

## **Privacy Impact assessment (PIA)**

### *Aims of the study*

The aim of our study is to understand how different green and built aspects of the urban environment affect wellbeing. Previous research has shown that there are many health and wellbeing benefits to spending time in green spaces and engaging with the natural world (e.g. Bowler et al., 2010; Russell et al., 2013). However, few of these previous studies have used an experimental research design where the potential benefits of engaging with green spaces and built spaces are directly compared (Sandifer et al., 2015). The study will compare whether using an app to connect with nature or connect with built spaces, has any impact on health and wellbeing. We hope that the results will fill this knowledge gap and inform policy makers and town planners about how city spaces could be designed for better health and wellbeing.

### *Why is a Privacy Impact Assessment (PIA) needed?*

The need for a PIA was identified because: i) the project involves the collection of new information about individuals; ii) the project asks individuals to provide information about themselves; iii) anonymised data about individuals will be stored indefinitely at the UK Data Centre and may be shared with other researchers who have not previously had access to the information.

### *What data will be collected?*

This study will collect questionnaire data. Questionnaires will be completed before using the app, after 30 days of using the app and again after two months to see whether health and wellbeing scores change. Questionnaires will include: basic demographics (age, gender, ethnicity, post code); childhood and current engagement with nature; access to a garden; questionnaires about positive emotions, general health, quality of life and engagement with nature. Four daily questions will ask about your experience of the green and built spaces you encounter. We will also collect some data through your smartphone about your location.

### *Why will this data be collected?*

Demographics: age, gender, ethnicity, post code

Previous research has shown that age (De Vries et al. 2003; Maas et al., 2006), gender (Richardson & Mitchell 2010) and ethnicity (Natural England, 2015) affect how much people engage with the natural world and also affects how much they benefit from it. We ask for the first 4 digits of your post code so we can get an idea of how much green or built space is near to where you live and how far from home you travel to other green or built spaces.

Childhood and current connection to nature

The study will assess whether a person's connection with nature changes as a result of using the app. Research has shown that childhood engagement with nature impacts on attitudes and behaviours toward the environment as an adult (Wells & Lekies, 2006) as does growing up in a rural setting (Hinds & Sparks, 2008).

Access to a garden

Participants who have access to a garden have a more localised green space that they can use as opposed to needing to travel to green spaces. There is a lot of research showing the benefits to health and wellbeing of garden use (e.g. Bond et al., 2012; Dunnett & Qasim, 2000).

Positive emotions

Previous research has shown links between spending time in green spaces and positive emotion. However, this research has only looked at one type of general positive emotion and has not distinguished between different types of positive emotions (see McMahan & Estes 2015 for review). The types of positive affect questionnaire measures two types of positive emotion (activated and soothing) which map onto different physiological systems (activated/seeking resources and rest/digest). A recent review (Richardson et al 2016) has shown that spending time in green spaces is associated with greater rest/digest activity. We would like to further test this finding in the current study by including this questionnaire to distinguish types of positive emotion.

General health

Previous research has shown an association between living near green spaces and experiencing better health (e.g. Lee & Maheswaran, 2011; Maas et al., 2006). An important aim of the study is to assess whether green or built spaces impact on general health. The measure of general health used in this study can be used to calculate the financial benefits of using the app to connect with green or built spaces. If health improves then the burden on the NHS and Social Services is reduced and this becomes a financial incentive for town planners and policy makers to provide public access to these spaces.

#### Quality of life

The study will assess whether connecting with green or built spaces through the app affects wellbeing. Previous research has shown that living near and spending time in green spaces has beneficial effects on wellbeing and mental health (e.g. Guite et al 2006; O'Campo et al 2009). The measure of quality of life used in the study can also be used to make a financial argument for the importance of access to these spaces.

#### Engagement with nature

Measuring engagement with nature will enable us to see whether the app worked as intended and improved peoples connection with green spaces. Engagement with nature has been shown to affect the relationship between accessing nature and wellbeing (Zhang et al., 2014).

#### Daily experience of green/built space questions

These questions will assess the quality of the green/built space you encounter by asking about the variety of plant and animal species present. The variety of species have been shown to affect the amount of benefit gained from spending time in green spaces (Fuller et al 2007; Wheeler et al 2015). Previous research suggests that benefits can be gained from green spaces through different mechanisms, such as relaxation (Kaplan 1995), socialising (Maas et al 2009) and exercise (Pretty et al 2005), hence two questions ask about what you were doing and whether you were alone or with someone else. Finally, a question asks about how you felt about the green/built space. This question is to take account of whether you liked the place they encountered. Some previous research has noted that some people can find certain green spaces unpleasant or even threatening (Milligan et al 2007).

