



## Developing a place-sensitive tool for park-safety management experiences from green-space managers and female park users in Oslo

K.H.Evensen<sup>a,\*</sup>, G.Hemsett<sup>a</sup>, H.Nordh<sup>b</sup>

<sup>a</sup> Dept. of Landscape Architecture, Faculty of Landscape and Society, Norwegian University of Life Sciences, Norway

<sup>b</sup> Dept. of Urban and Rural Development, Swedish University of Agricultural Sciences, Norway

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### ABSTRACT

Fear of crime may restrict people's use of urban green spaces and thus decrease those spaces' potential public health benefits. Managerial measures in public green spaces that enhance perceived safety are therefore necessary. However, park management in the Nordic countries lacks the knowledge and practice of assessing park users' perceptions of safety. The objective of this paper was to develop a place-sensitive tool for park safety-management practice that combined park manager and user perspectives adapted to the Nordic context. Two empirical studies were conducted in Oslo to achieve this objective. Phase 1 included a focus-group interview with a team of municipal green-space managers to investigate challenges in their safety-related work. In phase 2 a multi-method field study was conducted in an urban park to assess female perceptions of safety in a place-sensitive manner and test methods to be included in a tool for managers. First, safety walks and interviews with ten female residents provided on-site information on how their local park was perceived in terms of safety and identified problematic places. These places were then systematically assessed by twenty female non-residents using questionnaires exploring the relation between perceived environmental attributes and perceived safety. Based on the green-space managers' experiences and addressed needs and experiences from the field study, a place-sensitive method and accompanying tool—called SAFE—for assessing perceived safety in urban parks for managerial purposes is presented.

### 1. Introduction

Urban parks are important environments for recreation in cities (World Health Organisation WHO, 2016). However, several studies worldwide, show that fear of crime may restrict the benefits people accrue from using these urban green spaces (Foster et al., 2014; Lapham et al., 2016; Fleming et al., 2016; Root et al., 2017; Williams et al., 2020). United Nations (UN) Sustainable Development Goal 11 is to create inclusive, safe, resilient, sustainable cities (United Nations, 2015). Planning principles based on crime prevention through environmental design (CPTED) have been widely applied to decrease crime in neighbourhoods but have not been used systematically to improve perceived safety in urban parks (Iqbal and Ceccato, 2015). By the time this study was conducted, the municipal plan for Oslo, *Smart, Green and Safe* (Oslo kommune, 2015) emphasised that city planning should promote the well-being and perceived safety of all citizens at all times. Still, the municipal master plan did not suggest how green space may enhance perceived safety nor any measures to promote the perceived safety of such spaces. Interestingly, the “Nordic

Green Space Award” developed for assessing and promoting urban green-space qualities in the Nordic countries, notably also lacks perceived safety as a criterion (Lindholm et al., 2016). This paper therefore explores methods for enhancing perceived safety via green-space management to develop a place-sensitive tool for park-safety management that combines park managers and users (women) perspectives.

#### 1.1. A socio-ecological perspective on perceived safety

Perceived safety is a complex psychological phenomenon that emerges from the interaction between a place's perceived social and physical attributes. Based on the empirical literature on the fear of crime in urban parks, Sreetheran and van den Bosch (2014) developed a socio-ecological framework for understanding what park characteristics relate to perceived safety (Fig. 1). The framework illustrates how the social attributes (e.g. social incivilities, such as drug use, lack of trust and social cohesion in neighbourhoods) and physical attributes (e.g. physical incivilities, such as graffiti, litter, poor lighting and unwanted vegetation) of a park influence users' experience of it. It also

\* Corresponding author at: Norwegian University of Life Sciences, Post Box 5003, N-1432, Aas, Norway.  
E-mail address: [katinka.evensen@nmbu.no](mailto:katinka.evensen@nmbu.no) (K.H.Evensen)

