

# Mountains of trouble: Accounting for environmental costs of land use change from tourism development

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## ABSTRACT

Land use change is the main driver of nature and biodiversity loss worldwide, and tourism developments contribute to this loss. The combination of Cost-benefit analysis (CBA) and Stated Preference (SP) methods can help inform tourism management by translating the environmental and economic impacts of developments into welfare impacts in monetary terms. We perform a CBA at both the local and regional levels for small (S), medium (M), and large (L) developments in a certified sustainable mountain destination in Norway. The *L-development* is the preferred tourism management locally as local economic benefits outweigh the local environmental costs. However, when we also include the economic and environmental impacts outside of the destination, we find the *S-development* to provide higher total welfare at the regional level. This shows that local governments' dual role as regulators and promoters of tourism is problematic since sustainable management should also account for the nonmarket environmental welfare impacts outside of the destination.

## 1. Introduction

The Earth's ecosystems and biodiversity are suffering unprecedented degradation and decline, and land-use changes due to developments are the most severe threats globally. There is an urgent need for transformative change across economic sectors, including tourism, to achieve future sustainability (IPBES, 2019). Tourism is one of the largest and fastest-growing sectors in the world economy (UNWTO, 2020) and is found to degrade ecosystem services and reduce biodiversity (Gössling, 2018, pp. 437–447; Pulido-Fernández et al., 2019). This study demonstrates that combining Cost-benefit analysis (CBA) and Stated Preference Methods (SP) with more classic local economic analysis in the tourism field can help better inform tourism management and achieve a more sustainable development path.

Research on sustainable tourism policy has expanded rapidly over the past 20 years (Guo et al., 2019), and sustainable tourism is promoted

at all levels of governance (Hall, 2013). Environmental indicators help operationalise and monitor sustainable tourism and have become important tools identified in research and applied in tourism management (Rasoolimanesh et al., 2020). For instance, the European Commission has developed a set of environmental indicators to monitor tourism, while in Norway, destinations are certified as sustainable using indicators. However, Gasparini and Mariotti (2021) find limited use of such information in actual decision-making. Connell et al. (2009) point to local governments' dual role as both regulators to protect the environment and partners in tourism management to develop the local economy, as problematic. Adding to this, limited funds and the case-by-case nature of environmental regulation complicates local governments' consideration of the cumulative environmental effects of tourism developments (Connell et al., 2009). Hall (2013) argues that sustainable tourism policy failure does not seem to lead to policy learning. We believe dual and conflicting roles at the local policy level

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and the use of inconclusive environmental indicators may cause an underappreciation of environmental costs in local benefit-driven tourism development. This, in turn, may lead to conflicts between local interests and wider societal and environmental interests, resulting in sub-optimal outcomes from a welfare economic point of view.

CBA is the most comprehensive evaluation tool, including all the most important costs and benefits of tourism development (Candela & Figini, 2012). In contrast to sustainable tourism indicators (Mihalic, 2016), CBA permits the decision maker to compare 'apples' and 'oranges' by translating the environmental and economic impacts of tourism management across a range of indicators into a single metric: the net-present value of benefits and costs, a monetary measure of the well-being effect for society (Boadway, 2016; Dwyer, 2012). Although CBA is increasingly used across a range of economic sectors and areas (e.g., transport, construction, health, and environment) and would be highly suitable to examine the trade-offs at the heart of sustainable tourism, CBA has rarely been used within tourism economics (Song et al., 2012).

Local sustainable tourism management must consider the non-local and non-market values of ecosystem services and biodiversity in decision-making. Tourism development yields profits to local communities and affects ecosystem services, imposing externalities on people within and outside the destination. The total economic value (TEV) of changes in ecosystem services includes use values that stem from peoples' harvesting and experience of nature and non-use values that arise when individuals value nature for reasons such as altruism toward others and future generations (Iversen, Grimsrud, Mitani, & Lindhjem, 2022).

Within economics, stated preference (SP) methods (i.e., choice experiments (CE) and contingent valuation (CV) survey methods) are available tools for estimating changes in TEV of change in quality or quantity of non-market ecosystem services for use in CBA (Bateman et al., 2002). There is a SP literature within tourism research focusing on topics such as conservation and sustainability (e.g., Alves et al., 2017; Andersson & Lundberg, 2013; Chen et al., 2017; Grilli et al., 2021; Lindberg et al., 2019), valuation of market goods (e.g. Lyu, 2017; Román & Martín, 2016), demand for events (e.g. Brida et al., 2017; Crouch et al., 2019) and conflicting interests between residents and tourists (e.g. Concu & Atzeni, 2012; Lindberg et al., 1999; Lindberg et al., 2001; Lindberg & Veisten, 2012).

However, there is little research on the overall market and non-market welfare impacts of tourism development, comparing economic benefits with the loss of ecosystem services using a combination of SP surveys and CBA. Concu and Atzeni (2012) study differences in tourists' and residents' preferences regarding the construction of new buildings on the seashore and tourism's impact on the economy and crowding in Sardinia. Lindberg and Veisten (2012) assess local and non-local preference heterogeneity for tourism infrastructure development in a national park in Norway. Most studies focus on preferences rather than valuing costs and benefits in a welfare economic framework (Meleddu, 2014).

We fill this important research gap by estimating the welfare effects of tourism development using the large Norefjell-Reinsjøfjell (NR) mountain area in Norway as a case. Tourism generates substantial economic activity at mountain destinations in Norway, of which new private vacation homes are the most important economic impulse (e.g., Menon, 2019, p. 129). In Norway, as in many other countries, tourism development is seen as essential for sustaining the economic activity and populations in rural areas (Norwegian Ministry of Trade, Industry and Fisheries, 2017), as employment in the primary sectors (i.e. agriculture, forestry and fisheries) dwindle. Blumentrath et al. (2022) investigate the land allocated for the future development of vacation homes in current municipal land-use plans in Norway and find that designated undeveloped areas facilitate more than a doubling of today's 485,000 vacation homes. Vacation home developments have caused 30–40 per cent of the loss of forest and wetland areas by developments in Norway (Rørholt &

Steinnes, 2020) and is a significant factor behind the recent red-listing of wild reindeer (Rolandsen et al., 2022).<sup>1</sup> Norway is responsible for managing wild reindeer in Europe, as it is home to almost the entire remaining European reindeer population.

The NR area is one of the most prominent tourism mountain areas close to the capital, Oslo, with peaks up to 1,500 m above sea level. Most municipalities in the NR area have recently been certified as sustainable destinations in accordance with indicators approved by the Global Sustainable Tourism Council. The NR area is home to a ski resort and 7,500 private vacation homes, generating more than 1.3 million overnight stays each year (Handberg et al., 2022), and also a population of 550 wild reindeer under pressure from human activity (Punsvik, 2019). Currently, the local governments are considering allowing landowners and developers to construct up to 8,000 new private vacation homes in their land use plans. This study uses a CBA framework where the environmental and economic impacts of three distinct vacation home development scenarios are analysed to identify potential welfare improvements.

We combine several data sources and methods. Contingent valuation (CV), a survey-based non-market valuation method, measures the nonmarket benefits of reduced vacation home construction. Official price statistics, information from local businesses, a survey of vacation home owners, and an analysis of business profits are combined in an economic impact analysis to measure the cost of foregone producer surplus of reduced vacation home construction. The producer surplus is a measure of the economic benefits the businesses receive when selling their goods and services in the market. The benefits and costs of the scenarios are analysed at the local and regional levels in a CBA framework. We also analyse the distribution of the nonmarket values associated with changing management in geospatial analysis. We aim to answer the following questions:

- i) Which development scenario provides the highest welfare at the tourism destination?
- ii) Which development scenario provides the highest welfare to society at large, i.e. when including nonlocal externalities?
- iii) Which groups benefit from (reduced) development?

The study contributes to the tourism management literature by providing the first use of CBA of tourism development, combining CV and economic impact analysis methods. We empirically investigate whether local governments' dual role as both regulators and promoters of economic development are at odds with environmental interests by conducting and comparing CBA at the local and regional scale. The study also adds to the environmental valuation literature by monetising the non-market values of mountain ecosystem services affected by developments, a relatively rare application. The paper is organised as follows: Section 2 provides the analytical framework and the case, Section 3 presents costs and benefits, Section 4 presents the overall CBA results, and Section 5 discusses and concludes.

