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TRANQUILLITY ISLANDS: DESIGNING RESTORATIVE SOUNDSCAPES IN URBAN ENVIRONMENTS

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ABSTRACT

In an increasingly noisy world, the need for restorative environments is critical to human well-being. "Tranquillity Islands" are designated quiet zones within urban landscapes, designed to mitigate the adverse effects of noise pollution and enhance mental and physical health. This paper explores the acoustic design principles, materials, and technologies used to create these serene environments, focusing on their integration into densely populated cities.

The paper summarises investigations of how soundscapes can be manipulated to evoke tranquillity, using natural elements like water features, vegetation, and the terrain. This includes the examination of the role of psychoacoustic research in determining which sound profiles, such as water sounds, human vocalisations and transportation noise, can contribute, or detract, from assessments of tranquillity and anxiety. We present findings from case studies and examples of existing Tranquillity Islands, both outdoors and indoors, including Maggie's Centres designed with cancer patients care and restoration in mind. Described are their design methodologies, community impact, and measurable outcomes including reducing noise exposure, improving relaxation and reducing stress.

This research underscores the potential of Tranquillity Islands to transform urban spaces into sanctuaries of peace, offering a scalable and sustainable model for cities seeking to balance growth with the quality of life.

Keywords: Tranquillity, islands, restorative, soundscapes

1. INTRODUCTION

The Tranquillity Rating Prediction Tool (TRAP) was developed to allow a quantification of the perceived tranquillity in different environments and especially useful in designing Tranquillity Islands or havens of peace. The equation for urban environments can be written as:

$$TR = 10.55 + 0.041 NCF - 0.146 L_{day} + MF \quad (1)$$

Where TR is the average tranquillity rating on a 0 to 10 scale where 0 represents "not tranquil at all" and 10 represents "excellent tranquillity". NCF is the percentage of natural features in view, and L_{day} is the average noise level during daytime 8am to 6 pm [1,2]. Figure 1 shows the variation of TR with L_{day} at different levels of NCF .

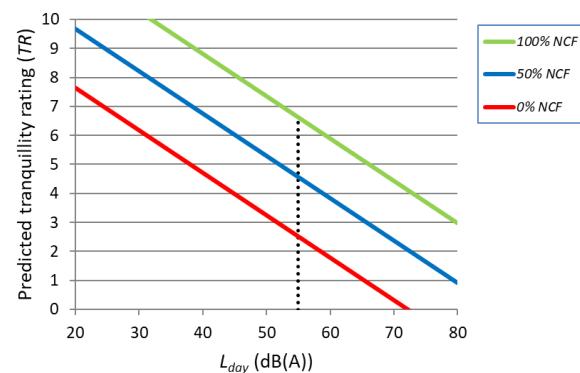


Figure 1. Variation of TR with L_{day}

For example, it can be seen that at a noise level of 55 L_{day} the predicted TR value can vary from 2.5 at $NCF=0$

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to 6.6 if $NCF=100$. Therefore, it is possible to improve the tranquillity level by improving the percentage of natural features in view e.g. by introducing grass lawns, shrubs, trees or water.

In addition to its use as a design tool it has been used to assess the tranquillity of a range of urban and country parks and to devise Tranquillity Trails that are urban routes connecting quiet spaces.

Recent studies have demonstrated that human vocalisations can also degrade tranquillity in a broadly equivalent way to mechanical noises [3]. In addition, studies of various water sounds can improve tranquillity especially if they are natural sounding though litter can degrade ratings [4]. *MF* stands for moderating factors this can be one scale point for appropriate water sounds and minus one point where litter and graffiti are present. The link between ratings of tranquillity and relaxation and stress has been obtained by questionnaire surveys in Hong Kong [5] and Bradford [1]. Figure 2 shows the importance of various factors in affecting tranquillity based on 538 responses in Kowloon and Sha Tin parks.