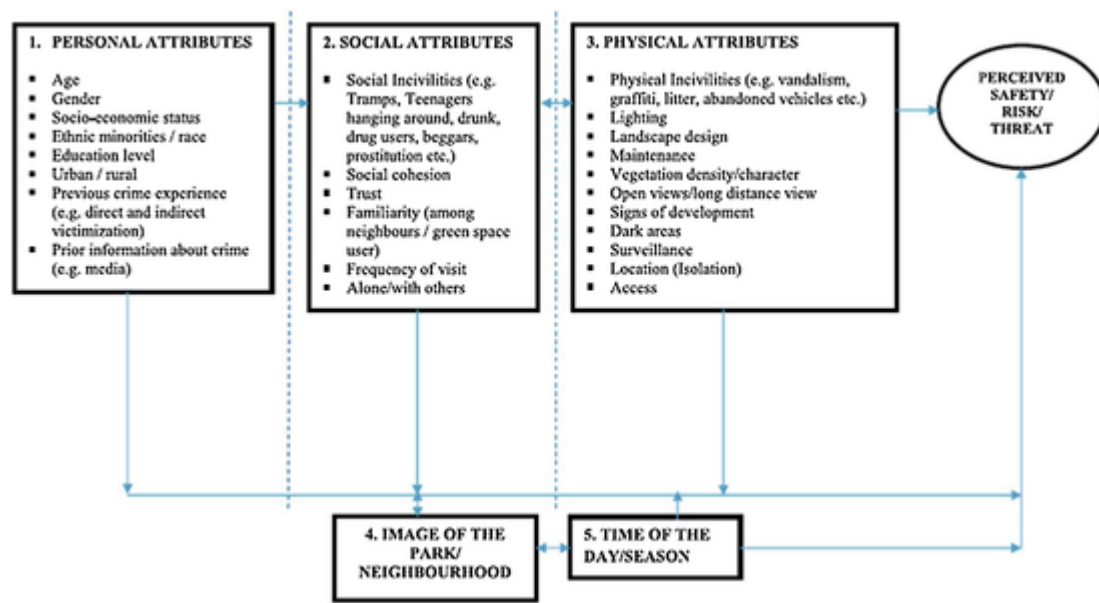


Fig. 1. Conceptual framework for analysing fear of crime in urban green spaces based on a socio-ecological approach (figure taken with permission from Sreetheran and van den Bosch (2014)).

shows how the park experience is moderated by individual characteristics of the user (age, gender, personal experience), as well as the park's general image among the public, the time of day and season. The complexity of perceived safety in their framework also demonstrates the necessity of incorporating users' perspectives in park management, as suggested by the concept of public-value management (Lindholm et al., 2016).

From a planning perspective, creating physical environments perceived as equally accessible to all genders are essential to support socially sustainable societies (Boverket, 2010). The field of criminology has discussed women's fear of crime in public spaces for decades (Stanko, 1995). Studies in various cultural contexts worldwide have found that women perceive urban green spaces, such as parks, as potentially unsafe more often than men (e.g. Nasar and Jones, 1997; Johansson et al., 2012; Jorgensen et al., 2013; Mak and Jim, 2018), and some cultures try resolving the problem with women-only parks (e.g. Iqbal, 2018). Applying a socio-ecological perspective to green space-safety management focussing on women's experience is thus relevant.

### 1.2. Landscape design and perceived safety

Green space has generally been found to promote social safety except in inner-city areas (Maas et al., 2009). However, dense or poorly maintained vegetation in urban parks may evoke the fear of crime and is thus the most investigated attribute of parks (Jansson et al., 2013; Sreetheran and van den Bosch, 2014). Vegetation can obstruct views, decreasing park users' visual access and perceived control, therewith, evoking fear (Nasar and Jones, 1997; Jorgensen et al., 2013). Designs that improve legibility can enhance perceived safety (e.g. Fisher and Nasar, 1992; Blöbaum and Hunecke, 2005), well-being and even mental restoration (Gatersleben and Andrews, 2013). Such findings also resonate with the prospect-refuge theory (Appleton, 1996), which holds that people prefer places that provide both *prospect*—creating an overview—and *refuge*—offering opportunities to hide or withdraw. However, an environment with opportunities to hide may also evoke fear because it can be experienced as a potential hiding place for criminals (Lindgren and Nilsen, 2012). Hence, in relation to perceived safety, providing physical shelter has the para-

doxical effect of being perceived as both positive and negative. Wang et al. (2017) who studied, urban woodland understory characteristics, found that a vegetative understory of middle height was preferred over low and high vegetation, confirming the paradoxical effect of refuge. However, they did not directly assess perceived safety.

In addition to the landscape attributes of perceived prospect and refuge, attributes that tend to generate a perception of entrapment are negatively related to perceived safety (e.g. Nasar and Jones, 1997; Herzog and Kutzli, 2002; Blöbaum and Hunecke, 2005). Hence, park design that provides the possibility of escape from any given area is expected to enhance perceived safety. In a study of perceived enclosure and safety a gender difference only appeared in moderately and highly enclosed park areas, where women reported lower perceived safety than men (Baran et al., 2018). In a study in Hong Kong, Mak and Jim (2018) found that park design and management issues were more associated with the fear of crime than visitor-related concerns and inherent park characteristics, further supporting the application of a broad socio-ecological perspective to understanding perceived safety in urban parks.

