



Public urban green space management in Norwegian municipalities: A managers' perspective on place-keeping

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ABSTRACT

This study establishes a baseline for green space management in Norwegian municipalities. The aim of a comprehensive survey sent to all Norwegian municipalities in 2017, was to describe green space management and compare municipal differences in terms of place-keeping. Place-keeping, the responsive long-term management of public spaces, is used as an analytical framework to characterise the factors that influence Norwegian municipal green space management. The survey assessed place-keeping in terms of policies and strategies, funding, evaluations, management and maintenance as well as partnerships. Although Norwegian green space managers expect budgets to remain stable, they foresee an increase in tasks, more green spaces to manage and more visitors. To maintain the quality of green spaces, managers face difficulties such as incalculable financial challenges and a lack of techniques for evaluating and measuring the quality of green space. Norwegian green space management seems to be largely operational in nature, with limited focus on a tactical level. This is reinforced by a lack of municipal strategies for managing green spaces, potentially based on tactical and operational expertise. Only one in three managers reported having a strategy to maintain green spaces, despite the fact that in the survey, the quality of green spaces was rated more highly when a strategy was in place. Strategic management is suggested as a possible way to ensure quality green space. Individual managers appear to play a key role in the initiation of green space strategies, in reaching out to the political-administrative interface for acquiring sufficient funding, and to facilitate long-term place-keeping partnerships.

1. Introduction

Healthy and well-managed urban green spaces contribute significantly to urban inhabitants' quality of life. Some of the best-known benefits range from positive effects on mental health (Richardson et al., 2013), reduction of stress (Grahn and Stigsdotter, 2010) and alleviation of mental fatigue (Kaplan, 2001), to improved health (Picavet et al., 2016) and increased physical activity (Richardson et al., 2013). Other services of urban green spaces include improvement of local climate, air quality (Pugh et al., 2012), and carbon sequestration (Townsend-Small and Czimczik, 2010), along with supporting services such as biodiversity and habitat provision (Sandström et al., 2006). Although there is a growing consensus among scholars and policymakers about the benefits of urban green spaces, management of these spaces is under pressure. Rising urban density leading to the use of green spaces for building projects (Haaland and van den Bosch, 2015) is one factor, compounded by the limited resources allocated to green space management (Lindholst et al., 2017; Neal and Community First Partnership,

2016). Inadequate management negatively affects green space quality, yet quality is fundamental for attractive, publicly valued, sustainable and profitable green spaces (Dempsey and Smith, 2014). For cities to benefit from green spaces, it is vital to keep these spaces functional and of high quality.

To our knowledge, holistic assessments of Norwegian municipal green space management are sparse, and the value of long-term management is often underestimated in the Nordic countries, including Norway (Randrup and Persson, 2009). This creates a gap in knowledge by discounting potentially fundamental contributions from managers and institutions on how to keep the quality of green spaces.

In Norway, green spaces with original nature and urban forests are diminishing while more cultivated and sealed surfaces are increasing in cities (Thorén, 2010). Natural areas are poorly safeguarded (Thorén, 2010) and access to and quantity of spaces tends to overshadow actual quality (Gundersen, 2004). Responsibility for the management of green spaces is traditionally taken by local authorities (Meland, 2006). Municipal institutions have, however, been subjected to internal

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organisational changes and reforms in response to new public management and governance (Øgard, 2014) creating more independent agencies and subordinating organisational units, including those responsible for green spaces. These units are now several organisational steps away from political leaders (Lægred et al., 2013; Persson and Randrup, 2006). In municipal institutions, responsibility for green space management is unclear and varied. It might be spread over different departments or units (Stokke et al., 2009) and is only one of many tasks performed by public employees (Meland, 2006) who often lack competence (Durucz, 2014).

Apart from municipal organisational diversity, differences in green space management arise from geography. Norway has vast natural environments spreading through eight climatic zones. Just above 2 200 km² (1.7%) of Norway's total land area of 323 809 km² is considered urban (Statistics Norway, 2018a), yet 80% of Norwegian residents live in these areas (Statistics Norway, 2018b). The population is expected to increase from 5.3 million currently to 6 million by 2040, with the largest increase in these urban areas (Syse et al., 2018). With this in mind, the involvement of private and voluntary sectors in managing green space becomes increasingly important, as involvement of individuals has great significance in securing and facilitating the green resource (Stokke et al., 2006; Stokke and Falleth, 2010). However, technical standards and registries – which might neglect user perspectives on the functions and effects of green space – are dominating green space upkeep regimes (Tordsson, 2008).

The concept of place-keeping provides a framework for keeping quality green space in a long-term perspective (Dempsey and Smith, 2014). Place-keeping is a way of organising management and a well-coordinated place-keeping process establishes the basis for potential place transformation. The concept was coined by Wild et al. (2008) and elaborated by Dempsey et al. (2014), extending practical and research knowledge on processes and factors (policy, funding, design and management, evaluation, governance and partnership) that influence the environment in which municipalities facilitate the long-term management of green spaces.

