

# The Assessment of Green Infrastructure Equity (AGIE) methodology:

(A CASE STUDY IN PLYMOUTH)



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## Report aim

The Assessment of Green Infrastructure Equity (AGIE) methodology uses a suite of metrics to produce a single GI equity score, enabling local authorities or other interested parties to identify neighbourhoods that have high green infrastructure inequity. This report aims to provide:

1. A high-level summary of the AGIE methodology
2. A case study of how the metric can be used, for Plymouth City Council
3. An assessment of green infrastructure equity in Plymouth.

The authors hope it is of interest to those involved in green infrastructure planning across the country, and of direct use to those involved in green infrastructure planning in Plymouth.

The authors welcome enquiries and comments, which should be addressed in the first instance to the lead author: [Martha.Crockatt@ouce.ox.ac.uk](mailto:Martha.Crockatt@ouce.ox.ac.uk) or [treeequity@woodlandtrust.org.uk](mailto:treeequity@woodlandtrust.org.uk).

## Executive summary

This report introduces the Assessment of Green Infrastructure Equity (AGIE) methodology, a new approach for assessing how equitably green infrastructure (GI) is distributed in relation to socioeconomic and environmental need. It is developed in collaboration with Plymouth City Council, and is based on the Woodland Trust's Tree Equity Score and a greenspace equity metric developed by the University of Oxford, which draws on Natural England's Green Infrastructure data.

GI—including parks, gardens, street trees, and other natural features—provides significant benefits for health, wellbeing, climate resilience, and biodiversity, but socioeconomically deprived areas often have less GI, thus losing out on these benefits. As there is evidence that socioeconomically deprived communities benefit more from GI, it is especially important to identify those that lack access to it.

We have designed the methodology to help local authorities identify priority areas for GI support, for example through investment in delivery and targeted policy. AGIE combines nine metrics into a single equity score for each neighbourhood, using publicly available datasets. These metrics capture three dimensions: distribution of GI (greenspace access, greenspace provision, tree canopy cover, manmade surfaces), environmental need (air quality, heat disparity), and socioeconomic need (Indices of Multiple Deprivation, age dependency ratio, minoritised ethnicity). Based on the combined score, neighbourhoods are ranked into quartiles from highest to lowest need for improved GI equity.

AGIE is not a standalone decision-making tool but a starting point for evidence-based planning and collaboration with local communities. By identifying neighbourhoods with the greatest need for GI improvements, it supports efforts to create healthier, more equitable, and climate-resilient cities.

Our case study is Plymouth City Council (PCC), a coastal city with strong industrial heritage, and with green infrastructure benefits embedded in its policies and strategies. The city has relatively high levels of socioeconomic deprivation. Plymouth has 29 km<sup>2</sup> of green and blue space (37% of its area), of which 30% is publicly accessible. Tree canopy cover is relatively high (17%), but varies widely between neighbourhoods. Applying AGIE to Plymouth revealed marked disparities in GI equity across the city; the southwest of Plymouth has the lowest GI equity, with highest-priority neighbourhoods clustered in Drake, Devonport, St Peter & the Waterfront, and Sutton & Mount Gould. These areas have less than one-tenth the greenspace per person compared to the least greenspace deprived areas, half the canopy cover, and more than double the proportion of manmade surfaces. They also experience greater heat extremes and poorer air quality.

The findings provide Plymouth City Council with a robust evidence base to target interventions such as street tree planting and greenspace improvements, monitor progress, and strengthen investment cases. The results align with existing local priorities, helping to validate the approach, and add value by quantifying inequity and visualising patterns across the city. Beyond Plymouth, AGiE offers a scalable tool for councils, NGOs, and researchers across England to support equitable access to GI benefits.

Current limitations include the exclusion of blue space—particularly important for coastal cities such as Plymouth—and lack of data on greenspace quality, condition, and other characteristics such as facilities (e.g. paths, cafés, toilets, benches) or biodiversity. Future development will incorporate blue space and footpaths, generate AGiE scores for all urban areas in England, and explore the possibility of enabling local data updates.



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## Introduction

This report describes development of a new methodology, AGIE (Assessment of Green Infrastructure Equity), for assessing the provision of urban trees and other green infrastructure in relation to socio-economic deprivation. The metric has been tested in the city of Plymouth, but the methodology can also be applied elsewhere in England. In this report, we first present the background to why this metric was developed, including a summary of existing metrics, and then describe how and why the AGIE methodology was developed and how it can be applied elsewhere. Next, we describe the Plymouth case study area and relevant greenspace policies, and present the findings of the AGIE assessment for Plymouth. Finally, we discuss how the metric could help to inform greenspace policy in Plymouth, describe its limitations, and suggest next steps for further development.