## 2. Analytical framework, methods, and data

### 2.1. Cost-benefit analysis and the decision rule

CBA is a welfare economic tool to help policymakers evaluate changes in economic outcomes resulting from public policy. Since U.S

<sup>1</sup> About 230 square kilometres of forests and 10 square kilometres of wetlands were developed in the period from 2008 to 2019 (Rørholt & Steinnes, 2020). In our case study area, the average size of vacation homes built between 2017 and 2021 was 111 square meters. This is an increase from an average size of 64 square meters from 1983 to 1987 (Handberg et al., 2022). A standard newly built vacation home in Norway can be accessed by car and has installed electricity, internet and a fully equipped kitchen and bathroom.

federal government mandated the use of CBA in every major regulatory initiative in 1981, CBA has become an important evaluation method across many different countries, contexts, and purposes (Boardman et al., 2017). According to Norwegian law, all governmental plans or initiatives with significant welfare impacts must be evaluated by CBA. When policy initiatives are considered to have only minor or medium-sized welfare impacts, CBA is not required.

CBA identifies the scope of the policy, its effect on resource allocation and prices, and the consequences for the welfare of the individuals affected. CBA provides an overall measure of welfare change following policy alternatives aggregating individual welfare changes (Boadway, 2016). Thus, CBA provides a ranking of policy options that account for each option's social benefits and costs compared to a reference option without policy change. The social welfare function aggregates weighted individual utilities over allocations of resources, where the weight represents a preference ordering of individual utilities. The most frequently applied approach, which we also follow, is to put equal weight on individuals' willingness to pay. This individualistic approach is non-paternalistic and mimics market logic, although it also implicitly puts more weight on wealthier individuals' utilities due to their expected lower marginal utility of money (Boadway, 2016; Brekke, 1997).

The decision rule in an intertemporal context is the net present value (NPV) criterion (Boadway, 2016). This implies that the policymaker should choose the policy option that maximises welfare  $W$  in terms of the NPV of the future flow of net benefits, as given in Equation (1):

$$\text{Max NPV} = : \sum_{t=1}^T \frac{(B_t - C_t)}{(1 + r_t)^t} \quad (1)$$

where  $B$  is the social benefits flow,  $C$  is the social costs flow,  $r$  is the social discount rate, the superscript  $t$  in  $B$  and  $C$  denotes that annual benefits minus costs are aggregated over the time period of the policy  $T$ .

## 2.2. Case study context: the Norefjell-Reinsjøfjell (NR) mountain area

We study how tourism development affects social welfare using the NR mountain area in southeast Norway as a case. The NR mountain area, known for its landscapes and panoramic views, is a popular tourist destination that people visit for hiking, cross-country and alpine skiing, cycling and other recreational activities. The NR mountain area is home to 7,500 private vacation homes, several hotels and alpine ski centres. The NR mountain area has an extensive network of hiking and skiing trails. Fig. 1 juxtaposes images capturing diverse landscapes, vacation homes, and wild reindeer in NR alongside a map of Norway, Viken and Oslo.

In Norway, each landowner applies for permission from their municipality to build vacation homes on their land. Municipalities handle the applications and decide land use through zoning and regulation plans. Zoning plans describe how land and resources should be used within a given geographical area, while regulation plans provide more detailed regulations. Since vacation home developments are not considered to have significant welfare impacts, land use decisions about whether to preserve or develop natural areas are not evaluated by CBA, but by less resource-demanding impact assessments. Pedersen et al. (2019) found that the municipalities' impact assessments of zoning plans are often inadequate and poorly substantiated, particularly with regard to the effects on biodiversity, cultural heritage, and landscape. Non-local interests in zoning plans are represented by the County Governor's and civil society's right to comment on the zoning decisions. The County Governors can object if municipalities ignore their comments, and if so, the national government has the final say. However, local interests are given substantial weight when final decisions are made (OECD, 2022). Interested parties can submit objections to adopted regulation plans to the county governor, but very few appeals succeed.

Tourism and the construction of vacation homes are important sources of income and critical for sustaining the communities in the NR

mountain area (Handberg et al., 2022; Tofteng et al., 2018). The five municipalities in the NR mountain area, home to 12,500 inhabitants, are considering large-scale developments, and the local zoning plans facilitate the construction of up to 8,000 new vacation homes in the years to come, of which a substantial share are included in more detailed regulation plans (Viken County, 2020). The municipalities are Krødsherad, Flå and Sigdal, certified as sustainable destinations in 2021, Nesbyen, certified in 2022, and Nore og Uvdal. Fig. 2 provides a density map of vacation homes in NR on the left and showcases a vacation home area in NR on the right.

Vacation home development in the NR area competes for space with red-listed wildlife species, including reindeer (*Rangifer tarandus*), which is considered threatened (Artsdatabanken, 2021). Almost the entire European strain of 25,000 wild reindeer live in 24 administrative areas in southern Norway (Gundersen et al., 2019), of which a herd of 550 wild reindeer live in the NR mountain area.

Land use changes due to vacation home developments may affect regulating ecosystem services (e.g. carbon sequestration), provisioning ecosystem services (e.g. timber production) and cultural ecosystem services. Cultural ecosystem services include various services directly benefitting humans, such as landscape aesthetics and the experience of nature and wildlife through recreation and tourism (Daniel et al., 2012). Vacation home development in NR reduces recreational areas and changes landscapes below and above the tree line. Additional vacation homes increase the number of visitors, hikers, and cross-country skiers, potentially contributing to crowding. As a result, the local authorities are considering widening the trail paths and extending the trail network.

The construction and use of vacation homes and the associated infrastructure affect biodiversity by reducing forests and mountain vegetation and reducing the carrying capacity of the wild reindeer population. An increased number of vacation homes will challenge the existence of the wild reindeer herd in the NR mountain area (Gundersen et al., 2019; Punsvik, 2019). Punsvik (2019) points to the loss of habitat, barriers to migration to winter pastures, and disturbance during calving, both due to the building of the new vacation homes and increased recreational use of the mountain area, as serious threats towards the wild reindeer herd. Vacation homes in the Norefjell area are, on average, used 55 days per annum with more than 3 persons per visit, generating substantial recreational use of the mountains.

People affected by the increased number of vacation homes are the users of the area, such as the local population, tourists staying in vacation homes and day-visitors, as well as the general population in Viken county, including the capital Oslo and other parts of Norway who could have non-use values attached to the preservation of landscapes, nature, animals and birds. There are around 2 million inhabitants in Viken county and Oslo – i.e., more than one-third of the Norwegian population.

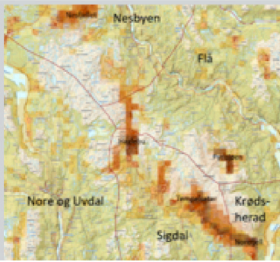
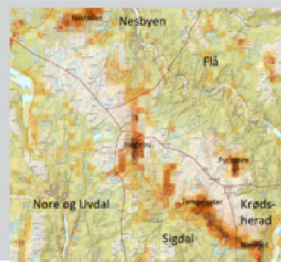
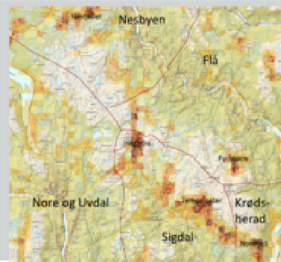



## 2.3. Methods, data, and assumptions

### Measuring environmental values using contingent valuation

Vacation home construction affects the use and non-use values of the natural environment in the area. In the business-as-usual (BAU) option *Large development (L-development)*, it is expected 6,500 new vacation homes will put the ecosystem services of the NR mountain area under strong pressure. We presume that most, but not all, of the potential new 8,000 vacation homes are developed by 2040. The other two scenario options, *Medium development (M-development)* and *Small development (S-development)*, involve a reduction in the number of vacation homes constructed until 2040.<sup>2</sup> These two options deliver benefits in terms of increased non-market values since the pressures on ecosystem services are reduced compared to the BAU option. The consumer surplus of reducing the number of vacation homes constructed in the future is measured using the CV method.

<sup>2</sup> The *S-development* option requires changing municipal regulation plans.

**Table 1**  
The three development options presented to respondents in the Contingent Valuation survey.

	LARGE DEVELOPMENT	MEDIUM DEVELOPMENT	SMALL DEVELOPMENT
Recreational home density in 2040			
Total recreational homes in 2040	14,000 recreational homes	11,000 recreational homes	8,000 recreational homes
Growth until 2040	6,500 new recreational homes / 85% growth	3,500 new recreational homes / 45% growth	500 new recreational homes / 5% growth
Development	Over and under the tree line	Under the tree line	Under the tree line
Growth in hikers in 2040	100% more hikers 	60% more hikers 	20% more hikers 
Recreation above the tree line	Upgrading of current paths and expanding trail network	Upgrading of current paths	Paths as today
Recreation below the tree line	Large development in recreation areas	Some development in recreation areas	Little development in recreation areas
The wild reindeer population in 2040	Carrying capacity very strongly threatened	Carrying capacity strongly threatened	Carrying capacity somewhat threatened

The CV survey was conducted in June 2021 as an internet survey, recruiting respondents both by mobile phone messages and from internet panel of the survey company. In the survey, the *L*-, *M*- and *S*-development options for the NR mountain area are presented to the respondents as distinct management alternatives, see [Table 1](#).