Place-keeping utilises a new institutionalised perspective, looking at the local organisation and managers' perceptions. In this article, we establish a baseline for green space management in Norwegian municipalities, by describing managers' perspectives on place-keeping. The key research questions addressed are: (1) *What are the characteristics of Norwegian place-keeping?* (2) *How do Norwegian municipalities differ in their place-keeping activities?*

2. Place-keeping in Norway

Place-keeping provides an analytical framework to characterise Norwegian green space management, the organisation and managers' perspectives. We acknowledge that other analytical frameworks exist, such as the Policy Arrangement Approach (Arts and Leroy, 2006). This approach considers four interrelated dimensions, rules of the game, actors, discourses and resources. But, place-keeping was considered a suitable framework for this study, as it provides a holistic approach to characterising the actual factors, the resources, that influence Norwegian municipal management on a national scale. Through the lens of place-keeping, the environment that managers have at their disposal is identified. The relations between actors in place-keeping are difficult to comprehend within the breath of the characterisation of municipal resources aimed for in this article. With this in mind, our study does not fully represent all aspects of place-keeping factors. The analytical framework utilised is visualised in Fig. 1.

Focusing on existing green spaces and their quality; the design and management factors are limited to maintenance, as one part of the management process. Also, governance, “conceptualised as the sphere of relations between government and other actors in civil society or non-governmental sectors” (Smith et al., 2014a), is about the interactions between those involved and their roles and relations. Because



Fig. 1. Analytical framework: Adapted place-keeping concept (Source: Dempsey and Smith, 2014 (adapted)).

these relations are complex, we focus on existing partnerships within municipalities in the article, describing managers' assessments of funding, policies and strategies, evaluations, partnerships, management and maintenance, as well as quality as a result of the place-keeping process. The dimensions are assessed through a series of key themes presented in Table 1 and discussed in the following sections.

2.1. Local organisation

As stated in the introduction, Norwegian municipalities have been reorganised, and green space organisational management units have moved further away from political decision-makers (Persson and Randrup, 2006), creating a more varied and complex management situation. This also means that communication within units, departments and with politicians has changed. Tasks within municipalities are varied and, considering the strategic park-management model (Randrup and Persson, 2009), three interrelated activity levels should be considered (policy, tactic, and operation) to ensure effective management. Municipalities were found to focus on operational tasks (Randrup and Persson, 2009) and considering the described differences between them, more central municipalities are more likely to have more resources for the entire management process. Centrality differentiates municipalities based on if they are rural or urban, weighing the importance of distances to workplace and service functions from home. Norwegian municipalities are thereby grouped into six groups, ranging from most-central municipalities, to second-most central, middle-central 1, middle-central 2, second-least central and least-central municipalities (Centrality is further explained in section 3.2).

The types of spaces managed differ between municipalities. In the article, we use “green space” as an umbrella term, defining green areas as spaces that are publicly owned, where management is the responsibility of the local authority, access is free for all, and some type of recreational amenity is available (Henderson, 2013). Following the legal framework for planning and building in Norway (Norwegian Plan and Building Act 2008), we classified green spaces in recreational areas, spaces along waterways, parks and natural areas. An additional three categories were deemed important for resource allocation especially within middle-central municipalities, resulting in seven categories which include graveyards, school playgrounds, and trees.

2.2. Policies and strategies

Legal frameworks such as the Norwegian Plan and Building Act

Table 1
Analytical place-keeping dimensions and key survey themes.

Analytical dimensions	Key themes in the survey
Local organisation	<ul style="list-style-type: none"> ● Green space management organisational distance from political decision-making ● Staff numbers working with tactical, operational and administrative tasks ● Total amount of, and the development of green spaces over the last three (2014–2016), and next three years (2017–2020) ● Changes of visitors in the coming years
Policies & strategies	<ul style="list-style-type: none"> ● Written strategies for managing (developing) green space ● Aims related to green spaces strategies
Funding	<ul style="list-style-type: none"> ● Operational budgets, past changes and future predictions ● New facilities and increased assets ● External sources of funding ● Estimates of costs created through neglected upkeep of space ● Sufficient budget to keep quality green space
Evaluation	<ul style="list-style-type: none"> ● Visitor monitoring and satisfaction ● Mapping of green space
Partnerships	<ul style="list-style-type: none"> ● Volunteers involved in upkeep of green space ● Volunteers that engage in green space (re-)planning or (re-)design phase and how they are involved
Management & maintenance	<ul style="list-style-type: none"> ● Maintenance regimes, e.g. in-house and/or outsourcing ● Quality measurements/descriptions
Quality as the result of place-keeping	<ul style="list-style-type: none"> ● Managers' overall quality perception of green space, past changes and future predictions ● Threats to green space quality

(Kommunal-og moderniseringsdepartementet (KMD, 2008), guidelines and local regulations build the context for managers. These frameworks range from, for example, the safeguarding of cultural heritage and inclusive design to protecting biodiversity (Norwegian Nature Diversity Act 2009) and stormwater management (Norwegian Water Resource Act 2000). Further, municipalities are required to ensure the health of inhabitants (Public Health Act 2011), which can be operationalised, besides other measures, through quality green space provision (Kommunal- og moderniseringsdepartementet (KMD, 2016). However, the implementation and follow-up of policies and the development of strategies for green spaces are dependent upon the individual municipalities, managers and resources available (Stokke et al., 2009).

2.3. Funding

Green space budgets are financed through revenue funding allocation within the local authority department. As a consequence of fragmented responsibilities for green spaces (Randrup and Persson, 2009) and the flow of funds from different departments needing a great deal of organisation and administration (Meland, 2006), the estimation of budgets is difficult. Investment in new spaces or developing existing spaces can increase running costs, which frequently happens without increasing budgets for operational work or extra resources (Kreutz et al., 2014). Some municipalities might seek out external funding at different levels, through public sector grants, private sector partnerships or third sector resources.

