Rethinking the economic valuation of natural land

Daams, Michiel Nicolaas

CHAPTER 8.

Conclusions and discussion

8. Conclusions and discussion

In our discussion of the main findings of the present research, we begin in section 8.2 with a brief summary of the research objective and study questions, followed by a discussion in section 8.2 of the insights gained from the analyses. In section 8.3 policy implications of this research are offered, and thereafter in section 8.4, we conclude with discussions of the data and methodologies applied in this thesis, and provide suggestions for future research.

8.1 Summary of the main objective and related research questions

The main objective of this thesis is to better understand how people value natural land along urban-rural gradients. In order to carry out all of the steps towards achieving this objective, we have worked on rethinking the economic valuation of natural land. We have adopted a wide perspective on well-being and employed spatially explicit methods, both in order to analyze monetary and non-monetary economic values of natural land and associated amenities. These analyses were dedicated to the investigation of three research questions on: the value of maintaining the current supply of natural land in urban as well as in rural areas; the role of natural land in rural economic development options of the Dutch Wadden area; and enquiries into how natural land relates to the well-being of people in population concentrations (urban areas and cities). In addressing each of these questions empirically, we have often considered data on Figure 8.1's *y*-axis 'Well-being from natural land', from the Hotspotmonitor survey (see Box 1 in section 1.1) across the chapters in this thesis. Also indicated in Figure 8.1 is the depiction of each chapter's spatial scope along urban-rural gradients, as well as the specific research question(s) dedicated to each chapter.

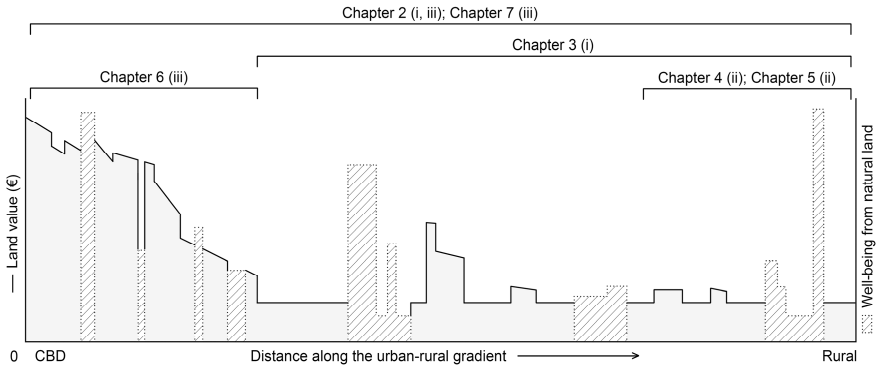

Figure 8.1 – Spatial scope of each chapter indicated on a hypothetical urban-rural gradient. The Roman numerals in parentheses refer to research questions (i) "How can the value of maintaining the current supply of natural land, in both monetary and non-monetary terms, be better understood by accounting for how people subjectively evaluate natural land?" (ii) "How can we better understand the role of natural land in the rural economic development of the Wadden area?" and (iii) "How can we better understand the spatial interplay between demand for and supply of natural land and population concentrations?"

8.2 Main findings

In order to address in particular the first research research question in this thesis, in Chapter 2 we have considered that meaningful monetary values of natural land can be derived from the prices of nearby properties traded in the residential market. Market prices for residential property are known to internalize buyers' evaluations of the value of property as well as, importantly, its location relative to amenities, including those associated with natural land. This is particularly relevant for the economic valuation of natural land, since the residential market is the largest market in terms of capital value in which the benefits of natural land are (indirectly) traded. Therefore, in Chapter 2 we were interested in assessing what the value of natural land and associated amenities has added to the prices of nearby property. Theory suggests that property prices are determined by the interactions among all potential buyers. The implication here is that, in order to estimate its true capitalization in property prices, natural land needs to be measured in a way that captures how potential property buyers perceive it. However, this measurement has largely been ignored in the empirical literature on property prices. In order to account for perception explicitly, we identified the locations of pieces of natural land that had likely been sought after by potential property buyers because these were perceived as attractive by a wide general public. We hypothesized that the impact of such natural land

on property prices would range across a wider distance than existing studies would lead us to believe. In testing this, the spatial scale of the estimated impact on property prices was allowed to be the outcome of our analysis. Furthermore, in our analysis we controlled for structural characteristics of property as well as unobserved locational characteristics of the observed properties, as these could otherwise confound estimates of the impact of attractive natural land on nearby property prices.

