

Long-standing visitor monitoring as a tool for ecosystem service valuation as well as planning for competing uses in a recreation and protected area, the Meijendel Dunes

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The Meijendel Dunes, bordering The Hague (450,000 inhabitants), is a green space, covering 2000 ha. However, the area is as well important for nature conservation, recreation, drinking water production and sea defence. For the planning and management of such ‘contested’ areas that face competing spatial claims information is required to understand the various ways in which space is used, experienced and valued. Within this context, we aim (1) to show the role of a long-standing programme for visitor monitoring for both recreational mobility and resource management for nature conservation; (2) to explore the application of such data for ecosystem service valuation. The large number of visits (about 900,000 a year) shows the providing of a significant social-economical service. Additional insights in what the visitors find important and attractive help to qualify the value of the area. This is important for internal and external discussions about management and policy measures.

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Introduction

Spatial planning requires decision making about the use and organisation of space. In many areas this implies decision-making about competing land use claims. This is also true for the planning and management of natural areas. Various EU directives, like the Habitats Directive, Birds Directive and the Water framework Directive have put more emphasis on a careful and well-considered management of these areas and therewith on sufficient knowledge about the various activities and their reciprocal relationships. Many of the natural areas are Europe's most fragile and valuable habitats that are currently protected under the Birds and Habitats Directives. Following these directives the managers of these sites need to ensure protection for the species and habitats which often implies that they have to balance conservation objectives with competing social and economical activities in and around the protected areas. Many of these areas are also popular visitor destinations. Walking, hiking, mountain biking, walking the dog, photography and looking for flora and fauna are among the activities that are done in these areas. Especially with high visitor numbers such activities need to be carefully managed. The European Commission argues that good planning and management of Natura 2000 sites depends on accurate and sufficiently detailed information. Quantitative data about visitor use should be part of this information (Micallef & Williams 2002). Loomis (2000) argues that data from long-term monitoring are essential for assessing visitor impact on natural resources, facilities planning, budgeting, calculating the economic contribution of tourism, and estimating the economic value of the recreation experience to the visitor themselves. The demand for information about visitor use data is shared by site-managers all over the world. Cope et al. (2000) have shown that some form of visitor monitoring is undertaken by a wide range of site-managers in many different ways, varying from guest estimates made by the staff to advanced counting technologies with infrared person counters. Costs, however, are often a reason why long-term data collection receives little attention in everyday management practises (Cessford et al. 2002; Micallef & Williams 2002). Consequently, visitor counting is usually organised without being systematically planned and without being able to meet the demand for accurate and detailed information (Reynolds & Elson 1996; Muhar et al. 2002; Loomis 2000).

Another important aspect that receives more and more attention is the valuation of the various activities. Costanza et al. (1997) argue that "because ecosystem services are not fully 'captured' in commercial markets or adequately quantified in terms comparable with economic services and manufactured capital, they are often given too little weight in policy decisions" (p 253). Therewith they refer to the capacity of natural processes and components to provide goods and service that satisfy human needs, directly or indirectly (De Groot et al. 2002). Despite much research on the valuation of these ecosystems services it is still difficult to arrive at a monetary estimation of human values that would allow a simple comparison in planning and management practices. This is partly due to the fact that many values can never be expressed in money. This is especially true for important values that are often attributed to natural areas like spiritual enrichment, mental development and leisure, enjoy the scenery, rest, relaxation, refreshment, recreation, inspiration and education. Nevertheless it can be useful to

gain a more quantified impression of recreational use and experience. This would require more information on how many people do visit an area, how often do they come and how do they experience and value these visits.

