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in this issue...

**How Heathrow expansion could influence
UK aviation noise policy**

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plus... Investigating novel solutions for natural
ventilation – passive ventilation and metamaterials

An introduction to sound power standards

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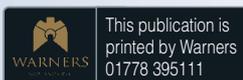
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BULLETIN

Volume 43 No 5 September/October 2018

Institute affairs

5 President's letter

6 Engineering Division

7 2018 conference programme

8 Branch news

20 Short course results

70 Institute diary

38 Heathrow expansion influences UK aviation noise policy

50 Investigating novel solutions for natural ventilation – passive ventilation and metamaterials

General news

24 World industry news

64 Product news

69 People news

Industry update

60 ANC Awards

60 Campbell Associates Charity Acoustic Cup 2018

60 Enbox wins innovation award

62 How Local Authorities investigate noise complaints

Technical contributions Instrumentation Corner

14 An introduction to sound power standards

30 The Hush City project and its relevance to planning policy

Regulars

70 List of sponsors, committee meetings and Institute Council



The Institute of Acoustics in the UK's professional body for those working in acoustics, noise and vibration. It was formed in 1974 from the amalgamation of the Acoustics Group of the Institute of Physics and the British Acoustical Society. The Institute of acoustics is a nominated body of the Engineering Council, offering registration at Chartered and Incorporated Engineer levels.

The Institute has over 3000 members working in a diverse range of research, educational, governmental and industrial organisations. This multidisciplinary culture provides a productive environment for cross-fertilisation of ideas and initiatives. The range of interests of members within the world of acoustics is equally wide, embracing such aspects as aerodynamics, architectural acoustics, building acoustics, electroacoustic, engineering dynamics, noise and vibration, hearing, speech, physical acoustics, underwater acoustics, together with a variety of environmental aspects. The Institute is a Registered Charity no. 267026

 Institute of
Acoustics

The Hush City project and its relevance to planning policy

By Philip Dunbavin and Antonella Radicchi

Let me start with a little history.

Noise Policy Statement for England

In March 2010, the Department for Environment Food and Rural Affairs (DEFRA) published the Noise Policy Statement for England (NPSE). This was aimed at promoting good health and a good quality of life through the effective management of noise, within the context of Government policy on sustainable development.

National Planning Policy Framework

Then in March 2012, the Department for Communities and Local Government replaced over 1,000 pages of national policy with the National Planning Policy Framework (NPPF). The NPPF was some 50 pages long and left a vast vacuum; in that it did not contain any objective numbers. What it did contain, was a clear statement as to what planning policies should aim to achieve.

In the NPPF, at paragraph 123, the fourth aim is stated as: *“...identify and protect areas of tranquillity which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason.”*

While this is clearly a desirable objective there is no guidance on how to identify, let alone protect, these areas of tranquillity. The development of soundscape clearly has the potential to do just that. However, full soundscape studies are not cheap to undertake and very few planning authorities have the budget for an extensive number of them.

Soundscape

In 2014, the ISO norm on soundscape definition and its conceptual framework was published, and a new ISO norm to standardise soundscape data collection and reporting requirements is under preparation (1). These ISO norms are fundamental to the achievement of data quality and to the development of consistent and robust comparative studies in soundscape research, and they can contribute to the establishment of the emerging soundscape science.

At Euronoise 2018, in Crete, Antonella Radicchi presented a paper on the use of mobile applications in soundscape research (2). This was a bit of a ‘eureka moment’ because that paper has enormous implications for the protection of tranquil areas. The Environmental Noise Directive (END) results in maps of noisy or non-tranquil places and this is driven by road, railways and airports. Even laypersons would expect the sound levels caused by those transportation methods to be far less than tranquil. This app does something new – it helps planning authorities to locate areas that are tranquil in places they may never have thought to look. Even more significant, is that this can be achieved at virtually no cost to planning authorities

A screening of mobile apps available on the market to crowdsource and produce noise and sound maps was conducted through a literature and market review by Dr Antonella Radicchi, at the Technical University of Berlin, Germany. She found that 28 mobile apps had been available between 2008 and

the end of 2016. The full list of these apps is given in her paper (2) presented at Euronoise 2018.