### 1.3. Assessing perceived safety

Research on public environmental health and safety programmes has called for more direct measurements of perceived safety in public spaces (e.g. Kondo et al., 2015). Reviewing the literature, Jansson et al. (2013) and Sreetheran and van den Bosch (2014) found that the field is largely built on landscape-preference studies using photos or videos to explore the effects of various physical attributes on perceived safety. Such studies provide basic knowledge about how people respond to various physical features, which can be useful in developing general design guidelines. However, parks may vary considerably in, for example, topography and social attributes, requiring site-specific adaptations of safety measures. This requires systematic mapping of park attributes and user experiences. Fieldwork protocols comprising many methods to assess perceived safety in public spaces, including safety walks and using data from geographic information systems, have been developed and tested (i.e. Ceccato and Hanson, 2013; Ceccato, 2019). These capture the complexity of assessing perceived safety in urban parks and contribute to the field of research but may still not be useful for the practice of green-space management.

The construction of valid assessment instruments of perceived safety is also debated in the field of research. The main critique is that the way questions are asked may itself induce fear or feelings of unsafety (Fotios et al., 2015). Therefore, further studies are needed for methodological development in this field. As Sreetheran and van den Bosch (2014) socio-ecological framework for perceived safety in urban parks shows, perceived safety seems especially influenced by context; indeed, Ceccato (2019) has called for more place-sensitive methods for mapping perceived safety in urban parks. Hence, enhancing perceived safety in parks requires green-space managers to take more context-specific measures.

#### 1.4. Objective of the paper

The objective of this paper is to uncover the needs of park management regarding safety enhancement, to explore and test various ways to assess perceived safety and to develop a place-sensitive tool for park-safety management that combines manager and user perspectives adapted to the urban Nordic context. The tool is builds on experiences from two empirical studies conducted in Oslo; on managerial urban-park safety practices and from assessing perceived safety among female park users.

## 2. Methods

In order to develop a place-sensitive tool for park-safety management practice that combine manager and user perspectives we conducted two separate studies, one focusing on green-space managers' needs (Phase 1) and another one on park users' perceptions (Phase 2) (see Fig. 2 for an overview of the studies and their methods). Phase 1 included a focus-group interview with a team of municipal green-space managers to investigate challenges in their safety-related work. In phase 2 a multi-method field study was conducted to assess perceived safety in a place-sensitive manner. The choice of park for the field study in Oslo was made after consultation with the manager group in phase 1. The park was chosen due to its generic park characteristics being a neighbourhood park in a residential area and as many other parks having challenges related to safety issues. The participants in the second phase were all female. Even if fear of crime is a concern for everyone, several studies report that perceived safety is a more salient issue for women (e.g. Nasar and Jones, 1997; Johansson et al., 2012; Jorgensen et al., 2013; Mak and Jim, 2018), and it was thus expected that women could provide more pronounced and valid experiences useful for developing the tool. The studies were approved by the Norwegian Centre for Research Data.

### 2.1. Phase 1: green-space management and safety

#### 2.1.1. Focus-group interview with park managers

We conducted a focus-group interview with a strategic sample of four employees of the Oslo Park Management team in Oslo. All the interviewees worked in green-space management and maintenance: two senior managers (female and male) and two younger gardeners (female and male). We invited the interviewees to a one-hour discussion moderated by the first author accompanied by the third author. The interview aimed to discover *if* and *how* the municipality promoted perceived safety and included a reflection exercise on what attributes of green

space the interviewees thought could promote perceived safety. The interview was recorded and transcribed with the permission of the interviewees and was conducted in a community building in the park used for a field study, in Oslo, in phase 2 (see Fig. 4 for a map of the park).

The analysis of the interview transcript has two parts: the managers' understanding of perceived safety measures and an exploration of how they work with measures to promote perceived safety in green spaces in Oslo. In the first part, the physical-attribute categories presented in the socio-ecological framework by Sreetheran and van den Bosch (2014) were used as predefined themes in a top down thematic analysis (Braun and Clarke, 2006). The transcript was carefully reviewed and quotations describing physical attributes in accordance with the socio-ecological framework were marked (see Fig. 1 for sub-categories). In the second part, exploring the managerial practices of safety measures, a bottom up approach described by Creswell (2009) was applied. First, the first and third authors read the entire transcript for an overview of the material. They then individually coded the transcript and highlighted the municipality's practices of safety enhancement and community involvement regarding perceived safety in green-space management and maintenance. Codes were then merged into themes. The length of the transcribed focus group interview was 46 pages; hence the coding was done manually with coloured pens. The authors compared marked segments of the text and, after discussion, selected quotations representative of each theme.

### 2.2. Phase 2: field study

We also conducted a multi-method field study to assess perceived safety in a place-sensitive manner. First, safety walks and interviews with female residents provided on-site information on how the park was perceived in terms of safety and was conducted in order to identify problematic places. Second, the identified places were further studied through systematic assessments of perceived safety with non-residents. The purpose was to collect experience with how to organize an on-site perceived safety assessment that could be integrated into the place-sensitive tool for park-safety management. The assessment was therefore done with non-residents in order to control for familiarity of the place and hence produce a more neutral assessment.