Respondents were asked to rank the three options from the most to the least preferred or choose a no-opinion alternative. If the respondent preferred a reduced vacation home development option to the BAU, we asked a follow-up question on their annual willingness to pay (WTP) increased taxes for changing the management option from BAU to their preferred option from 2021 until 2040. A horizontal payment card slider was used where 23 amounts on the scale ranging from 0 to NOK 12,000, including an option to specify the exact amount if the respondent preferred to pay more than NOK 12,000. There was also a “Don’t know” response option. [Vossler and Holladay \(2018\)](#) identify conditions under which payment card question format is incentive-compatible. See the formulation of the WTP question and the payment card slider in [Appendix A.1](#). The WTP is the respondent’s valuation of the construction of fewer vacation homes, a reduction in the expected number of hikers, reduced pressure on the carrying capacity of the wild reindeer, and fewer landscape changes compared to BAU. We chose to set the time period to 2040 to balance an emergence of policy consequences while restricting the time horizon to provide payment vehicle realism.

The CV survey, valuation scenario and WTP question were designed to encourage truthful responses following the guidelines proposed by [Johnston et al. \(2017\)](#). We informed respondents that a tax increase would be equal and binding for household residents and all vacation home owners in the municipalities (local respondents) and equal and binding for every household in Viken and Oslo (non-local respondents). We used increased municipal tax as the payment vehicle for local residents and vacation home owners in the NR mountain area, while we used increased county tax as the payment vehicle for non-local respondents in other parts of Viken and Oslo counties. Both residents and vacation home owners pay property taxes to these local municipalities in terms of a certain percentage (typically 0.01–0.03 %) of the assessed values of homes and vacation homes. Counties do not collect property taxes, but they do collect other taxes, so a new county tax is not unrealistic. Further, due to a large ongoing county reform by the Norwegian government at the time of the survey, a new tax was deemed realistic when testing the design in the pretests and focus groups.

We promote consequentiality, an essential feature of SP surveys achieving truthful responses, by stating that the desired level of development and WTP will be reported to relevant authorities and promote incentive compatibility by stressing cost uncertainty, following [Vossler and Holladay \(2018\)](#) and [Vossler and Zawojka \(2020\)](#). [Vossler and Zawojka \(2020\)](#) show that a payment card format with cost uncertainty

provides equal WTP estimates as a single binary choice format. According to SP guidelines, “the most straightforward means to achieving incentive compatibility is through the use of a single binary-choice question for each respondent” (Johnston et al., 2017, p. 345). The text introducing cost uncertainty was as follows:

“The municipalities are planning large vacation home development in the Norefjell area. Viken county, on the other hand, wants to reduce the development of vacation homes to protect recreation and wild reindeer for residents of Viken and Oslo. The fewer vacation homes are built in the municipality, the less the municipalities’ income will be. Increased municipal tax for residents and cabin owners can cover the loss of income and preserve wild reindeer and recreation. Whether and how much municipal tax should have to increase is uncertain at this point.”

Further, following Johnston et al. (2017), we applied a decision rule saying that if WTP is equal to or higher than the cost of changing policy, the construction of vacation homes will be reduced, and taxes increased. A formulation stressing that WTP above the cost would be counted as a vote in favour of the project was tried, but due to comprehensibility considerations, we decided to simplify the wording.

#### Measuring economic values using economic impact analysis

Vacation home construction generates incomes and profits across industries both within NR and outside the area. Income from sales of new vacation homes covers buying and clearing the land, construction and materials, and necessary infrastructure such as roads, access to water, and handling wastewater.

In the typical economic impact analysis, both wages and profits are usually estimated at full value, implying no opportunity costs of the production inputs. In CBA, it is essential to subtract the opportunity cost of resource use. This implies the analysis includes only producer surplus as a benefit. We assume that the producer surplus is equal to the production profits after subtracting wage costs and costs of other inputs (Boardman et al., 2017; Burgan & Mules, 2001; Dwyer et al., 2016).

We multiply the prices of new vacation homes by the number of new vacation homes in the NR mountain area in the development scenario to estimate the total business income generated from constructing vacation homes. The local share of this business income was determined in a recent impact analysis, carried out to supplement data collection for this paper (Handberg et al., 2022). We gathered information on the use of vacation homes and the yearly cost of vacation home maintenance along with the local construction companies’ market share from the vacation home owners in the CV survey. The vacation home owners’ consumption of goods and services when visiting their vacation homes was also gathered from recent impact analysis literature (Handberg et al., 2022).

To subtract the opportunity cost of capital and labour, we multiply the estimated business income with the operating margin among local and regional construction, tourism, and retail companies. The operating margin is obtained from a dataset of all business accounts of registered companies within the NR mountain area, Viken and Oslo.

### 3. Cost-benefit analysis: market and non-market impacts of management

#### 3.1. Benefits of reduced vacation homes development

Three main groups were targeted for data collection: the local population, the owners of vacation homes, and the population in Viken and Oslo counties. There are 5,800 resident households and 7,500 vacation home households in the five local municipalities, and approximately 900,000 households in Viken and Oslo. The sample frame was adult residents and vacation home owners with accessible telephone numbers and the survey company Kantar’s panel of pre-recruited respondents from Viken and Oslo. We chose an internet survey data collection mode, and the local population and the owners of vacation homes were

targeted using SMS with a link to the survey, while the population in Viken and Oslo were targeted through the survey company’s high-quality randomly pre-recruited panel of respondents. The survey invitation was sent to 14,102 persons. We received 2,047 completed surveys, which implies a real response rate of 14.5 percent. The real response rate was 29 percent of invitations to the survey company’s panel, while the real response rate was 9 percent of the invitations sent by SMS. The three samples were selected using quotas matching population benchmarks for characteristics as recommended by Johnston et al. (2017). The data were collected in June 2021. Table 2 compares samples and populations.

Compared to the population, there is an underrepresentation of respondents with primary school education as their highest education level and an overrepresentation of respondents with more than three years of university education. In addition, households are larger and have higher incomes, both in the local resident and the Viken/Oslo sample compared to the relevant populations. As for the owners of vacation homes, we have no data on the underlying population characteristics.

Respondents were asked what scenario option in Table 1 they preferred and could either report the most preferred option, rank all options, or answer no opinion (see Fig. 2). Fig. 3 reports the respondents’ answers by interest groups. More than half of the respondents prefer the *S-development* option in all groups.

Respondents who preferred either *S-development* or *M-development* were asked for their WTP in terms of increased annual municipal or county taxes to change the land use policies to their preferred option. Respondents who preferred the *S-development* were asked a follow-up question regarding their WTP for *M-development*.

As recommended, we use interval regression to analyse the interval payment card data (Boyle, 2017; Cameron & Huppert, 1989). Interval regression is a generalisation of Tobit for data observed in intervals, estimated using Maximum Likelihood (Cameron & Trivedi, 2010). In the interval regression, the probability of observing an answer is equal to the cumulative distribution function (CDF)  $\Phi$  of the assumed distribution: In our case, the normal distribution, evaluated at the upper payment card bound  $WTP_{Ui}$ , minus the CDF evaluated at the lower payment card bound  $WTP_{Li}$ . The loglikelihood function of the interval regression model for a sample of  $n$  individuals can be expressed as follows:

$$\log L = \sum_{i=1}^n \log[\Phi(WTP_{Ui}) - \Phi(WTP_{Li})] \quad (2)$$

Table 3 below presents the mean annual WTP per household for their preferred vacation home development option within each group sampled, estimated using In Table 4, we analyse the preferences related to sociodemographic characteristics and respondent attitudes using interval regression. Among respondents who prefer reduced development, residents, and owners of vacation homes in NR have a mean WTP amounting to more than 3,000 NOK. Other residents in Viken/Oslo have a mean annual WTP of 1,300 NOK per household in increased county taxes.<sup>3</sup>

When we assume that respondents who ranked *L-development* as their first choice or stated “no opinion” have zero WTP for *M-development* and *S-development* and include them as zeros in the estimation of mean WTP, we get the following results for the *S-development*: The mean annual household WTP to get a *S-development* (instead of the BAU *L-development*) is 3,112 NOK among local residents in the NR mountain area,

<sup>3</sup> We include zero answers and “don’t know”-answers as zero while excluding protest zeros and protest “don’t know”-answers. Protesters were identified by agreeing with one of the following statements: “It is not my household’s responsibility to pay for the municipalities’ reduced income”, “What I answer will not affect the chosen management”, and “I feel it is not right to weigh the environment in terms of money” or “I don’t want to pay until I know what it costs”.

