# The Positive Soundscape Project: A re-evaluation of environmental sound

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## Case for Support
## Part 1 – Research Track Record

Mags Adams is a Research Fellow in the Acoustics Research Centre at the University of Salford with five years post-doctoral research experience. She is currently working on a large EPSRC project 'VivaCity 2020: designing urban sustainability into city centre living' and has produced several recent papers on soundscapes – including their perception, sustainability and planning. She organised a session at the RGS-IBG conference 2005 on '*Urban Sustainability: rethinking senses of place'* and is currently guest editing a special issue of *Senses and Society* on 'Senses and the City'. She is particularly interested in theoretical interconnections between sustainability, urban form and individual practice as well as sensory experience. She has developed a participatory methodology incorporating photo surveys, soundwalks and semi-structured interviews to explore sensory experiences of urban spaces with a view to incorporating residents' perceptions of environmental quality in 24-hour cities into urban design decision making. She has worked successfully in multi-disciplinary teams on a number of projects and produced a number of key publications and presented at international conferences.

Angus Carlyle is a Senior Lecturer in the School of Media at the London College of Communication, University of the Arts. His research interests focus on the intersection between technology, culture and creativity, with a specific emphasis on sound. He has published nine chapters in a variety of books, more than 30 articles in journals and has delivered in excess of 20 conference papers and invited public lectures. His practice-based research in the field of sound art has been exhibited on Resonance FM and on Radio Taxi, at the Architects' Association, the Contemporary Art Museum, Strasbourg, the DCA Gallery, Tucson, Arizona, the CCCA in Barcelona, the Los Angeles Contemporary Exhibitions (LACE) gallery, the LePlacard International Festival and the Port Elliot Literary Festival. He is Co-Director of Creative Research into Sound Arts Practice (CRiSAP), an initiative dedicated to the exploration of sound in artistic contexts. CRiSAP facilities include a wide range of high-end microphones and recording equipment, a professional recording environment and a variety of multi-channel diffusion systems with a large ($72m^2$) sound-proofed installation space.

Peter Cusack – (guitar, bouzouki, live electronics) - is a sound artist/musician and environmental recordist with a special interest in acoustic ecology. Project activities range from song writing, through improvised music, to research on how sound contributes to our sense of place and recording projects that document areas of special sonic interest – most recently Lake Baikal, Siberia; the Azerbaijan oil fields; Xinjiang Province, China. In 1998 he initiated the 'Your Favourite London Sound' project, which aims to find out what Londoners find positive in their city's soundscape. Currently involved in 'Sound & the City' the British Council sound art project in Beijing, 2005/6. Active in improvised and electro-acoustic musics he has played 100s of concerts at home and abroad. He is a Senior Lecturer in 'Sound Arts & Design' at the London College of Communication and gives 'field recording' workshops worldwide, including at The School of the Art Institute of Chicago (summer 2004). With Swiss video artist Ursula Biemann and students from the Architectural University in Baku, Azerbaijan, has just finished "Baku: In 5 Quarters" – an examination of different planning aesthetics in Baku in the context of it's oil history, including their effect on the local soundscape.

Bill Davies conducts research in room acoustics, particularly its perceptual aspects. Starting in auditorium acoustics, he has broadened his interests to include perception and control of several kinds of complex sound fields both in rooms and outdoors. He has previously supervised research using qualitative social science methods, laboratory psychoacoustic methods and novel sound reproduction systems, all of direct relevance to the proposed project. Bill Davies has published about 25 papers in acoustics. As the head of the Acoustics, Audio and Video group at Salford (29 full-time staff), he is

used to trying to get a group of academics to produce the right output at the right time. The acoustics group at Salford owns world-class acoustic labs, recently rebuilt for £2.5M. These include an anechoic chamber, two semi-anechoics, a listening room, four recording studios and extensive systems for field recording and measurement.

Ken Hume is Head of the Division of Health Science and is a member of the Noise Research Group in CATE (Centre for Air Transport and the Environment) at Manchester Metropolitan University. CATE's main activities are research into global and local air quality and noise disturbance issues as a consequence of aviation. His research career has involved: Auditory evoked brain potential responses to meaningful and meaningless stimuli. The interaction of sleep stage patterns and circadian rhythms in humans eg shift work. The disturbance of sleep patterns by aircraft noise and other factors (eg. alcohol, sleep apnoea). Tinnitus, and the interaction of loud music and social drugs in young adults. More recently his research has focused on the health impacts of noise through sleep disturbance and community response (both physiological and attitudinal) to aircraft noise around airports which has involved complaint analysis. Hume has published over 100 papers/reports and works on a number of national, European and international committees/groups/research projects concerned with noise disturbance and is the current chair of ICBEN (International Committee for the Biological Effects of Noise, Group 5 – Sleep disturbance) and has been the Hon Sec of the British Sleep Society.