Out of these 28 apps, 16 are noise meter-based applications and 11 are audio recorder-based ones. Only SoundOfTheCity works both as a sound recorder and as a noise meter, even if the data collection process of audio recordings and noise measurements is not sequential.

This state of the art reflects the current dichotomy between the two main approaches applied nowadays to analyse and evaluate the sonic environment: the noise-based approach and the soundscape approach.

The former relies on quantitative indicators (e.g. acoustical indices) and the usual remedy is to apply anti-noise strategies to noise sources. The latter focuses on the “acoustic environment as perceived, experienced, and/or understood by people, in context” (3) and it applies more qualitative and interdisciplinary measures to evaluate and (re)design the sonic environment.

Clearly, there was a lack of an app that could enable the simultaneous and sequential collection of complex mixed data, to effectively integrate the soundscape approach with the noise-based one to reach a holistic and mixed approach, as indicated by the European Environment Agency, especially in the framework of research on quiet areas (4).

Methods to identify areas of tranquillity

As reported in (Radicchi 2017; Radicchi et al. 2017)(6), the END draws the attention of protecting and planning quiet areas as an effective measure to reduce noise pollution, and it defines the concepts of a ‘quiet area in open country’ and a ‘quiet area in an agglomeration’, by applying noise indicators and thresholds, which should be set up by the respective Member States.

However, END does not provide any common methodology to protect and plan quiet areas. Consequently, the Member States and academic scholars have experimented with diverse methods, mainly based on:

- Acoustical criteria, such as ‘noise indicators’ defined by the Member States;
- Distance-based criteria; and
- Mixed criteria: composed of acoustical, size-based and land use-based criteria, or the integration of acoustical criteria with accessibility-based criteria, the SLOPE indicator, the TR indicator – to name only a few.

Although in professional and academic environments, a growing interest towards the inspection of qualitative definition of concepts like quietness and tranquillity has been registered, especially in the frame of research in quiet areas, experimentation with digital new media to favour public participation and the collection of people’s preferences is still at the very beginning, with few examples available.

Taking inspiration from citizen science trends in the use of GPS-equipped smartphones as sensors in data collection, and evaluations in the field of environmental noise, the idea

P36 ►

of using a mobile app to identify, map and evaluate ‘everyday quiet areas’ seemed to be appropriate, as it can be used by means of smartphones and carried out by citizens in their everyday life, independently of the researchers.

After reviewing the state of the art, the option to re-use an existing app was discarded, because there was no mobile application on the market that enabled the simultaneous and sequential collection of mixed data, such as audio recordings and related noise pressure levels, pictures of the place where the sounds are recorded, user feedback on the location where the sounds are recorded, and that addressed a variety of issues, such as the quality of the sonic environment and of the overall location, sense of security, accessibility, user behaviour, weather conditions and many others (see below for more details). Consequently, the Hush City app was developed from scratch.

The Hush City app

The Hush City app was developed to fill this gap. It is a novel, free mobile application, launched in April 2017 as a tool to crowdsource, evaluate and map everyday quiet areas (5).

The Hush City app (re)places people at the core of the sonic environment evaluation process and it is aimed at understanding what quietness is for people. It goes beyond the definitions of quiet areas, applied within the context of EU-funded research projects, which are mainly based on quantitative criteria – such as acoustical indicators, land use criteria, size-based criteria or a combination of the above (5).

The most innovative aspects of the Hush City mobile application include both the data collection and the data consultation processes. In regard to innovation in data collection, the Hush City app allows the sequential collection on the same location and by the same user of a complex set of mixed data in a limited timeframe (approximately three minutes). The mixed data collectable consists of audio

recordings and related sound pressure levels, pictures of the place where the sounds are recorded and user feedback on the location where the sounds are recorded.