**Table 2**  
Descriptive statistics, survey respondents and populations.

	Resident households in NR municipalities		Vacation home households in NR	Other households in Viken and Oslo	
	Respondents	Population	Respondents	Respondents	Population
No. of respondents	378		559	1,110	
Percentage women	48%	49%	44%	47%	50%
Age (adults)	53	52	59	53	48
<b>Education level</b>					
(1) Primary school	5%	31%	0%	4%	24%
(2) High school/apprenticeship	45%	48%	15%	27%	35%
(3) 3-4-year university	32%	16%	37%	38%	27%
(4) At least 5-year university	17%	4%	44%	29%	13%
(5) Doctorate (PhD)	1%	<1%	4%	2%	1%
Household size	2.59	2.71	2.66	2.29	2.75
Household income (median)	1,000,000	634,000	1,500,000	1,000,000	700,000



**Fig. 1.** Left: pictures of nr landscapes, vacation homes, and wild reindeer in NR. Photo: Torgeir Wittersø Skancke Right: Map of Norway, Viken and Oslo with population density (lighter areas are more densely populated).



**Fig. 2.** Left: Map of vacation home density in the NR mountain area (darker red areas have more vacation homes). Right: Example of a vacation home area in Gulsvikfjellet. Photo: Torgeir Wittersø Skancke

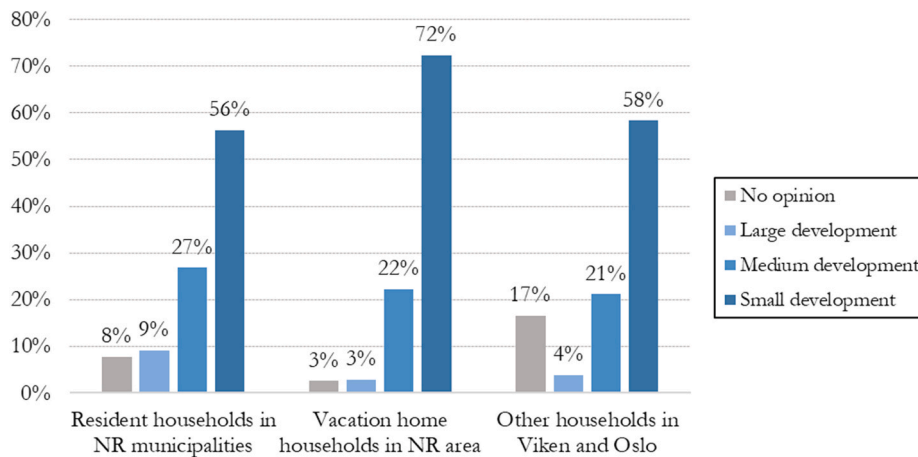


Fig. 3. The options preferred by the respondents in the samples.

Table 3

Mean unconditional annual, household willingness to pay (in NOK)\* estimates\*\* for getting *S-development* and *M-development* instead of the planned *L-development* for the period 2022–2040. Estimated using the interval regression package *intreg* in Stata.

Respondents:	Option:	Resident households in NR municipalities	Vacation home households in NR area	Other households in Viken and Oslo
Respondents preferring reduced development	M	2,281 (188)	2,227 (140)	1,083 (118)
	S	3,743 (315)	3,123 (261)	1,372 (216)
All, incl. respondents preferring BAU or “No opinion”	M	1,900 (156)	2,113 (124)	844 (95)
	S	3,112 (290)	2,965 (231)	1,074 (174)

Notes: \* In Norwegian kroner NOK (1 NOK = 0.1 EUR). \*\*Standard errors in parenthesis identified using the delta method (Oehlert, 1992).

2,965 NOK for the owners of vacation homes, and 1,074 NOK for residents in Viken/Oslo.<sup>4,5</sup> These WTP estimates are used as input in the CBA.

In Table 4, we analyse the preferences related to sociodemographic characteristics and respondent attitudes using interval regression. See descriptive statistics for the additional variables concerning respondents’ experience and attitudes in Appendix A.2. Our motivation is to answer the research question of who benefits from reduced vacation home development and to assess the validity of the survey.

<sup>4</sup> We elicited WTP for *M-development* among the respondents who ranked *S-development* as their first choice and *M-development* as their second choice, but we did not elicit WTP for *S-development* for the respondents who ranked *M-development* as their first choice and *S-development* as their second choice. For this group, we assume that the WTP for *S-development* is larger than zero since they prefer this option to *L-development*, and equal to or lower than their upper bound WTP for *M-development* since they prefer *M-development* over *S-development*.

<sup>5</sup> 216 out of 457 respondents who ranked *M-development* as their first choice, did not rank their second choice. As with the others, we set their lower bound WTP for *S-development* equal to zero and their upper bound WTP equal to their upper bound WTP for *M-development*. We multiply their WTP by the share (79 %) preferring *S-development* as the second choice among those respondents who ranked two alternatives. Unbiased estimates hinge on the assumption that there is no systematic difference between the respondents who rank two alternatives and respondents who rank one alternative.

We identify a significant income effect; one extra million NOK per household significantly increase the WTP with estimates varying around 600–800 NOK across the models. This supports the validity of the results, as WTP is expected to increase with income (Bishop & Boyle, 2019). Higher educational levels among respondents also significantly increase WTP across all models, mirroring a typical result in other environmental valuation studies (e.g. Kotchen et al., 2013; Tianyu & Meng, 2020).

We also expect respondents affected by developments and respondents’ attitudes towards development to be correlated with their WTP. Since attitudes and preferences are closely linked as different expressions of respondents’ beliefs, desires and tastes, data on attitudes can be used to triangulate WTP estimates (Krupnick & Adamowicz, 2007). As anticipated, we find that the respondents who are the most negative towards landscape changes, more hikers and increased pressure on wild reindeer in the BAU alternative state a higher WTP for *S-development* than others, while the respondents who are the most positive toward more local services in BAU have significantly lower WTP. Further, respondents who reported that their recreational activities will be affected by the construction of vacation homes have almost 1,500 NOK higher WTP than other respondents, *ceteris paribus*. When restricting the sample to respondents who prefer *S-development* in model 4, we find that preferences for nature and local services are relatively less important in explaining the differences in WTP. This is due to the initial sorting of respondents by their preferred options, in which attitudes are important explanatory factors, while there is less difference in attitudes within the more homogenous group of respondents who prefer *S-development* as their first choice. Overall, the results confirm a strong association between respondents’ attitudes and WTP and lend support to the validity of the survey.

### 3.2. Costs of forgone producer surplus of reduced vacation home development

In the BAU *L-development* option, we stipulate that 6,500 new vacation homes will be built by 2040, 3,000 more than in the *M-development* option and 6,000 more than in the *S-development* option. We model a constant growth per year in the number of vacation homes per year until 2040. We assume that price, maintenance costs, overnight visits, and consumption per vacation home remain at today’s levels.

#### 3.2.1. Vacation home construction

To estimate the local and non-local producer surplus from vacation home construction, we need the price of new vacation homes in the NR mountain area, the local and non-local market shares, and the profit rate within the construction industry (Standard Industrial Classification

**Table 4**

Interval regressions of WTP for S-development instead of the BAU L-development. Parameter estimates with standard error in parenthesis. Models (1)–(3) include all respondents, except for protesters, while model (4) only includes respondents preferring reduced development. Models (2)–(4) omit respondents with missing data on questions as to whether they are affected by the development and on attitude questions. Estimated using the interval regression package *intreg* in Stata.