One of the areas in the Netherlands that provides various ecosystems services in the Meijendel dune area. The area is a protected nature area, but it also used for the production of drinking water and it attracts many people who want to walk or cycle in this nature area. As early as the 1960s, biologists concluded that the natural values of the area were decreasing because of overcrowding. One of the main problems was the many visitors arriving by car who could drive to the centre of the area. On sunny days long lines of motorists were driving through the area, searching for a parking place. Parking facilities were proposed to deal with these problems. However, regulations pertaining to the parking problem did not meet with much support from the visiting public, and policy makers demanded detailed information about recreational use (Bakker 1997). Information on the number of visitors and their ways of visiting the area was needed to support proposals to change entrances and relocate parking places. This information would also allow the proposed measures to be evaluated to determine their impact on the number of visitors and their behaviour. Moreover, information about the number of visitors could contribute to the future development of recreational facilities. The visitor monitoring programme in the Meijendel dune area was started to collect data about the number of visitors and their transport modes. The number of visitors has been counted for the past 20 years. During this period, new policies have been formulated and implemented, the number of parking spaces and their locations have changed and regulations have developed.

This paper is an extension of earlier work on visitor monitoring (Beunen et al. 2004 and 2006), aiming at a first exploration of the application of such data for ecosystem service valuation. We therefore first briefly resume the visitor counting in the Meijendel dune area. Next, the use of these data for evaluation of measures is illustrated, followed by a discussion section and conclusions.