The study was conducted in Torshovdalen, the third-largest park in inner Oslo, Norway (136 acres) (Wikipedia, 2018). The park is surrounded by block apartments and is an important recreation area and thoroughfare for residents. It also offers great views of the city and the fjord, and its open lawns with varied topography invite a variety of sport and recreational activities. A survey on crime and safety in Oslo Oslo kommune (2014) found that 9% of the population reported the green areas in their neighbourhood to be unsafe, with variation between the neighbourhoods.

#### 2.2.1. Safety walks

**2.2.1.1. Participants and procedure** Ten female residents of the apartments near the park ranging from 30 to 50 years old were interviewed. They were recruited through posters in the neighbourhood, local cafés, shops, schools, kindergartens and a health-service centre. All the included interviewees reported using the park for recreational purposes and as a thoroughfare in their everyday lives. The interviews were recorded with the participants' permissions. The sample of ten partici-

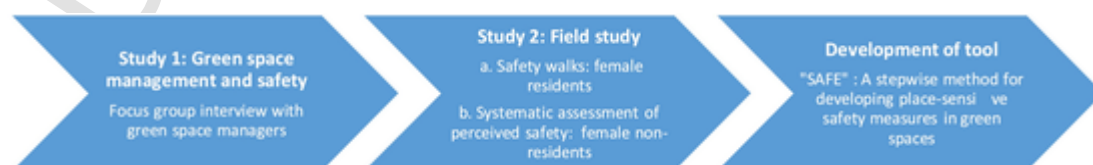


Fig. 2. Overview of the order of studies and the development of the tool SAFE.

pants was considered large enough for the purpose of identifying problematic places in the park since the user's responses overlapped to a great extent. Participants were individually walked through the park by the second author, following a route from the bottom south to the top north of the park. Before entering the park, interviewees were asked to draw a map (*mental map*) of the park. While walking the predefined route, they were interviewed about their experience of the park (see Appendix 1 for specific questions (In Supplementary material)). This paper focuses on results related to vegetation management and perceived safety according to Sreetheran and van den Bosch (2014) socio-ecological framework. The interviews were transcribed and analysed using a stepwise method (Smith et al., 2009). The mental map task (Cold, 2012) was designed to capture how interviewees mentally represented their neighbourhood park. First, they were asked to draw the park on a piece of paper and put crosses (+) on places they liked and dashes (-) on places they disliked. They were asked to explain these likes or dislikes while the interviewer took notes. The ten drawings showed various ways of representing the park. Fig. 3 shows examples of mental maps the participants generated. The maps had similarities in showing that the middle and northern parts of the park were the most used. Two areas were highlighted as the least appreciated (Places 1 and 2 in Figs. 4 and 5). These areas were characterised by more trees, which reduced views of the park and the surroundings.

### 2.2.2. Systematic assessment of perceived safety

To systematically assess the relation between perceived environmental attributes and perceived safety, three problematic places in the park were identified. The first place was identified by the park managers based on public complaints regarding safety issues, and the other two were identified by the interviewees on the safety walks. These three places in the park all consisted of pathways with fences on one side and views towards the park on the other, with vegetation of varying density along the pathway (Figs. 4 and 5).

**2.2.2.1. Participants and procedure** Twenty female graduate students (22–44 years old; median 29) at the Norwegian University of Life Sciences (NMBU) participated in the assessment. The walk was conducted in mid-September at the seasonal peak of vegetation density. The participants were divided into three groups. Each group walked through the park with one of the authors, visiting all three problematic places. At each location, participants were asked to assess the view ahead of them using a questionnaire. The study was a randomised experiment with a within-subject design, letting each participant assess each place in three different orders to prevent order effects.

**2.2.2.2. Questionnaire** A 16-item questionnaire was developed based on a selection of questions from existing instruments used for assessing perceived safety in public space (Herzog and Kutzli, 2002; Blöbaum and Hunecke, 2005; Johansson et al., 2011). At each location, participants were asked to imagine walking down the path *alone* during the day and during the evening and then respond on a 1–7 scale to several statements describing how they would feel. The following perceived physical environmental attributes were assessed: prospect (*From this place I have a good overview*), refuge (*I can see what is going on from here, without being seen*) and escape (*I can easily get away from this place*). We also included items covering “perceived safety – affective” (*I feel safe here/I feel anxious here* (reversed)) and “perceived safety – behavioural” (*I can walk here by myself/I would walk a long way to avoid this place* (reversed)). A total measure of perceived safety, which was the mean of these four items, was calculated. The measure proved reliable with a Cronbach's alpha between 0.90 and 0.91 for all three places. Based on earlier studies, we controlled for the following variables: neuroticism from the Big Five Inventory (Donnellan et al., 2006), which assess how well the following statements describe them in general on a scale from 1 to 7 (*Relaxed and tackles stress well/Is depressed/Worries a lot/Is easily nervous*) and familiarity (*How often have you visited this place?*) (Never–almost daily, 0–4).