	(1)	(2)	(3)	(4)
Vacation home household in NR area	1,390.8*** (369.2)	1,398.6*** (290.2)	841.5*** (284.0)	1,129.4*** (412.0)
Resident household in NR municipalities	2,454.7*** (395.2)	1,991.9*** (315.9)	1,628.3*** (323.9)	2,645.4*** (516.4)
Woman	73.73 (294.2)	332.4 (232.9)	−52.10 (225.1)	−90.79 (332.3)
Age	−0.119 (10.74)	1.900 (8.491)	−1.911 (8.128)	−4.277 (12.50)
Household size	−88.69 (135.0)	−44.34 (103.6)	86.64 (99.00)	187.5 (156.7)
Household income (MNOK)	659.9*** (231.3)	672.9*** (180.7)	588.4*** (172.2)	803.1*** (253.2)
Education level (1–5)	429.3*** (134.0)	492.5*** (105.3)	353.8*** (100.8)	518.9*** (154.0)
Affected by work in construction			−649.6 (655.3)	803.4 (1745.0)
Affected recreational activities			1,447.2*** (275.9)	1,435.2*** (391.6)
Landscape changes are very negative in BAU			1,222.4*** (275.2)	706.8 (451.1)
More hikers are very negative in BAU			567.5** (268.1)	405.3 (357.4)
Increased pressure on wild reindeer is very negative in BAU			650.9** (259.5)	498.9 (407.5)
More local services are very positive in BAU			−579.2* (310.8)	−331.5 (565.5)
Better municipal economy is very positive in BAU			−51.57 (272.8)	234.9 (435.4)
Constant	−965.6 (943.1)	−1,445.4** (734.7)	−1,957.4*** (731.9)	−2,343.7** (1153.8)
Log (sigma) constant	8.567*** (0.0192)	8.226*** (0.0212)	8.169*** (0.0212)	8.329*** (0.0271)
Number of observations	1361	1124	1124	684
Pseudo R <sup>2</sup>	0.005	0.010	0.021	0.019
Loglikelihood	−8,065.4	−5,949.6	−5,885.5	−3,196.0

Note: \*p < 0.10, \*\*p < 0.05, \*\*\*p < 0.01. Standard errors in parentheses. Norwegian kroner NOK (1 NOK = 0.1 EUR).

codes 41 and 42). In a parallel study to this research article, [Handberg et al. \(2022\)](#) use a Delphi survey technique involving two rounds of interviews with 28 experts on vacation development in NR mountains and find that a newly constructed vacation home in NR costs on average 4.3 million NOK. This result matches the official price statistics on vacation homes in the municipalities in the Norefjell area very well, indicating valid and reliable estimates. [Handberg et al. \(2022\)](#), using the Delphi survey, map the average value of a plot of real estate ready for

vacation home development to be 1.4 million kroner, and the average value of the unprepared plot of land regulated for the building of vacation homes, but not yet developed with the necessary infrastructure, to be 0.53 million kroner. [Handberg \(2022\)](#) also map the local shares of the incomes in the different part of the vacation home development value chain. The 28 local experts in their recent study estimate that local landowners receive 85 percent of the income from selling unprepared plots of land, that local businesses receive 80 percent of the income from clearing and preparing the land, and that local businesses receive 40 percent of the income from constructing the vacation homes ([Handberg et al., 2022](#)). The remaining share of the income is non-local income, and we assume these go to landowners and businesses residing in Viken/Oslo, even though a very small share might accrue to landowners and businesses in other parts of Norway.

### 3.2.2. Vacation home ownership costs

We estimate spending associated with the ownership and use of vacation homes. Our survey of the vacation home owners in the area indicates a mean annual cost of 45,000 NOK in maintenance, furniture and electricity, TV, and taxes, of which 33,000 NOK is local expenditure.

### 3.2.3. Vacation home users' consumption

Based on results from the CV survey, we presume that each vacation home is used 55 days a year and by 3.1 persons per day. Following [Handberg et al. \(2022\)](#), we assume that each person spends 500 NOK per overnight stay on goods and services, of which 45 percent is local spending. Similar visitor numbers and consumption levels are found in several other surveys of vacation home owners in Norway (e.g. [Norsk Turistutvikling, 2017](#)).

### 3.2.4. Producer surplus

In CBA, only producer surplus is considered as an economic benefit since land, labour and capital could be used in other types of production and subtracting the opportunity cost of resource use from generated incomes is crucial ([Boardman et al., 2017](#); [Burgan & Mules, 2001](#); [Dwyer et al., 2016](#)). Thus, to include the producer surplus in the CBA, we calculate and include the profits associated with developing, maintaining, and using vacation homes in Norefjell. Data on financial statements for enterprises in Norway is available in The Brønnøysund Register of Company Accounts and contains businesses' incomes, costs, and profits. In this data, we identify an average 5 percent income-weighted EBITDA-margin (Earnings Before Interest, Taxes, Depreciation, and Amortisation) among firms within construction, tourism services and retail in Viken and Oslo. Using this information on profits, we calculate a five percent producer surplus of the generated income from the construction of vacation homes, the maintenance of the new vacation homes, and the consumption when using the new vacation homes.

Additionally, a substantial part of the income from vacation home development accrue to landowners. The plots of land set aside for the development of vacation homes in Norefjell have no alternative commercial use. The land was initially regulated for recreational and agricultural use in the municipalities' zoning plans, but with very little agriculture in the Norefjell mountain areas, the economic opportunity cost of developing the land is near zero. However, the landowners have to spend some time on the paperwork to get getting a detailed regulation allowing for vacation home development. [Handberg et al. \(2022\)](#) find that the opportunity cost of time spent by landowners in the process of regulating the plot for vacation home development is an average of 70,000 NOK per plot. Subtracting this opportunity cost from a regulated plot's value of 0.53 million kroner, the profit per vacation home plot is 0.46 million NOK. The profit per plot is multiplied by the number of additional vacation homes in the policy options when calculating this part of the producer surplus in the CBA.

### 3.3. Other impacts on the welfare of reduced vacation home development

#### 3.3.1. Carbon dioxide emissions from land use changes and construction of vacation homes

When building vacation homes, both the land use changes and the construction itself contribute to carbon dioxide emissions (Walnum, 2020; Xue et al., 2020). An investigation of the carbon dioxide effect of land use changes due to vacation home development in the Turufjell area of Flå municipality, 10 km north of the NR mountain area, found that 2,000 new vacation homes in that area release 190,000 tonnes of carbon dioxide due to lost peatlands (Bråten & Olsson, 2020), implying 95 tonnes of carbon dioxide emission per vacation home built. Magnusson et al. (2020) stipulate the emission of 200 tonnes of carbon dioxide per thousand square meters if developing peatland and 60 tonnes of carbon dioxide if developing forest. Further, Most of the original land cover used to build vacation homes and infrastructure will be forests in the NR mountain area. The average size of a plot of land per vacation home is about a thousand square meters in the NR area (Handberg et al., 2022). Walnum (2020) finds that a typical newly built Norwegian vacation home will emit between 12,000 and 24,000 tonnes of carbon dioxide in construction and materials.

However, estimated carbon emissions from land use changes and construction of vacation homes are uncertain and depend on local soil conditions in Norefjell not investigated at this point. In addition, large future improvements in building techniques with regard to carbon emissions are anticipated, as is expected in other construction and production processes as Norway pursues emission reduction targets in line with the Paris Agreement. Due to the mentioned uncertainties, we did not include information on different carbon emissions predictions in the policy options presented to the respondents (Table 1). However, the respondents might still have factored in emission reductions associated with less development when answering the survey. Thus, both to avoid double counting the benefits related to emission reductions and due to the large uncertainties when calculating the values, we keep the carbon emissions from the development of vacation homes out of the CBA.

#### 3.3.2. Willingness to pay for reduced vacation home development outside Viken and Oslo

The CV survey was not sent residents outside Viken and Oslo. The reason was that we wanted the respondents to have some knowledge of the NR area as well as potentially use the mountains. We, therefore, restricted the scope of the market for the CBA to avoid compromising the validity of the design. We find a positive correlation between travel time to the NR mountain area and “don’t know” and protest answers within the Viken and Oslo counties, indicating that restricting the scope of the market improved data quality. The drawback of setting the scope of the market to Viken and Oslo is a lack of information on the potential WTP to avoid the BAU-alternative among respondents outside Viken and Oslo.

## 4. Overall CBA results: trade-offs between local and wider societal interests

### 4.1. Costs, benefits, and net benefits

When deciding the preferred management from a local perspective, we include impacts on the producer and consumer surplus among the local population, owners of vacation homes, and local producers with a time horizon ending in 2040. When deciding the preferred management from wider societal interests, we include welfare effects on the population in Viken and Oslo, non-local profits, and the social cost of carbon emissions. See additional assumptions applied in the CBA calculations in Appendix A.4. Table 5 presents the value of the costs, benefits, and net benefits of changing the management option from *L-development* to *M-development* or *S-development* – at the local and regional scale.

We find that a move away from the BAU *L-development* option will

**Table 5**

Present value (PV) of costs and benefits, and net present value (NPV) of reducing vacation home developments in the NR mountain area for the period 2022–2040 in million 2021-NOK.

