

ZENE ÉS HANGZÁSOK A TÁJÉPÍTÉSZETBEN *MUSIC AND SOUNDS IN LANDSCAPE ARCHITECTURE*

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ABSZTRAKT

A cikk a zene és a hangzások tájépítészeti alkotásokban betöltött szerepét és alkalmazásának alternatíváit tárja fel, illetve az akusztikus környezet tudatos tervezésének jelentőségére hívja fel a figyelmet. Ennek megalapozásaként összefoglalja a szabadterek jellegzetes akusztikus ingereinek környeztpsichológiai aspektusait, majd az utóbbi körülbelül 25 év témára vonatkozó, angol nyelvű szakirodalmából válogatva összegzi a kísérletekkel és megvalósult példákkal bizonyított tervezési elveket. Ezzel sorvezetőt biztosít az akusztikus környezet tudatos befolyásolásának módszertanához számos külföldi és magyar példán keresztül bemutatva az ún. 'soundscape design' alkalmazási lehetőségeit. A téma ismertetése az általános irányelvektől halad a tájépítészet egyes részterületein alkalmazható szempontokig kitérve például a funkciókínálat és -elrendezés meghatározására, a térfalak tervezésére, a növényalkalmazásra, anyaghasználatra, fenntartásra vagy akár vízarchitektúrák és művészi alkotások integrálására a koncepcióba az akusztikus tervezés nézőpontjának figyelembevételével. Bár a cikk alapvetően a zene és hangzások hanghatásokként való megközelítésére fókuszál, egy rövid fejezetben a zenetematika

vizuális megjelenítésének eseteit is összegyűjti. Végül kitér a téma egy speciális alkalmazási lehetőségére, a zenés játszóterekre, ahol különösen koncentráltan van jelen a zene akusztikus és vizuális formában egyaránt. Általánosan elmondható tehát, hogy számos tájépítészeti eszköz és jó példa ismert az akusztikus tervezés elveinek megvalósítására, amelyek átgondolt alkalmazásával sokkal élhetőbb és karakteresebb szabadterek hozhatók létre városainkban.

Kulcsszavak: akusztikus környezet, zene, akusztikus design, zenés játszótér, land art ©

ABSTRACT

This paper discusses the potential role of music and sounds in landscape architecture, and highlights the significance of conscious acoustic design. To validate this statement, the article summarises the environmental psychological aspects of a typical urban soundscape, and provides a selection of English-language literature on the subject covering approximately the last 25 years, to summarise design principles demonstrated by experiments and real-life examples. This provides a guideline to the methodology of influencing the acoustic environment, illustrated with a number of examples from both abroad and Hungary. The presentation of the topic ranges from general aspects to criteria related to the different components of a landscape architecture project, such as the selection and arrangement of functions, the design of physical boundaries and planting, the application of materials, maintenance issues or the integration of water features and artwork into the composition, while taking the perspectives of acoustic design into account. Although the paper has a specific focus on sounds and music as parts of the audible environment, a brief chapter also collects the opportunities of visualization of the music theme. Finally, the literature review touches on the special issue of musical playgrounds, where the music theme can be particularly articulated and concentrated either visually or acoustically. On the whole, it can be concluded that there are a wide range of landscape architecture tools and examples of good practice in the implementation of soundscape design principles, which, if applied thoughtfully, can create more liveable and characteristic open spaces in our environment.

Keywords: soundscape, music, acoustic design, musical playground, land art

INTRODUCTION

This article is based on the literature review of my diploma thesis entitled the *Landscape renewal plan of the Csajkovszkij park in Kőbánya*. Beside the results of the site analysis, the design process was inspired by the name of the park and its current programme, determined by busts of romantic musicians. These features anticipate the integration of the musical theme in the concept, including the implementation of soundscape design principles. For the validation of this idea, the analysis in the thesis provided an overview of the relevant literature and case studies on the connection of music and landscape architecture. This article is an extract of this research, presenting the acoustic and visual aspects of music and sounds in landscape architecture and the possibilities of integration of acoustic design in landscape architecture projects.