Paul Jennings of WMG (Warwick Manufacturing Group) is the leader of their Technology and Information Group, a research team comprising 10 full-time researchers and 7 doctorate students. Their primary research interests are product perception, in particular sound quality, and hybrid vehicles. He is a founder member of WMG's research committee and for ten years has served on WMG's Engineering Doctorate Executive which has responsibility for all WMG's research degrees. In the past 9 years he has been Principal Investigator for 11 projects which have had associated grants with a total value of £3.2 million. These grants have been from EPSRC, the Department for Transport and Advantage West Midlands, and have all involved industrial collaborators, primarily from the automotive industry. Four of these projects have developed new tools and techniques for predicting noise levels and character. He has published over 50 papers at national and international level, of which 15 have been related to noise-related research. Facilities available for this project include a state-of-the-art Listening Room which includes professional data capture equipment and software.

Chris Plack is a psychoacoustician and a Fellow of the Acoustical Society of America. His research interests include: cochlear processing, loudness perception, pitch perception, and auditory temporal resolution. He has a particular interest in the underlying causes of sensorineural hearing loss (the most common type of hearing impairment). Over the course of his career he has developed the "temporal window" computational model of temporal resolution and intensity coding, which now includes a realistic cochlear simulation, based on psychophysical measures. Chris Plack has published 37 articles in international journals, and has received £1.2m in research council and charity funding as PI. He is head of the newly formed Sensory Neuroscience Unit at Lancaster University, which will shortly house three double-walled sound-attenuating booths, state-of-the-art evoked potential and multi-electrode cortical EEG systems, TMS equipment, and an fMRI analysis suite.

## Part 2 – Proposed research

BACKGROUND

In the acoustics community, sound in the environment, especially that made by other people, has overwhelmingly been considered in negative terms, as both intrusive and undesirable. The (often tacit) goal of environmental acoustics could be stated as reducing the amount of sound to the lowest possible level. Numerous metrics have been developed to quantify unwanted sound over the last fifty years, but in the last ten years there has been a gradual move in both legislation and research to standardise on some form of A-weighted equivalent continuous level ($L_{Aeq}$). A considerable proportion of research and engineering effort in acoustics is expended on trying to reduce $L_{Aeq}$ at the recipient's ears by means of: quieter transport (Jha, 2005), ingenious noise barriers (Watts et al., 2004) and active control at the listener's head (Hansen, 2005), to take a very few examples. However, there is a growing sense that this effort is not producing wholly satisfying outcomes. The latest National Noise Incidence Study (BRE, 2002) shows that traffic noise is audible at 87% of homes in England and Wales, and 54% of the population is exposed to levels beyond the World Health Organisation guidelines for avoiding serious annoyance. The recent EPSRC Ideas Factory, "A Noisy Future?", from which this proposal comes, was an explicit attempt to address this perceived failure of traditional engineering methods of noise control.

Beyond the boundaries of engineering acoustics, attempts have been made to engage with human responses to the acoustic environment in more nuanced ways. In the 1970s R. Murray Schafer, through the work of the World Soundscape Project, sought to construct an analytical perspective that could track changes in the soundscape over time and across cultures. He defined a soundscape as "the total acoustic environment", a definition that reflected his engagement with the environmental movements of the 70s and emphasized ecologically-orientated concerns about the 'polluted' nature of the soundscape of that era (Schafer, 1994). Others have defined soundscape differently. Emily Thompson (2002), following the work of Alain Corbin, defines the soundscape as an auditory or aural landscape. Like a landscape, she says, a soundscape is simultaneously a physical environment and a way of perceiving that environment; it is both a world and a culture constructed to make sense of that world. Barry Truax (1999) defines it as an environment of sound where the emphasis is on the way the sound is perceived and understood by an individual, or by a society. For him the key is the relationship between the individual and any such environment, whether environment is identified as a real place or a more abstract construction such as a musical composition. In spite of the distinct differences in their individual approaches, Schafer, Thompson and Truax's work shares a commitment to identifying and analysing both the negative and the positive aspects of the acoustic environment. It is their shared recognition of the positive aspects of the soundscape which can inspire innovation in this current project.

Mainstream acoustic science has attempted, over the last fifteen years, to integrate some of the concepts of the soundscape pioneers. The most recent International Congress on Acoustics, at Kobe in 2004, included three sessions on soundscapes, with themes such as traffic, urban noise and perceived noisiness (Hiramatsu, 2004). Thus far, though, much of the acoustics soundscape work seems still to be oriented toward the priorities of engineering noise control: participants in a typical study identify the 'bad' sounds in the soundscape, perhaps so that town planners know what they should be attempting to attenuate. However, students of urban planning and regulation note that, to date, this work appears to be having little impact, beyond codes on permitted noise levels. Visual aesthetics are a major part of the planning system with strong guidelines determining what is acceptable or unacceptable. A corresponding aesthetics of sound is missing. For example, references to 'landscape value', and 'visual effects of the development on the surrounding area and landscape' are commonplace in planning documents (ODPM, 2001a; ODPM, 2004). Reasons for this may include the ease through which the visual landscape can be captured and replicated compared to the acoustic landscape.