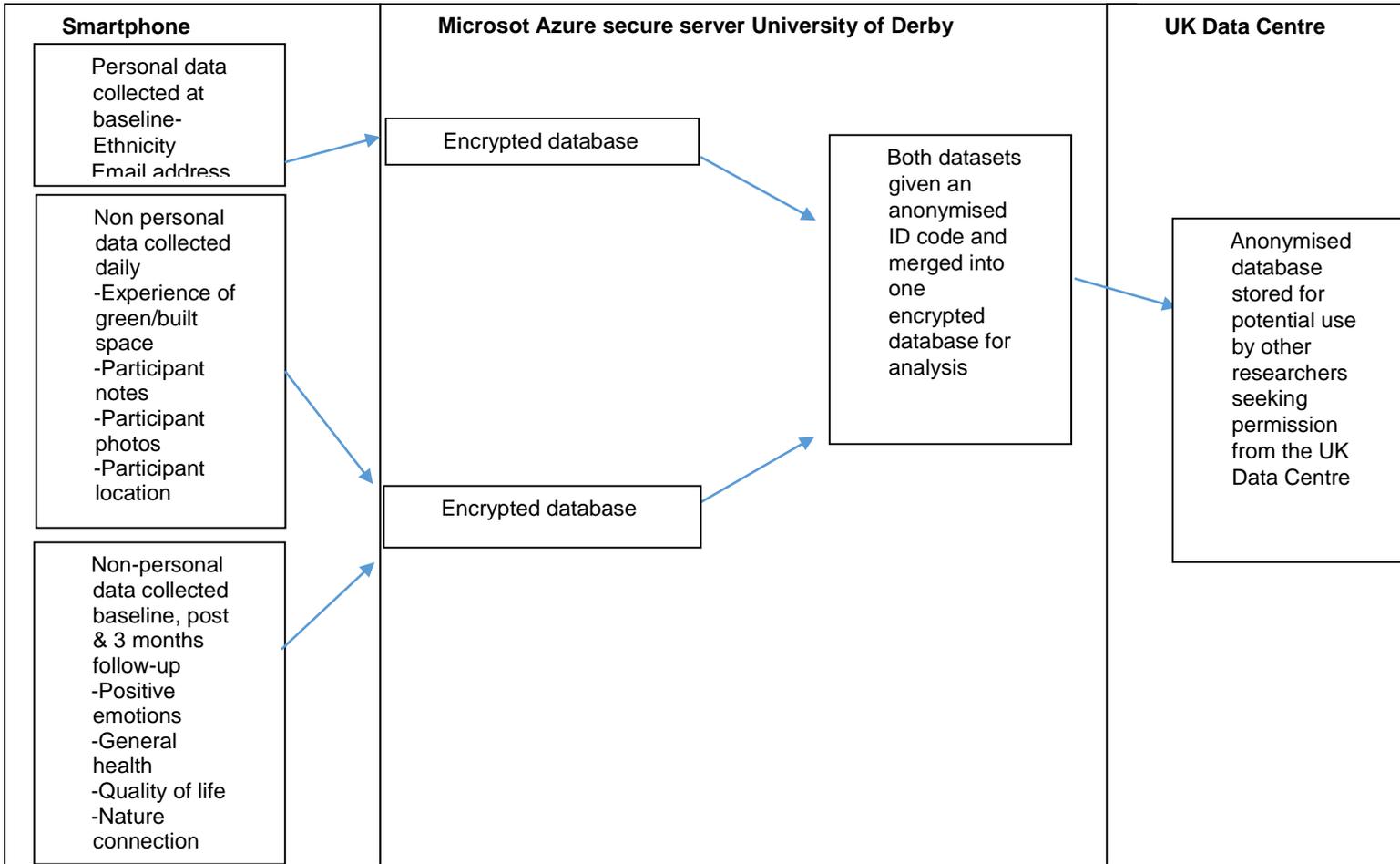
#### Location data

Publicly accessible green spaces will be programmed into the app. When you get close to one of these spaces your phone will record their location. This is so we can see how much green space people encountered during their day. Once a day when you get close to one of these spaces your phone will send you a prompt asking you to notice the space, make notes about the good things and perhaps take a photo, or report your location. The tracking is set up to only happen during the day and in public green spaces. The tracking can be switched off at any time. This location data will allow us to see the types of green and built spaces people encounter and to assess which types of space offer the most health and wellbeing benefits. Previous research by Wheeler et al (2015) has shown that the type of green space (e.g. wetland, woodland, grassland) can influence how much people benefit from it.

#### *Where will the data be sent and stored?*

The question about ethnicity and email address are the only data that we are collecting which is classed as personal data. All of the other questionnaire data collected would not be enough alone to identify a person. In other words, most of the data are non-identifiable and anonymous. Because the ethnicity data and email addresses are personal data these will be stored in a separate database from your questionnaire responses so that data remain anonymous. These separate databases will be stored on a Microsoft Azure secure server at the University of Derby and will only be accessed by the researchers working on the study. Microsoft Azure are audited by a third party at least once a year for compliance with ISO/IEC 27001 and ISO/IEC 27018 certification, providing independent validation that applicable security controls are in place and operating effectively. The anonymised data will be extracted from Azure and kept on the University of Derbys secure server indefinitely. To comply with our funder (the Natural Environment Research Council-NERC) all anonymised data will be held indefinitely at the UK Data Centre. This data may be accessed by other researchers after gaining permissions through the UK Data Centre. We are collecting data from over 1,000 participants and the data will be reported in publications at population level, for example, "45% of Sheffield residents experienced a change in wellbeing after using the app". Figure 1 below shows the flow of data throughout the study.