**2.2.2.3. Analysis** The data analysis was carried out using IBM SPSS v.25. A preliminary analysis showed that age and self-reported neuroticism had no effects on total perceived safety, so these variables were excluded from further analyses. Paired-sample *t*-tests and repeated-measures analysis of variance (RM-ANOVA) were utilised to analyse differences between the perceptions of the three places. To explore how perceived physical attributes were related to perceived safety, linear regression analysis was conducted for each place. Standard diagnostic techniques were applied to check that statistical assumptions were met by all the analyses.

## 3. Results

### 3.1. Phase 1: green-space management and safety

#### 3.1.1. Understanding of park attributes affecting perceived safety

In the focus-group interview the park managers' understanding of what affects perceived safety in green spaces, they mentioned nine of the eleven physical attributes of parks in Sreetheran and van den Bosch (2014) socio-ecological framework: *physical incivilities, lighting, landscape design, maintenance, vegetation density/character, open views/long distance views, signs of development, dark areas* and *access* but not



Fig. 3. Examples of female residents' mental maps of the park generated before safety walks.



Fig. 4. The location of the three selected problematic places in the park.

surveillance or location. Unsurprisingly, much of the discussion focused on the sub-category *vegetation density/character*. The managers discussed vegetation height and how different bush shapes could create hiding places for criminal activity, amplifying the perception of parks as unsafe places. They also emphasised how *dark areas* and signs of *physical incivilities*, such as graffiti and used injection needles, could trigger feelings of unsafety. The managers discussed the importance of *open views/long-distance views*, *maintenance*, *lighting* and avoiding *dark areas* in parks and other open spaces and how vegetation should be trimmed to promote or avoid such experiences.

### 3.1.2. Practices of safety enhancement

Regular safety-enhancing routines were not part of the managers' daily green space-management work. Instead, they had a practical approach illustrated by the following quotation from one of the managers as they discussed how to find the best solution at each place: *'It's very rare that we make a decision without going out and taking a look at the place (...). We do a lot, really. We actually use a kind of gut feeling at each place and consider each case carefully.'*

The managers also described instances of cooperation with the police to find solutions. The police were also involved when green-space managers were asked to clean up after people occupying public green spaces. Safety-enhancing measures could also conflict with other aspects of management, such as nature conservation and biodiversity. The type of green space also affected the choice of safety-enhancing measures. Parks were described as more heavily managed than natural areas. The interviewees described measures taken to promote safety, such as trimming vegetation in strategic places, increasing the height of tree canopies to avoid shadowing the light from light poles, and using bushes with thorns to prevent criminal activity in the vegetation.

Although safety issues had no formal management routines, the interviews yielded several examples of managers concerned for safety measures in their daily work; for example, one manager said, *'What we often think is that if it (the bush/hedge) is so big that an adult can easily stand inside it, without anyone noticing, then we think it's more threatening than one which does not grow more than 1.20 (m) tall.'*

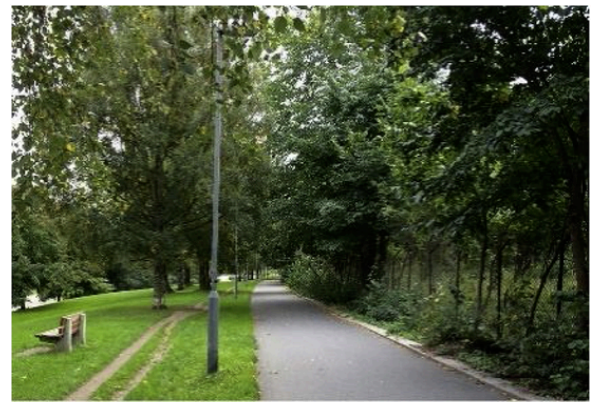


Fig. 5. Photos of the three selected problematic places in the park (1, 2, 3).

One manager also mentioned the Yardstick Parkcheck tool, a questionnaire they regularly used to assess park quality (Yardstick Parkcheck, 2012). However, only one single question covers park visitors' experiences of perceived safety in this tool.

### 3.1.3. Management practice of community involvement regarding perceived safety

Feedback from local residents on safety-enhancing measures was described as crucial to the managers' work: *'We do not feel the issues they are physically experiencing, and we are the ones who are going to make changes for them, so we are very dependent on their feedback.'*

Several channels through which local inhabitants could give feedback were mentioned: telephone, Short Message Service (SMS), e-mail, an application service, Facebook and an online service for complaints. Managers were also commonly approached by local residents when working in the field. Even if people were generally good at providing feedback, the managers perceived that not everyone knew how to do it; one mentioned, *'I think we would get many more complaints if people*

knew how easy it is to reach us and that they can come up with that type of complaint. I do not really think people know how much influence they can have.'