Of course, there are areas of engineering acoustics which do attempt to characterise the multi-dimensional nature of listening to a complex sound field. In auditorium acoustics, it has been recognised for forty years that perception of the sound of a hall typically comprises four or five orthogonal factors and that several metrics are therefore needed to predict or assess a hall sound field (Ando, 1983). It is therefore a given in auditorium design that there are many excellent concert halls which, nevertheless, can sound very different from each other. (Of course, individual preference plays a role here too.)

The current project emerged as the leading proposal from the multi-disciplinary Ideas Factory, "A Noisy Future?" It seeks to bring together insights from sonic art, ethnographic investigations of the soundscape and quantitative psychoacoustics to provide a better account of the relationship between the soundscape and the perceptions of those within it. As such, it was peer reviewed as outstanding and recommended for funding within the Ideas Factory. This document represents a transcription, explanation and development of the materials which were peer reviewed.

AIMS

- To acknowledge the relevance of **positive** soundscapes, to move away from a focus on **negative** noise and to identify a means whereby the concept of positive soundscapes can effectively be incorporated into planning;
- The evaluation of the relationship between the acoustic/auditory environment and the responses and behavioural characteristics of people living within it.

OBJECTIVES

- To determine what individuals/groups perceive to be component parts of a soundscape.
- To determine how individuals value these components.
- To classify types of soundscape.
- To determine what factors constrain and influence the creation of soundscapes.
- To establish perceptual differences in soundscapes between normal and impaired (visual & hearing) subjects.
- To bring together artistic, social, psychological and physical science and manufacturing approaches.
- To engage and inform the public about the creation and perception of their local soundscape.

METHODOLOGY AND PROGRAMME OF WORK

*Overview*

The project has three main strands: quantitative psychoacoustics, qualitative social science, and art. Outputs from each will inform the other two, and each will help to provide a context and validation for the others.

*Literature and policy review*

In addition to a rigorous academic review of literature in soundscape studies across disciplines, attention will be devoted to gaining an overview of the applicable policy and planning documents. This will ensure that the projects' outputs are relevant in terms of planning and designing future environments. Policy makers will be engaged at this early stage of the project to identify viable changes to the acoustic environment through semi-structured interviews and focus groups. This will promote awareness of the project within the user community and will help us disseminate results at the end. Key stakeholders in planning will be identified with the help of Max Dixon of the GLA. Alongside the review of academic and policy literature, a comparable investigation will be conducted into creative responses to acoustic environments. Tracing the lineage of the online collective soundscapes of today (such as soundtransit.nl) back to Walter Ruttman's 1928 exercise in "cinema for the ear", *Weekend*, this investigation will provide a unique context for the artistic dimension to this project.

*Identify the soundscapes to study*

Identification of the exact fieldwork location will be determined once the project has commenced and will be informed by practical considerations, such as accessibility, as well as outputs from the literature review. It is, however, possible to identify some site characteristics now. The project will focus on one geographical study area, containing several different soundscapes. To be most relevant to planning outputs, the area should be urban, though not dominated by traffic noise. We may, for example, have three different case studies in a city centre where we get a contrast between busy roads with traffic noise, urban green spaces, and pedestrian areas with voices. The case studies could be: urban pedestrianised, urban indoor/outdoor (like an open air shopping centre or market), urban green space. This might then give us a variety of interesting positive sounds.

*Soundwalks*

This is an active form of participation in the soundscape. The essential purpose is to encourage participants to listen discriminately and to make critical judgements about the sounds heard and their

contribution to the balance or imbalance of the sonic environment. Sound-making may be incorporated into the walk – e.g., the texture of different ground cover making different sounds could be explored. The purpose of a soundwalk is to explore sounds related to the environment (both natural and anthropogenic), and to be aware of one's own sounds (voice, footsteps etc). The walking route is recorded on a map which also highlights features of acoustic interest. This map may develop with successive soundwalks (each one adding to the acoustic features recorded on the map). Groups that could be targeted, and which will be confirmed when the project commences, include:

- People who have made noise complaints;
- School children and a soundwalk of their school, playground, walk to school;
- Blind and/or deaf people;
- Different age groups: Teenagers, retirees, working parents, etc (separate groups for male/female);
- Professional people: planners, health professionals, construction workers.

Some of the soundwalks will be recorded (perhaps binaurally) to provide part of the material for the laboratory psychoacoustic experiments. Once the frame of reference for the lab-based psychacoustic tests has been established, participants in the later soundwalks will also be asked to rate defined aspects of the soundscape. This data can then be used to validate the results of the lab tests.

*Interviews with individuals and/or focus groups*

Focus groups will be conducted with the groups mentioned above. Focus groups are organised discussions with a selected group of individuals to gain information about their views and experiences of a topic. They help gain insights into people's shared understandings of everyday life. This will enable us to explore people's understandings of soundscapes and the focus group moderator(s) will control the areas of discussion. One way in which this could be achieved is to use artistic artefacts produced during the project – such as the Soundscape Sequencer (see below) - to provoke discussion (and hence also provide feedback on the art output). Interviews will then be conducted with individuals, at a later date, to explore some of the ideas that come out of the focus groups. Other more standard focus groups would be conducted with specific professional groups (e.g. planners). This will contribute to the policy review process identified above.

