Combined Sound- & Lightwalks. 
A perception based method to analyze and evaluate the sonic and light environment of our cities at night.

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Summary
Paraphrasing the definition of a soundwalk provided by Westerkamp in 1974, a combined sound- & lightwalk could be meant as any excursion whose main purpose is listening to the environment and looking at its artificially lit components. More in general, a combined sound- & lightwalk could be placed in the practice of “sensewalking”, which was introduced in the fifth and sixth decade of the XX century, as a method used by a range of disciplines to “investigate and analyze how we understand, experience and utilize spaces” by focusing on sensory information gained through one or more senses. Whereas soundwalks have a rather long history with a consistent body of literature and examples of practices, lightwalks are a much younger phenomenon. Therefore, theory and practice of soundwalking was taken as a reference for defining this new method of combined light- and soundwalking. Against this background, this paper illustrates the method’s theoretical background and it provides indications on how combined sound- & lighwalks can be performed, by describing a case study where the method was applied for the first time. To conclude, relevance of the method and its potential impact on urban planning processes are discussed.

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1. Introduction
An estimated 55% per cent of the world’s population now live in cities and according to the United Nations, this percentage is estimated to rise up to 60% by 2030, with one in every three people will live in cities with at least half a million inhabitants [1]. Unfortunately, this trend in urban population growth is accompanied by detrimental effects on people’s health and by increasing levels of environmental injustice: noise and light pollution play a major role. Noise pollution, for instance, is the second environmental stressor after air pollution, which affects our health, well-being and quality of life [2]. Similarly, artificial light became common place: it increased at a rate of 3 to 6 per cent per year in the second half of the 20th century and it is increasing on a worldwide scale [3]. As a result, the world experienced a loss of the night [4] with major impacts on night sky visibility, on flora and fauna, human sleep and health. At the European level, several approaches have been developed so far to deal with the issue of artificial light and noise pollution. However, most of these approaches are mainly based on quantitative criteria and they have resulted in being insufficient, by failing to recognize the importance of human perception in the evaluation of sound and light issues. Furthermore, despite light and noise pollution are phenomena individually addressed, the interplay of both the phenomena through an integrated urban planning approach is still significantly overlooked. Therefore there is evidence for stating the importance of applying a mixed and integrated approach to soundscape and lightscape planning at night in cities. Such an auspicious approach should be based on a toolkit of methods for the analysis and the evaluation of the combined phenomenon to
then define planning guidelines and policies aimed to reducing these problems. Against this background, we envisioned the combined sound- & lightwalking as an experimental method to analyze and evaluate to what extent light and noise pollution, in combination, impact on human health, quality of life and social well-being of citizens. The method was initially experimented in the framework of the design studio Light- and soundscapes of the urban night – Berlin/Firenze co-taught by the authors at the Technical University in Berlin in the Fall Semester A.Y. 2016-2017. The method was then deepened in the occasion of the XXXII Italian Congress of Geographers, which took place in Rome in June 2017 and where a combined sound- & lightwalk was guided by the authors with a group of participants of the congress. The latter represents the case study presented in this paper, along with the method outlined in greater detail. Despite the fact that the case study was exclusively experimental and the method needs further developments, the results showed the relevance of the method and the importance of the results for understanding the relationship of sound and artificial light at night on perception and well-being. More systematic results could have a major impact on urban planning processes.

2. State of the art

In general terms, walking as a method of exploring the world belongs to the history of mankind, as the so-called Bedolina Map shows: carved in stone during the late Bronze Age and the Iron Age (1000-200 BC), it is one of the most ancient topographic maps and depicts walking routes from one place to another [5]. In modern times, especially during the 19th and 20th centuries, walking in cities was acknowledged as a creative, reflective and sometimes subversive way of exploring and understanding the city, by means of diverse practices such as “aural flânerie” [6], “nightwalks” [7], and the Situationist dérive, [8, 9]. In the 1950s and 1960s, “sensewalking” was introduced as a method used by a range of disciplines to “investigate and analyse how we understand, experience and utilize spaces” [10] by focusing on sensory information gained through one or more senses. “Sensewalks” usually focus on everyday experiences of the city gained focusing on one particular sense, and, accordingly, soundwalks can be considered as an example of sensewalking, as can be lightwalks and smellwalks [5].