The managers also expressed that the involvement of local residents differed between districts of the city. The most engaged people were usually those with the most resources or those with considerable amounts of free time, such as the unemployed.

### 3.2. Phase 2: field study

#### 3.2.1. Safety walks

Many interviewed female residents spontaneously mentioned examples of both social and physical attributes of parks that influenced their experiences of safety that closely matched Sreetheran and van den Bosch (2014) framework. Two factors, maintenance and the perceived prospects of vegetation management, seemed particularly important to their perceptions of safety.

First, good maintenance, including lack of litter and maintenance of vegetation, was mentioned: 'It's very good that they cut and keep it so that the hedge does not lean over the walkway. Then it looks tidier, and once things look neat and structured, it's less scary, or feels less scary. (...) It's also the feeling that [if] it's a bit unkempt and wild, then you get a bit like something might be hidden here.'

Second, most interviewees mentioned vegetation management to create overviews or prospects as decisive for perceived safety in parks. One interviewee formulated the experience of the park like this: 'It is an open valley, and that is very advantageous, that there are lawns and that some trees are slightly spread out. It gives you a very good overview. And that makes it feel safe.' She further explained how she experienced one part of the park differently: 'The only thing may be the small area down there by the skate ramp. You get the feeling that people can jump out of the shrubs. So there it feels a bit more unsafe.'

Another interviewee mentioned how prospects are directly influenced by vegetation design: 'Here [the trees] are placed in clusters, and it's very open in between. I think that makes it very safe. If there were continuous vegetation everywhere, then it would feel a bit more unsafe. Then it's harder to get away if something happened. Here that is not the case. You should not go so far before you are very visible.'

Another interviewee stated that having an overview is decisive for her choice to cross the park after dark: 'That is important if you are going through a park in the middle of the night. Alone as a woman, I do not think I'd walk here if there were lots of bushes that blocked the overall view.'

More than half the interviewees favoured tall trees rather than dense vegetation, such as bushes. They mentioned that tall trees provide a clearer view from under the canopies, while dense bushes made the park less legible, as one said: 'There are many trees here, for example, but it is [still] open, and one has a view.'

#### 3.2.2. Systematic assessment of perceived safety

Twenty females participated in the safety walks to visit and assess the three identified locations in the park. Thirty percent of the participants had been to the park more than once before (degree of familiarity). The mean neuroticism score among the participants was 3.08 (SD = 0.51) (scale 1–7), however as mentioned, this was unrelated to perceived safety, and was therefore not included in the analysis.

To explore the relation between perceived environmental attributes and perceived safety, the systematic assessments of the three identified problematic places in the park were compared. Paired-sample *t*-tests showed that the female users perceived all three places as significantly less safe in the evening scenario than during the day (Table 1). The means of the perceived safety scores in the evening were all low, indicating that they did not feel safe.

**Table 1**

Systematic assessment (N = 20). Descriptions and results from paired-sample *t*-tests between perceived safety during the day and in the evening in the three places.

Place	Day M (SD)	Evening M (SD)	Sig. 2-tailed
1 Perceived safety - affective	5.88 (.99)	2.65 (1.44)	0.000
Perceived safety - behavioural	5.88 (1.28)	3.10 (1.71)	0.000
2 Perceived safety - affective	5.75 (1.09)	2.60 (1.47)	0.000
Perceived safety - behavioural	6.25 (.95)	2.88 (1.61)	0.000
3 Perceived safety - affective	6.03 (.91)	2.80 (1.44)	0.000
Perceived safety - behavioural	6.00 (1.25)	3.33 (1.57)	0.000

RM-ANOVA (Table 2) showed that the three places were perceived differently in terms of prospect during the day. Place 2 was rated the lowest in perceived prospect, significantly lower than Place 3. No significant differences existed between the places in any other perceived physical attribute. For perceived safety (total), Place 2 was rated relatively less safe, but not significantly so, than the two other places.

We then tested whether the perceived physical attributes could explain the perceived safety of the various places (see Table 3). A regression analysis showed that the perceived prospect of Place 1 was significantly associated with perceived safety. At Place 2, perceived escape

**Table 2**

Systematic assessment (N = 20). RM-ANOVA describing Places 1–3 and prospect, refuge, escape, and perceived safety (total, evening) (scales 1–7).