	Local impacts		Regional impacts	
	M-development	S-development	M-development	S-development
Reduced vacation home development from Large to:				
PV of costs: Forgone producer surplus				
- Construction	-230	-460	-482	-965
- Tourism consumption	-39	-78	-86	-171
- Property sales profits	-888	-1775	-1047	-2094
PV of benefits: Increased consumer surplus				
- WTP resident households in NR municipalities	152	192	152	192
- WTP vacation home households in NR area	216	294	192	294
- WTP other households in Viken/Oslo			10,200	13,015
Net present value of reducing development from L to S and M	-789	-1828	8953	10,271

reduce local net benefits. Although more than 80 percent of respondents in local samples would like to avoid *L-development*, the large reduction in producer surplus among local businesses and property owners outweigh the aggregated WTP for a change in policies.

The welfare improvement outside the destination of reducing development surpasses the loss of producer surplus by manyfold. The *S-development* yields the highest NPV when including all impacts at the regional scale, while the *M-development* option also substantially increases the overall welfare compared to the *L-development* option. A change from the *L-development* option to the *S-development* option results in a 15 percent higher net benefit than a change to the *M-development* option.

### 4.2. Spatial distribution of non-market values

If the management were to change from the BAU *L-development* to the *S-development* option, there would be beneficiaries among local residents, owners of vacation homes and other residents in Viken and Oslo. To explore distributional effects, we run two regressions: one logit regression on whether respondents choose the *S-development* option and one interval regression on WTP for *S-development*, controlling for the same sociodemographic attributes as in Section 4. We include a variable on travel time by car from the NR mountain area zip code to respondents’ home zip code. The travelling time data are calculated using GIS data on the Norwegian route network and the associated speed limits (Holmen, 2020).

The regression results are found in Table 7 in Appendix A.4. Socio-demographic variables are important in explaining the probability of choosing the *S-development* option, while the estimated coefficient for travel time is insignificant. The travel time variable significantly explains, at the 1 percent level, WTP in the interval regression; one hour of increased travel time by car is associated with 1,600 kroner reduced WTP among respondents who prefer the *S-development* option.

We use the regression coefficients to predict each respondent’s probability of choosing the *S-development* option and their WTP for this

development option and calculate the mean predicted probability and WTP at the municipal level. Each respondent's predicted WTP is averaged within the municipality and then standardized by subtracting the mean WTP across municipalities and divided by the standard deviation at the municipal level. See the predicted probabilities and WTP and the associated standardized coefficients in appendix A.5. Fig. 4 displays the geographical variation in the probability of choosing the *S-development* option and the mean WTP for this option.

We see two contrasting patterns when inspecting the maps in Fig. 4. Residents in and close to the NR mountain area seem less likely to prefer the *S-development* option than residents in areas further away. There is variation across space, and the travel time variable does not enter significantly, see the logit model in Appendix A.4. In contrast, even though a larger share of the residents in the NR mountain area prefers the *M-development* or *L-development* options than on average for all the municipalities, local residents in the NR mountain area still have the highest average WTP in Viken and Oslo for the *S-development* option. The WTP for the *S-development* option is lowest among the municipalities further away from the NR mountain area, indicating a distance decay in non-market values.

## 5. Discussion and conclusion

Local developments and the associated land-use change are the most severe threats to ecosystems and biodiversity globally (IPBES, 2019) and in Norway (OECD, 2022). Although research on sustainable tourism has expanded rapidly in recent years (Guo et al., 2019), and is highlighted in policies across all levels of government (Hall, 2013), tourism is still found to degrade ecosystem services and reduce biodiversity (Pulido-Fernández et al., 2019).

Pedersen et al. (2019) find that non-market ES and biodiversity are poorly assessed and given little weight in municipalities' zoning regulations. Norwegian law does not require municipalities to conduct CBA on their zoning regulations since the welfare impacts are not considered significant. CBA permits the decision maker to compare the environmental and economic impacts of tourism management on well-being (Boadway, 2016; Dwyer, 2012). This study demonstrates that combining Cost-benefit analysis (CBA) and Stated Preference Methods (SP) can improve tourism and land management and reduce ecosystems and biodiversity degradation. By valuing the environmental values affected by tourism development in the NR area, we identify substantial

environmental costs overlooked in decision-making at the local governmental level.

The large development option (*L-development*) yields the highest welfare at the tourism destination due to the large local producer surplus. Selling plots of land is the most lucrative part of the vacation home production value chain, and most of the landowners in the NR mountains are local residents. In contrast, the small development option (*S-development*) yields the highest welfare at the regional scale due to the substantial environmental costs associated with vacation home developments. Local populations and residents close to the NR area and existing vacation home owners benefit the most if the management plan is changed to the small development option.

Local policymakers at certified sustainable destinations in NR have continued to open up new areas to tourism developments for years, even as the wild reindeer population has become increasingly threatened. Over half of the local population wants as little development as possible. This study empirically confirms that local governments have a problematic dual role as both regulators to protect the environment and partners in tourism management to develop the local economy. A recent review finds that private sector entities are the source of most planning proposals approved by municipalities, while local protesters, environmental agencies and civil society have little opportunity to change development plans (OECD, 2022). The case-by-case nature of regulation might also hinder the protection of the environment from tourism development (Connell et al., 2009).

Our results at the local scale are comparable to results in Concu and Atzeni (2012). They studied residents' and tourists' preferences regarding the reform of environmental protection policies with consequences for the tourism industry in Sardinia. Like us, they find that environmental protection provides welfare gains to local residents. Contrary to our findings, tourists in their study do not seem concerned about environmental protection.

Most people in Viken and Oslo prefer the small development option. Since many people in Viken and Oslo have positive WTP, the development level providing the highest welfare shifts from large to small. Avoiding *L-development* by reducing to the medium development option (*M-development*) yields the most considerable welfare improvement, while further reducing the development from *M-development* to *S-development* provides only a 16 percent increase in net benefit due to the apparent diminishing marginal utility of restricting the development.

In a similar setting, Lindberg and Veisten (2012) use a choice

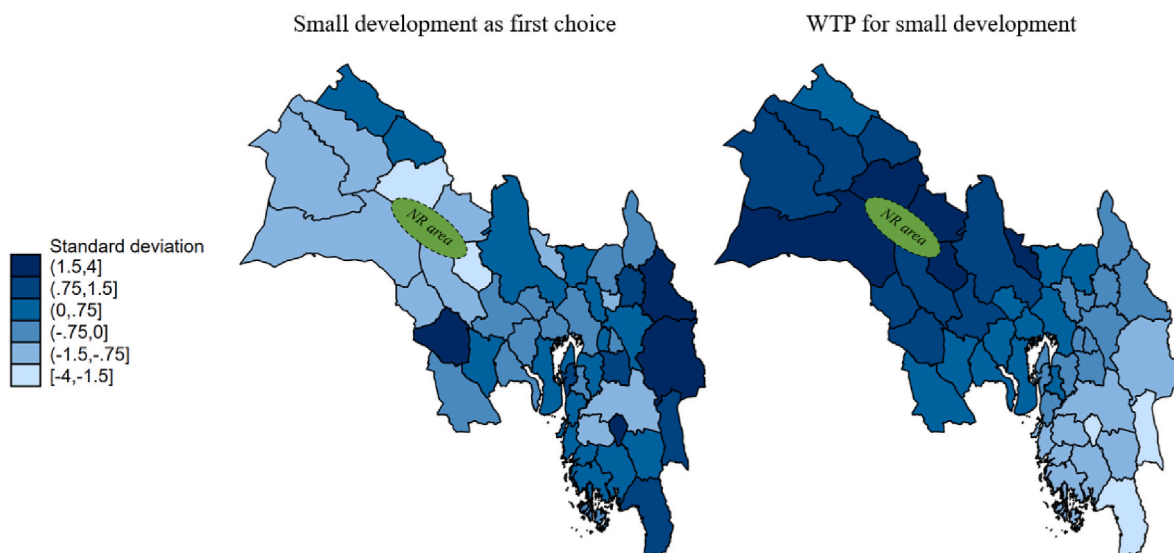


Fig. 4. Conditional probability estimates of choosing the *S-development* option (to the left) and conditional WTP estimates from changing management option from *L-development* to *S-development* (to the right), both averaged and standardized at the municipal level. Note: Estimates are made on the sample of residents in the NR mountain area and on the sample of residents in Viken and Oslo.

experiment to study local and non-local preferences for the potential development of a gondola affecting wild reindeer in the Gudbrandsdal region of Norway. Comparable to our results at the regional scale, they find that gondola development would get similar levels of support among locals and non-locals, while they further find that both groups experience similar levels of disutility from wild reindeer habitat loss. As [Concu and Atzeni \(2012\)](#), [Lindberg and Veisten \(2012\)](#) do not estimate changes in the producer surplus of the tourism development.