Empirical evidence from our OLS multivariable analysis of residential property prices in Chapter 2 showed that economic benefits of living nearby natural land extend over a considerably wider distance than existing studies have suggested, *if* natural land is perceived as attractive. Furthermore, the estimates of the value that attractive natural land adds to the prices of nearby property were shown to decay smoothly with distance. Analysis of results from several alternative model specifications indicated that the main results are robust.

In addition to the findings from the main analysis and associated robustness checks, it was shown in Chapter 2 how the impact of attractive natural land on property prices varies between regions of different degrees of urbanization: metropolitan, urban, and non-urban. The most noticeable variation in these explorative results could be explained by the notion that attractive natural land is overall scarcer in the more urbanized regions, thereby rendering its value to property buyers to be higher in urban regions than in rural regions. Remaining variations in these additional results was in line with insights from empirical economic literature outside the field of property prices.

From an empirical perspective, the abovementioned findings in Chapter 2 have two main implications. The first relates to the finding that land use data by themselves are not specific enough to construct measures which reflect how potential property buyers perceive the attractiveness of natural land. We could of course have expected so from findings in Chapters 3 and 4, as these suggest that some single natural land uses include attractive as well as less attractive areas. However, the finding on valuation given in Chapter 2 has quantified that the systematic measurement of subjective attractiveness is of high significance in understanding the monetary economic value of the current supply of natural land. The implication here is that property price analyses such as the one carried out in this research, should capture as precisely as possible the way natural land is perceived by potential property buyers. This notion is not new, but our findings shed new light on this matter, which is important, as it is only touched upon in existing empirical studies. In the same vein, the second implication of our results is that if perceived attractiveness is *not* taken into account, as current studies neglect to do, the distance over which natural land is capitalized in property prices is likely to be misunderstood. Both these implications have underlined the importance of the findings in Chapter 2 in providing a partial answer to the first research question in this thesis “how can the value

of maintaining the current supply of natural land, in both monetary and non-monetary terms, be better understood by accounting for how people subjectively evaluate natural land?"

In the valuation of the current supply of natural land, the value which it adds to property is particularly relevant when natural land situated in or near population concentrations is considered (cf. the third research question in this thesis, see section 1.2 or Figure 8.1); but there can also be value in conserving natural land in areas where few people live, if it is somehow appreciated. In Chapter 3 we assessed people's appreciation for nature areas throughout the Netherlands. In conjunction with our study in this chapter, we have also discussed the criticism of the current European Natura 2000 nature protection policy, especially in the Netherlands; this policy has been highlighted as too technocratic because it is apparently motivated mostly by ecological arguments. Such limited weight given by social human values in the designation of conservation sites can imply that natural land or the quality of its amenities may be lost due to land use change with relative ease, even when it is appreciated by people. In Chapter 3 we therefore delved deeper into emotions that are aroused in people by nature areas, in a systematic way. In doing so, we have assessed the spatial overlap of Natura 2000 areas and the collectively appreciated nature areas.

Contrary to what one might expect, given the mainly ecological criteria for Natura 2000 designation, although several sites permit recreational activities, Natura 2000 areas were found to have considerable overlap with the areas appreciated by a wide public. Little or no overlap was observed mostly in the case for smaller areas, but we also observed little overlap for a couple large areas. Further spatial analyses were performed for all nature taken together per specific *type* instead of by nature area. The outcomes showed that nature types that were (in general) more attractive such as dunes, coastline, and forests, had larger shares of their areas protected by Natura 2000 legislation.

In Chapter 3 we also assessed the different needs that nature areas serve, as well as the depth of emotion associated with these areas. Content analysis was performed on people's open elaborations as to why they appreciate particular nature areas. The findings have indicated that in several cases "appreciation" was motivated by one or more of three types of emotional experience: 'peace and quiet', 'let's explore', and 'peak'. Across emotion categories, the highest densities were evident in the large nature areas along the coastline and several areas across the central part of the country. However, specific emotion categories appeared more frequently in relation to some locations compared to others. This assessment fulfilled our presumption in Chapter 3: that latent nature-induced emotions can be quantified in the spatial analysis of distinct nature areas.