Visitor counting in the Meijendel dune area

The Meijendel dune area

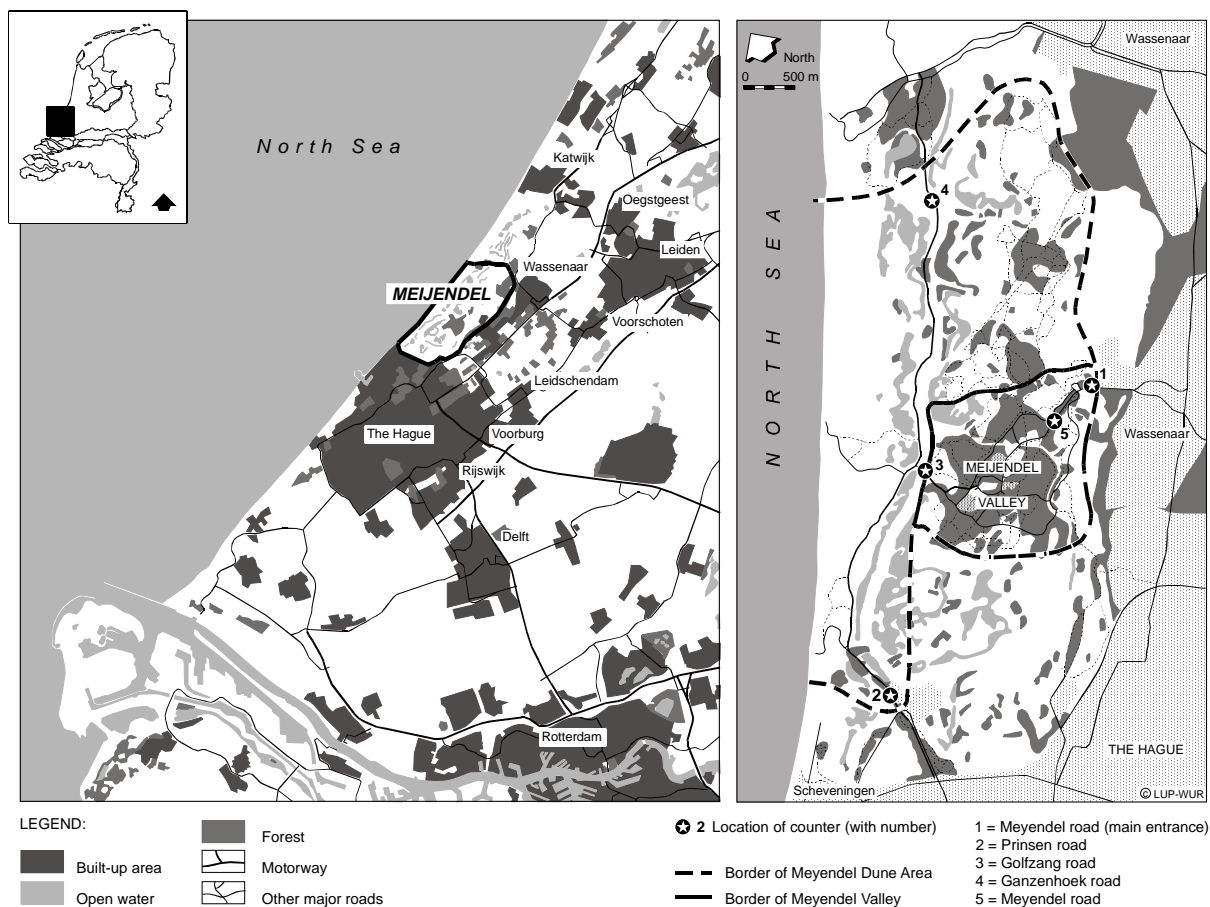


Figure 1. The Meijendel Dune Area with the Meijendel Valley in its centre. Left panel: Location and surroundings near the city of The Hague, The Netherlands. Right panel: Counting locations; site 6 was added in the south-east of the Valley after the opening of a new bicycle path in 2007. Source: Jaarsma et al. (2010)

Meijendel (Figure 1, left panel) is a dune area situated directly north of the city of The Hague with about 450,000 inhabitants. The dune area covers about 2,000 hectares, about 600 of which are accessible to visitors. To the north-west the area is bordered by the North Sea coast. East of the area lies the town of Wassenaar (about 26,000 inhabitants). The road from Wassenaar to the North Sea coast (Wassenaarse Slag) forms the northern boundary.

The area is important for nature conservation, leisure activities, drinking water production, and sea defence (Bakker & Kramer 1993). The most important place for leisure activities is the Meijendel valley in the centre of the area. This valley covers about 200 hectares and has about 25 kilometres of footpaths and 6 kilometres of bicycle paths. A visitor centre, a restaurant, and a playground are situated here. A jumping-off place for horses was outsourced in 1997. The Meijendel dune area receives about 900,000 visits per year;

about 30% visit the area more than once a week and most visitors live in the surroundings of the area (Bakker 1997; Jaarsma et al. 2003; Beunen et al. 2006a).

There are three major entrances to the Meijendel dune area. The Wassenaar entrance (location 1 in Figure 1, right panel) is the only entrance for cars. Two parking areas are sited within Meijendel, one in the centre of the valley (200 parking spaces) and one close to the Wassenaar entrance (about 300 parking spaces). The parking area in the Meijendel valley originally had about 500 parking spaces, but in 1995 the number of spaces there was reduced with 300 in order to restrict traffic through the area. With some delay caused by land use planning procedures, in 1999 150 extra parking spaces were constructed near the Wassenaar entrance. Entrances for cyclists and pedestrians are found close to The Hague in the south (location 2) and close to Katwijk in the north (location 4). At these entrances, cars must be parked outside the borders of the area. A bicycle path through the area parallel with the coast line connects The Hague with Katwijk. A new bicycle path was opened in 2007, which connects the centre of the area with a new entrance in the south-eastern part. In addition to these bicycle paths, there are several other bicycle routes and footpaths within the area.

Methods applied

Basically, visitor monitoring consists of three components: visitor counting, visitor profiling, and analysing visitor opinions (Cope et al. 2000; MacGregor 1998; Cope et al. 1999). The visitor monitoring program in the Meijendel Dunes combines visitor counting with occasional visitor surveys. Daily counts on all entrances of the number of cars and bicycles with automatic devices and a pressure-sensitive tube across the road were the basis of the visitor monitoring. Visual sampling is used to calibrate these daily data and to estimate the number of pedestrians. Applying a counter-coefficient (to correct for inaccuracies made by the detector), and an axles-coefficient (to correct for multiple axes), allowed for the re-calculation of the number of vehicle-axles into the number of vehicles (cars and bicycles). Finally, the average vehicle occupancy was applied to estimate the number of visiting persons.

According to de Bruin et al. (1988) 12 types of days have been distinguished (4 seasons; weekdays, Saturday and Sunday). Visual counts were executed during 1992-1996 in each season and in total on 2 weekdays, 3 Saturdays and 3 Sundays. The classification into 12 could then be reviewed into 8 types, based on small differences in the averages for similar days of the week in some sequential seasons. In 2002 an update of the visual counts on location 1 was made, followed by an integral update in 2009/2010.

