

## Environment and Human Health

### Mapping Physical and Visual Access to Greenspaces

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This research is part of the Scottish Government's GreenHealth project. It provides a method for considering physical and visual access of green spaces. The findings illustrate the potential geographic significance of the inclusion of measures of visibility of green spaces together with the distance to green spaces from residential properties.

#### Main Findings

- Ensuring the visibility of green space can make a significant difference to the interpretation of accessibility.
- Analysis of the physical accessibility of green spaces with respect to individual properties and population numbers enables comparisons to be made of the effects of changes in green space provision and housing over time.
- Analysis of the visibility of green spaces from residential properties enables identification of those which are most visible and those least visible.
- Properties with similar levels of combined physical and visual accessibility tend to be geographically clustered, largely reflecting the spatial distribution and patterns of housing and green spaces.
- Data on physical and visual accessibility of different types of green spaces could be used as metrics in monitoring and reporting.



## Background

Positive associations are reported between human health, wellbeing and access to outdoor natural environments, and between physical activity in natural environments and lowered risks of poor mental health (Information note 1). In economically deprived areas, green spaces are a resource for alleviating stress, with evidence that people in the vicinity of more green space have lower levels of physiological and self-reported stress (Information note 2).

The significance of accessibility of green spaces from people's homes with respect to health and wellbeing is reported by studies in Sweden and The Netherlands. For example, they show that living less than 1 km from a green space was linked to significant reductions in risk of cardiovascular disease or stress, and that higher amounts of green space within 3km of people's homes showed benefits in coping with stressful life events.

Systematic reviews of the contribution of contact with nature to human health and wellbeing (e.g. Bowler et al., 2009) suggest evidence of health benefits of views of nature. These include views of built environments having adverse impacts on levels of stress, with nature-dominated views providing 'pleasant distractions' and blocking 'worrisome, stressful thoughts', and positive effects of views of trees, and the use of imagery of nature indoors.

The benefits conferred by views of green spaces are increasingly being taken into account in guidance for land managers and planners in the creation of new spaces, and design of hospital and care environments. For example, the Forestry Commission proposes that those confined to bed should be able to enjoy the outdoors from inside, with views of trees or a garden being made available.

This note summarises the development of a method to enable spatial assessments of physical and visual access to green spaces at the level of individual properties.

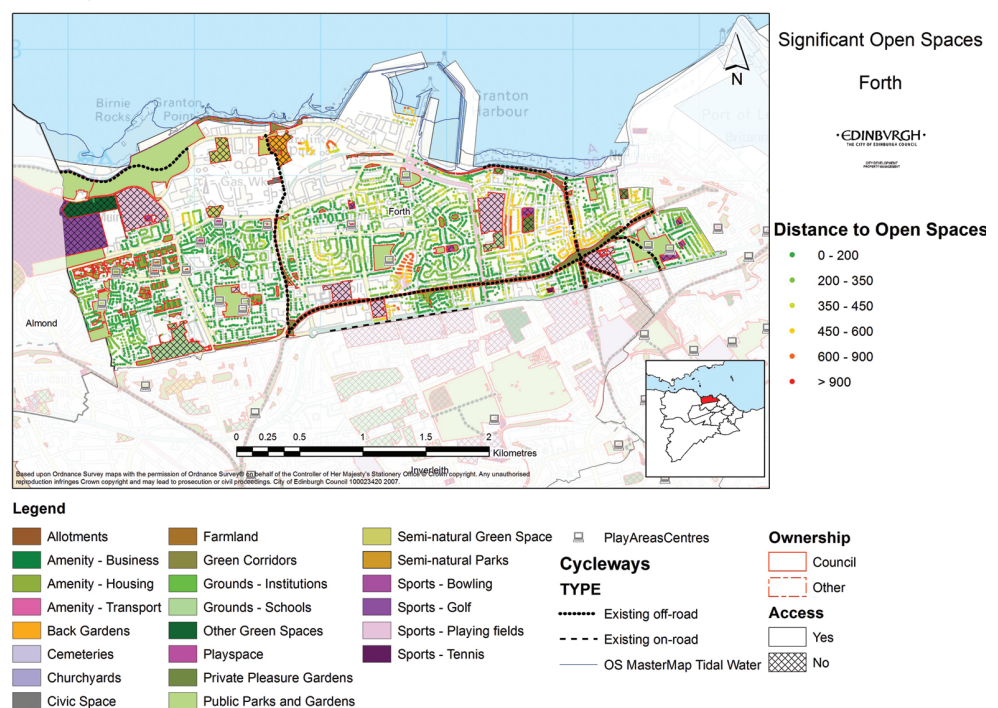
## Research Undertaken

The method tested required input from existing data on the distribution and extent of green and open spaces, roads and paths, properties and population. To this is added new data from an urban height model.