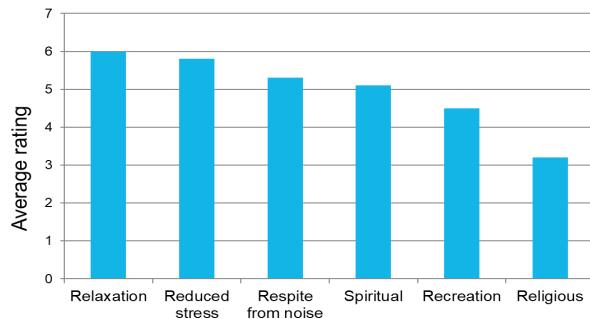


Figure 2. The benefits of tranquil spaces on a 0-7 scale of importance

Surveys in 8 parks in Bradford and HK have shown a trend with the degree of tranquillity as can be seen in Figure 3. As levels of tranquillity increase there is a significant increase in the percentage reporting they are more relaxed (Figure 2a) while the levels of stress reduces significantly with increasing tranquillity (Figure 2b).

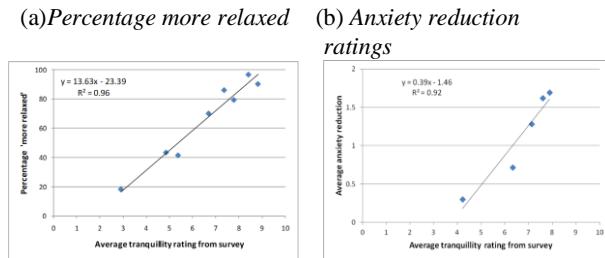


Figure 3. Levels of relaxation and anxiety by average tranquillity ratings

Below are examples of studies using TRAP to design and evaluate projects.

2. EXAMPLES

2.1 Peace Garden

The Peace Garden was constructed on the University of Bradford's urban campus and adjacent to the heavily trafficked Great Horton Road. It was clear that traffic noise reduction was required and a noise barrier was constructed in the form of a serpentine wall 1.8m high. This allowed the existing trees to be preserved while allowing the barrier to be built as close as possible to the road and pavement. This reduced the average noise level by 9 dB and improved the *TR* value by an estimated 1.3 scale points (from equation 1) In addition, a water feature was installed and seating close by. Again, an improvement of 1 scale point could be expected. To improve the *NCF* value, plantings were made in and around the seating area and especially along the length of the serpentine wall. Figure 4 shows a plan view of the garden. Before the construction of the garden the view would have been dominated by the road and traffic on Great Horton Road (Figure 5).

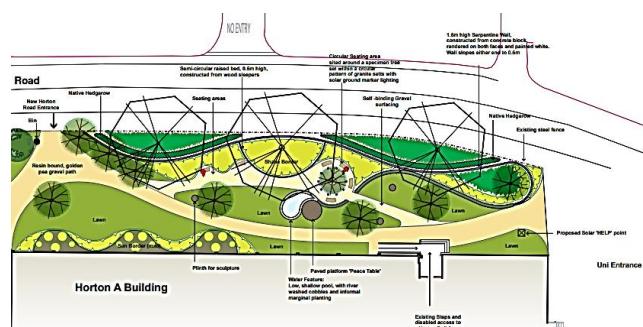


Figure 4. Plan of Peace Garden





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Interviews with users of the garden took place shortly after opening and the average rating of *TR* was 4.9. The percentage reporting they were more relaxed after visiting was 43%. Note that before the construction of the garden it is estimated the rating would have been much lower at 1.0



Figure 5. Views towards Great Horton Road

2.2 Health Centre

The Bradford Student Health Service located within walking distance of the University of Bradford campus has a waiting room that fitted well with experimental requirements since it was necessary to treat an area which was reasonably well isolated from the rest of the facilities so that the effects of any environmental “treatments” that are applied as part of the study are not contaminated by sounds or views from outside the study area. In this waiting room study worry and stress reduction was the aim and it was considered a more tranquil environment would be beneficial [6]. In the original room a popular music station was playing over a radio and this was replaced by a recorder playing sounds of gentle waves breaking on a shingle beach. The noticeboards previously displayed health information leaflets only. These were replaced by pictures of natural scenes that were adjusted in size to completely cover the notice boards. The scenes and sounds were ranked from a large sample of options by volunteers. Figure 6 shows a view of the room before and after the changes that were made.