When evaluating an environment, it is evident that the primary impulse is usually visual, but from the 1960s,

many scientific researchers have confirmed that 'soundscape' can also highly affect our perception and emotional reaction to a place [1, 2]. The phrase 'soundscape' was first used by R. Murray Schafer and can be defined briefly as the acoustic environment. It was also evidenced that audible impulses have an impact on development of place identity [1–4] and the sense of security [5]. Natural sounds (for instance bird chirping and babble of water) [6, 7] and also music [8] are known for their effects of relieving stress, as verified by many research [4, 9]. In the light of this, it is not surprising that sound preference studies show that people favour natural sounds over human ones (like talking, laughing or singing), but the assessment of artificial sounds was the worst [2, 10, 11]. The survey by Wei Yang and Jian Kang conducted at two squares of Sheffield with the participation of 1000 passers-by also supported these findings. Their questionnaire pointed out that the most preferred sounds on these public places were the sounds of water, twittering of birds, chime of bells and street music, whereas the most disturbing sounds were connected to traffic and construction [2]. Further research proved that sound stimuli play a great role in preference of urban places amongst users [2]. Considering these environmental psychological aspects, we can recognise the importance of conscious soundscape design in landscape architecture and urbanism, which results in creating a more liveable environment in our cities [10, 12, 13].

MATERIALS AND METHODS

Although this field of science has been studied since the 1960s (thanks to the work of the previously mentioned R. Murray Schafer), it has only become well-represented in the 21st century through an adequate number of scientific researches. Accordingly, my brief literature and case study review focuses on the most recent results of approximately the last 25 years (from 1993 to 2019). Many of these researches already made use of the current technical solutions and electronic devices in order to provide more accurate data and demonstrate a wider range of opportunities in examination and development of urban soundscape. Among the researchers of this field, the work of the Swedish landscape architect and researcher Gunnar Cerwén is to be highlighted. He turned to urban soundscape with a special interest and his publications and website entitled '<https://soundscapedesign.info>' could be highly useful to get familiar with the practical application of soundscape design and methodology. Since this aspect of landscape architecture is rather under-represented in the Hungarian scientific literature, this paper relies only on international scientific references. Although a Hungarian syllabus of acoustic design principles is not available, there are many examples in Hungarian landscape architecture where acoustic environment plays a significant

role in the design. My collection of 55 examples (presented partly in this article) contains sites from Hungary and from abroad as well. Through the synthesis of the relevant scientific works, this paper presents a collection of design principles firstly in general, then it focuses on different segments of landscape architecture in every paragraph. The first chapter discusses the comprehensive methods and first steps of soundscape design, and determines the 'prevention' or the 'masking' of unwanted sounds as the two major possibilities of improving soundscapes. According to this, the following two chapters list the methods of preventing and masking noises and other tools in landscape architecture for optimizing the acoustic environment. Although the paper has a specific focus on sounds and music as acoustic stimuli, a brief chapter also collects some solutions of presenting the music theme visually. The last thematic chapter introduces the special topic of musical playgrounds, where expression of the music theme can be particularly articulated and concentrated either visually or acoustically.

RESULTS AND DISCUSSION

Similarly to many design processes, we can also set a guideline for acoustic design and for the analysis beforehand, which helps to create a pleasant and attractive audible environment.

1) Ultimate methods in soundscape design

The starting point in soundscape design is the identification of the existing unfavourable acoustic qualities and the pleasant sounds on the site and taking account of the possibilities to abolish or mask unwanted sounds [11, 14, 15, 16, 17]. Finally, the new, desirable sound identity of the place needs to be determined [3]. Along with this, the acoustic orientation points of the location should be listed as the 'soundmarks' of the site. This term was introduced by M. R. Schafer by analogy of the existing phrase 'landmark' [2], and it refers to the most distinctive, determining and unique sounds of a place which still do not have to be the loudest ones. Good examples of this could be the sound effects of squares in the Mediterranean, like talking, clinking of glasses and cutlery etc. which are closely associated with the atmosphere of these venues [4]. Or we can think about the splashing sound of a water feature in a residential area that makes the location familiar and recognisable from the corner of the street, and in this way, it creates an additional layer to the identity of the place.