	Place 1 M (SD)	Place 2 M (SD)	Place 3 M (SD)	F	p	$\eta^2$
<b>Perceived physical attributes</b>						
<b>Prospect</b>	4.10 (1.68)	3.55 (1.15)	4.55 (1.23)	3.716	.034*	.164
<b>Refuge</b>	4.10 (1.37)	3.45 (1.23)	4.00 (1.30)	1.753	.187	.084
<b>Escape</b>	4.45 (1.82)	3.90 (1.33)	4.60 (0.94)	1.804	.178	.087
<b>Perceived safety (total, evening)</b>	2.88 (1.53)	2.74 (1.47)	3.06 (1.44)	1.183	.305	.059

**Table 3**

Regression analysis predicting perceived safety (total, evening) from perceived physical attributes in Places 1–3.

	B	Std. Error	Beta
<b>Place 1</b>			
<b>Familiarity</b>	.513	.236	.383*
<b>Prospect</b>	.546	.209	.599*
<b>Refuge</b>	-.116	.215	-.103
<b>Escape</b>	.060	.185	.071
<b>Place 2</b>			
<b>Familiarity</b>	.908	.217	.706**
<b>Prospect</b>	-.177	.237	-.137
<b>Refuge</b>	-.088	.200	-.073
<b>Escape</b>	.678	.187	.613**
<b>Place 3</b>			
<b>Familiarity</b>	.741	.313	.588*
<b>Prospect</b>	.003	.337	.002
<b>Refuge</b>	-.228	.262	-.205
<b>Escape</b>	-.019	.458	-.012

\*  $p < 0.05$ .

\*\*  $p < 0.01$ .

was associated with perceived safety. At Place 3, no perceived physical attributes predicted perceived safety.

#### 4. Discussion

Perceived safety in urban parks is a complex phenomenon that demands a socio-ecological approach (Sreetheran and van der Bosch, 2014; Mak and Jim, 2018). The objective of this paper was to uncover the needs of park management regarding safety enhancement, to explore and test various ways to assess perceived safety and to develop a place-sensitive tool for park-safety management that combined manager and user perspectives.

The focus-group interview with Oslo municipality park managers showed they shared a broad understanding of perceived safety and associated measures that corresponded with users' perspectives on park use based on Sreetheran and van der Bosch (2014) framework. The managers were particularly concerned with the framework's physical park attributes to promote perceived safety, such as vegetation height, how vegetation should be trimmed, open views, long-distance views, maintenance and lighting. The interviews also revealed that the managers did not have any formal routines for safety measures in their daily practice, but they expressed concern for safety throughout their everyday work. The municipality's park management has several channels through which local inhabitants can give feedback about their park experiences and register complaints about safety issues. However, relatively few inhabitants use this option, making it even more important to deliberately involve local participants in assessing perceived park safety. These findings are consistent with the challenges of green-space management noted by Lindholm et al. (2015, 2016), namely, that systematic user involvement in green space management is still lacking and relies to a large extent on mapping by experts.

In the field study in Torshovdalen in Oslo, safety walks with female residents provided information about their experiences of green-space management and safety issues consistent with a socio-ecological framework (Sreetheran and van den Bosch, 2014). Maintenance and perceived prospect emerged as two particularly important physical attributes related to vegetation management. The interviewees preferred open views and intermittent vegetation that did not provide hiding places for potential criminal activity or attackers. Part of the field study was also a systematic assessment of perceived safety by female non-residents. Here we found that all three problematic places as previously identified by residents and managers, were experienced as less safe in the evening than during the day. Relative differences also existed in terms of perceived safety between the three places, showing that even within the same park, perceived safety may vary. Furthermore, the analysis showed that the differences in perceived safety could be explained by differences in the perceptions of the physical attributes of the places, such as prospect and possibility for escape, in line with Sreetheran and van den Bosch (2014) socio-ecological framework. This result also resonates with Baran et al. (2018) finding that moderately and highly enclosed park areas were perceived as less safe among women than men. The perceived refuge of the environment, however, was unrelated to perceived safety. This finding can be explained by the paradox that perceived refuge can function as a potentially desirable physical attribute during daytime by providing shelter, but as dangerous at night by potentially harbouring attackers. The find-

ings in the systematic assessment with non-residents also confirmed the experiences expressed by the local residents.

Altogether, the field study findings are also consistent with earlier findings that maintaining a low-density understory in parks and urban forests provides better visual access for users and hence better perceived safety (Jansson et al., 2013; Wang et al., 2017). Interestingly, research on actual crime resonates with our findings, showing that smaller, view-obstructing trees are related to more crime in residential areas (Donovan and Prestemon, 2012). These findings also align with other studies on green-space users in the Nordic countries (e.g. Lindgren and Nilsen, 2012) and support the argument that safety measures should be taken in public green spaces to provide equal access to both genders (Johansson et al., 2012) to increase social sustainability (Boverket, 2010). Improving perceived safety through physical layout may attract more people of both genders and thereby influence the social attributes of parks (Sreetheran and van den Bosch, 2014). Lapham et al. (2016) also confirmed such interactions in a study of green space and safety in four cities.