For study areas in Edinburgh and Dundee, selected to represent high levels of deprivation with low and high proportions of green space (Information Note 2), a spatial database of green and open space was derived by interpretation of Ordnance Survey Master-map. This was used to distinguish between different urban land cover and uses. These data were checked with aerial photography and the Google Streetview, and significant footpaths added to those of the Ordnance Survey in their Urban Paths Theme.

Access points to green spaces were recorded where a footpath linked with a green space, i.e. 'formal' access, or open space is adjacent to a footpath, pavement or road and no physical barrier to access exists, i.e. informal' access. For informal points of access, estimates were made of locations where there may be indications of a path having been developed.

Distances between each residential property and the closest accessible green space of each type were then calculated,



**Figure 1. Accessibility from properties to public green spaces for the Forth Neighbour Partnership Area, Edinburgh.**



and then repeated with updated data on properties. Figure 1 shows an example of the output for the area of Forth in north Edinburgh, excluding private and communal gardens.

The visibility of a) green and open spaces from each residential property, and b) properties from green spaces, was calculated. A database of buildings and addresses was created from Ordnance Survey data, with data on building heights from LiDAR. These data have been used to derive an index of visibility of green space from individual properties, using tools developed for architecture and used in visual impact assessments.

Information on the population census for 2001 was added to the property database to support queries relating to population profile with respect to accessibility of green spaces and facilities. The resultant database of population linked to accessibility enables queries to estimate the number of people with different levels of accessibility to different types of green spaces. It can also be linked to other data related to individual properties, such as the level of visual accessibility, that is the visibility of green spaces from a property.

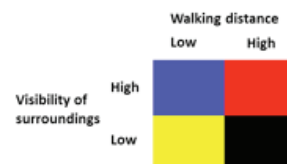
The data on physical and visual access were combined to enable assessments of access to green spaces, and the exploration of the spatial implications for guidance on measures of accessibility to different types of green space. An example is shown for the Pilton area of Edinburgh, comprising 5,907 properties.

Properties were classified using a mid-point in the visibility index for splitting 'high' and 'low' visibility of green space, and the physical distance is split using examples of 300m and 200m walking distances as thresholds. Figure 2 shows the geographic distribution of properties with a combined visual and physical accessibility for each of the two distance thresholds.

The green space data used in this study continue to be updated with new releases of the national mapping by Ordnance Survey, which will enable the measurement of changes in the extent of green spaces. These data are being updated to reflect the PAN 65 classification, with units split or combined where land use changes for only part of a green space. Examples would include semi-natural green space converted for sports or playspaces, or green spaces converted into combinations of housing and associated amenity green space.



Figure 2. Combined physical and visual accessibility of greenspaces to properties in Pilton, Edinburgh: (a) 300 m walking distance; (b) 200 m walking distance.



## Conclusions

The method and findings reported illustrate how physical and visual accessibility of green and open spaces can be combined at the level of individual properties, and linked to data on population.

A database linking property, green space and population data can be used to identify potential clusters of properties for which access to green space is limited and allows an exploration of where, geographically, the inclusion of green spaces may be appropriate.

The analysis of visual and physical accessibility of different types of green space can now utilise Scotland's Greenspace Map, with the potential to consider links to the functionality and quality of spaces through interpretation of the PAN 65 open space typology.

The approach presented has a number of limitations:

(i) no account is taken of physical and social factors, such as topographic inhibitors to movement, and inhibitions to use of certain spaces, so maps of minimum distances may not equate to routes of minimum travel time; (ii) calculations of distance relate to entrances to green spaces, thus estimates for specific features (e.g. children's playspaces within green spaces) may be underestimated; (iii) it may not be possible to distinguish between different types of vegetation cover from a distance, or at different times of the year; (iv) the extent of areas visible will vary depending upon the storey of a building.

## Policy relevance

The outputs illustrate how quantitative data on physical and visual access can be derived in relation to population profiles. The findings support the aims of the **Scottish Planning Policy** (SPP) with respect to Location and Design of New Development, and the considerations in a settlement strategy of accessibility of home, services and open space, in which it identifies two constraints on access – physical and cultural. Visual could be added as a further consideration.

Such quantitative data provide metrics of physical and visual accessibility which can be used as indicators of access to green spaces from residential properties, and population catchments of different types of green space. These could be used to assess the application of the **Land Use Strategy** Principle H, that outdoor recreation opportunities and public access to land should be encouraged, along with the provision of accessible green space close to where people live, given their importance for health and well-being.

Such indicators could potentially also be used by Community Planning Partnerships in future local authority Single Outcome Agreements (SOAs), in particular in relation to Scottish Government National Outcome "*we have tackled the significant inequalities in Scottish society*".

The data infrastructure for the type of analysis presented is supported by the One Scotland Mapping agreement for the public sector, coordinated by Scottish Government. Increasing access to the derived products is consistent with obligations to increase the availability of environmental data, such as through Scotland's Environment Web. However, ongoing technical and financial support is required, and in particular the maintenance of the currency of the data (e.g. Scotland's Greenspace Map), probably in collaboration with Ordnance Survey.

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### References

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