2.4. Evaluation

Evaluations give a clearer picture of the quality of spaces, inform decision-making (Stokke et al., 2009), enhance public spending and improve processes and actions of place-keeping (Smith et al., 2014b). Municipalities are required to maintain awareness of the opportunities green spaces offer and how these spaces influence public health (Miljødirektoratet, 2014). Having a better understanding of green space benefits, based on evidence, can facilitate management practices and policy directives to improve quality and public health. Such evaluations are often based on surveys monitoring the results of place-keeping, such as user satisfaction (Smith et al., 2014b). A variety of indicators of the physical qualities of green space have been put forward to aid decision-making since the 1980s (Elvestad et al., 1984; Gabrielsen and Eik, 1992; Guttu and Thorén, 1999; Miljødirektoratet, 2014). Mapping of green space is also put forward as a valuable tool for assessing green space physical structure, benefits, potentials and many more related values (Salbitano et al., 2016).

2.5. Partnerships

Partnerships are “an association of two or more partners with a shared responsibility for the long-term management of a place” (Burton and Mathers, 2014, p. 78), and can be effective in public space management (de Magalhaes and Carmona, 2009) and in advancing public policy (Stokke et al., 2009). The European Landscape Convention supports partnerships involving the public, by engaging them in decision-making processes at a tactical level of management. Although this convention stipulated a legal requirement in planning processes in Norway, the law does not specify who is entitled to participate, nor the extent of participants' involvement (Falleth and Sandkjær Hansen, 2011). Each municipality decides how to involve inhabitants. Operational management is based on agreements and partnerships rather than on strict controls (Stokke et al., 2009) and volunteers play an important role in green space maintenance (Stokke et al., 2006).

2.6. Management and maintenance

Maintenance refers to the operational side of management in the upkeep of green spaces. Traditionally, maintenance is in the hands of municipalities; however, management and steering mechanisms are becoming less direct, measuring performance in terms of aims, results, quality control and competition (Øgard, 2014) which increases the use of standardised maintenance routines (Leiren et al., 2016). This perspective is based on technical concerns, neglecting the values of nature for the individual and society (Tordsson, 2008). In Norway, the standard mainly used is the NS, 3420-ZK, 2016, containing specification texts for building, construction and installations, and ZK refers to the operation and maintenance of parks and gardens. Green space quality descriptions are used to communicate a shared vision of quality in green space and are part of responsibility-sharing in keeping green spaces. Making use of standards is one way to operationalise quality, along with other tools such as the Nordic Green Space Award (Lindholst et al., 2016), or the UK-based Green Flag Award (Green Flag Award, 2018).

2.7. Quality as the result of place-keeping

Overall municipal policy visions may highlight green spaces as vital for achieving quality of life and well-being for local inhabitants. Human engagement with green space provides many desirable health outcomes (Millennium Ecosystem Assessment (MEA, 2005), and for keeping these benefits and services, quality management is vital, expressed as place-keeping practices.

Quality is a term based on an abstracted concept, however, with a positive connotation (Dahler-Larsen, 2008). Quality is both, descriptive and perceptive. On the one hand describing the characteristics of a feature, e.g., the material in question (vegetation) and its condition. On the other hand, something that is experienced, based on perceptions and experiences associated with the feature or the sum of features (e.g. the services provided by vegetation; smells, shade, memories etc). This perception of quality provides an overall impression of the excellence of a green space.

Green spaces are managed by public institutions and these define, as an outset what the descriptive quality of a green space is, and how to manage this quality. The public organisations are functional and operational closed systems, thus producing quality in their own terms and within their own evaluations. Quality is conceptualised in technical standards describing quality, a “compliance-to-specification” concept as Reeves and Bednar (1994) describe it. These standards shaped the understanding of quality as an instrument for maintaining tasks (Lindholm et al., 2015b). Besides this technical (descriptive) quality description, in the survey we defined quality in terms of managers’ perspectives and their various understandings of the concept when applied to green spaces, describing the overall perceived green space quality, seen from the managers perspective.

3. Methods

3.1. Development and distribution of the survey

A preliminary version of the survey was tested and discussed with a pilot group during a workshop in May 2017. Seven green space managers representing six municipalities (most-central to middle-central 1) participated. The revised survey was then sent to the pilot participants in its online form.

The main survey was sent to managers in key tactical positions in departments responsible for parks or green space. Green space managers are viewed as key informants regarding the state of green space management, given their position close to both local politicians and local operational employees. To identify managers, a detailed analysis of administrative structures was conducted and municipal websites were searched explicitly for an indication of units responsible for green spaces. If no such unit could be identified, we used the municipal website engine, using several search words to identify responsible green space managers. If there was no contact person found, we focused on technical units (identified as relevant units by Persson and Randrup, 2006) and chose the head of the department.

The survey was implemented online and emailed (using an access link) to all 425 municipal managers, identified as key informants, in Norway in October 2017. Participants were given a period of two months to answer the questionnaire. In this period, we sent a total of four reminders, and a final personal reminder to those who had started but not completed the survey.

3.2. Response rate

We received responses from 153 unique municipalities, of which 139 municipalities completed the survey and formed the basis for this analysis. This amounted to an answer frequency of 36% (33% respectively). However, using the centrality index categorisation from Statistics Norway, we had a representative sample of the most-central, second-most central and middle-central municipalities, representing almost 70% of the Norwegian population (Table 2).