In Chapter 4 we highlighted the divide between well-being and conventional economic metrics in the valuation of natural land in a rural area, the Dutch Wadden area. More specifically, we considered the theoretical notion that as capital, labor and information are increasingly mobile and tend to flow towards urban areas, rural areas can build their competitiveness on the utilization of immobile production factors, including natural land. From the literature it follows that such an approach to regional development has shaped the Dutch Wadden area's rural economy over time. In the present-day, as we have demonstrated, the Dutch Wadden area has a mature tourism industry, which in 2010 attracted over one million visitors. However, little is known about how much the tourism industry contributes to local economies along the Wadden area's islands and mainland coastal areas, and how this relates to the appreciation of nature. This question is exercising the minds of policy makers concerned about the potential of subareas within the Wadden area for tourism development.

In the literature on the economic development of tourism destinations, most theoretical attention has been given to the role of visitor flows. Visitor flows may grow, stabilize, or decline over time, thus indicating the competitive state of a tourism destination such as the Dutch Wadden area, relative to alternative destinations. But visitor flows give only a narrow perspective on the economic importance and development potential of tourism within a local economy. Therefore, led by insights from regional economic literature, in Chapter 4 we have analyzed how much tourism contributes to employment across rural economies within the Dutch Wadden area, and how this compares to the level of people's appreciation for natural land and associated amenities in specific locations.

Findings in Chapter 4 indicate that the substantial flows of visitors to the Wadden area lead to modest employment figures for the tourism sector. Due to this important finding, the contribution of tourism to local economies was characterized further by assessing the degree of economic specialization towards this sector across the Wadden municipalities, a study which is ignored by analyses of visitor flows. Importantly, this was evaluated jointly with the intensity with which a relatively random sample of the Dutch population appreciates the natural land and associated amenities in specific locations within the observed municipalities. This analysis confirmed the widespread knowledge that in the municipalities of the Dutch Wadden islands, although the numbers of jobs in tourism there are modest in an absolute sense, economies are strongly specialized in tourism. Also, as one might expect, it was shown that this corresponded with levels of natural amenity; but in our analysis we did so with unique quantitative accuracy. We found, importantly, that municipalities on the mainland coast include few jobs in tourism and are also little specialized in this sector. In general, on the mainland coast, this specialization is found to slowly converge over time towards the

Dutch average level. The lagging situation of the tourism sector on the mainland seems at par with the limited appreciation that we found for its nature. Furthermore, we provided systematic insights into the subjective motivations of people in relation to why they appreciate specific natural locations in the Dutch Wadden area. Closer scrutiny of the content of individuals' motivations indicated that natural land and associated amenities may arouse deep feelings within people. The implication here is that for some people there is a strong connection between their evaluation of the nature of the Dutch Wadden area and their own well-being. The abovementioned findings have shown that measuring subjective evaluations of nature in a spatially explicit way can help understand the economic importance of natural land in the Wadden area's rural economy (cf. the second research question in this thesis).

From Chapters 3 and 4 we can conclude that the economic value of the current supply of natural land can be better understood if we consider not only conventional 'hard' value-metrics such as money and jobs, but also 'soft' metrics such as appreciation of nature and the emotions which appreciated nature arouses in people (cf. the first research question in this thesis). This notion holds true especially for locations where hard value-metrics of nature seem to capture value in a narrow way – as signified by the finding in Chapter 4, that the (rural) Dutch Wadden area serves the needs of many visitors and thereby adds to their well-being, but this economic situation yields only a small number of jobs. Nevertheless, even when different values of natural land are quantified in an appropriate way the comprehension of trade-offs, with regard to values of alternative uses of land, is likely to continue to be a thorny task.