A substantial principle is that newly created sound effects have to fit the place [10, 18, 19] and pursuing silence is not necessarily the best method to improve the sonic environment [1]. Urban spaces with strong acoustic

stimuli could be equally popular as quieter places if the impulses are adequate and negative sounds are (at least partially) eliminated [10, 14]. Moreover, abolishing all negative sounds could generate increasing stress and tension in users if they are not replaced by pleasant acoustic qualities [1].

Another crucial thing to bear in mind at the beginning of the design process is to arrange functional units considering the typical activities and sounds created by them (for example the buzzing of a playground or the characteristic sounds of a café terrace), so that the acoustic impulses do not disturb each other [16]. In addition, designers need to have regard to the surrounding functions as well, with particular respect to residential areas [3]. It can also be a big advantage if various options are provided on the site between areas with intensive, vivid sound effects and quiet, tranquil places [16, 20, 21].

Voices that can enhance the vitality of a site are, for instance, talking, laughing or dynamic music, while sounds such as wind chime, chirping of birds or meditative music increase soothing ambience [8]. Water is a multifunctional feature, as it can be efficient to create any of these atmospheres depending on its form and appearance [8].

2) Methods for preventing unwanted sounds

Physical boundaries and topography

Physical boundaries of space are crucial factors in soundscape design [2]. For example, buildings can muffle or echo and amplify noises depending on the side from which the sound is coming [16]. Topography can also play a significant role in damping bothering noises: we can raise sound-absorbing berms, or in a larger scale, can create quieter valleys. A good example of these could be the land art works between the Schiphol Airport and the residential area near Amsterdam (Figure 1 a, b), where the labyrinth of hills can occlude a considerable proportion of the noise pollution [22]. In the design process, it should be considered that noise screens have to reach the height of about 1.8 m and should be placed close to the source of the unwanted sounds (Figure 2 a). Efficiency can be increased by creepers or even mossy surface could improve sound absorption [16].

Maintenance

Taking the noise of maintenance machines into account can also help to prevent unpleasant sounds. From this point of view a frequently mown lawn causes much more noise pollution than an extensive meadow [16]. Furthermore, in more extensive areas involving animals (for instance, a flock of sheep) in maintenance could also be beneficial for a pleasant soundscape [16].

Figure 1 a, b: The berms of the Land Art Park Buitenschot near the Schiphol Airport in Amsterdam not only function as sound-absorbing artefacts, but can also be regarded as an extensive land art work [22]. (Designer: H+N+S Landscape Architect, 2003, Netherlands)

[HTTP://WWW.HNSLAND.NL/EN/PROJECTS/LAND-ART-PARK-BUITENSCHOT](http://www.hnslan.nl/en/projects/land-art-park-buitenschot) (2020. 05. 24.)



Noise of traffic

One of the most common problems in urban soundscapes is the volume of traffic, which can be solved by traffic reduction, decrease of the speed limit or – as the most radical solution – by turning the street into a pedestrian zone [16]. Besides, sound-absorbing pavements can be applied on roads and also for special functional units such as skateparks, sports fields or playgrounds to damp their inherent noise [2].

3) Masking unwanted sounds and other methods to improve the soundscape

In case the sources of disturbing sounds cannot be eliminated and their volume does not exceed 65-70 dB [16], masking negative sound effects can be an efficient solution to optimize the acoustic environment [17, 23]. We can differentiate two types of noise masking: the energetic method means that the covering sound masks the unwanted sound effects completely, while in the other case both of the sounds remain audible, but the listener's attention is rather drawn to the masker sound [16, 23]. There are several landscape architecture tools to achieve this effect, detailed as follows.