The centrality index provides a better picture of the situation in the municipality, whether rural or urban, by combining service functions within, and commuting time from, a basic geographical unit, with weighted numbers to adjust for close service functions and commutes (Høydahl, 2017).

3.3. Statistical approach

To explore the data, we used standard descriptive statistical measurements for each question and its variables utilising the software program R (R Development Core Team, 2016). To test the relationship between managers’ perspectives on place-keeping dimensions and the differences in municipalities (explanatory variables), we modelled the survey answers as binary or ordinal variables, depending on the question, using logistic regression in Proc Logistic in SAS 9.4. As explanatory variables in the logistic regression, we used managers’ responses about the organisation of their municipality, the use of strategies and evaluation tools, as well as the municipal budget and additional information from Statistics Norway about municipal populations (Statistics Norway, 2017) and centrality (in terms of the centrality index).

First, municipal organisation is represented through the movement of subordinated units within the organisation away from political decision level. This creates a more complex management situation and therefore, the placing of the unit is assumed to influence differences within place-keeping processes. Second, the use of strategies is seen as decisive for place-keeping; therefore, having a strategy was used as explanatory variable (binary variable). Third, evaluation tools are promoted to facilitate quality green spaces and are essential for effective management. We chose to use mapping (an ordinal class variable) as an evaluation tool in the analysis since other tools were not as frequently used. Fourth, although budgets are decisive for managing green spaces, reported numbers were inconclusive, and we based our analysis on municipal budget per capita (covering the gross operational expenditure for recreation according to Statistics Norway, 2016) and complemented with reported numbers when the official statistic was not available. Negative value and zero values were modelled as missing data since it was not possible to assess if these were true values or reflected a lack of reported data.

Score tests were used to control for proportional odds assumptions being upheld for the ordinal models. When the proportional odds assumptions were not upheld, multinomial regression was used instead of logistic regression. However, since the significant variable and level were the same for both multinomial and logistic models, the results reported are from logistic regression. Odds ratios were modelled as the probability of yes for the binary variables and positive/increasing rankings for ordinal variables. Stepwise selection with an inclusion level of 0.05 and the exclusion level of 0.10 was used to find the most parsimonious models. To test if the selected model was significant and adequate, the log-likelihood ratio test (LR test) and the residual chi-square test were used, and, when appropriate, the Hosmer and Lemeshow goodness-of-fit test. For all reported models with only the model of quality measures as a borderline case, test assumption of the models was upheld. To give a measure of the discrimination capacity of the model, the area under the ROC curve was calculated. These values range between 0.5 and 1, where higher values indicate a higher predictive power of the model.

4. Results

The factors that influence Norwegian place-keeping processes are presented according to the analytical dimensions of the place-keeping concept. The results from the logistic regression, modelling the relationships between place-keeping dimensions and managers’ responses about the organisation of their municipalities are presented in Table 3.

4.1. Local organisation

Local organisation in Norwegian municipalities indicates that units working with green spaces are positioned two organisational steps away from political decision level (40%) in general. Half of the most-central municipalities reported being four or more steps away from political decision level. However, the positioning does not relate to any

Table 2
Responses after centrality index (Høydahl, 2017).

Centrality index	Number of municipalities	Number of inhabitants	Share of inhabitants	Responses
CI 1: most-central municipalities	7	1,028,323	19.6	7
CI 2: second-most central municipalities	23	1,207,202	23.0	13
CI 3: middle-central 1 municipalities	64	1,425,313	27.1	35
CI 4: middle-central 2 municipalities	90	862,188	16.4	29
CI 5: second-least central municipalities	113	491,726	9.4	30
CI 6: least-central municipalities	125	243,565	4.6	26

of the dependent variables: budget changes, having a strategy or engaging in partnerships (Table 3).

Considering the park-management model, most employees work in operations and fewer at a tactical level. Particularly in least-central municipalities (CI 4, 5 and 6), this difference is evident (Table 4). In least-central municipalities, for example, 36% of the managers reported having one person employed on a tactical level, while 64% reported having one employee on an operational level (neither of these employees might work full-time). Municipalities that are more central clearly have more employees at all levels, and yet most people are employed in an operational capacity.

Every fourth manager reported that green space numbers had increased in the previous three years (43.9%) and will continue to increase in the future (41.8%). A slight majority of managers reported no changes in the past (48.3%) and for the future (46%) and only about 2% reported decreasing numbers. Simultaneously, green space visitation was expected to increase in the next three years, as reported by 58.3% of managers. Only 0.7% reported an anticipated decrease of visitor numbers, while 15.8% expected no change.

4.2. Policies and strategies

Fifty-five per cent of Norwegian managers reported not having a strategy for green spaces (30.9% have a strategy, and 17.7% do not know if they have one or not). The majority of the most-central and middle-central municipalities reported having strategies for green space management, while those with lower centrality were mostly reporting not having a strategy. However, within each centrality level there were at least two municipalities reporting having a strategy (Table 5).

Managers reported that most strategies include aims related to

public health (85.1%), followed by inclusive design (65.8), recreation (62.3), biodiversity (50%), and stormwater management (43%). Strategies are, however, significant in managers' views on funding, on the usage of quality measurements in maintenance routines, and in managers' quality perceptions of their own green spaces (Table 3).

4.3. Funding

Half of the Norwegian managers (48.9%) could not quantify their budgets for place-keeping. However, at all centrality levels, a narrow majority could state their budgets – except for least-central municipalities, in which the number of those who could state their budgets equalled the number of those who could not (Table 6). Besides that, almost half of the managers reported that budgets would stay the same in the next three years (48.2%), while 20.1% expected reductions and 32% expected increasing budgets. More central municipalities (CI 1–4) appear to be more optimistic about the future, while 28.6% in most-central municipalities reported an increase in budgets, and only 8% reported increased budgets in least-central municipalities.