In Chapter 5 we provide a comprehensive discussion of the Dutch Wadden area, a UNESCO World Heritage Site and rural area that stretches partly along the North Sea in the northern periphery of the Netherlands. Although it is renowned for its ecological integrity and quality, the Wadden area is rife with conflict about land use, involving amongst others, claims for space by industrial sites such as energy plants or waste burning plants, and resource extraction space requested by fisheries. The desirability of such land use in specific locations in the Wadden area has been the subject of public policy debates due to the inherent conflicting economic and ecological values. As such, the economic and ecological values associated with land use play a crucial role in the Dutch Wadden area's development. In characterizing the situation in the Wadden area, however, scientific information has often been challenged and disputed, or used in selective ways. Moreover, information is often fragmented due to its being based on data from project evaluations. To address the above mentioned issues, in Chapter 5 we aimed to set out the fundamentals of a common knowledge base of the economy and ecology of the Wadden area. To do so, we have integrated the emergent theoretical insights and empirical illustrations, thus providing the structure for an evaluation of impacts of projects and

policies in the wider context of regional economic development. This has ultimately led us to the specification of a public data-tool with a scientific underpinning, a tool that is able to inform policy decision makers and relevant stakeholders who are involved in the development of the Dutch Wadden area (cf. the second research question in this thesis).

The findings in Chapter 5 indicate specific characteristics that the considered public data-tool, known as the Spatial Economic Ecological Database (SEED), requires in order to function in an optimal way. SEED is characterized by the following: the database is built on publicly available GIS-maps – maps which must remain publicly available – to be used on platforms such as so-called map-tables or online viewers. Included maps visualize indicators of spatial distributions of key ecological and economic values, or developments therein. The values that are visualized in maps reflect both key drivers and assets, and additional maps can be included to provide information needed to answer specific policy-questions. Such questions may pertain to (potential) conflicts between natural and non-natural land use, be it through direct competition for land, or through externalities. In exploring such matters we concluded from the literature on project evaluation that it is important for the values in each map to be understandable to all stakeholders. Overall comprehension of SEED may be increased by paring down the number of included indicators. However, overall comprehension is mainly achieved by working towards a set of indicators validated by experts as the most appropriate, given the data availability and the policy or project evaluation-related question at hand. Thus, SEED is aimed to be consensus-based. From a spatial perspective, it is essential that the included maps allow for the assessment of project impacts at multiple scales. In particular, the spatial scale on which an indicator is measured should be the outcome of analysis, not an a priori definition. But it should also be possible to consider impacts at the scale of decision making. We argue that, by adopting the abovementioned criteria, SEED can facilitate public understanding of economic and ecological values in the Dutch Wadden area considered in land use-related decision making at both project *and* regional level.

When considered together, some of the findings from Chapters 4 and 5 further deepen our knowledge about the Dutch Wadden area's contribution to the well-being of people who live throughout the Netherlands. It is relevant that in both chapters the same survey data on appreciation for the Wadden area's nature has been analyzed. These data measured the locations of nature that people designated as attractive; individuals were permitted to choose only a single location. This location was not restricted to the Wadden area but could be situated anywhere in the Netherlands. In Chapter 4 we found that of all designations of attractiveness, the Wadden area attracts about one sixth share: higher than one would expect if this collective appreciation were a derivative of the Wadden area's share in the *total* Dutch land area, as measured in Chapter 5. This finding implies that compared to most nature in the Netherlands, the Wadden area's nature is relatively

attractive. Moreover, in Chapter 5 we have shown that of the people who were found to appreciate the Wadden area, the majority live in urban areas across the Netherlands; this insight provides a partial answer to the third research question in this thesis. So despite its peripheral location, the Dutch Wadden area serves both the well-being of its local population and the well-being of potentially sizable external urban populations.

In Chapter 6 we verified the lack of internationally usable indicators for the local supply of natural land that adds to the well-being of people who live in nearby cities. In the absence of verifiable indicators, the growing empirical field is neither able to robustly study the relationship between natural land and the competitiveness of cities in attracting populations nor to study the well-being of urban dwellers. Furthermore, we suggest that policy makers will wish to understand how the livability in their city compares to that of other cities with regard to the supply of natural land. Our interest in this chapter was to ascertain at city level how close their populations live to natural land which may add to their well-being – because somehow it provides a satisfactory level of amenity services. Therefore, in Chapter 6 we have approximated the subjective level of amenity in relation to the supply of natural land across the observed countries the Netherlands, Denmark, and Germany. We conducted this approximation based on the spatially-explicit approach introduced in Chapter 2, which was shown to yield an *attractiveness-based* measure with a strong connection to people's residential location choices, and by extension, their well-being. This underlines the strength of the attractiveness based measure constructed in Chapter 6 as a well-being indicator. Furthermore, we also confirmed from the literature that the most important precondition for people's connectedness with natural land is the distance between natural land and residential location. We have therefore put the measurement of this distance at the core of our city-level analysis in Chapter 6.