The term soundwalk was introduced by Murray Schafer in the 1970s in the frame of the World Soundscape Project (WSP): Schafer and his group used soundwalks to investigate Canadian and European soundscapes, emphasizing the action of “listening” as a means to increase awareness of the notion and evaluation of soundscapes and differentiating between “listening walks” and a “soundwalks” [11]. However, it was Hildegard Westerkamp, the German-Canadian composer and musician member of the WSP, who contributed to the definition and spreading of soundwalking as “any excursion whose main purpose is listening to the environment [by giving] our ears priority” [12]. Since the early examples of soundwalks, practitioners have experimented with a huge variety of methods within the arts and humanities, social sciences, ecology studies and engineering [9]. Soundwalks have been performed as methods of inquiry in urban planning and soundscape research with both groups of experts and “local experts” as well as educational tools for enhancing public awareness toward the sonic aspects of the environment among the public [5, 13, 14, 15]. On the other hand, lightwalks are a much younger phenomenon – in line with the scientific interest for noise and light pollution and noise and light conflicts [16, 17, 18]. So far, they are mainly meant to sensitize citizens for the lit nighttime environment [19]. The purpose to get information on the citizens’ perception of different lightscapes is only recently getting momentum [19, 20], but proves the importance of the method in the same way as soundwalks. To develop further the method of lightwalking, in autumn 2017 a lightwalk with complex evaluation points was led in Berlin by one of the authors as a side event to a congress on urban night life, namely “stadtnachacht – BerlinNights 2017” [19]. The practice of combined sound- & lightwalks as a method has not systematically explored – as far as we know – but we are convinced of its usefulness and valuable contribution to the understanding of the nighttime city.

3. Combined sound- & lightwalks: the Rome case study

Paraphrasing the definition of a soundwalk provided by Westerkamp in 1974, a “combined
sound- & lightwalk” could be meant as “any excursion whose main purpose is listening to the environment and looking at its artificially lit components”. Accordingly, also a combined sound- & lightwalk can be placed in the practice of “sensewalking” [10]. Theory and practice of soundwalking was taken as a reference for defining this new method of combined light- and soundwalking, given the longer history of soundwalking compared to that one of lightwalking. In detail, we referred to the “4 Variations” in soundwalking, as outlined in [5]. The “4 Variations” are differentiated according to the purposes to be fulfilled through the conduction of the soundwalk: civic and political, educational and research purposes; accordingly the soundwalks are categorized in: silent soundwalks, commented soundwalks with simple evaluation points, solo soundwalks and soundwalks with complex evaluation points (see Figure 1).

Taking as a reference the “4 Variations” framework, in Berlin and Florence we experimented with “silent sound- & lightwalks”, whereas in Rome we conducted a “sound- & lightwalk with complex evaluation points”, respectively in the fall 2016 and in early summer 2017. The latter was organized as a side event of the XXXII Italian Congress of Geographers, which took place in Rome in June 2017. There, a “sound- & lightwalk with complex evaluation points” was performed in order to investigate the quality of both the soundscapes and the lightscapes of the area under investigation, through both qualitative and quantitative data, collected by the participants during the walk. The sound- & lightwalk was guided along a predefined path, in which 5 evaluation points were pre-selected as being appropriate for data collection, given the diversity in lightscape and soundscapes (see Figure 2). The number of participants was of 10 people. Before the start of the walk, a short introduction was given and afterwards the questionnaires to be filled during the walk were handed out to the participants. The questionnaire was composed of 4 questions, identical per each evaluation spot. In the first two questions participants were asked to rate how dark and quiet the lightscape and the soundscape were in each location. A 5-point linear scale was used: not dark – very dark and not quiet – very quiet, respectively. The third question addressed the pleasantness of the environment in each location: participants were asked to rate it through a 5-point linear scale (not pleasant – very pleasant). Through the final question, participants were asked to describe how the overall