Having a strategy was found to be significantly related to perceiving rises in budgets in the future (Table 3). Most municipalities (61.2%), at all levels of centrality, sought other sources of funding, including government support (grants and lottery funds), private investments and gifts, as well as volunteer work by charity associations and informal groups. Sixty-three per cent of managers reported that acquiring new green spaces or facilities was not followed up with increased budgets. However, most-central and second-most-central municipalities did report an increase in budgets following new facility acquisitions, while middle- and least-central municipalities reported the opposite. Exactly 79% did not estimate costs owing to the neglected state of their green

Table 3
Results from modelling of relationships between survey questions and explanatory variables.

Analytical dimensions		LR Test	Significant Variables	Levels	Estimate	SE	Significant Odds ratio point estimates (95% Confidence Interval)	AUROC
Funding	Budget changes Future (Ordinal)	0.0001	Strategy ***	Yes	0.9275	(0.2561)	Yes vs No: 6.40 (2.34 - 17.44)	0.679
	Budget changes Past (Ordinal)	0.0036	Strategy **	Yes	0.6563	(0.2292)	Yes vs No: 3.72 (1.51 - 9.13)	0.635
	Other sources for funding (Binary)	0.00	Mapping **	None	Ref	Ref	Partly vs None 5.33 (1.32 - 21.53)	
		18		Partly	0.4486	(0.4769)		
				Fully	0.7768	(0.4714)	Fully vs None 7.41 (1.88 - 29.25)	0.724
Partnerships	Public Involvement Operations (Binary)	< .0001	CI ***	CI 1	Ref	Ref		0.818
				CI 2	1.6564	(0.9225)	2 vs 5: 13.50 (1.34 - 135.98)	
				CI 3	0.3064	(0.5186)	2 vs 6: 54.00 (4.21 - 692.47)	
				CI 4	1.8570	(0.9151)	3 vs 6: 14.00 (2.37 - 82.717)	
				CI 5	-0.9463	(0.5435)	4 vs 5: 16.50 (1.67 - 163.41)	
				CI 6	-2.3326	(0.7065)	4 vs 6: 65.00 (5.23 - 833.51)	
					None	Ref	Ref	Fully vs None: 6.56 (1.77 - 24.35)
	Public Involvement Planning/design (Binary)	0.0087	Mapping GS **	Partly	0.1053	(0.4191)		
				Fully	0.8880	(0.4248)		
Maintenance Quality	System to measure quality (Binary)	< .0001	Strategy ***	Yes	1.4420	(0.4027)	Yes vs No: 17.89 (3.69 - 86.71)	0.797
	Perception (Ordinal)	0.0192	Strategy *	Yes	0.5846	(0.2556)	Yes vs No 3.22 (1.18 - 8.77)	0.635
	Change of quality Future (Ordinal)	0.0077	Strategy **	Yes	0.5828	(0.2225)	Yes vs No: 3.21 (1.34 - 7.67)	0.623
	Change of quality Past (Ordinal)	0.0007	Strategy **	Yes	0.7617	(0.2326)	Yes vs No: 4.59 (1.84 - 11.42)	0.658

Using logistic ordinal and binary regression with stepwise selection of variables with inclusion level of 0.05 and exclusion level of 0.1. Odds ratios modelled as the probability of yes for binary variables and positive/increasing rankings for ordinal variables. Only significant pairwise comparisons of Odds ratios are shown. LR Test of global null hypothesis (LR Test) and area under ROC curve (AUROC) included to support model validation (the level of > 0.7 is said to indicate a fair predictive capability and values are highlighted in bold). Significance codes: '***' 0.001 '**' 0.01 '*' 0.05. None significant models are denoted ns.

Table 4
Employee numbers on tactical, operational/administrative and operational levels after centrality index and total numbers for all municipalities (in % excluding NA).

Level	All municipalities		Centrality index					
			1	2	3	4	5	6
Tactical	41.7%	No employees	14.3	15.4	5.7	10	24.1	44
		0-1	42.9	30.8	57.1	73.3	58.6	36
		2-3	14.3	38.5	22.9	10	6.9	16
		4-5	14.3	7.7	5.7	3.3	3.4	-
		6-10	-	-	2.9	-	-	-
		More than 10	14.3	7.7	5.7	-	3.4	-
Operations/ Administration	58.3%	No employees	14.3	7.7	2.9	13.3	17.2	24
		0-1	14.3	30.8	42.9	60	69	56
		2-3	42.9	30.8	28.6	23.3	6.9	12
		4-5	-	15.4	11.4	3.3	-	-
		6-10	-	-	5.7	-	3.4	-
		More than 10	28.6	15.4	8.6	-	-	-
Operations	76.3%	No employees	14.3	7.7	2.9	10	6.9	20
		0-1	-	7.7	20	40	62.1	64
		2-3	14.3	15.4	20	20	13.8	12
		4-5	28.6	30.8	17.1	16.7	10.3	-
		6-10	-	7.7	22.9	6.7	3.4	-
		More than 10	42.9	30.8	17.1	6.7	-	-

Table 5
Municipal responses to having a strategy after centrality index (in % excluding NAs).