Our findings in Chapter 6 show considerable variation in how close, on average, the inhabitants of the observed cities are to natural land of high subjective amenity. Considerable variation was also found when findings were compared internationally across cities of a similar size. Interestingly, over all of the cities, the closeness of their populations to attractive natural land was found to have a low level of association with how close these populations are to any natural land (regardless of its attractiveness). Thus, in 'greener' cities people do not necessarily live closer to attractive nature than people who live in 'less green' cities. This finding has provided an answer to the third research question in this thesis "How can we better understand the spatial interplay between demand for and supply of natural land and population concentrations?" Although in Chapter 6 we adopted a supply-side perspective, by considering data on the attractiveness of natural land our indicator nevertheless uniquely captured the proximity of urban populations to natural land that may actually be in demand by these populations.

In addition, we found that in cities with higher population densities, populations are on average living closer to attractive natural land than are the populations of lower density cities. An explanation for this is that since natural land is the counterpart of developed urban land, the relatively more extensive development of land in lower density cities pushes the populations of these cities to live farther away from scarce amenities such as attractive natural land. When looking at how close city populations live to natural land of *any* level of amenity, however, we found an inverse relation with urban density compared to that found for attractive natural land. Taking together the two aforementioned results, it is clear that living in high density cities does not come solely at the expense of living as close to natural land as possible in a low density city: higher densities may allow people to live closer to attractive natural land. This finding is in contrast with conventional studies and well-being indicators of the supply of natural land in cities, because they have not yet considered the role of attractiveness.

Natural land and its associated amenities can promote human well-being as they may offer desirable landscapes in which to live and reside. Natural land use, however, is a counterpart of developed land in residential use, which also promotes our well-being. Importantly, the literature suggests that urbanization is an ongoing trend that fosters processes of wealth creation, and that higher wealth in turn invokes higher appreciation of natural land in residential areas. If this is the case, then if we were to only account for the wide-spread residential preferences of people living today in urban development, this would undermine the well-being of future populations. Indeed, in Chapter 7 we observed that the general population in the Netherlands, as well as populations in many other parts of the world, are likely to grow considerably wealthier over time. In that chapter we were therefore concerned with how 'green', and how centralized or decentralized, we should build our cities if we adopt a perspective on well-being over the long-term. In order to provide an indication of how green a wide share of the population may prefer to live in the long-term if it continues to grow richer over time, we analyzed how green the present-day rich live. More specifically, we looked into the absolute physical dimensions of the parcels of present-day rich properties recently transacted, and how close these properties are to (attractive) public natural land. To understand how green the present-day rich live in a relative sense, the characteristics of relatively expensive properties were compared with the characteristics of relatively cheaper properties. In doing so, single family and apartment properties were analyzed separately because of the systematic differences in the locations, characteristics, and pricing of these property structures. Different definitions of 'properties of the rich' were also considered in the analysis in order to ensure robust findings.

Our findings in Chapter 7 indicate that, on average and compared across varying levels of urbanization, single family properties of the rich have parcels that are

considerably larger than the parcels of single family properties of the more general population. In a similar way we have demonstrated that the rich live relatively close to public green. Public green that is appreciated by a wider population is found to be particularly sought after by rich property buyers. Similar results (as for the single family properties) are found for the - relatively few and highly urban - apartments bought by rich households. With respect to the level of urbanity at their home locations, the rich who bought single family properties are found to prefer extremes: they tend to live in either very highly urban locations or (mostly) in the least urban types of locations – if these residences are nearby cities.

Using the abovementioned findings from the main analysis in Chapter 7, we then performed a 'forecasting' analysis. We considered what would happen to demand over the long-term, say by the end of the 21st century, if more people started to live in homes with parcels as large as those bought by the present-day rich. And, in doing so they would relocate across local property markets to achieve the distribution similar to what we have previously established for the properties of the present-day rich. The resulting forecasts serve as illustrational purposes since it is unrealistic to presume that a considerable share of the population could live like the present-day rich if general wealth were to rise. Increased competition for land would drive up land prices since, countrywide, little adjustment is likely to be possible on the supply-side of the land market either due to enforcement of restrictive planning controls by government, or by sheer lack of developable land. Thus, it is not general wealth but rather relative wealth that would allow one to live like the present-day rich. The forecasts emphatically show that if over the long-term a mere quarter of the total population wished to live like the present-day rich, there would be insufficient space to accommodate their wants. Thus, if the general Dutch population grows wealthier over time, it is possible that its preferences in how green they want to live will increasingly exceed the greenness of the supply of property. Such divergence in quality aspects to the match of demand and supply is forecasted to be especially strong in relatively central or urbanized local property markets (cf. the third research question in this thesis). In so far as these local property markets are concerned, for markets in the peripheries of the Netherlands the current surpluses of land available for development is forecasted to remain at about the current levels of supply, even while all demand for land by the assumed future population of rich households is taken as satisfied.