*'Soundplay'*

A number of creative strategies will be employed to complement the quantitative psychoacoustics and qualitative social science.

Once the perceived components of the soundscape have been identified, 'Soundscape Sequencer' software will be developed around an accessible interface (perhaps akin to acoustic Lego) that will enable the users to manipulate blocks of sound to produce dimensionally dynamic creative soundscapes. The sound material necessary to create the building blocks for the Soundscape Sequencer will be derived in part from the field recordings and synthesised audio originating from other areas of this project; however, there is great potential in providing a vehicle for phonographers (who pursue field recording as a creative practice) and others to upload their sonic building blocks for use in the software. As a consequence, the player of the Soundscape Sequencer would have at their disposal a considerable range of sounds from which to choose. Commissioning artists to experiment with the Soundscape Sequencer will provide other soundscapes to generate discussion in focus groups and interviews.

Peter Cusack's long-standing 'Favourite Sounds' project will provide a powerful mechanism for investigating soundscapes from a creative perspective. The intention is to coordinate a 'Favourite Sounds of' investigation that culminates in an audio CD for the wider geographical area in which the chosen fieldwork location is situated. This will deliver a broader acoustic context in which to frame the localised soundscapes. It will also offer an opportunity to explore convergences and divergences between different methodological approaches and gives further possibilities for public engagement.

The public dimension of the artistic contributions to the Positive Soundscapes project will culminate in an exhibition that will curate a number of distinct perspectives on the central concerns of this research project, including: the historical span of creative responses to the soundscape (referred to under the Literature and Policy Review above); aspects of the various iterations of the 'Favourite Sounds' project; visual work depicting the acoustic environment that may provide alternatives to the established conventions of sound-mapping; a 'sonification' project where numerical and graphical data gathered in other areas of the project is reinterpreted as sound (the International Conference on Auditory Display

2006 is hosting a similar event). The exhibition will have a gallery-based dimension, an innovative web presence (aligned to the Soundscape Sequencer site) and radio programmes.

*Lab-based evaluations of soundscapes*
This part of the project will involve playing both real and synthesised/mixed soundscapes to participants in a neutral, well-damped listening room and requiring them to make judgements about what they perceive. One series of experiments will consist of preference tests and principal component analysis to identify how many significant orthogonal factors are involved in the listening experience. This is a necessary foundation before suitable metrics can be developed to quantify a soundscape. To help gain some insight into the extent of differences in perception between different groups, tests will be conducted with different groups of participants – for example, unimpaired, hearing-impaired and vision-impaired.

The speech recognition threshold (SRT), a measure of the lowest intelligible level of speech in a given acoustic environment, will be used to assess speech intelligibility in each of the recorded soundscapes. Of particular interest is the relationship of speech intelligibility in an acoustic environment to perceived sound quality of that environment. This has great relevance for the hearing impaired, who often experience extreme difficulty in understanding speech in noisy environments. The SRT measures will be used to make speech intelligibility maps of the environment under study, for both normal and impaired listeners, to overlay with the sound quality maps.

*Interactive creation of ideal soundscapes*
In addition to quality rating experiments, participants will be required to generate their ideal soundscape for a set of different contexts. Computer generated faders will be used by participants to manipulate the levels of each of the sound components (recorded in the field in the same environmental context), until the relative and absolute levels of the components are chosen to produce the most agreeable soundscape for that context. These experiments will provide an additional measure of which environmental components are rated most highly in a given context, and will help determine how sound components interact. For example, is it possible to reduce the annoyance of traffic noise by masking with an agreeable component such as the sound of a fountain?

*Signal processing and development of metrics*
The quantified perceptual factors identified in the laboratory will be used to help guide the development of physical metrics to evaluate the soundscape. Essentially, this involves applying signal processing techniques to the sounds used as stimuli to extract physical correlates of the perceptual factors. One starting point here will be to look at the process by which metrics have been derived in research on product sound quality (Blauert and Jekosch, 1997). Because the perceptual factors have not yet been identified, it is not yet clear how many physical correlates or eventual metrics might result. However, other kinds of listening experience have been shown to result in four or five perceptual factors. For example, the acoustic of a concert hall is perceived in terms of loudness, clarity, reverberance and auditory spaciousness (the last often split into two factors). These are correlated to physical metrics derived from the acoustic impulse response measured in the auditorium. For the experience of listening in a soundscape, it would be surprising if some form of $L_{Aeq}$ was not a significant correlate, but it is very unlikely that $L_{Aeq}$ is sufficient on its own. This part of the project will aim to produce a set of metrics which better fit the subjective experience than that used at present.