In 2005 a survey was held among the visitors in the area by means of a questionnaire that was distributed in the area. Visitors could take this questionnaire home, fill it in and return it by mail. A total of 740 questionnaires were returned. Through this questionnaire visitors were asked about their background, their

reasons for visiting the area, their wishes, their activities within the area and their opinion about the area and the management of the area.

Overall results of 18 years of monitoring

Table 1 presents the annual results from the monitoring programme so far. This information is summarized from detailed annual reports of traffic flows and visit volumes.

Table 1. Overview of annual traffic volumes (cars and bicycles), visits (by car, bicycle and on foot; total of visits) and modal split (in per cents) in the Meijendel dunes, 1992-2008.

year	Number of vehicles		Number of visits by				Modal split (in %%)		
	<i>cars</i>	<i>bicycles</i>	<i>car</i>	<i>bicycle</i>	<i>on foot</i>	<i>total</i>	<i>car</i>	<i>bicycle</i>	<i>on foot</i>
1992	219,000	485,000	428,200	499,000	26,000	950,000	45	53	3
1993	222,000	441,000	438,900	455,000	25,000	918,400	48	50	3
1994	225,000	480,000	444,000	493,000	25,000	963,000	46	51	3
1995	187,500	513,000	396,500	529,000	31,000	956,400	41	55	3
1996	171,000	422,000	372,000	431,500	31,000	830,900	45	52	4
1997	177,000	484,000	386,000	496,000	33,000	914,000	42	54	4
1998	171,550	393,650	375,150	407,550	24,700	807,400	46	50	3
1999	177,700	453,500	386,800	470,100	27,800	884,700	44	53	3
2000	171,915	436,358	373,598	452,168	25,578	851,344	44	53	3
2001	188,705	441,103	412,233	456,665	25,121	894,119	46	51	3
2002	191,990	440,555	403,600	456,300	25,300	885,200	46	52	3
2003	194,530	499,040	409,040	517,440	27,910	954,400	43	54	3
2004	195,400	439,700	410,900	455,100	26,000	892,000	46	51	3
2005	191,630	466,470	401,000	482,700	29,300	913,000	44	53	3
2006	162,790	452,600	342,400	468,600	28,000	839,000	41	56	3
2007	171,154	470,745	360,935	483,598	30,419	875,000	41	55	3
2008	163,624	476,557	343,958	487,912	27,834	859,704	40	57	3
average	187,205	458,546	393,248	473,037	27,586	893,445	44	53	3

On average the annual number of visitors in 1992-2008 is about 893,500; it varies between 807,400 (1998) and 963,000 (1994). The average modal split is 53% by bicycle (range 50-57%), 44% by car (40-48%) and 3% on foot.

The survey in 2005 showed that many people visit the area on a regular basis. More than 50% of the people visit the area at least once a month and more than 20% every week. Nature, quietness and walking are the most important reasons to visit the area. About 50% of the visitors regularly uses the restaurant facilities that can be found in the centre of the area (Beunen et al. 2006a).

Monitoring of visitor data & evaluation of measures

In the past decade several measures were taken to manage visitor flows. The monitoring program allows for an evaluation of the measures and their effects. Examples are the introduction of compulsory use of leashes for dogs in this former leash-free zone in 1995, aiming at less uncontrolled dogs outside the paths and resulting in less walking the dog. In order to protect nature values in the valley, the manager has introduced a policy of outplacement of activities, especially those not necessarily bound to this sensitive location. After outsourcing of a jumping-off place for horses in 1997 the number of trailers decreased with 55%.

Furthermore parking policy measures were taken to reduce car traffic towards the centre of the area, as explained before. In order to study the distribution of cars over the area, cars to the centre and cars parking near the entrance had to be counted separately. During the first years of the monitoring programme, only the total number of cars entering the area was counted, and it was not possible to make a separation. Therefore, an additional counting location was installed in 1997 to count cars driving to the centre (location 5 in Figure 1, right panel).