The role of water features

Different forms of water are usually defined as the primary and most effective soundscape qualities in several scientific works [2, 9, 10, 24]. Accordingly, they usually lead the lists of sound-preference research, as shown earlier [2, 24]. Water can produce countless variants of sound impulses which we can take advantage of in acoustic design: it can appear as the ripple of a garden creek or a canal, the sound of waves in any still water or the sound of rain and the sonic stimuli produced by fountains or water features [10]. It is important to note, however, that the constantly changing, rhythmical sounds of a water feature can distract attention the most, whereas monotonous sound effects can rather be calming, but human brain gets used to them quicker [2]. Another advantage of water features is that they can also provide a visual focus of the site by their characteristic appearance and thus reinforce the dominant effect in terms of audible impulses [20]. In order to maximize effectiveness, water can be combined with music, which is exploited in landscape architecture, for instance, through the use of musical fountains [8, 20]. A good example of this can be found at Margaret Island in Budapest, where the water show was first accompanied by live music, then by various blocks of classical and popular music and the changing water feature and light effects are adjusted to the rhythm of the music [25]. Another popular example is provided by the musical walks in the palace gardens of Versailles featuring musical compositions of

Baroque musicians completed by water shows [26]. The recreational effect of music combined with splashing water has already been recognised by landscape architects in the Renaissance era. For example, it appears in the park of Villa d'Este (built in the second half of the 16th century), where the Fountain of Neptune encompasses a water organ which is still in operation today [27].

Planting design

Visual covering of the source of the sound can help to stifle noises by quasi distancing them from the receiver. A typical example of this is blocking the visibility of roads by vegetation [16]. Although the sound-absorbing ability is significant only in the case of proper density and thickness of vegetation, in the case of specific taxa, the combined sound effects of wind and leaves can also increase the role of planting in modulating the soundscape. Plants of particular acoustic value may be bamboos (e.g., *Sasa palmata*, *Phyllostachys viridiglaucescens*), poplars (*Populus sp.*, especially *Populus tremula*) and birches (*Betula sp.*) or ornamental grasses (e.g., *Cortaderia selloana*, *Stipa tenuissima*, *Briza media* or *Panicum virgatum*). By consciously positioning them spatially (for instance, in higher areas or at the corners of buildings, in wind channels or in other areas exposed to wind), the desired effect can be intensified, in addition, wind protection can also be improved [24]. The ability of attracting birds and insects (e.g., bees, crickets, cicadas) to an open scape is also a strongly vegetation-related acoustic factor, which can be promoted by implementing the principles of biotope design. Indeed, an environment with greater biodiversity produces stronger and more diverse acoustic stimuli [16, 28]. In order to facilitate this, food sources (such as berry-bearing shrubs, melliferous plants, or even deadwood in more extensive areas), shelter (e.g. dense shrubbery) and water should be provided in the garden for animals [12].

Replay of natural sounds and music

In today's cities, there is an ever-growing number of experiments with the installation of loudspeakers to suppress unwanted noises by replaying natural sounds. Examples include the Nauener Platz in Berlin (Image 2 a, b), where audio islands were created with speakers installed in seatings to play relaxing natural sounds and gabion noise screens were used to muffle the noise of surrounding traffic [29]. Another related project is the sea-themed Vardens Park in Gothenburg, where the characteristic sounds of seagulls, whales and waves are played to enhance the atmosphere (designers: Ulf Rehnström, Per Hedfors) [20]. Bill Fontana's works are also similar, as he experimented, for instance, in London and Paris, with replaying the sound effects of the British and French

Figure 2 a, b: Audio islands and gabion noise screens at Nauener Platz in Berlin, where soundscape design decisions were based on monitoring the noise levels on site [29]. (Researcher and designer: Prof. Dr. Brigitte Schulle-Fortkamp, 2011-2012, Germany)
https://www.researchgate.net/publication/306085310_WHEN_SOUNDSCAPE_MEETS_ARCHITECTURE, <https://sonicagents.wordpress.com/2013/01/04/a-soundscape-re-modeled/#more-264>, (2020. 04. 30.)