Has your municipality a written strategy for green space?		Centrality index					
		1	2	3	4	5	6
Yes	Yes	71.4	61.5	48.6	23.3	13.8	8.0
	No	14.3	30.8	34.3	46.7	62.1	80.0
	Don't know	14.3	7.7	11.4	30	20.7	12.0

spaces. In general, managers perceived their budgets to be insufficient to maintain the current quality of green spaces (64.8%) at all levels of centrality.

4.4. Evaluations

Overall, Norwegian managers rarely conduct user satisfaction surveys (only 14.4% had done so) or visitor monitoring (only 6.5%). That which is done is primarily carried out in most-central municipalities, however partial monitoring is utilised by all municipalities (80% of the least-central municipalities carry out some kind of monitoring). Mapping of green spaces and their potential is more frequently done; about one in every three managers reported having mapped green spaces and another 19.4% reported having partially mapped spaces (Table 7).

A pattern in the logistic regression analysis indicated that those municipalities reported to have mapped green spaces were estimated to be more likely to engage the public in (re-)planning and (re-)designing processes. Also, the odds of using other sources of funding were estimated to be higher when managers reported having fully mapped green

Table 6
Municipal responses to budget estimations after centrality index (in % excluding NAs).

Can you estimate the municipality's total budget?		All municipalities		Centrality index					
				1	2	3	4	5	6
Yes	Yes	48.9	57.1	69.2	48.6	50.0	44.8	41.7	
	No	32.4	14.3	23.1	25.7	33.3	41.4	41.7	
	Don't know	18.0	28.6	7.7	25.7	16.7	13.8	16.7	
Budget changes (2018-2020)	Increase	32.0	28.6	38.5	31.4	33.3	6.9	8.0	
	No change	48.2	42.9	46.2	34.3	51.7	51.7	64.0	
	Reductions	20.1	14.3	7.7	25.7	31.0	31.0	20.0	
	Do not know	7.9	14.3	7.7	8.6	6.9	6.9	8.0	

Table 7
Municipal responses to evaluation techniques after centrality index (in % excluding NAs).

Evaluation Tools		Centrality index					
		1	2	3	4	5	6
Visitor monitoring	Yes	28.6	-	8.6	3.3	6.9	4.0
	Partially	28.6	76.9	65.7	70	72.4	80.0
	No	14.3	15.4	14.3	3.3	3.4	8.0
	Don't know	28.6	7.7	11.4	23.3	13.8	8.0
Visitor satisfaction	Yes	42.9	38.5	25.7	-	6.9	4.0
	Partially	14.3	53.8	54.3	60.0	69.0	80.0
	No	14.3	-	5.7	10.0	3.4	4.0
	Don't know	28.6	7.7	11.4	26.7	20.7	8.0
Mapping	Yes	57.1	30.8	37.1	30.0	27.6	24.0
	Partially	-	-	-	-	-	-
	No	14.3	23.1	22.9	26.7	37.9	40.0
	Don't know	-	23.1	11.4	26.7	10.3	24.0

spaces (Table 3).

4.5. Partnerships

Almost half of the managers (49.7%) reported having engaged their local inhabitants at a tactical management level. The majority of municipalities at all levels of centrality have engaged in some form of tactical involvement. However, this involvement is mainly based on consultation. Initiatives whereby inhabitants take over responsibility were sparse, and only 23.2% of the managers reported having relinquished responsibility. However, projects initiated by inhabitants had a higher response, and about half the managers reported having engaged in such. This was especially striking in the most-central and least-

Table 8
Municipal responses to engaging in operational partnerships after centrality index (in % excluding NAs).

		Centrality index					
		1	2	3	4	5	6
Do you involve partners in green space operations?	Yes	42.9	69.2	60.0	50.0	27.6	12.0
	No	42.9	23.1	34.3	36.7	58.6	84.0
	Don't know	14.3	7.7	5.7	13.3	10.3	4.0

central municipalities. Operational partnerships involved friendship groups, sports organisations, garden associations as well as cultural heritage associations; 42.4% of the respondents in this study engaged with these third-sector partners (Table 8).

It is also noteworthy that centrality appears to play a role in the engagement with private partners or organisations (Table 3). Municipalities with a centrality index of 2, 3 and 4 were found to be more likely to engage the public in operational tasks than municipalities with a centrality index of 1, 5 and 6 (Table 8). However, at each level, at least three municipalities engage in such partnerships.

4.6. Management and maintenance

The prevalent maintenance regime (86.2%) makes use of municipally owned units in the form of in-house production. About 6% of managers use their own specialised business units which are also municipally owned. Private services were used by around 7% of managers, who were largely from the most-central municipalities. Most managers (70.5%) did not expect changes in these arrangements in the next three years; 14.4% expected changes and another 14.4% were unsure.

Three out of four Norwegian municipalities do not use a system to measure quality. Having a system to measure quality, however, is related to having a strategy (Table 3). More central municipalities were more likely to have a system to measure quality, while the least-central municipalities had no such system (Table 9). Those who used quality description methods conformed to a specified standard (Norwegian Standard NS, 3420-ZK, 2016), and very few other systems were mentioned.

4.7. Quality as the result of place-keeping

Approximately two thirds (67.6%) of managers perceived their green spaces as being of medium quality, while 26.6% considered their spaces to be good quality and only 5.7% perceive their spaces as not up to standard. Nearly 80% of the managers expected improvements or no change in the quality of spaces over the next three years, with only 12.9% expecting a reduction. The logistic regression analysis suggests that Norwegian managers who reported having a strategy perceive their spaces as being of higher quality than those controlled by managers who do not have a strategy. Managers' perceptions of improved quality in the past and predictions for improved quality in the future may be related to strategic work. Having a strategy appears to make it more likely to envisage higher quality of green spaces in the future (Table 3).