8.3 Implications for policy

In this research we have studied how people value natural land in specific locations along urban-rural gradients. Land use-related policy institutions in the Netherlands currently seek to involve the general public more in land use policy and to also underpin decision

making with increased amounts of systematic information on how people value natural land (e.g. Dutch Ministry of Economic Affairs 2013; 2014; Netherlands Environmental Assessment Agency 2014). In so doing, as we argued in Chapter 1 in line with the literature, both monetary and non-monetary values of natural land should be accounted for. In other words, decision making on the spatial allocation of land use and public investment in land use management should take broad account of people's well-being from natural land and its associated amenities. Substantiation of such well-being can be improved using our findings in Chapters 2 to 7. Below we discuss the implications of these findings for local, regional, and national policy. The discussion below of policy implications considers topics addressed by each of the three research questions in this thesis (see section 1.2) in a consecutive way, followed by an integrative implication of findings in this thesis for policy.

8.3.1 Conservation and public investment

Findings from Chapters 2, 3 and 4 support quantitative economic substantiation of nature conservation policy, which aims to maintain the current supply of natural land, as well as similar substantiation of public investment in nature across urban-rural gradients. In and near population concentrations the monetary opportunity costs of the conservation of natural land can be high. With regard to such areas, decision making can consider how people value natural land in the largest market, in terms of capital, in which it indirectly adds monetary value to traded goods: the residential property market. Our findings in Chapter 2 raise a major implication with regard to public investment in natural land near residential areas. We showed that natural land and associated amenities, if evaluated by people as attractive, can add value over considerably wider distances than the extensive literature on this topic has suggested. Even while such positive impact on property prices decreases with distance, the aggregate economic benefits of living nearby attractive natural land are shown to be based to a limited degree on the value-added to the most nearby properties. The implication then is that – especially near population concentrations – substantially larger investments in sustaining the supply of natural land, if attractive, can be legitimized than was previously possible with information from property transactions.

Currently Dutch nature protection policy refers mostly to ecological motives rather than the appreciation that people have for natural land and associated amenities. Chapter 3 has, however, shown that in addition to monetary metrics (Chapter 2), the specific emotional content of *appreciation* can be monitored and assessed spatially in policy-relevant indicators. Policy making can use this information to add support for protecting natural land in specific areas (Chapters 3 and 4). Similarly, the protection of areas which are on a lower level of ecological importance and also lowly appreciated could be reconsidered. Moreover, appreciation-based indicators can be used to gauge public sentiment towards new conservation area designations, and this seems to be in line with

Dutch policy making, which seeks to increase public involvement in conservation. Such consideration of appreciation, besides ecological motives, can widen the legitimacy of nature conservation from a sustainable development perspective, since it accounts for human demands for conservation more explicitly. The quantification of emotions induced by nature can play a role in conservation policy in rural areas especially, since the 'hard' economic productivity of natural land measured in money or jobs may be rather low there, but the well-being production may nevertheless be high, as implied by Chapter 4. Also in rural areas, competition with non-natural land use may be limited, thereby rendering the relevance of insight into 'hard' economic values to be lower compared to that of urban areas. Urban spatial policy making can, however, make use of information on how many people appreciate specific pieces of natural land, and why these pieces are appreciated, in order to understand their value.