Figure 6. Comparison of waiting room before and after treatment

The results showed that the treatment had a significant effect on the ratings of tranquillity as can be seen in Figure 7 below:

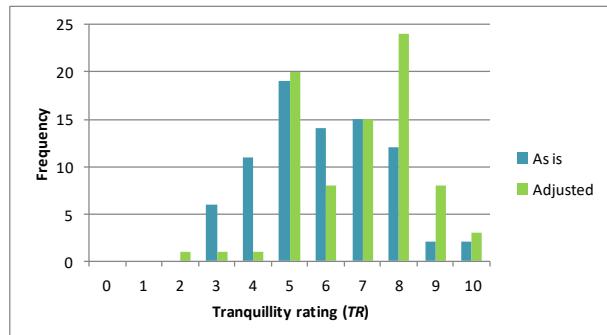


Figure 7. Ratings of tranquillity (*TR*) before and after the treatment

2.3 High Line NYC

The High Line is a 1.45-mile-long (2.33 km) elevated linear park, greenway, and rail trail created on a former New York Central Railroad spur on the west side of Manhattan in New York City. This park has about 400 species of plants, including grasses and trees. Each species is selected based on their appearance, in addition to how well they survive throughout the year. The park has a team of 10 horticulturists, who trim and prune the plants throughout the year to prevent overgrowth. It can be reached through eleven entrances, five of which are accessible to people with disabilities. Figure 8 shows views from the High Line.



Figure 8. Views of the High Line [7]

Because it is raised above street level noise levels are lower than at ground level. This is due to additional distance from the mainly traffic sources source and screening effects of the elevated structure though buildings would be responsible for some reflected noise. A survey conducted on the pavement below the High Line showed the mean difference in noise exposure was a modest 4.6 dB(A) [7]. However, in addition, the percentage of natural features in



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view (*NCF*) would have been close to zero at ground level but much higher in the park due to grasses, shrubs and trees. The reduction in noise level from L_{Aeq} of 71.9 at ground level to 67.3 dB(A) along the High Line would raise the *TR* by a small amount from 0.1 to 0.7 along the park but the improvement in *NCF* would be up to nearly 100% in places resulting in a *TR* value close to 5.0. This illustrates the importance of natural features in the creation of Tranquillity Islands.

2.4 Maggie's Centre, Manchester

Lord Norman Foster designed the Maggie's Centre in Manchester. He has said [8] "I have first-hand experience of the distress of a cancer diagnosis and understand how Maggie's Centres are as a retreat offering information, sanctuary and support. Our aim in Manchester, the city my youth, was to create a building that is welcoming, friendly and without any of the institutional references of a hospital or health centre – a light-filled, homely, space where people can gather, talk or simply reflect". The views of the centre outside and within illustrate how this was achieved with the use ample windows allowing views of the gardens and interior spaces filled with shrubs and flowers (see Figure 9). There are number of these cosy spaces with comfortable seating all with an abundance of greenery and plenty of daylight. Jenks [8] describes a detail of the garden room: "The scale and colour of the terracotta pots humanises the interior giving it scale and grounding it in the earth...." The centre view in Figure 9 shows this greenhouse effect.

Of course, such designs boost the percentage of natural features in view both inside and out and the low noise levels (it being tucked away from main roads) will necessarily result in relative high *TR* values.



Figure 9: Views inside and outside the Maggie's Centre in Manchester [8]

If the *TR* value reaches 8 after visiting the Centre then from previous surveys this suggest 80% of respondents will say they are more relaxed and anxiety levels will be lower too. It remains for further research to confirm these indications.

3. CONCLUSION

This paper illustrates the effectiveness and versatility of the Tranquillity Rating Prediction Tool (TRAPT) in designing and evaluating urban indoor and outdoor environments that enhance tranquillity. The integration of acoustic design, natural features, and psychoacoustic principles has been shown to significantly improve relaxation and reduce stress levels in diverse case studies, including urban parks and healthcare waiting areas.

Key findings demonstrate that reducing noise levels and increasing the presence of natural elements are critical for fostering tranquillity. The studies of the Peace Garden, waiting room, High Line, and Maggie's Centre emphasize the profound impact of combining visual and auditory elements to create restorative environments. The measurable improvements in tranquillity ratings and associated stress reduction highlight the transformative potential of such spaces for urban well-being.

Future work could focus on expanding the application of TRAPT to diverse urban contexts, exploring its integration with community-driven projects, and investigating long-term benefits on public health. By leveraging TRAPT as a strategic design tool, urban planners and architects can create scalable, sustainable sanctuaries, helping cities balance growth with improved quality of life for their inhabitants.

4. ACKNOWLEDGMENTS

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