We find that wealthier households have significantly higher WTP for reducing to *S-development*, which supports the construct validity of the survey ([Bishop & Boyle, 2019](#)). We also find that people with higher education, people who say their recreational activities will be affected, and people who are very negative towards environmental changes in the business-as-usual (BAU) alternative will benefit by reducing to *S-development*. The geospatial analysis shows that the tourism L-development option causes non-market externalities with a distance decay outside the local municipalities. Distance decay in non-market values is found in many SP studies of changes in environmental goods, especially for use values ([Glenk et al., 2020](#)). The negative association between values and distance might be explained by factors such as increasing costs to access the area, an increasing number of substitute areas to the NR mountains, less knowledge and information about the NR area, and decreasing moral obligation towards preserving the nature there ([De Valck & Rolfe, 2018](#); [Glenk et al., 2020](#)).

We have set the extent of the market for the NR mountain ecosystem services somewhat restrictive to avoid compromising the validity of the survey design and to generally be conservative in estimating non-market benefits. If people in other parts of Norway outside Viken and Oslo are affected by negative externalities from vacation home development in the NR area, which is not unlikely as non-use values related to wild reindeer may be important, the net benefits of *S-development* would be larger, strengthening our conclusions.

We evaluate future welfare impacts from the present, assuming stable preferences over time. A critique against using SP to value biodiversity is that preferences are myopic; people do not fully include the interests of future generations in their WTP ([Lienhoop et al., 2015](#)). The respondents have stated their WTP to protect wild reindeer and ecosystem services until 2040. Under large development, the number of wild reindeer will be reduced and threatened by extinction at some point. Myopic preferences among our respondents would imply higher future WTP as the wild reindeer population declines towards extinction.

The study disregards potential market adjustments. In a dynamic environment, a large vacation home development at the start of the period could harm the sustainability and future attractiveness of the destination, causing vacation home prices to drop, reducing investments in new vacation homes and economic impacts. If so, negative externalities of new vacation homes will be reflected in market prices and diminish the need for policy interventions. We also do not explore what future tourists would do if they could not buy a vacation home in the NR mountains. Suppose more vacation homes are built in other mountain areas in Norway due to less development in the NR area. In that case, some of the positive environmental effects of reducing development in the NR area could be offset. Nevertheless, if other local governments also considered all welfare impacts of local tourism development, as we would recommend, they too would have to care for overall environmental costs, reducing this potential offset.

We do not allow for negative WTP for less development in our SP study, as this could result in double-counting when we separately assess the economic benefits of vacation home development. This study finds, as do several other studies, that some respondents have a preference for more local services and jobs from economic development ([Ahi & Kipperberg, 2020](#)). Including the demand for market values in the nonmarket valuation estimates would be possible by allowing for negative WTP among the respondents that prefer *L-development*. Although it is reasonable to assume that people would be willing to pay for better access to market goods, including negative WTP would be

problematic since respondents' demand for market goods would turn up in both the elicited WTP and the increased producer surplus generated by the large development.

There are caveats related to generalising results from our samples to the broader population. Comparing with available population data, we find that our samples are similar in age and gender. However, households with higher incomes and respondents with more than four years of university education are somewhat overrepresented across samples. Further, the lower response rate among households invited to the survey using SMS may indicate some degree of self-selection into the survey. These caveats could suggest that WTP for reduced development of vacation homes may be overestimated. Due to the magnitude of the net benefits of reducing from the large to small development and the fact that potential positive WTP of a percentage of people outside the study region is not included, we believe our conclusions are robust to the mentioned sampling issues.

Striking the right balance between economic and environmental values is a general problem in management across destinations, countries, and contexts. Our study is one example of how SP methods and CBA are suitable for studying trade-offs between such values in a tourism context. Future research should combine SP and CBA to assess the social welfare implications of other land and tourism management issues in different contexts. By including the most important local and non-local market and non-market welfare effects of vacation home developments, our study provides an important empirical example of how local tourism policies that solely account for local impacts may conflict with national environmental interests. Tourism management that primarily focuses on positive economic benefits locally achieves less desirable outcomes for wider society. Choosing the small development path leads to increased overall welfare, which could be redistributed to compensate the losing parties, improving welfare at both the local and the regional scale compared to the large development. Developing policies that reconcile local interests and wider societal interests in tourism and land management is essential for ensuring sustainable tourism and is an important topic for future research. The increasing importance of tourism for economic activity, the associated ecosystem degradation, and the need for climate change mitigation warrant more research on socially optimal tourism and land management.

#### Credit author statement

Conceptualization Endre Kildal Iversen, Kristine Grimsrud, Henrik Lindhjem, Ståle Navrud; Methodology Endre Kildal Iversen, Kristine Grimsrud, Henrik Lindhjem, Ståle Navrud; Software Endre Kildal Iversen; Formal analysis Endre Kildal Iversen; Investigation Endre Kildal Iversen, Kristine Grimsrud; Henrik Lindhjem, Ståle Navrud; Data Curation Endre Kildal Iversen; Writing - Original Draft Endre Kildal Iversen, Kristine Grimsrud; Henrik Lindhjem, Ståle Navrud; Writing - Review & Editing Endre Kildal Iversen, Kristine Grimsrud; Henrik Lindhjem, Ståle Navrud; Visualization Endre Kildal Iversen, Kristine Grimsrud; Henrik Lindhjem, Ståle Navrud; Supervision Endre Kildal Iversen, Ståle Navrud (see [Fig. 1](#))

#### Impact statement

In spite of the promotion of sustainable tourism and extensive research on sustainable tourism policies over the past 20 years, tourism developments continue to cause environmental degradation. We demonstrate how the combination of Cost-benefit analysis (CBA) and Stated Preference (SP) methods can be a useful decision-support tool for sustainable tourism management, illustrating the trade-off between local economic benefits and environmental impacts. Increased consideration of ecosystem services in tourism management will lead to potential welfare improvements. We demonstrate this by analysing the conflict between local benefit-driven tourism development and tourism management accounting for wider societal and environmental interests

at a mountain destination in Norway. We document the problematic dual role of local governments as both regulators and promoters of tourism pointing towards environmental regulations that reduce the ecological footprint of tourism developments and increase total welfare effects. Beneficiaries are residents and tourists at the destinations as well as society at large.

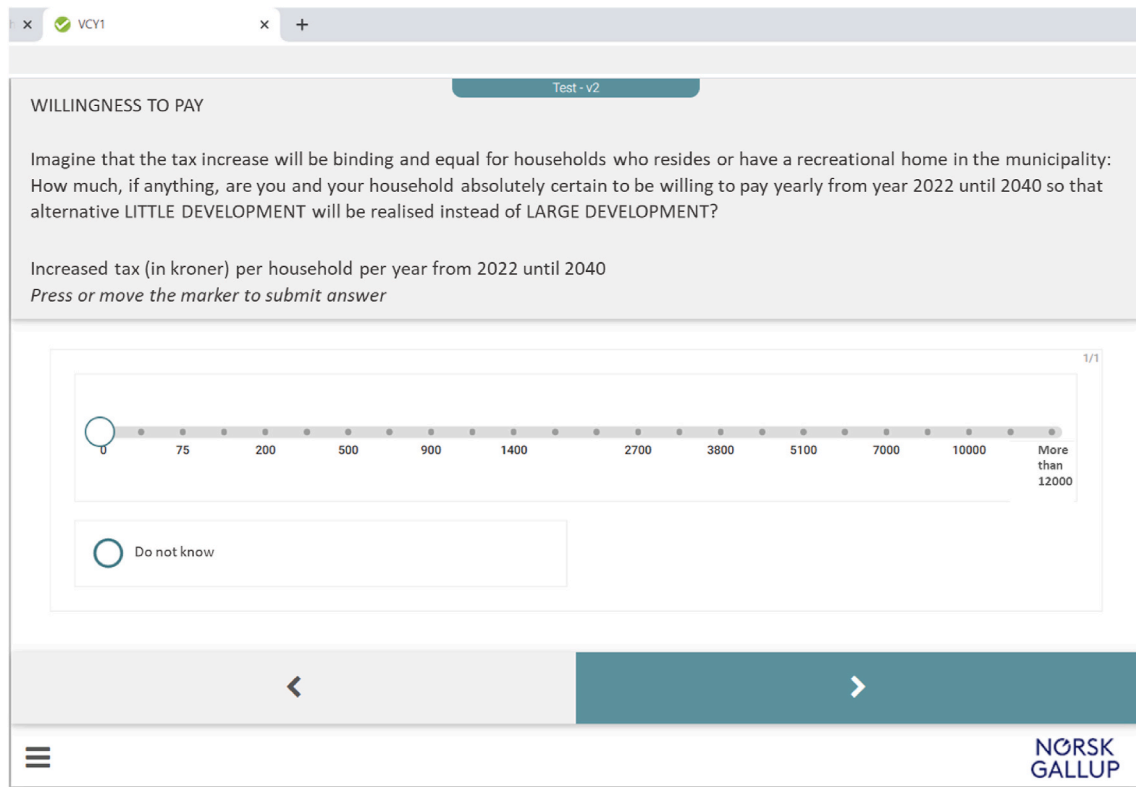
**Declaration of competing interest**

None.