8.3.2 Rural tourism economies

We have demonstrated that natural land in rural areas, specifically those on the islands and the mainland along the Dutch Wadden area, may be deeply appreciated and attract many visitors, but still yield few local jobs (Chapter 4). Nevertheless, rural areas can build a competitive economy on natural amenity-based tourism, even as mobile production factors tend to flow towards cities. Results in Chapter 4 confirm that the Wadden islands have mature and specialized tourism economies. In contrast, however, we can observe the case of the municipalities along the mainland coast of the Wadden Sea. Even though space in these municipalities seems to be ample, their potential for tourism-based rural development appears to be limited. Their economic specialization in the tourism sector is shown to lag behind the national average, and attractive natural land that could sustain a tourism economy by attracting visitors to the mainland coast area is scarce. The option to offer people the enjoyment of 'mere space' remains, but such development would need to compete with possibly deeply felt experiences that the islands offer, and could also conflict with the industrial ambitions of the mainland described in Chapter 5. Furthermore, novel techniques in spatial surveying can be used to assess the origins of the country-wide appreciation for natural land and associated amenities in the Wadden area (Chapter 5). Then, if a spatial planning intervention is considered in a location within the Wadden area, decision making can determine the segment of the population whose well-being may be impacted on, at an above-local scale. A spatial intervention can include the well-being of the relevant local population but also the well-being of the many people who live elsewhere but who somehow connect to the nature of the Wadden area – a 'good' of recognizable public value.

8.3.3 Urban structure

In Chapter 7 we established that if the general Dutch population continues to grow wealthier over time, the demand for living nearby (attractive) natural land, and having more green space directly around the home, is likely to rise considerably over the long-term. This, however, seems to offer limited potential for peripheral regions to attract populations, even while the developable land there is abundant. The possible increase in demand for residential land has been indicated to concentrate in local property markets which are more central and urbanized. Although, also in such local property markets considerable growth demand for (green) residential space may not materialize due to mechanisms in the land market, our findings in Chapter 7 have two major implications for policy. First, more green space should be provided in cities, to account for growing demand for living in a 'green' way as wealth increases over time; but this should not necessarily be at the cost of urbanity. Indeed, the observed present-day rich tend to prefer either the density of centralized cities or the spaciousness of decentralized residential forms – if nearby cities. In both cases they are found to live more green than the rest of the population. Second, policy making should rethink the development of property nearby nature in the hinterlands of cities. In so doing, spatial planning could consider our results from Chapter 6, one of which underlines that higher population densities allow urban populations to live closer to attractive nature. However, people do not need to live directly adjacent to attractive natural land and associated amenities in order to enjoy their benefits, as was shown in Chapter 2, because such nature may still add considerably to the well-being of people who live several kilometers away.

8.3.4 Public accessibility of information and scientific knowledge

The research conducted in this thesis has argued that natural land is an immobile good. Its economic value, however, is more mobile because people who appreciate natural land in any location along an urban-rural gradient may live anywhere else along such gradient. This kind of economic integration between rural and urban areas by itself is difficult to grasp. Moreover, in the allocation of land use, and public investment in land use, it is the value of natural land relative to the value of non-natural land use that matters. Hence, the interplay between natural land use and people's well-being can be quite complex from a spatial perspective, and challenging for decision makers to arrive at policies that optimize people's well-being. Therefore, based on Chapter 5, we suggest that decision making on land use policy should be supported with a map-orientated common knowledge base. Such a knowledge base can include spatially-explicit maps of key economic and ecological values in the Netherlands, and explanations of how the maps can be interpreted. In order to inform stakeholders in the decision making, a concise basic insight into policy issues could be offered (given the several results from Chapters 2-7) if they are added in maps. In which locations is natural land appreciated by people? How does this

relate to the spatial coverage of Natura 2000, or to the level of residential property prices? The proposed integration of data and knowledge, although not offering a grand conceptual scheme, contributes to the policy debate on land use, because it offers basic information grounded in scientific insights which are often quite technical and field-specific, and allows knowledge to be made accessible to public stakeholders involved in policy on natural land use.

8.4 Discussion and suggestions for future research

Within this section we reflect on the methods and associated data that have shaped the present research. Throughout the thesis the performed spatial analyses of the value of natural land were cross-sectional, mainly due to the novelty of the type of spatial data on people's appreciation for specific pieces of natural land applied in Chapters 2 to 7. More specifically, we have used data from the Hotspotmonitor (HSM) database, which span over the 2010-2013 period (see Box 1 in Chapter 1). HSM data have allowed us to enrich conventional economic valuation analysis with unique information on how people evaluate the supply of natural land. While these GIS-based survey data are secondary, they have been gathered with a goal that is resonated in this thesis: to understand spatial structures in people's latent appreciation of natural land and associated amenities (Sijtsma et al. 2012). Through the HSM we have been able to integrate the qualitative but also standardized information from the HSM surveys into the economic valuation of natural land in systematic ways, thus contributing to the literature that aims to bridge this methodological gap. Based on our findings set out in Chapters 2 to 7, as well as the ways in which HSM data have been applied in this research, we can suggest three main opportunities for further research.