User feedback is collected by means of a predefined questionnaire, structured in three sections; soundscape, general issues and issues related to activities.

Questions are designed to explore the correlation between the soundscape and the following topics:

- emotional responses;
- semantic descriptors;
- perceived quietness;
- positive and negative sounds;
- level of oral interaction and social communication;
- sense of the place;
- landscape quality;
- level of maintenance and cleanliness;
- sense of security; and
- accessibility to the location.

Additional information collected through the questionnaire regards major sound sources, user status, weather conditions, number of people in the area and major activities performed in the area.

How the Hush City app works

By clicking on the button ‘Map the quietness around you’, users are guided through data collection of their favourite ‘everyday quiet areas’. The first action required is to record the sound of the chosen area by clicking on the button ‘Record’, the app starts recording and it automatically stops after 30 seconds. Secondly, users are asked to click on the button ‘Analyse’ and the app calculates and displays the sound pressure levels of the sound recorded. Thirdly, users are asked to take a picture of the place where the sound was recorded, and finally they are invited to evaluate the soundscape and the surroundings by replying to a pre-defined questionnaire. The sequence is shown below: P38 ▶

DATA COLLECTION OF THE ‘EVERYDAY QUIET AREA’ IS COMPOSED OF

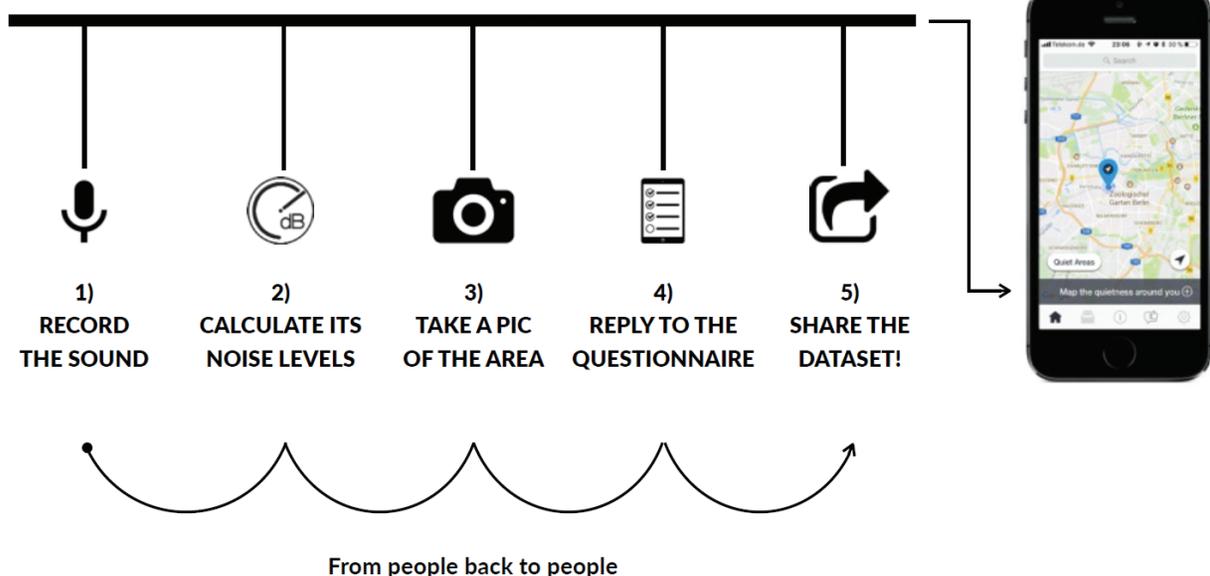


Figure 1. Image displaying the data collection sequence of the Hush City app (Image source © Antonella Radicchi 2018)