Managers reported that the greatest threat to green space quality

Table 9
Municipal responses to the usage of an overall system to measure quality after centrality index (in % excluding NAs).

		Centrality index					
		1	2	3	4	5	6
Do you use an overall system to measure quality green space?	Yes	71.4	23.1	22.9	6.7	10.3	–
	No	–	69.2	71.4	76.7	72.4	96.0
	Don't know	28.6	7.7	5.7	13.3	13.8	4.0

was insufficient budgets (87.4%), followed by a lack of awareness of green issues on the part of political leaders (42.5%) and lacking green competencies (33.1%) as the third-most significant threat to keeping green space quality. However, 11.5% of managers' self-reported threats were closely related to lacking political awareness. The following are two samples of the respondents' comments:

Lack of understanding of administration and political leadership, expertise and equipment.

The connection between public health, quality of living and green structure is difficult to mediate to both administration leaders and politicians.

5. Discussion

In this article, we describe Norwegian municipal green space management, by describing managers' perspectives on place-keeping. Similar overviews have recently been created in the UK (Neal and Community First Partnership, 2016; Neal, 2014) and in Sweden (Randrup et al., 2017), and we use these surveys as context for the Norwegian situation.

According to our survey, one in four Norwegian municipal managers expects numbers of green spaces and visitors to increase in the future, especially in the most-central municipalities. Yet, budgets are expected to remain stable in the future, although more central municipalities have a more positive view on increasing budgets than less central municipalities. Insufficient budgets are reported as the greatest single threat to maintaining green space quality. Acquiring new facilities is not usually accompanied by a corresponding increase in budget, and the costs of neglecting the upkeep of space are not known. In combination with the fact that half the managers are unable to estimate their budgets, it is likely that it will become increasingly more difficult to keep quality in green spaces. Managers in Sweden also expect an increase in green space numbers and visitors and stable budgets in the future (Randrup et al., 2017) as opposed to the UK (Neal and Community First Partnership, 2016), where budgets have been cut dramatically during the last decades (Dempsey and Burton, 2012).

Only one in three of the Norwegian managers has a strategy for green spaces. More-central municipalities are however more likely to have such strategies than less-central municipalities and yet in all levels of the centrality index, municipalities report to have a strategy. Managers who report to have a strategy, reflect overall political visions in their strategies, especially concerning public health. The lower focus on strategic work in Norway is likely to be a consequence of having fewer employees working on tactical levels than on operational and administrative levels. This might also be a result of the many small management units having only limited resources to fund strategic work, as seen for example in Sweden, in relation to municipal trees and inventories (Östberg et al., 2018). In Sweden, one in two managers reported having a strategic plan (Randrup et al., 2017), while about half of the UK managers (48.4%) reported having a strategy. Logistic regression analysis suggests that municipalities who have a strategic plan are more likely to have a system for measuring quality. None of the other explanatory variables explained the use of quality measurements. Moreover, quality is in general rated higher with managers who have a strategy. Having a strategy is significantly related to perceiving rises in budgets in the future. The re-occurring statistical relationship found in this study between different aspects of place-keeping and having a strategy for green spaces suggests that strategic work is a prerequisite for quality place-keeping. Therefore, it appears that the limited focus on strategic work in Norwegian place-keeping processes is significant. This limited focus on tactical work and lack of strategic plans characterises most Norwegian municipalities, as well as those in Sweden (Östberg et al., 2018).

In Norway, operations are mainly carried out by in-house providers; however, most-central municipalities utilise entrepreneurs. Most Swedish managers (68.3%) use primarily their own resources for the

upkeep of green spaces. However, about 30% report using a private contractor (Randrup et al., 2017) which is a substantially higher figure than the 7% reported in Norway in the current study. Utilising a system to measure quality is only used by a minority of municipalities, except from most-central municipalities where almost all use a system. This may be explained by the fact that the majority perform maintenance and operations in-house, especially the less central municipalities, and hence consider quality as inherent. The measures mainly used are quality specifications from Norwegian standards.

Evaluations from visitors to green spaces, indicating their preferences and perceptions of quality, rarely take place, and mapping of the green resources is only carried out by one in three managers (more, if partial mapping is included). Despite the method, within all levels of centrality, there are municipalities that perform evaluations and the logistic regression analysis suggests that those municipalities that do mapping are more likely to use other sources of funding, suggesting that an awareness of the qualities through the results of evaluations of spaces might facilitate the search for such other sources.

However, it is uncertain what the relationship is between specifications of quality and the real and desired performance (Lindholm et al., 2015a), leaving Norwegian managers in a situation where they may be knowledgeable about the technical quality of green spaces, but lack information from users about their preferences and perceptions of quality. Standardised structures may produce inflexible systems that are slow to respond to changes in external circumstances, such as seasonal changes in use and plant growth, changing user requirements, changing surroundings (Dempsey and Burton, 2012) or budget and priority changes (Burton et al., 2014). Nevertheless, having quality measures, standards or other measures ensures a quality vision. Considering the increasing pressures on quality of green spaces, it seems odd not to have any system at all that ensures quality.