##### 4.1. Implications for practice -Developing a method useful for green-space managers

Based on the findings and methodological insights gained in the studies presented in this paper, a practical tool was developed. The tool is intended for practitioners in green-space management, such as landscape architects and planners, and it provides a stepwise procedure for mapping and developing place-sensitive safety measures in green space that utilises the input of both managers and green-space users (see Fig. 6; see Appendix for a full version of the tool (In Supplementary material)). The method was developed to be both easy to organise and easily interpretable without advanced statistics.

The tool involves three steps (Fig. 6). Step 1 is organised as two workshops, one with green-space managers and another with local residents. The aim of the first step is to create awareness around perceived safety issues and to identify problematic areas in terms of users' perceived safety in a selected green space. In Step 2, the problematic areas are assessed using predefined and validated questions capturing perceived prospect, escape and perceived safety, components that were all found to be relevant in this study. The assessment is organised as an evening walk with local residents in the green space. However, the walks can be converted into survey using photos of the identified problematic places asking the provided questions on perceived physical attributed and safety. Finally, Step 3 is organised as a group discussion with the managers involved in Step 1 focusing on measures how to solve the challenges identified in previous steps. See the Appendix (In Supplementary material) for a full version of the tool.

##### 4.2. Future research

The field study was restricted to a specific user group – females between 25 and 50 years old – and to one case in Oslo. It thus provides useful insights into this group's experience of safety in an urban park, but because of the small sample size, care should be taken in generalising its findings. Further, the field study was conducted during the day, and the participants were asked to *imagine* how they would feel walking alone in the park in the evening, thus relying on their ability to imagine, something which can both exaggerate or reduce feelings of

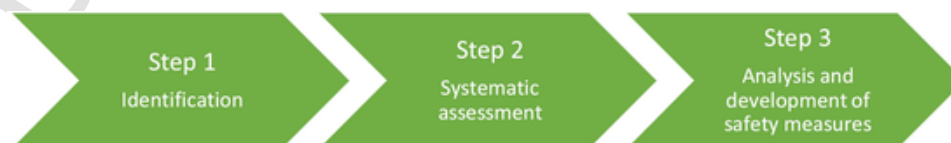


Fig. 6. Steps 1–3 of a place-sensitive method (SAFE) for developing safety measures in green space.

unsafety, making the findings somewhat less certain. In future research, the effects of safety-enhancing interventions should be tested on-site, with both male and female participants and the selection of items in questionnaires should be validated to provide a broader understanding of how green-space management can contribute to resolving public safety issues. Further evaluation of the tool SAFE developed in this paper, is also called upon.

#### 4.3. Conclusion

Findings from this study revealed that the municipality's park management in Oslo had no formal routines for safety measures in their daily practice and that they lacked tools for systematic user involvement in green-space management. The result is somewhat surprising since perceived safety is a topic addressed in both the municipal master plan and in the UN's Sustainable Development Goal, and not least since fear of crime is something that may prevent people, particularly women, from using outdoor green spaces in the evenings. By approaching managers and residents we could identify problematic areas within a green space in Oslo and found that the physical attributes associated with perceived safety were related to park design and vegetation management. Here, perceived prospect and escape had an impact on perceived safety. These findings imply the possibility of detecting physical attributes related to perceived safety through user assessment and accordingly resolving safety issues through careful management. In this paper, we explored and tested a number of methods on how to assess perceived safety: focus group with managers, safety walks with female residents including mind maps of disliked places, systematic assessment of perceived safety by an independent group of female participants. All groups brought valuable information. Managers and residents were familiar with the site and could pinpoint crucial places and challenges within the park. However, the independent group of participants involved in the systematic assessment brought knowledge about how visitors from the public, not familiar with the site, perceived it. Throughout the paper, we argue for the importance of a site-specific approach and involvement of users when working with safety enhancing measures in green spaces. To meet the uncovered needs of the park managers and inspire practitioners, we used the findings and methodological insights gained from the study to develop a practical tool. The tool called SAFE, is a place-sensitive tool for park-safety management, based on user's (women) experiences and park managers practices adapted to the urban Nordic context.

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#### Uncited references

Wolfe and Mennis (2012).

#### CRedit authorship contribution statement

**K.H Evensen:** Conceptualization, Methodology, Formal analysis, Investigation, Visualization, Data curation, Writing - original draft, Writing - review & eEditing, Visualization. **G. Hemsett:** Methodology, For-

mal analysis, Investigation, Writing - review & editing, Visualization. **H. Nordh:** Conceptualization, Methodology, Formal analysis, Investigation, Writing - review & editing, Visualization, Project administration, Funding acquisition.

#### Declaration of Competing Interest

None.

#### Appendix A. Supplementary data

Supplementary material related to this article can be found, in the online version, at doi:<https://doi.org/10.1016/j.ufug.2021.127057>.

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