Figure 1: Flow of data throughout the study



### Addressing privacy risks

The study has been approved by the Human Sciences Research Ethics Committee at the University of Derby (ref: 08-1617-KMp) and the West Midlands Research Ethics Committee (ref: 222700). The data protection plan submitted with our ethics applications have been based on the Data Protection Act (1998), advice from the UK Data Centre and guidance from the Information Commissioners Office (ICO) document 'Privacy in mobile apps: Guidance for app developers'. Protection of your data will be a joint responsibility between the University of Derby and the app developers 'Furthermore Ltd'. A subcontract has been signed by both parties agreeing to the terms of the data protection plan.

Ethnicity data and email addresses are personal data and therefore classed as sensitive data. Sensitive data will be held separately from your questionnaire responses and notes. The data are thereby further anonymised. The data will be held in two separate databases in the University of Derby's secure servers (ethnicity data in one, questionnaire and note data in the in the other). The app developers will encrypt end-to-end from device to any storage media, hence the databases and servers will be encrypted. The storage area will be encrypted with a tool which meets ISO27001. We will ensure that any central server only enables strongly-encrypted connections and has a valid SSL / TLS certificate.

Security testing both the app and any central servers by the app developers, research team and a panel of potential end-users (members of the public) before rollout will take place to ensure the data protection plan is effective. After any changes to the app's code, the data processor will test to ensure that the app's behaviour is as expected and still matches with the data protection plan.

If the researchers or developers become aware of an actual security breach of systems we are responsible for, we will take swift and appropriate action to remedy the problem. This should also include, where possible, notifying users of known vulnerable versions of the app so that they can protect themselves by upgrading. Any privacy risks and solutions will be recorded on a privacy risks register.

### Privacy and related risks

Privacy issue	Risk to individuals	Compliance risk	Associated organisation/corporate risk
Collection, transfer and storage of personal data (ethnicity & email addresses) to secure server	Risk of data being lost in transfer. Risk of third party accessing data at transfer or storage.	Failure of the researchers or app developers to follow the data protection plan.	Reputational and financial.

### Privacy solutions

Risk	Solution	Result: is the risk eliminated, reduced, or accepted?	Evaluation: is the final impact on individuals after implementing each solution a justified, compliant and proportionate response to the aims of the project?
Risk of data being lost in transfer. Risk of third party accessing data.	All personal data will be collected, processed and stored in accordance with the Data Protection Act (1998). Only the minimum data required to answer the research	Reduced	Yes, even if data were accessed by a third party, the only personal data is the ethnicity data and email addresses. This alone is not enough to identify an individual and

	<p>questions will be collected and stored. None of the data can be shared with any third party unless necessary for national security or public safety in accordance with Article 8 of the European Human Rights Convention. Sensitive data will be held separately from other data. The data are thereby further anonymised. The databases and servers will be encrypted with a tool which meets ISO27001. Any central server used will have a valid SSL / TLS certificate. Security testing of the app will be conducted before rollout.</p>		<p>connect them with their questionnaire or location data.</p>
--	--	--	--

*Sign off and recording the PIA outcomes*

<b>Risk</b>	<b>Approved solution</b>	<b>Approved by</b>
<p>Risk of data being lost in transfer. Risk of third party accessing data.</p>	<p>Data to be processed in compliance with the Data Protection Act.(1998) . Personal data and other data to be stored in separate databases on a secure encrypted server. Security testing of app before rollout.</p>	<p>Study lead Dr Miles Richardson</p>

*Integrating the PIA outcomes back into the project plan*

<b>Action to be taken</b>	<b>Date for completion of actions</b>	<b>Responsibility for action</b>
<p>Data protection plan written in accordance with Data Protection Act (1998), guidance from the UK Data Centre and ICO.</p>	<p>20/11/16</p>	<p>Dr Kirsten McEwan</p>
<p>Ethical approval sought from the University of Derby.</p>	<p>12/12/16</p>	<p>Dr Kirsten McEwan</p>
<p>Subcontract between the researchers and app developers detailing data protection plan to be signed by both parties.</p>	<p>20/01/17</p>	<p>Dr Kirsten McEwan Furthermore app developers</p>
<p>Ethical approval obtained from the University of Derby</p>	<p>24/01/17</p>	<p>Dr Kirsten McEwan</p>
	<p>02/17</p>	<p>Dr Kirsten McEwan</p>

<p>Ethical approval sought from the NHS ethics committee.  Ethical approval obtained from the NHS ethics committee.  Security testing before rollout and ongoing security testing.  Any vulnerabilities or adverse events to be addressed swiftly and recorded on a privacy risk register.</p>	03/17	Dr Kirsten McEwan
	02/17-ongoing	Furthermore app developers
	05/17-ongoing	Furthermore app developers

<p><b>Contact point for future privacy concerns</b>  Dr Kirsten McEwan  k.mcewan@derby.ac.uk</p>
--