During the first years of the monitoring programme about 2600 cars per day drove through the area on an average Sunday; Saturdays (1400 cars) and weekdays (850 cars) are less crowded (Figure 2). After the removal of 300 parking spaces in the area centre in 1995, this daily average on Sundays decreased to about 2000 cars, the average on Saturdays to 1000 cars and the average on weekdays to 650 cars. Together, this is a difference of about 45 000 cars per year. For all types of days the averages increased after new parking spaces were constructed in 1999. These changes strongly indicate that the shift in the number of parking spaces affects the number of cars to the area. It is interesting to note that the removal of parking spaces immediately led to fewer cars, while the increase in number of cars after the construction of new parking spaces took some time.

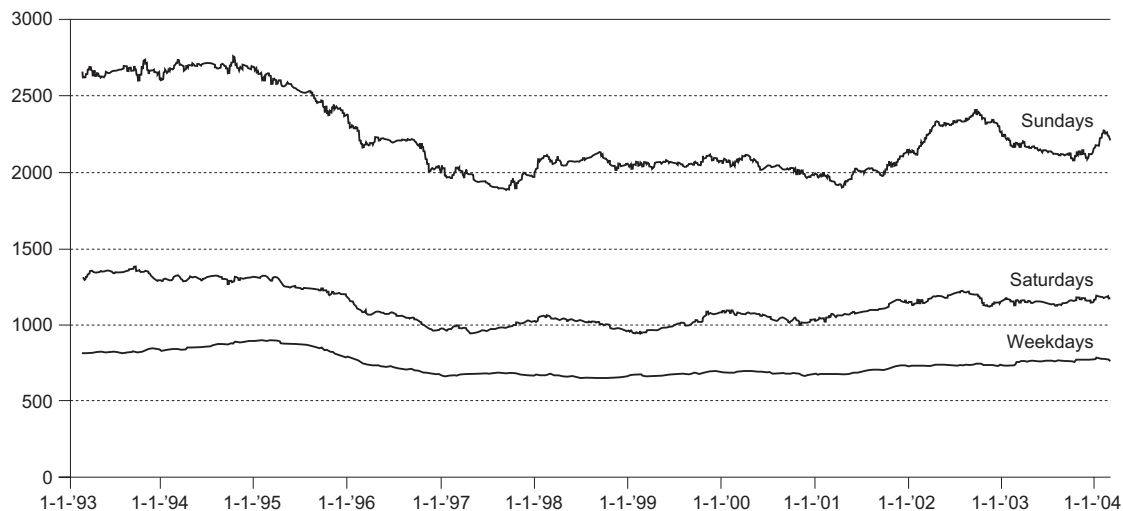


Figure 2. Yearly advancing average number of cars per type of day in the Meijndel Dunes. Source: Beunen et al. (2006).

However, reducing the yearly number of cars was not the main goal. Measures were mainly implemented to reduce the number of cars on peak days and to keep more cars out of the area centre. In order to evaluate whether this has been achieved, it is necessary to have a closer look at the averages on the different types of day and to discuss the spatial distribution of cars in the area.

From 1992 to 2003 the average number of cars on weekdays decreased by 6%. On Saturdays, the reduction was 13%. The decrease in the number of cars was most noticeable on Sundays. On these days the average number of cars to Meijndel Dunes decreased from 1300 to 1100, a reduction of 15%. The lowest averages were counted in 1997 and 1998 when the number of cars on weekend days was about 75% of the number in 1992. After construction of the new parking places, the numbers slowly increased. In the first years of the monitoring programme, the average number of cars on peak days was about 2200 (Table 2). After parking places in the area centre were reduced, this number decreased to about 1600 cars. In 2002 and 2003 this number increased to 1800 cars. This shows that the number of cars on peak days fell by 400 cars per day, a 20% reduction.

Table 2. The average number of cars in the Meijndel Dunes on the ten most crowded days per year, 1992-2003. Absolute numbers and relative for 1992 = 1.00. Source: Beunen et al. (2006).