<table>
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<tr>
<th>Purpose</th>
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<tr>
<td>Civic and political</td>
<td>Silent soundwalks</td>
<td>Define a route, potentially with several listening stops along it. Then, walk in a line at a slow pace and stick to the route, in silence. If listening spots are part of the soundwalk, stop the group at these points and focus on listening for one minute, in silence. Then go on. At the end, a group discussion takes place. Questionnaires and maps can be handed out to facilitate the discussion. Participant data collection is not recommended during the soundwalk.</td>
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<tr>
<td>Educational</td>
<td>Commented soundwalks with simple evaluation points</td>
<td>Define a route with several evaluation points along it. Then, walk in a line at a slow pace and stick to the route, in silence. Stop the group at the evaluation points, focus on listening for one minute, in silence. Then start the group discussion. Then go on and repeat the procedure at each evaluation point. At the end, a group discussion takes place. Questionnaires and maps can be handed out to facilitate the group discussions during the soundwalks and at the end. Data collection is encouraged during the soundwalk.</td>
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<tr>
<td>Research</td>
<td>Solo soundwalks</td>
<td>Walk in silence along an open, imaginary, improvised route. Follow your ears and let them guide you in the sonic exploration of the area. Data collection is highly recommended immediately upon completion, in the form of a sonic diary/sonic notes/sonic mental maps. Recording the solo soundwalk and listening to it when back home is highly recommended to reflect on variations in perception. Binaural recordings are highly recommended.</td>
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<td>Research</td>
<td>Soundwalks with complex evaluation points</td>
<td>Define a route with several evaluation points along it. Then, walk in a line at a slow pace and stick to the route, in silence. Stop the group at the evaluation points, focus on listening for one minute, in silence, and start the collection of mixed data. Then go on and repeat the procedure at each evaluation point. At the end, a group discussion takes place. For comparative analyses, the collection of mixed data implies: • Quantitative data: DB(A) measurements, source definition; • Qualitative data: field recordings, psychoacoustic analyses, questionnaires, pictures, videos. Binaural recordings are imperative in order to develop psychoacoustic analyses.</td>
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Figure 1. Figure illustrating the “4 Variations” in soundwalking according to [5]
Participants were guided to walk in a line at a slow pace and stick to the route, in silence. At each evaluation point, the group stopped: firstly, participants were asked to focus on listening and looking around for one minute, in silence, and then they were invited to replying to the predefined questionnaire. While participants were replying to the questionnaire, the authors made light and noise measurements, using respectively a testo 540 lux meter and a SAUTER SU 130 sound level meter. Noise measurements were taken as $\text{dB(A)_{leq}}$ over a time frame of 1 minute, whereas light measurements were made at different spots in the location, according to the punctual and diverse lights sources (e.g. at special lit entrances, at entrances to the hospital and the police station, nearby a stage equipped with a sky beamer etc.). This procedure was repeated at each evaluation point. At the end, a group discussion took place. Overall, the sound- & lightwalk lasted approximately 70 minutes. Data collected by the participants in each of the 5 locations were then analysed in correlation with the measurements taken by the authors at each evaluation point. The results provided interesting insights about the validity of the method and the response of the participants to the sonic and light environment. The first location in via Celio Vibenna was rated as “fairly pleasant” and overall evaluated as being “not dark” and “slightly dark” and “not quiet” and “slightly quiet”. Here, noise and light measurements were 70.5 $\text{dB(A)_{leq}}$ and 11-22-209 lux. The second location in via Labicana was rated as “not pleasant” and “slightly pleasant” and overall evaluated as being “not dark” and “slightly dark” and “not quiet” and “slightly quiet”. Here, noise and light measurements were 65.9 $\text{dB(A)_{leq}}$ and 3-280-348 lux. The third location in via Capo d’Africa was rated as “fairly pleasant” and overall evaluated as being “fairly dark” and “slightly dark” and “fairly quiet” and “slightly quiet”. Here, noise and light measurements were 65 $\text{dB(A)_{leq}}$ and 12-22-200 lux. The fourth location, in via Celimontana, was rated as “pleasant” and overall evaluated as being “dark” and “quiet”. Here, noise and light measurements were 59.6 $\text{dB(A)_{leq}}$ and 1-24-170 lux. The fifth location in via Claudia was rated as “not pleasant” and “slightly pleasant” and overall evaluated as being “not dark” and “slightly dark” and “not quiet” and “slightly quiet”. Here, noise and light measurements were 76.9 $\text{dB(A)_{leq}}$ and 3-280 lux.

Figure 2. Map illustrating the sound- & lightwalk’s path with the 5 evaluation points: (1) via Celio Vibenna (2) via Labicana (3) via Capo D’Africa (4) via Celimontana (5) via Claudia (Image source: Antonella Radicchi 2017).
Not surprisingly, the two most unpleasant spots, Via Labicana and Via Claudia, were also ones with the highest levels of brightness and lack of quietness.

4. Discussion

From the evaluation of the free comments provided by the participants emerged that adjectives such as noisy and bright were the most used to describe the soundscape and the lightscape of the locations. This result leads to the consideration that an alternative and more intuitive linear scale could be implemented, in which the end points of the scale: “very noisy – very quiet” and “very bright – very dark” substitute “not quiet – very quiet” and “not dark – very dark”, used in the Rome combined sound- & lightwalk.

In the individual perceptual evaluation, extreme diverse feedbacks were provided, as it is the case of the first location in via Celio Vibenna, where two participants respectively valued the spot as “not pleasant” and as “very pleasant”. In this case, the ambivalence might depend on the subjective valuation of urban liveliness, however it might be interesting exploring how such highly subjective responses can be integrated in urban analyses and planning processes.

Whereas the location in via Celimontana was rated as “pleasant” by the majority of the participants, it was also perceived as insecure and indicated by one participant as a place to avoid, due to the high levels of darkness. Again, via Celimontana, the darkest and most quiet spot was also perceived as fragile, due to the passing by of occasional cars or motorbikes.

Sound sources producing mechanical and motorized noises (e.g. cars, trams, motorbikes, ventilation machines) were rated negatively and as being very loud; on the other hand light sources were ambivalently perceived by the participants: e.g. very lit entrances to the hospital and to the police station were perceived as annoying, whereas a very lit area with the sky beamer was considered as appropriate.

5. Conclusion

This combined sound- & lightwalk was experimental and cannot be considered as representative, but indicative. Nonetheless, this method is worth to be further developed and it can be indeed considered as appropriate for jointly evaluating the soundscapes and lightscapes of the environment from a qualitative as well as a quantitative perspective. It is a method that could be placed in the tool-kit of city makers aiming to design and plan an environmentally just and healthy city.

Acknowledgement

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References