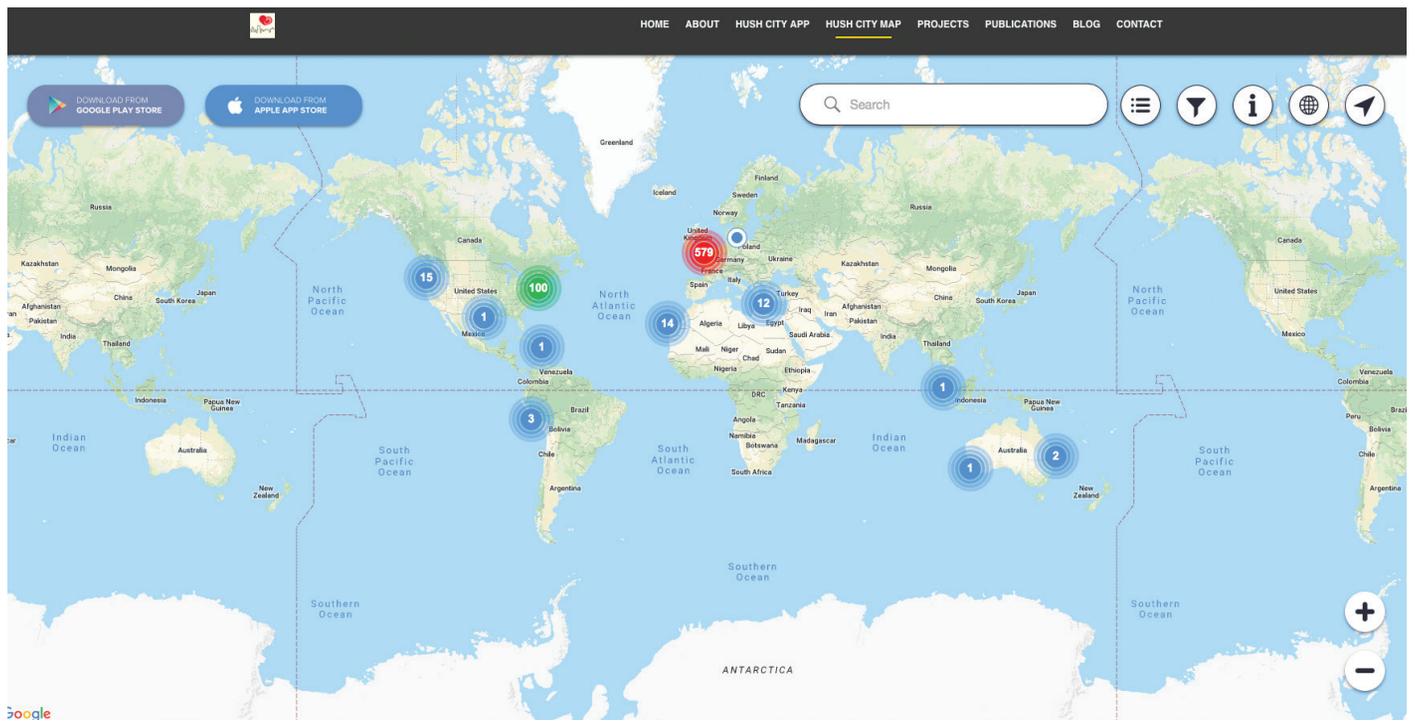


Figure 2. Image displaying the Hush City Map, accessible online at: <https://map.opensourcesoundscapes.org/view-area>

The Hush City map

When the map view mode is active, colour markers are displayed on the dark background map. Colours are automatically assigned to the markers by the Hush City application, according to the sound pressure levels of each sound recorded. For example, light green markers indicate that in these spots, sound pressure levels were approximately between 35-40 dB(A). So clearly, planning authorities can use the Hush City map to locate areas of tranquillity that they need to protect.

