst (2010), the hedonic price function (equation 4) is altered to:

(5) $$Y = \rho WY + X\beta + u$$

(6) $$u = \lambda Wu + \varepsilon$$

Hence, this estimation method exploits the spatial lag of the dependent variable and controls for further spatial correlation in the error-term instead of using a spatial lag of the independent variable as the spatial Durbin model. For the estimation, a two-step estimation procedure as described in detail by Drukker et al. (2011) has been employed. The constant is suppressed as the model assumes and the heteroskedastic disturbance term is used. Results are reported in Table 8. The spatial weighting matrix is as before an inverse distance matrix. Regarding the results, house characteristics tend to be stable as well as most of the economic and natural local characteristics (e.g. distance to street and proximity to forest for Skjern). The for the analysis interesting estimates, distances and access to buffer zone as well as the dummy if the house has a buffer zone on the ground and was sold after 2008, are generally robust. The distance towards the 10 meter buffer zone lost its significance in Ribe. In this model, however, the proximity to lakes and rivers in general seems to increase the sales price of the house significantly. Hence, hedonic house price estimations tend to be model sensitive. Similar issues were also detected by Olson (2010). But the alterations due to the estimation models are in this study relatively low – thus, results are robust.

Please note: Green marked coefficients are the same as in the SDM, orange marked coefficients changed the significance, and coefficients are marked red if significance and sign changed.

	Ribe		Ringkøbing-Skjern	
	Dependent Variable: Ln(Sales price)			
Age (demeaned)	0.00105	0.00104	**0.00726*** **	**0.00747*** **
	(0.000689)	(0.000692)	(0.00136)	(0.00138)
Age^2 (demeaned)	-5.44e-07	-5.41e-07	**-0.000153*** **	**-0.000153*** **
	(3.52e-07)	(3.54e-07)	(2.43e-05)	(2.48e-05)
Rebuild x Age (dem.)	**1.42e-06** **	**1.43e-06*** **	**1.40e-06** **	**1.36e-06** **
	(5.52e-07)	(5.54e-07)	(6.68e-07)	(6.74e-07)
Ln(toilet)	**0.000879***	**0.000870***	0.000763	0.000681
	(0.000508)	(0.000484)	(0.000668)	(0.000627)
Ln(building size)	**0.121** **	**0.114***	**0.579*** **	**0.581*** **
	(0.0599)	(0.0606)	(0.0412)	(0.0412)
Ln(lot size)	**0.163*** **	**0.167*** **	0.00207	0.00206
	(0.0557)	(0.0572)	(0.00137)	(0.00137)
Ln(parking)	**-0.115*** **	**-0.107*** **	**-0.0370*** **	**-0.0352*** **
	(0.0196)	(0.0196)	(0.0131)	(0.0132)
Ln(street)	0.00125	0.00156	**0.0695*** **	**0.0776*** **
	(0.0178)	(0.0179)	(0.0213)	(0.0212)
Ln(city)	-1.10e-05	-1.05e-05	-5.43e-06	-4.87e-06
	(0.000179)	(0.000177)	(0.000252)	(0.000252)
Ln(river)	-0.0368		**-0.0897*** **	
	(0.0266)		(0.0224)	
Ln(river>2.5m)		**-0.0407** **		**-0.0892*** **
		(0.0205)		(0.0219)
Ln(lake)	**-0.0655** **	**-0.0587** **	0.00947	0.0112
	(0.0255)	(0.0258)	(0.0215)	(0.0208)
Ln(10 meters buffer)		-2.69e-05		**-0.000367*** **
		(9.16e-05)		(8.02e-05)
Ln(access 10 meters buffer)		**-0.000492*** **		0.000277
		(0.000130)		(0.000178)
Ln(beach)	-0.0479	-0.0466	**-0.0797*** **	**-0.0758*** **
	(0.0458)	(0.0436)	(0.0193)	(0.0190)
Ln(forest)	0.00814	0.0171	**-0.000945*** **	**-0.00102*** **
	(0.0167)	(0.0173)	(6.20e-05)	(5.99e-05)
Ln(farmland)	**0.103*** **	**0.100*** **	**0.0604*** **	**0.0522*** **
	(0.0240)	(0.0225)	(0.0155)	(0.0151)
Ln(windmill)	**0.132*** **	**0.141*** **	0.0345	0.0276
	(0.0476)	(0.0466)	(0.0271)	(0.0267)
MPFD	-0.0927	-0.0478	0.0421	0.0272
	(0.272)	(0.272)	(0.186)	(0.187)
D(riparian property)	**0.154***	0.0845	-0.0818	0.0157
	(0.0920)	(0.0939)	(0.119)	(0.128)
$d^{buffer}_{sold>2008}$		0.0732		**-0.294** **
		(0.101)		(0.135)
D(ZIP 6900)			**0.0697** **	**0.0688** **
			(0.0279)	(0.0273)
Year-Dummies	Yes	Yes	Yes	Yes
Rho	0.860***	0.850***	0.814***	0.807***
	(0.0561)	(0.0567)	(0.0342)	(0.0343)
Observations	1,529	1,529	2,473	2,473

Table 8: Kelejian-Prucha Estimation
Robust standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1