*Field recordings of soundscapes*
The lab tests and the art projects will require many more field recordings than can be provided by the soundwalks, so a specific programme of field recording in the chosen soundscapes is needed. This will use a variety of recording methods, such as binaural, soundfield and directional mic-ing of multiple components/sources. The programme of field recordings will be carefully structured to allow the effect of context on perception to be explored in several ways. To take two simple examples, recordings will be made at different times in the same location and at different locations at the same time of day. As well as providing the source material for laboratory stimuli in this project, the field recordings will constitute a useful corpus for further research in soundscapes, and so will be made generally available, perhaps via the project web page.

*Recruitment of participants*
Participants will be recruited through various contacts. People who have made noise complaints will be contacted via The UK Noise Association and the Local Authority in the case study area. Local

schools will be contacted in order to work with school children (CRB Disclosure will be sought for all researchers working with children). Flyers will be distributed to local homes and businesses in the case study area and press-releases will be sent to the local media. Local residents' groups, parents' groups, etc will be sent information. Hearing-impaired participants will be recruited through contacts with local audiology clinics. They will be screened using standard audiometric tests (air and bone audiometry) that will identify the sensorineural and conductive components of the loss for each individual. Visually impaired participants will be recruited through contacts with local ophthalmology clinics and through contacts with the RNIB. They will be screened for normal hearing by means of a standard audiogram. Normal hearing and seeing participants will be recruited via local advertisements. They will be screened by means of a standard audiogram. These participants will include age-matched controls for the hearing- and visually impaired participants, who are likely to come from older populations.

*fMRI validation*

The perceptual metrics will be used to generate a set of soundscape types from combinations of the recorded components. The soundscape types will be matched for overall loudness, but differ on the most significant quality metrics identified by the perceptual experiments. Functional magnetic resonance imaging (fMRI) will be used to measure brain activation in response to these soundscapes for normally hearing listeners. 10 second samples of each soundscape type will be presented in a randomised design during a 45-minute session. Different samples of each soundscape type will be included to control for possible variations in spectrotemporal complexity. It is anticipated that pleasurable soundscapes will cause activation in brain areas associated with reward, particularly in limbic and paralimbic areas such as the anterior insula, and nucleus accumbens, and aversive / stressful soundscapes will cause activation in amygdala, hippocampus, and neighbouring structures (Blood et al., 1999; Brown et al., 2004; Koelsch et al., in press). These measurements will provide a physiological validation of the perceptual metrics. Imaging data will be collected at the Sheffield Cognition and Neuro-Imaging Laboratory (SCANLab). Mr. Rob Pheasant, an EPSRC-sponsored PhD student, and his supervisor Professor Kirill Horoshenkov of the University of Bradford (who was a participant at the Ideas' Factory), have agreed to provide assistance with the data collection. Colour images generated from the brain scans will be incorporated into the exhibition in the manner identified above, to encourage the public to think about how environmental sound impacts on their thought processes.

NOVELTY AND RISK

- A focus on the positive components of the soundscape
- Integration of many different methodologies and disciplines
- Public engagement throughout the project – built into most of the methods used as we actively recruit members of the public to participate
- Employing artistic practice to both generate data for scientific research and 'translate' scientific research into creative artefacts.
- Use of hearing- and visually-impaired subjects
- A rigorous psychoacoustic perspective on the soundscape

RELEVANCE TO BENEFICIARIES

In the short term the non-academic project participants and related stakeholder groups will benefit from this project. Engagement with the public and specific interest groups (through the creative work, for example) will create a greater social awareness of the issue of (positive) sound and noise in society. In the medium term, planners and developers will benefit from a positive soundscape evaluation system, because there is currently no systematic means of evaluating the subjective nature of urban soundscapes. In the longer term, this should potentially improve the quality of life of residents in mixed-use city centre areas (for example) as regeneration projects take account of positive soundscapes at early stages in the decision-making processes.

DISSEMINATION AND EXPLOITATION

Because of the wide background of the project team, journal papers for a range of audiences will be written. We anticipate producing three conference papers and four papers in international refereed journals, ensuring a broad academic impact. Regular updates on the project will be given to academics and industry through the meetings of the proposed Noise Futures network. Final results and knowledge to influence soundscape design will be communicated via a seminar for planners and policymakers. Involving key professionals near the start of the project (see *Literature and policy review* above) and keeping them 'warm' with brief progress reports will increase the likely impact of this output seminar.

Two web pages will be set up to give access to project findings and data as they are produced. One page will focus on the social and natural science results, with lay language summaries and access to a library of downloadable field recordings. The other page will host creative output, including the soundscape sequencer.