The data that has been submitted has been checked to ensure that it is of a good quality, so that there will be no garbage in the datasets. Once datasets are submitted by the users, the researchers evaluate the datasets in order to ensure their quality. Datasets which clearly originate from user tests are deleted. Datasets that contain inappropriate data are also deleted. Inappropriate data is considered when:

1. Pictures depict private rooms, personal objects and/or profile pictures; and
2. Recordings and comments contain messages and/or sounds, which do not relate to the project's aim.

The everyday quiet areas collected with Hush City app are now accessible to everyone online at this website:

<https://map.opensourcesoundscapes.org/view-area>

The Hush City map of Berlin

The QGIS (open source geographic information system) elaboration of the Hush City map of Berlin is shown below (updated to February 2018). The light green areas are those identified as urban recreation areas by the official Plan of Quiet Areas of Berlin. These were the obvious areas of quietness, but the surprise is that the Berlin Everyday Quiet Areas are generally not in the same places as the urban recreation areas. This means that there are many more areas of quietness than was previously thought.

Filters can be applied to the map to select areas using a range of descriptors including perceived quietness, landscape quality and accessibility to the areas etc. This is in addition to the sound levels, which makes this a valuable tool for planning authorities, environmental health officers and acoustic consultants.

The implications for the United Kingdom

The Hush City app has the potential to assist planning authorities to comply with their duties under the NPPF, more importantly, it will also, wherever possible, contribute to the health and quality of life.

How to get involved

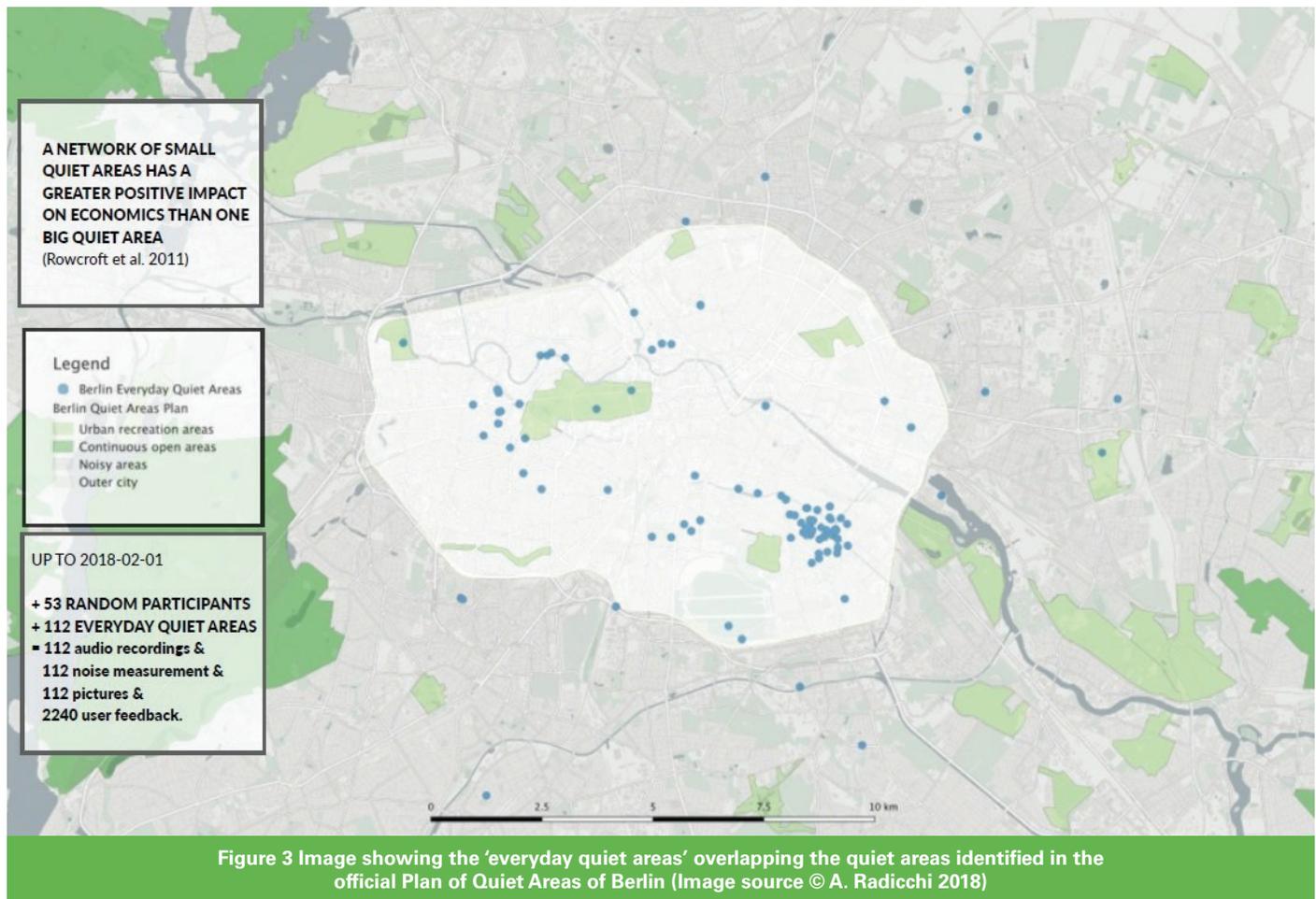
Simply follow this link to download the free app for either IOS or Android. <http://www.opensourcesoundscapes.org/hush-city/>