The first opportunity pertains to the spatial scale on which attractiveness of natural land is considered. Across Chapters 2 to 7, HSM data were analyzed that have measured the coordinates of point-locations were HSM respondents have perceived natural land as attractive at the national scale. This has ensured that the measurement of attractiveness was spatially consistent across the observed study areas. However, it has ignored the presence of natural land that is not necessarily appreciated on a national scale, but rather on a regional or local scale and thereby be relevant to people's well-being. In Chapters 2, 3, 6, and 7, attractive areas were spatially delineated based on the clustering of the national scale HSM point-data. It should be noted that the boundaries of these areas do not necessarily reflect the way these are perceived by respondents to the HSM survey, as they marked point locations. Rather, the cluster areas denote the approximation of the areas which are collectively appreciated because of their attractiveness. An optimal approach to delineating such cluster areas was identified in Chapter 2 by establishing the clustering parameters that led to areas for which the highest impacts on nearby residential

property prices significantly different from zero could be observed – the resulting attractive areas were also analyzed in Chapters 6 and 7. Applying these data in Chapters 2, 6, and 7 has mitigated the possible influence of spatial selection effects on results, as people may tend to live near nature that they appreciate and vice versa. Nevertheless, future research can analyze appreciation for natural land within local property markets, which are relatively homogenous, in order to determine how the supply of locally or regionally attractive natural land may be related to people's well-being.

The second opportunity for further research stems from relating our findings to the notion that in the spatial pattern of new residential developments in the Netherlands "the impact of the presence of natural areas is rather small" (Rietveld and Wagtendonk 2004, pp. 2060–2061). However, findings in Chapters 2 and 7 suggest a desirability of developing residential areas nearby attractive natural land, as this may add to people's well-being in a considerable way. However, changes in the supply of attractive natural land may influence the quality of the natural amenities involved, whereas the value that people attach to living nearby attractive natural land may change with changes in the supply of such land or property in nearby locations. This can be evaluated in future research when, at some point in time, spatially-explicit data on the appreciation of natural land, such as the Hotspotmonitor data, allow for the observation of changes in appreciation over time that spatially overlap with changes in natural land supply.

The third and final main opportunity for further research relates to the bid rent and well-being 'curves' in Figure 1.1 in the first chapter of this thesis. We have shown in Chapter 2 how people's well-being from natural land may be internalized in the prices of residential property across urban-rural gradients. However, we have not analyzed how in some peripheral rural areas the supply of natural land relates to the value of property for recreational use, where people from across urban-rural gradients may spend leisure time. Such value could possibly be characterized in Figure 1.1 as a monetary spike in the right side tail of the bid-rent curve. In a similar vein, findings in Chapters 2 and 3 have shown clear overlap between people's appreciation for natural land and agricultural uses in some areas. Since within the literature there appears to be limited consensus on whether agricultural land adds to the natural landscape, future research could further analyze how attractive agricultural areas relate to people's well-being. This has not been investigated explicitly in this thesis since the market for agricultural land – not its products – is not a major market in terms of economic transactions that play a key role in people's everyday lives. However, we have explicitly acknowledged in our analyses that agricultural use may shape how people have perceived natural land's attractiveness in the observed study areas.

Our final point of discussion regards the level of generality of our analytical results to other countries. This is quite uncertain, given qualitative and quantitative

differences in the supply of natural land, the variation in the strictness of nature protection legislation and property development regimes, and perhaps also in the preference structures of people. The main contribution of the analyses in this thesis from an international perspective is more likely to be in their empirical innovations. The methods we have applied here, largely as a result of the standardized nature of the Hotspotmonitor data, may be relatively easily extended to studies in other countries or regions, as evinced by our international analysis in Chapter 6. Further international applications, in a variety of urban and rural contexts, could expand on or corroborate the insights arising from our examination into how people value natural land across urban-rural gradients.

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