Figure 4: The positioning of the wind organ in Burnley called the 'The Singing Ringing Tree' is not only practical because of the winds on the top of the hill, but also makes this installation a distinctive eye-catcher on a landscape scale [35]. (Designers: Mike Tonikin, Anna Liu, 2006, UK)
<https://i.ho.redbubble.net/image/9858891.5229/flat,1000x1000,075,F.JPG>, (2022. 01. 24.)



Figure 3: A big advantage of the design concept in the Millennium Park at the Jay Pritzker pavilion is bringing the sources of sound closer to the auditorium, which enables lower volume to make the performance enjoyable, making it less disturbing for the surrounding residential areas [34]. (Designer: Frank O. Gehry, 2004., USA)
<https://www.archdaily.com/892320/the-jay-pritzker-pavilion-gehry-partners>, (2020. 07. 20.)



Figure 5: The organic form of the sonic installation 'Sound Architecture 5' in Ockley recalls the patches of groundcovers under the trees [36]. (Designer: Ronald van der Meijs, 2014, UK)
<https://www.ronaldvandermeijs.nl/following/ronaldvandermeijs.nl/sound-architecture-5>, (2020. 04. 30.)



seashores to block the noise of cars in the busiest areas of the cities (such as Euston Road or the Arc de Triomphe) [13, 30]. These methods, however, raise questions: Is it not a better solution to create more biodiverse green spaces, and where it is not possible because of environmental pressures, will not these sounds feel like alien and inappropriate?

'La Limonaia dell'Imperialino' park in Florence slightly differs from the examples above as the replayed soundtracks there are a mixture of natural sound effects and music. Its system equipped with hidden speakers detects disturbing noises in real time and plays various types of sound recordings at different volumes in the park accordingly, to effectively mask the unwanted sounds [17]. When generating the playlists, an effort was made to select sounds which suit the spirit of the place, and adjust the cultural environment and the existing sounds recorded in the noise map. The basic principles that the designer team has set out for the development of similar audio content are that it should not be too boring and repetitive, but also not too complex or unpredictable [17]. It is also a design decision that the replayed sound in the case of one or another function should rather encourage relaxation, active pastime or even social interaction depending on how vibrant or soothing the tunes are. The special loudspeakers were disguised in the park as rocks or artworks or they were hanged from trees to spread the sound in a larger radius [17]. The results of the experiment were promising in terms of improving the recreational value of the garden [13].

The recreational value of a park could also be enriched by playing only music. Amongst others the hidden speakers of the 'Soundgate' system in the shopping district of Melbourne can be mentioned, which popularised compositions of local musicians [13], or the multimedia displays of the Miami Beach Soundscape, providing both audio and visual materials in concert quality [31]. A peculiar example is the 'Musikiosk', in the Parc du Portugal in Montreal, where anyone could connect to the installed interactive sound system with their electronic devices via Bluetooth and could play their own playlists on high quality loudspeakers [9]. According to the survey conducted in the course of the experiment, the installation has made the site a livelier and more atmospheric place and it became appreciated not only by the users of the Musikiosk but by other visitors of the park, too. This is mainly due to the positive impact that replaying music had on the acoustic environment, which was otherwise dominated by urban noise [9]. Another interactive, but Hungarian initiative is the installation of short-story- and poem-reading phone boxes in forest surroundings in Remeteszőlős and Pilisszentlászló, which provide the extraordinary experience of listening to literary works in nature [32].

Presence of live music

Nevertheless, several research have proven that live music captures park users' attention much more than music from loudspeakers. Additionally, interesting findings are that the efficiency of covering unwanted sounds is less dependent on whether classical or popular music is played, but the volume of the music needs to be chosen carefully, as the majority of people do not like too loud music in public spaces, regardless of its style [2]. In this light, music pavilions and amphitheatre-styled outdoor stages giving place for artistic performances can become prominent functions of parks. Moreover, the amphitheatre form can also help to boost the volume of the performance towards the auditorium. As an example, the stepped community space of the Akvárium Club at Erzsébet Square also takes advantage of this phenomenon. Where the traffic noise of Bajcsy-Zsilinszky Street is reduced as the space descends below street level, while the stepped design amplifies the music coming from the club at the bottom, so that it can be enjoyed on the upper terraces, too [33]. Another good example for integrating a sound reinforcement system in the landscape architectural design is the Jay Pritzker pavilion in Chicago (Figure 3). Here, the steel bars stretching above the spectators' area both add aesthetic value with their eye-catching pattern and are fitted with the speakers and cables [34].