PROJECT MANAGEMENT

It is proposed that the project team which formed at the Ideas Factory will act as co-Principal Investigators: Mags Adams, Angus Carlyle, Peter Cusack, Bill Davies, Ken Hume, Paul Jennings and Chris Plack. Adams (a RF) will carry out the qualitative work (soundwalks, interviews, focus groups, etc.). A post-doctoral RF based at Warwick will carry out the laboratory-based testing. The bulk of this will be done at Warwick with Jennings, with some travel to work at Lancaster with Plack and Salford with Davies. Hume will advise on the psychoacoustic work, particularly its physiological basis. Cusack will carry out the art work, in collaboration with Carlyle, whose role will be curatorial. A project RS, based at Salford and supervised by Davies will assist the RFs and focus particularly on integrating the qualitative and quantitative elements. Davies will act as the project co-ordinator (point of contact for EPSRC) and will ensure the integration of the qualitative, quantitative and art strands. A part-time administrator, based at Salford, will keep track.

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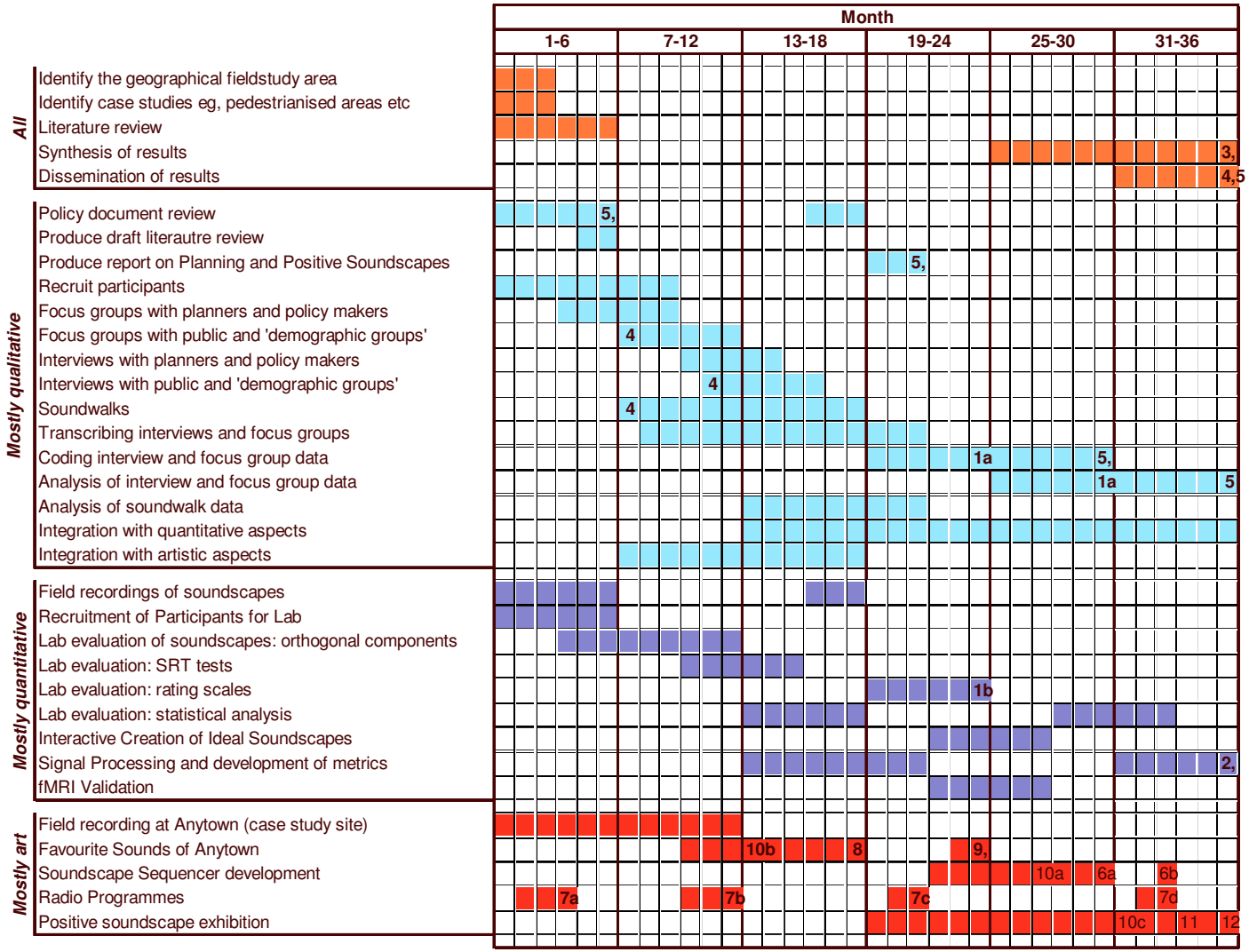
## Part 3 – Diagrammatic work plan




| Outcomes | |
|---|---|
| Perceptual dimensions of the soundscape | 1b |
| Perceived dimensions of the soundscape | 1a |
| Quantitative metrics of the soundscape | 2 |
| A positive soundscape evaluation system | 3 |
| Engage and inform the public | 4 |
| Knowledge that influences the policy process | 5 |
| Soundscape sequencer software | 6a |
| Soundscape sqquencer website | 10a |
| Soundscape sequencer commissions | 6b |
| Radio programme related to soundscapes | 7a |
| Radio programme related to noise and policy | 7b |
| Radio programme on favourite anytown sounds | 7c |
| Radio programme related to exhibition | 7d |
| Favourite sounds of anytown exhibition | 8 |
| Favourite Sounds of Anytown CD | 9 |
| Favourite sounds website | 10b |
| Exhibition website | 10c |
| Exhibition catalogue | 11 |
| Exhibition | 12 |