**Appendix A. Supplementary data**

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.tourman.2023.104870>.

**Appendices.**



A.1. Willingness to pay question.

**A.2**

Descriptive statistics additional variables in Table 4

	Agree	Observations
Affected by development through work in construction	61	2047
Affected recreational activities by development	411	2047
Landscape changes are very negative in BAU	1172	1909
More hikers are very negative in BAU	460	1907
Increased pressure on wild reindeer is very negative in BAU	1143	1884
More local services are very positive in BAU	438	1823
Better municipal economy is very positive in BAU	591	1851

## A.3 List of assumptions applied in the CBA

**Table 6**  
- Assumptions applied in the CBA

Element	Assumed	Source/Source of guideline
Start/end of the analysis	2022/2040	Own assumption
Project start	2022	Own assumption
Time horizon	18 years	Own assumption
Discount rate	4 % p.a.	Norwegian Ministry of Finance (2014)
<b>Consumer surplus</b>	Estimated aggregated WTP	Contingent Valuation survey
<b>Producer surplus</b>		
- Average market price of new vacation home	4.3 MNOK	Handberg et al. (2022)
Property sales profit	0.46 MNOK	Handberg et al. (2022)
Cost of construction	3.84 MNOK	SP survey
- Annual cost of maintenance	45 KNOK	Handberg et al. (2022)
- Yearly tourist consumption	88.5 KNOK	Tofteng et al. (2018);
Local businesses' market shares (in %):		
- property sales profit	85 %	Handberg et al. (2022)
- vacation home construction	45 %	Handberg et al. (2022)
- vacation home maintenance	75 %	Handberg et al. (2022)
- tourism consumption	45 %	Handberg et al. (2022)
- Construction profit rate	5 % in Viken/Oslo counties	Business accounting data
- Tourism and retail profit rate	5 % in Viken/Oslo counties	Business accounting data
- Resource rent property profits	86 % of incomes	Handberg et al. (2022)
Number of households in 2022		
- Local; 5 municipalities in NR mountain	5850	Statistics Norway
- owners of vacation homes	7500	Handberg et al. (2022)
- Viken and Oslo counties	898,000	Statistics Norway

Note: Prices in 2021- million Norwegian kroner (MNOK), 1 NOK = 0.1 EURO.

## A.4 Spatial regression

**Table 7**  
Factors explaining respondents choosing S-development. WTP among respondents who prefer S-development

	Logit	Interval regression
	Choose S-development	WTP
<i>Hours drive from home</i>	0.156 (0.101)	-1643.1*** (446.8)
<i>Woman</i>	0.413*** (0.151)	-330.2 (481.3)
<i>Age</i>	0.0652**	19.61
<i>Vacation home owners</i>	(0.0302)	(60.85)
<i>Log household income</i>	-0.000497* (0.000288)	-0.453 (0.560)
<i>Education level (1–5)</i>	-0.408*** (0.152)	932.6** (369.2)
<i>Constant</i>	0.158** (0.0687)	300.2** (128.2)
<i>Insignia constant</i>	3.462* (2.007)	-8813.5** (3877.5)
Number of observations	1043	481
Pseudo R <sup>2</sup>	0.030	0.013
Loglikelihood	-646.0	-2146.2

Note: \*p < 0.10, \*\*p < 0.05, \*\*\*p < 0.01. Standard error in parentheses.

## A.5 Conditional probability and WTP estimates and standardized coefficients by municipality

**Table 8**  
conditional probability and WTP estimates and standardized coefficients by municipality.

Municipality	Predicted probability of S-development	Data in Fig. 4: Standardized Probability	Predicted WTP for S-development	Data in Fig. 4: Standardized WTP
Oslo	.6,949,597	-.0269,474	2203.542	.1,959,601
HALDEN	.7,505,087	1.491516	-260.3431	-1.712404
MOSS	.7,053,146	2.561,106	876.9642	-8,315,204
SARPSBORG	.7,081,903	3,347,191	580.3295	-1.061274
FREDRIKSTAD	.7,130,466	4,674,668	578.0533	-1.063037
DRAMMEN	.678,329	-4,815,571	2545.905	4,611,312
KONGSBERG	.6,861,897	-2,666,816	2163.499	1,649,452
RINGERIKE	.697,185	0.338,819	3229.82	.990,847
HVALER	.6,943,299	-.0441,645	371.0784	-1.223346
MARKER	.7,372,565	1.12926	-845.3062	-2.165478
INDRE ØSTFOLD	.6,558,586	-1.095798	717.529	-9,550,085

(continued on next page)

Table 8 (continued)

Municipality	Predicted probability of S-development	Data in Fig. 4: Standardized Probability	Predicted WTP for S-development	Data in Fig. 4: Standardized WTP
SKIPTVET	.7,993,171	<b>2.825721</b>	-79.262	-1.57215
RAKKESTAD	.6,995,013	<b>.0971,991</b>	434.8601	-1.173945
RÅDE	.7,010,008	<b>.1,381,897</b>	228.7311	-1.333599
VÅLER (VIKEN)	.655,084	-1.116972	421.5608	-1.184246
VESTBY	.7,211,645	<b>.6,893,745</b>	1197.831	-5.829,979
NORDRE FOLLO	.7,101,528	<b>.3,883,646</b>	1714.333	-1,829,498
ÅS	.692,394	-0970,818	2122.583	.1,332,538
FROGN	.7,243,248	<b>.775,763</b>	1289.707	-511,837
NESODDEN	.6,991,363	<b>.0872,211</b>	1506.838	-3,436,612
BÆRUM	.677,148	-513,839	2605.158	.5,070,249
ASKER	.6,993,502	<b>.0930,704</b>	2155.439	.1,587,026
AURSKOG-HØLAND	.7,700,242	<b>2.024984</b>	395.5725	-1.204375
RÆLINGEN	.6,794,384	-4,512,321	1680.979	-2,087,837
ENEBAKK	.7,492,216	<b>1.456331</b>	976.8143	-7,541,831
LØRENSKOG	.7,201,943	<b>.662,854</b>	1478.841	-3,653,461
LILLESTRØM	.7,070,633	<b>.3,039,101</b>	1796.609	-119,224
NITTEDAL	.7,047,775	<b>.2,414,271</b>	1844.445	-0821,736
GJERDRUM	.6,550,604	-1.117617	1806.746	-1,113,727
ULLENSAKER	.7,262,989	<b>.8,297,263</b>	1386.124	-4,371,586
NES	.7,564,963	<b>1.65519</b>	998.5469	-7,373,505
EIDSVOLL	.6,783,649	-4,805,763	1870.945	-061,648
NANNESTAD	.6,733,071	-6,188,344	2245.24	.2,282,562
HOLE	.6,719,036	-6,571,985	2315.031	.2,823,119
FLÅ	.6,596,498	-9,921,619	4686.595	2.11917
NESBYEN	.6,386,216	-1.56698	4502.22	1.976365
GOL	.7,169,366	<b>.5,738,048</b>	3093.919	.8,855,873
HEMSEDAL	.7,218,124	<b>.7,070,853</b>	2312.693	.2,805,006
ÅL	.6,439,169	-1.422231	3106.449	.8,952,924
HOL	.6,587,418	-1.016985	3146.8	.9,265,451
SIGDAL	.6,437,108	-1.427865	3808.899	1.439364
KRØDSHERAD	.6,335,866	-1.704614	4285.828	1.808761
MODUM	.6,767,155	-525,663	3028.271	.8,347,403
ØVRE EIKER	.7,204,893	<b>.6,709,175</b>	2363.322	.3,197,146
LIER	.6,838,506	-3,306,212	2484.177	.4,133,213
FLESBERG	.7,543,014	<b>1.59519</b>	2769.798	.6,345,441
ROLLAG	.6,494,131	-1.271989	3101.781	.8,916,765
NORE OG UVDAL	.645,555	-1.377452	4045.519	1.622634
JEVNAKER	.6,609,983	-9,553,017	3973.723	1.567025
LUNNER	.6,970,826	<b>.0310,843</b>	2262.205	.2,413,963

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