Music in land art

There are also plenty of examples of the artistic interpretation of music and sounds, such as acoustic sculptures, sonic installations, wind chimes, water and wind organs and other 'land art' works. Highlights of these can be the sea organ in Zadar, which is both a stepped communal space and an unusual musical instrument played by the waves, or the 'Singing Ringing Tree', the wind organ in England, which benefits from the natural conditions as well, being installed on a hilltop in a particularly windy area (Figure 4) [35]. An installation in Ockley, United Kingdom, composed of 5000 bells called 'Sound Architecture 5' is also closely connected to its environment as it is played by the wind and the acorns falling down from the tree integrated in the artwork (Figure 5) [36]. So, by incorporating these features into the design, unpleasant sounds can be damped by art in public spaces as well.

Contrary to the pieces of art that can be admired only from the outside, outdoor musical instruments can also enrich the sonic character of a place, what is more, they can also trigger social interactions [16]. A good example of this is the hydraulophone in Toronto, which is a hybrid of a fountain and a flute, and involves visitors actively in shaping the acoustic environment with the water keyboard of the instrument (Figure 6) [22]. The range of functions on the greenway of Syracuse district in New

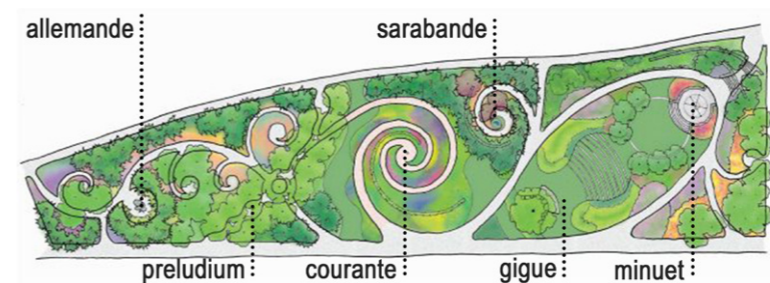


Figure 6: The 'FUNtain' hydraulophone at the Ontario Science Centre in Toronto mixes the sounds of rippling water and music. To operate the instrument, the water jets spouting out of the holes of its keyboard need to be blocked, so the pressure changes in the pipes of the structure making the connected organ pipes sound [22]. (Designer: Steve Mann, 2014, Canada) [HTTP://WEARCAM.ORG/OSCFUNTAIN/](http://wearcam.org/osc/fountain/), (2020. 04.30.)

Figure 7: With their sculptural appearance, tubular bells also add an aesthetic value to the place, so they can be used as an interactive artistic installation in any urban space (distributor: Hand Made Places play equipment manufacturer, UK) [HTTPS://WWW.HANDMADEPLACES.CO.UK/PRODUCTS/TUBULAR-BELLS/](https://www.handmadeplaces.co.uk/products/tubular-bells/), (2020. 04.30.)

Figure 8: The musical pavement installation called 'Trippy-Musical Shadows' at the Mesa Arts Centre is operated by the shadows of passers-by. Taking advantage of the sunlight is a smart designer decision, as Arizona is the sunniest state of the USA, so the installation reflects well its specific location [42]. (Designer: Daily tous les jours, 2016, USA) [HTTPS://WWW.COLLATER.AL/MESSA-MUSICAL-SHADOWS-OMBRE-DIVENTANO-MUSICA/](https://www.collater.al/mesa-musical-shadows-ombre-diventano-musica/) (2020. 07.27.)