1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
2295	2113	2212	2031	1618	1633	1589	1640	1584	1646	1779	1814
1	0.92	0.96	0.88	0.71	0.71	0.69	0.71	0.69	0.72	0.78	0.79

In the early years of the monitoring programme almost 90% of the cars drove to the centre (80% on Sundays) (Table 3). Currently, this is about 80% (and about 70% on Sundays). This shows that the measures

have affected the spatial distribution of cars in the area: more cars park near the entrance instead of driving to the centre. These numbers confirm observations by the site manager that more visitors park their car near the entrance and walk from there to the centre.

Table 3. Traffic to the area centre of Meijendel Dunes as percentage of the total traffic, 1997-2004. Source: Beunen et al. (2006).

	Weekday	Saturday	Sunday
1997	90%	89%	84%
1998	87%	86%	81%
1999	87%	88%	86%
2000	81%	81%	77%
2001	78%	78%	73%
2002	82%	80%	72%
2003	80%	79%	72%
2004	75%	78%	69%

A point of special interest is the opening in 2007 of a new bicycle path to the Valley. About 70,000 bicycles used this path in 2008. However, the total number of visits per bicycle in 2008 (488,000) is only slightly above the level in 2006 (469,000). A remarkably decrease of the annual number of visits per car is seen with some 60,000 since 2005, compared with a level just above 400,000 visits in 2001-2005. In the mean time the number of visits by bike has grown leaving the total numbers of visitors at almost the same level.

In recent years the manager of the site has taken several measures to restore dune ecosystems, which include the removal of pine trees and the closure of infiltrations basins that were once used to get water into the dunes. Although many visitors like both the pine trees as well as the water basins, which have become part of the dune landscape, the visitor survey shows that they also appreciate the restoration measures. This information proved to be useful input for discussions about the need and support of these measures.

Discussion

These experiences with visitor monitoring program in the Meijendel Dunes are used to illustrate the importance of long-term monitoring for evaluating spatial measures in transport planning as well as resource management in a contested area.

Visitor monitoring in the Meyendel Dune area has shown that the area provides a significant social-economical service, shown by the large number of visits (about 900,000 a year). Additional visitor surveys give further insights in what the visitors find important and attractive and help to qualify the value of the area. The combination of quantitative and qualitative information about the use of the area is important input for the management of the area. This data is important for internal and external discussions about management and policy measures. Quantitative data about visitor numbers, for example, is used to ground specific expenses that need to be taken to facilitate visitors flows and to convince politicians about the need of specific measures or policies. The high number of visitors shows that many people value the area, which supports the need to protect the area and prevent future development.

The Meijendel case shows the importance of long-term monitoring if one wants to evaluate measures (or policies). However, count data cannot be used to explain everything. Due to large fluctuations in leisure travel, “normal” fluctuation can only be separated from trends or effects from measures if a continuous series of data is collected with the same counting techniques over a long period of time. Even if data meet these requirements, sometimes other factors might colour these effects too much and make it impossible to link changes with implemented measures. Therefore, count data (like other data from monitoring projects) should be judged on its true merits and be used with an awareness of its limitations.

The quantitative data about the number of visits and cars was used to evaluate the effects of various measures in the area, with a particular focus on parking measures. From our nearly 20 years of experience with the visitor counting programme in the Meijendel dune area we can conclude that counting vehicles and using visual counts to determine the number of visitors to a certain area can provide reliable and accurate data necessary for management. From the long-term observations we conclude a decrease of visits by car, and, “hidden” within considerable year-to-year fluctuations, an increase for visits on bicycle. Weather conditions are thought to be an explaining factor. This needs further research, however. The same holds for an eventually exchange between car and bicycle when visiting Meijendel.

Conclusions

From our long-standing visitor monitoring program in the Meijendel dunes we conclude:

1. Information on the various ways in which space is used, experienced and valued is required for the planning and management of areas that face competing spatial claims, because it helps to qualify and quantify these specific claims.
 2. Visitor monitoring can provide this information. A well-thought methodology for a visitor counting program, combined with occasional visitor surveys, can provide reliable and credible data for the management of the area, collected at limited costs.
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Therewith, when space is luxury, visitor monitoring is a conditio sine qua non for the sustainable management of protected nature areas which are also popular leisure destinations.

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