What next?

The more people that can be encouraged to use the Hush City app; the better our knowledge of where the truly important tranquil places are will be, and Environmental Health Departments Search should encourage the general public to get involved. If we all get behind this approach, we might just end up protecting the quiet and tranquil areas for future generations.

Planning authorities can use the Hush City map as a tool when planning their noise policies and local plans. It will also help developers to identify where not to plan new developments, thereby aiding the protection of these tranquil areas.

When a local authority receives a planning application, they can use the Hush City map to see if there is likely to be a problem with that development in that particular location. Local authorities currently use the END noise maps to determine if a noise survey will be required, so the Hush City map could be a logical extension of that approach at the quieter end of the acoustic spectrum. They can use the Hush City



map to determine if a full soundscape survey will be required to determine the acceptability of any given planning application, helping to make the best possible use of authorities' resources.

Surprisingly, even in big cities like Berlin, there are many areas of tranquillity in some of the densest areas of development. Protection of these areas is clearly going to have significant health benefits for many of our citizens who live in highly developed areas and cities. 

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This technical contribution also contains elements that are more appropriate for an industry update. Although the article focuses on one product, we have placed it as a technical contribution in order to draw attention to the wider soundscape and tranquillity issues described and to keep readers up-to-date with the approach used and potential applications.

Authors

Philip Dunbavin is the Managing Director of PDA Ltd. He is a Fellow of the Institute of Acoustics, a Member of the Society of Environmental Engineers and a past Chairman of the Association of Noise Consultants. He is Chairman of the BSI committee EH/1/3 on environmental acoustics and also Chairman of the BSI's overarching EH/1 committee on Acoustics.

Philip is the convenor of ISO/TC43/SC1/WG54 on soundscape and also of the newly formed ISO/TC43/SC1/WG62 for social and socio-acoustics surveys.

Antonella Radicchi is an associate soundscape researcher and HEAD-Genuit Foundation fellow at TU Berlin Institute of City & Regional Planning, where she has established and led the Hush City Mobile Lab. Dr. Radicchi is a registered architect and holds a Ph.D. in Urban Design and Territorial Planning, with doctoral studies conducted at MIT (Cambridge, USA) and at the University of Firenze (IT).

She also acts as Lead Editor of the special issue 'Sound and the Healthy City' for the Cities & Health Journal.

Her publications and projects on soundscape are available at: www.opensourcesoundscapes.org