Figure 9: All of the movements of the Cello Suite in G major by J. S. Bach are interpreted by a garden area in the Musical Garden in Toronto. For instance, the minuet is represented by a formal, floral parterre, as this ballroom dance is associated with France, similarly to the Baroque parterres. The symmetrical song parts of the music are visually expressed by the symmetry and geometry of the parterres [45, 48]. (Designer: Julie Moir Messervy, 1999, Canada) [HTTPS://HU.PINTEREST.COM/PIN/463237511670166632/](https://hu.pinterest.com/pin/463237511670166632/), (2020. 05. 23.)

Figure 10: The installation called 'Soundscape' represents the Chinese anthem visually, which can also be played on the metal pipes [47]. (Designer: Edmond Wong Studio, 2010, China) [HTTP://WWW.EDMONDWONGSTUDIO.COM/SOUNDSCAPE.HTML](http://www.edmondwongstudio.com/soundscape.html), (2020. 05. 24.)

York is also boosted by music stops with outdoor musical instruments. Under the motto that 'anyone can be a street musician for a while' [37, 38], the project encourages interactive and playful use of public spaces. These kinds of attractions are often found in gardens of five senses, but they can also be adapted to an average urban environment or even to natural landscape. Installing outdoor tubular bells, for instance, is a particularly good choice in a garden of senses, as not only the sounds of the instrument can be perceived but also the resonance produced. To maximize this effect, the tubes should be arranged in a horseshoe-like layout, as in this way the user is surrounded by the vibration and the music (Figure 7) [39].

At the entrance of a place that provides a more special or contrasting acoustic environment, the literature recommends the incorporation of a forecourt in the design, helping the visitor to prepare for the arrival to a different soundscape by its sonic impulses [3]. This entry space can be strikingly quieter than the surroundings, or it can introduce a completely new atmosphere in contrast to the urban environment, by means of a water feature, for instance. Le Cylindre Sonore in the Parc de la Villette in Paris is a good example of this, which is an acoustic pavilion equipped with hidden speakers at the entrance to a garden area of a bamboo forest. Open from above, the structure communicates with its surroundings: birdsong infiltrates to the pavilion from the surrounding garden, but the melody of the speakers also echoes towards the promenade inviting the passers-by to a more secluded part of the park [40].

Pavements and pedestrian surfaces

An interesting point is that the acoustic stimuli resulting from the paving material can also strongly contribute to creating the identity of an environment. As an example, the sound of driving on a gravel road is associated with historical soundscape, thereby enhancing the atmosphere of a historic site [3]. Moreover, the sound effect produced by paving materials could be an identity-determining factor of a place for also those who only pass through the place, but do not use it for a longer period of time [3]. A specific way of developing the acoustic environment is the integration of interactive, musical pavements in the design. These constructions can detect the weight (such as the promenade in Newton Aycliffe, England) or even the shadow of the passers-by and respond by activating the hidden speakers in them [41]. In the project of Mesa Arts Centre in Arizona called 'Trippy-Musical Shadows', the soundtracks started by light sensors also adapt to the time of the day, featuring chore-like sounds in the playlist in the morning, energetic and rhythmical tracks in the afternoon and the relaxing sounds of a meadow in the

evening (Figure 8) [42]. Besides pedestrians, motorised traffic can also produce an acoustic game by using musical roads. In the USA and in Japan several examples can be found, but also Hungary has a similar installation near Somogybabod, on the road R67. Here, the rhythm and the melody of the Republic band's hit 'On the Road 67' are generated by plastic ribs glued to the road surface. This method is a good way to control the speed of traffic, as the melody generated by the resonance can only be heard properly if the speed limit is respected. In addition, the vibration of the 'sheet music' on the asphalt also slows traffic down, reducing its disturbing sound [43, 44].