## Annex 1. Justification of Resources: Full Economic Cost.

| | | | |
|---|---|---|---|
| *Staff* | RF to carry out the qualitative work | point 14, 3 yrs | £125,536 |
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| | RF to carry out the art work | pt 72 UAL scale, 3 yrs, 50%, London weight | £65,355 |
| | Technician to assist with quantitative work | point 7, 3 yrs, 20% | £14,742 |
| | Administrator (E01) to run the project | point 6, 3 yrs, 20% | £13,599 |
| | *Sub-total staff* | | *£344,768* |
| *Travel* | Meetings of whole project team | 9 people, 10 meetings, £100 each | £9,000 |
| | Meetings between RFs and PhD student | 4 people, 10 meetings, £100 each | £4,000 |
| | Hospitality | 10 meetings, 13 people, £5 each | £650 |
| | Interviews | 1 RF, 30 interviews, £150 | £4,500 |
| | Focus groups | 2 researchers, 15 groups, £150 | £4,500 |
| | Soundwalks | 2 researchers, 15 walks, £150 | £4,500 |
| | Favourite Sounds of Anytown recording | 1 RF, 30 trips, £150 | £4,500 |
| | Travel expenses for qualitative subjects | 200 visits, £10 contribution | £2,000 |
| | Travel expenses for lab subjects | 700 visits, £5 contribution | £3,500 |
| | Domestic Conferences | 5 people, 1 conference, £500 each | £2,500 |
| | International Conferences | 5 people, 2 conferences, £1250 each | £12,500 |
| | *Sub-total travel* | | *£52,150* |
| *other costs* | Laptops for RFs and PhD | 4 laptops at £1k each | £4,000 |
| | Recording eqpt for field work (for lab expts) | soundfield mic, 4 directionals, DAT | £9,000 |
| | Video camera for focus groups | domestic quality | £1,000 |
| | Recording eqpt for radio programme | Recorder, mics, pre-amp and case | £3,400 |
| | Soundscape Sequencer development | software developer £5k, graphic design £1k | £6,000 |
| | Sequencer dissemination | DVD-Rom manufacture £4k, website £1k | £5,000 |
| | Sequencer commission | 2 artists to produce work with the sequencer | £1,000 |
| | Favourite Sounds of Anytown questionnaires | publicity £1k, 1 researcher for 2 wks, £1k | £2,000 |
| | Favourite Sounds transcription | 2 phonographers for 2 wks | £1,600 |
| | Favourite Sounds audio dissemination | CD mastering £1k, manufacture £3k | £4,000 |
| | Favourite Sounds web dissemination | graphic design £2k, website hosting £1k | £3,000 |
| | Positive Soundscape Exhibition commissions | artists to produce soundscape work | £8,000 |
| | Exhibition physical costs | eqpt hire for installations, venue contribution | £10,000 |
| | Exhibition catalogue | design £1k, printing £3k, writers £1k | £5,000 |
| | Exhibition design | graphic design £2k, website design £1k | £3,000 |
| | Exhibition publicity | contrib to gallery ads £1k, launch event £1k | £2,000 |
| | Media (audio tapes, etc) | for all three strands of activity | £5,000 |
| | Interview safety system | 2 mobile phones & failsafe system | £2,000 |
| | Subject payments in the laboratory | £6/hr, 3 hrs, 700 tests | £12,600 |
| | Subject payments in qualitative work | £20 token, 200 people | £4,000 |
| | Subject recruitment agency | | £2,000 |
| | Transcription of interviews & focus groups | £100/hr, 100 hrs audio | £10,000 |
| | SCANLab fMRI scanner at Sheffield | £400/scan, 50 scans | £20,000 |
| | Dissemination costs | output seminar, page charges | £5,000 |
| | *Sub-total consumables* | | *£128,600* |
| *Investigators* | Angus Carlyle | 3 yrs, 15% | £21,483 |
| | Bill Davies | 3 yrs, 15% | £25,147 |
| | Paul Jennings | 3 yrs, 15% | £26,236 |
| | Ken Hume | 3 yrs, 15% | £27,648 |
| | Chris Plack | 3 yrs, 15% | £31,698 |
| | *Sub-total investigators* | | *£132,212* |

| | | | |
|---|---|---|---|
| *Estates* | London Arts | 0.65 FTE | £24,605 |
| | Salford | 1.55 FTE | £34,624 |
| | Lancaster | 0.15 FTE | £1,920 |
| | MMU | 0.15 FTE | £5,655 |
| | Warwick | 1.15 FTE | £52,385 |
| | *Sub-total estates* | | *£119,189* |
| *Indirect* | London Arts | 0.65 FTE | £69,426 |
| | Salford | 1.55 FTE | £122,382 |
| | Lancaster | 0.15 FTE | £11,948 |
| | MMU | 0.15 FTE | £19,383 |
| | Warwick | 1.15 FTE | £105,508 |
| | *Sub-total indirect costs* | | *£328,647* |
| *Exceptions* | PhD student | 3 yrs stipend | £36,000 |
| | PhD student | 3 yrs tuition fees | £9,480 |
| | *Sub-total exceptions* | | *£45,480* |
| | **TOTAL** | | **£1,151,045** |