Tactical work between the different management levels seems to leave political decision-makers and administrators unaware of the tasks necessary to keep quality green space. Combined with the lack of information from evaluations, incalculable financial challenges and focus on operational work, an obvious insufficiency exists which precludes the creation of overall local strategies based on evidence, tactical and operational expertise, as suggested by Randrup and Persson (2009). Moreover, the limited involvement of inhabitants at a tactical level, which is rather consultation-based than on actual participation, indicates a somewhat hierarchical approach to tactical partnerships (see Arnstein, 1969; Arts et al., 2006). By contrast, all municipalities, irrespective of centrality levels, engage in operational partnerships to a great degree. Second-most-central and middle-central municipalities are more likely to engage in such collaborations. A possible explanation might be that these municipalities still have enough resources to facilitate such partnerships while being small enough as organisations to maintain close relationships with their partners.

Besides this, neither the placing of the green space unit nor the centrality of a municipality seem to influence which municipalities have a strategy, map green spaces, involve third-sector resources in place-keeping processes or seek other sources of funding. This conclusion then suggests the important role that individual managers play in using available resources to facilitate quality green space, and as facilitators of public involvement. Municipal managers play an important role in facilitating initiatives in green spaces. While involved partners might have objectives that divert them from overall policy goals (MacKenzie et al., 2018) and they may lose interest in participating in the long term (Fors et al., 2015), managers provide a constant within these partnerships (Spijker and Parra, 2018). This is in contrast with findings in Sweden, where only 2.5% of managers involve volunteers in operational tasks (Randrup et al., 2017). In the UK, however, managers report an increase in partnerships, especially of friendship groups in promoting and encouraging the use of green spaces as well as maintenance of the spaces and organisation of events in green spaces (Neal and Community First Partnership, 2016).

5.1. Limitations

As is generally true of binary and ordinal logistic regression using low numbers of samples, the statistical models in this study have relatively low predictive power as indicated by the overall low AUROC values and large Odds ratio confidence intervals. As such, using the model for prediction is not recommended; the size of estimated odds should also be interpreted with caution, although the established significant relationship between the different variables can be seen with more certainty. This also suggests that the pattern of the variables *having a strategy* and *mapping green spaces* repeatedly showing significant relationships should be given more focus rather than individual effect size relationships within the models.

To characterise and compare Norwegian place-keeping, all municipalities were invited to participate in the survey. Municipalities which were more central (CI 1, 2, and 3) primarily answered the survey. Municipalities which were less central were expected to respond less, owing to the lack of own management units for green spaces, undefined responsibilities for green spaces, and less personnel, which also indicates that urban spaces might not be prioritised, and such municipalities might not consider having urban green spaces. These assumptions were confirmed by respondents:

Reply of a municipality with 7000 inhabitants (in 2017): We are a small municipality with a technical operations unit of about six people... green spaces are maintained as needed ... we have no professional in the department.

We reached out to managers in key positions related to green space management in all municipalities. Requirements were knowledge and potential responsibilities about overall strategy making as well as operational management. However since municipalities are organised differently depending on size and geographical structure, all managers approached might not have been in a position to answer all questions with equal justification based on their knowledge and experience. Therefore, results and relations established in this paper might have been slightly different by reaching out to other respondents. Also, terms such as *strategy* and *quality measures* may have been interpreted differently by the respondents, just as budgets and estimations of changes in budgets may have been challenging to establish. However, we deliberately asked for estimations rather than exact figures, and thus our results must be seen as qualified estimations and assumptions as a first attempt to assess a nationwide description of green space management in Norway.

6. Conclusion

The function performed by Norwegian municipalities of keeping quality green spaces is one which faces many challenges, as discussed. Funding is considered insufficient to keep quality green spaces, yet an increase in tasks is predicted, with more green spaces to manage and more visitors, creating a future dilemma.

Our study suggests that strategic work is decisive in keeping quality green space, although overall local strategies based on evidence, tactical and operational expertise challenge place-keeping. Having fewer employees on tactical levels exposes managers to operational work being carried out without long-term strategic vision. The lack of techniques for evaluating and measuring quality of green space amplifies this challenge. Tactical partnerships between the different management levels seem to be missing. Initiatives coming from local inhabitants appear to receive a positive response. This also points towards the extent of involvement in operations. Green space managers at all levels of centrality seem to attend to user interests by seeking external sources of funding, such as volunteering work and operational partnerships, emphasising a dependency on the individual manager as opposed to the minor role of the municipal organisation.

The most pronounced difference between urban (most central to middle central) and rural (least central) municipalities is their future

expectations. Urban municipalities are more optimistic and expect number of green space and number of visitors to increase and the budget to increase accordingly, even though they consider the budgets to be overall insufficient. Rural municipalities are less optimistic and do not expect increase in budgets following increased facility acquisition. It is also evident that urban municipalities more often have a strategy and measure quality while rural municipalities rarely have a strategy for green space management.

In view of these challenges, green space place-keeping seems to be at risk in Norwegian municipalities, especially less central municipalities, raising the question of whether the current role of green space managers is sufficient to ensure future place-keeping for green resources. The role of strategic work for keeping quality green space suggested in our findings, indicates that strategic management ensures quality green space. However, further research is necessary to explore governance within these partnerships, and the individual engagement of managers and their role within these arrangements. Strategies for green spaces and how these are related to other strategies, for example those concerning public health, might have implications for green space management and should be further researched.

Appendix A. Supplementary data

Supplementary data associated with this article can be found, in the online version, at <https://doi.org/10.1016/j.ufug.2019.126438>.

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