4) Visualization of the music theme

Music and sounds can also appear in landscape architecture projects as a theme or a concept, which primarily have a visual dimension, but often include elements that provide acoustic stimuli as well. Typical examples of the evocation of musical motifs are parks dedicated to famous musicians with the monument of the artist in the focal point of the space. Among these we can mention the Strauss memorial in the Stadtpark or the monument of Mozart in the Burggarten in Vienna, the Sibelius Park in Helsinki, and the 'Sound Garden' in Seattle, USA. A unique form of parks associated with a composer is when a specific piece of music inspires the composition of a garden. The Music Garden in Toronto is a good example of this, where the garden design is an interpretation of the Cello Suite in G major by J. S. Bach (Figure 9) [45]. Musical artworks can also be represented by public facilities or street furniture. We can mention, for instance, the fence with panels depicting the anthem of the town in Bergen, Norway [46], or the seating installation of the Edmond Wong Studio in Hong Kong, which visualizes the national anthem of China with curved metal pipes (Figure 10) [47]. Beyond these, there are numerous public open spaces with a musical concept reflected in patterns, decorations, sculptures and acoustic instruments. Examples of these parks include the Baishilong Music Park in Shenzhen, China (Figure 11) or Kammerer Park in Elk Grove, California. In terms of motifs, the piano and musical notes appear to be the most popular patterns. These can be manifested in paving layouts (Figure 12), pedestrian crossings, in the form of seatings or in decorative elements, fences, stairs, planting design or even water features and pools. In addition, certain special, interactive types of grand pianos can indeed be used as musical instruments on paving or on stairs. An example can be the 'Piano stairs' installed in the subway during the musical festival in Milan, where the main goal was to promote sport in everyday life by making the staircase 'audible' and more playful, thereby encouraging people to use this rather than the escalator [50].

Figure 11: The Baishilong Music Park in Shenzhen features several references to music, such as sculptures, a music pavilion and hidden speakers that play classical music [49]. (2019, China)
<https://pbs.twimg.com/media/EWM20JAUyAeyOvL?format=jpg&name=large> (2022. 01.24.)

Figure 12: The main promenade of Rio de Janeiro's neighbourhood 'Vila Isabel' – famous for its samba schools and vibrant street music – is decorated with a paving pattern representing the scores of famous local composers [54]. (1964, Brazil)
https://marialopeseconvidados.blogspot.com/2018/07/maria-lobes-e-arte-do-espetaculo_8.html, (2020. 04. 30.)

Figure 13: The playing equipment of the musical playground in the Jardin de Champ de Mars in Montpellier evokes surrealist artworks and enhances the identity of the park. (2008, France)
https://commons.wikimedia.org/wiki/File:Montpellier_esplanade_charles-de_gaulle3.jpg (2020.04.30)



5) Musical playgrounds

Musical playgrounds are a special field of representing music in landscape architecture, as references of the theme are more explicit and quite concentrated at these places. These playgrounds often depict musical notes, symbols and instruments visually, in patterns, forms and paintings, but the play equipment might also include a wider range of musical instruments offering more interaction (Figure 13).

Professional playground design features musical equipment with softer, not disturbing sound and all of the instruments are harmonised with each other. As an example, they can only be played in pentatonic or diatonic registers, so that no false melody can be created while improvising [51]. A specific advantage of musical playgrounds is that musical experimentation can develop creativity and fine motoric skills, and has an excellent stress-relieving effect. Furthermore, outdoor musical instruments are often suitable for disabled users as well, and some toys (e.g. xylophones) are also recommended for autistic people [52], making these playgrounds well adapted to universal design principles. In addition, instruments which can be used by multiple people at the same time encourage interaction between children. Finally, it can be recognised that these playgrounds can have strong educational value and can promote the appreciation of music from an early age [53].

CONCLUSION

Summarizing the above, it can be concluded that the visitors' impressions of a place are strongly affected by the acoustic environment and, accordingly, this plays a significant role in place preference. In addition, place identity is also in close connection with the typical soundscape of a site. Therefore, in landscape architecture projects it can be a great advantage if the above-mentioned principles and various tools of acoustic design are taken into consideration throughout the whole design process. As explained above, the acoustic factors can be relevant for the selection and arrangement of different functions and features of a place, for the design of physical barriers and planting, for choosing paving materials as well as integrating artworks into the composition. As a result, conscious soundscape planning can enrich every open space concept on many levels and can help to create more liveable and lovable surroundings with a stronger character. ©



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