*Staff*
Each of the three main areas of investigation requires a researcher. The novelty and inter-disciplinarity means that researchers with post-doctoral experience of projects with multiple disciplines will be required. It is proposed to employ Dr Mags Adams as RF CI for the social science work and Mr Peter Cusack as RF CI for the art work. The art involves less intensive data collection, and so this post is at 50%. A part-time technician will be required to set up experiments and assist with sound recording. A part-time administrator will be required to ensure the smooth running of a project with seven investigators, five institutions and multiple inter-disciplinary paths.

*Travel*
A relatively large sum is requested for travel. This is necessary for the project because it includes: travel expenses for many experimental subjects, travel expenses for multiple field trips for all three main project strands, travel expenses for project meetings and trips to conferences to disseminate the results and share ideas with other researchers. In particular, our experience of recent inter-disciplinary projects shows that frequent meetings of the whole project team are required, along with extra meetings of the RFs and the PhD student.

*Other costs (consumables)*
There are a significant number of consumable costs required. Many are needed for the several art projects – for the volume of output and impact planned, these represent good value. There are several lines associated with obtaining good data from subjects in the project (recruitment, payment and transcription). These are essential since the core of the project is human perception of soundscapes. There is also a significant costs for the use of the fMRI scanner at Sheffield – use of this state-of-the-art equipment is necessary to provide physiological underpinning to explanations of human perceptions.

*Investigator, estate and indirect costs (FEC costs)*
These are driven by the staff time required for the project. In particular, the five permanently-employed investigators will allocate 15% of their time over three years. Extra investigator time above a 'normal' project is needed because of the true inter-disciplinarity on this project. The different disciplines do not just operate as 'black boxes', producing final outputs for the other stages. Extra work is necessary because each investigator has to understand work in the others' disciplines in depth.

## Annex 2. Response to Referees' Comments.

(Referees' comments that are wholly positive are not addressed here.)

Objectives

*Factors for soundscapes can move to become part of the network project*

We agree that a key objective for the Noise Futures Network should be to engage with policymakers. However, it is important that this project has regard to the constraints shaping soundscapes. It is anticipated that through the focus groups we may identify social, cultural and local factors, as well as planning and policy constraints from the literature review. Because individual response to a soundscape occurs in the context of these constraints, they must be characterised to fulfil the other project objectives.

Methodology

*Where is the physical analysis of the soundscape done?*

The full written case for support shows that this happens in the lab, alongside the listening room tests. Correlating results from the two processes forms the basis for the development of an objective evaluation method.

*Mainly qualitative work supported by physical measurements in the lab presented in different combinations*

The project includes qualitative social science, quantitative measurement and art practice in roughly equal measure. All are necessary to give the most efficient and complete way of understanding perception of soundscapes.

*Can benefit enormously by linking to other projects, e.g. sound recognition*

There is a strong common interest with the sound recognition project – we will try to co-ordinate on work such as case study location and field recordings. It is likely that other cognate projects will emerge from the Noise Futures Network, and we will seek to open links with these.

*Need to include visual stimulus*

This will be investigated as a factor in the listening room tests. For example, we might present a photograph taken at the place and time of the recording. In addition, we will employ two research strategies specifically designed to gather multisensory data – the soundwalks and the 'Favourite Sounds' idea. We will also benefit from interaction with an existing Warwick project quantifying the effect of different levels of context (especially tactile and visual) in assessing vehicle sounds.

Outcomes/Impact

*Perceptual dimensions & metrics need further elaboration*

The written case for support expands on the methods and gives examples of what we might find.

*The other outcomes are well presented but need to be linked better to the objectives*

The written case for support shows how the objectives dictate the programme of work. The Gantt chart shows how the outcomes are linked to the work stages. Thus, the outcomes are linked to the objectives.

*Public engagement should be in objectives*

Yes - it is now!

Novelty/Adventure

*Need a better explanation of the novelty in the integration of several disciplines*

The novelty lies in several areas. First, there is a true two-way interaction between pairs of disciplines. For example, not only will the scientific output influence the creative processes and artefacts, but people interacting (playing) with creative outputs will point to perceptions which could be quantified in the lab. Similarly, the responses of soundwalk participants will help to frame the design of the lab experiments, while quantification of soundscape perception in the lab will improve analysis of the qualitative data. Thirdly, public interaction with early art outputs will be explored in some of the focus groups to provide data that will help the efforts of all three research strands (qualitative, quantitative and creative).