## Background

### Green infrastructure provides many benefits to urban populations

There is mounting evidence of the multiple benefits of green infrastructure (GI), such as parks, gardens, and street trees (Box 1), to humans. These include health and wellbeing benefits from recreation in, and interaction with, nature, as well as through improved air quality, flood protection and urban cooling (Choi et al., 2021; Lamont & Hinson, 2024; Twohig-Bennett & Jones, 2018). For example, a review of published research found increased exposure to greenspace is linked with lower heart rate, cholesterol, asthma and blood pressure, and decreases in rates of type II diabetes, low birth weight and all-cause mortality (Twohig-Bennett & Jones, 2018), and 80% of adults surveyed in England agree that being in nature makes them happy (Natural England's People and Nature Survey). The role of trees in urban environments is widely recognised for a broad range of ecosystem services, including human health and wellbeing, climate change mitigation and biodiversity conservation (UNECE, 2022). For example, it has been estimated that increasing canopy cover to 30% in European cities would avoid 12,000 deaths per year from air pollution (Sicard et al., 2025). Living near and / or visiting blue spaces, which includes lakes, rivers, and coasts, is also shown to have benefits for physical and mental health and wellbeing (e.g. Wheeler et al., 2012; White et al., 2013; McDougall et al., 2022). For example, a systematic review found beneficial links between blue space in urban environments and obesity, mortality, general health and self-reported mental health and wellbeing (Smith et al., 2021). At present the AGIE metric focuses on green infrastructure, but, given the importance of blue space, there are plans to include blue space in a future iteration.

With over 80% of England's population living in urban areas (Statistical Digest of Rural England, 2022), GI in cities and towns is of particular importance to health and wellbeing. Urban GI can contribute to achieving almost half (44%) of the UN Sustainable Development Goals' targets (Lombardía & Gómez-Villarino, 2023), showing that GI also has a role in making our towns and cities more equitable places in which to live.

## Box 1: What is “green infrastructure”?

The National Planning Policy Framework describes green infrastructure (GI) as:

A network of multi-functional green and blue spaces and other natural features, urban and rural, which is capable of delivering a wide range of environmental, economic, health and wellbeing benefits for nature, climate, local and wider communities and prosperity.

GI includes a wide range of natural and semi-natural features including parks, nature reserves, woodlands, private gardens, street trees, hedges, green roofs, wooded footpaths, allotments, churchyards, roadside verges, canals and rivers. What these features have in common is that they provide natural benefits such as places for relaxation and enjoyment, clean air, flood prevention and cooling. Together, they form a network of natural features that benefit everyday life.

Accessible greenspace (AGS) refers to green spaces such as parks, nature reserves, common land and beaches which are usually open to members of the public, with no entrance fee. For example, a municipal park that is locked overnight is AGS, whereas a private estate that is open to the public only on certain days of the year, even if free, would not be classed as AGS.

### Not everyone has access to these benefits

GI is not distributed evenly across urban areas in the UK, with less affluent communities often having less actual or perceived access to GI (Ferguson et al., 2018; Jones et al., 2009). It has also been found that less affluent communities receive greater health benefits from local GI than more affluent communities (Rigolon et al., 2021); this is attributed to these communities relying more on local public greenspace as they typically have less access to other resources that promote health, such as gym membership or a large private garden. In order to maximise the benefits of GI at a population level, it is therefore important to identify communities that are both socioeconomically deprived and have low levels of GI in their local area. Identifying these communities would allow local authorities to develop strategy and policies in areas including climate change adaptation, public health, community, green infrastructure and planning that promote equitable access to GI benefits, potentially

reducing the long-term costs of health and social care, and making neighbourhoods more pleasant to live in.

There are several ways of identifying more vulnerable communities. The English Indices of Multiple Deprivation (IMD) are widely used, standardised metrics that score neighbourhoods (LSOAs<sup>1</sup>) using factors including health, income and employment[1]. Another measure for identifying vulnerable communities is the age dependency ratio. This measures the number of older people (age 65+) and children (0-17) as a proportion of working age adults (18-64). A higher dependency ratio can lead to increased demand for healthcare services, as both the elderly and the young may require more medical attention and support. Another key factor is ethnicity. People from minority ethnic groups are less likely to live in neighbourhoods with high access to greenspaces compared with white people (The Health Foundation, 2024).

### Green infrastructure is influenced by multiple policies at different levels

Due to data availability, this project has focussed on England rather than the UK. In England, various national policies and targets require local authorities to consider the distribution of GI. These include Local Nature Recovery Strategies, which must identify existing high value nature sites and prioritise strategic areas for nature recovery (Defra, 2024); Biodiversity Net Gain legislation (Defra, 2023), which requires new developments to have a net positive impact on biodiversity; government targets to rapidly increase housing stock (MHCLG, 2024), and announcements of new national forests which will encompass urban areas (Defra, 2025a).

These policies are supported by the government's GI Framework, Principles and Standards (Natural England, 2025a), which emphasises the importance of accessible greenspace for public health and provides a framework of standards for places to work towards (Grace et al., 2025). Yet delivering these policies can be challenging for local authorities with limited budgets. We hope to support councils in decision-making by developing methods for identifying neighbourhoods that should be prioritised for GI enhancement.

### Existing metrics to assess green infrastructure provision and equity

A number of existing metrics and standards can be used by local councils in GI policy- and decision-making. These can be used in several ways: to allow objective comparison of areas; to provide a baseline against which to measure change; to prioritise policy and/or delivery within an administrative area; or to identify neighbourhoods that are in need of a particular element of green infrastructure.

[1] Lower-layer Super Output Areas (LSOAs) can be considered neighbourhoods; these official areas are clusters of post codes with an average of 650 households or 1200 people that share similar characteristics and are widely used in social geography. Each LSOA has an IMD score and a relative ranking from 1 (most deprived) to 32,844 (least deprived).

Indices of Multiple Deprivation (IMD) provide an official measure of relative deprivation in England. The IMD is created from seven domains: income; employment; education, skills and training; health deprivation and disability; crime; barriers to housing and services; and living environment. The domains are weighted so that some contribute more to the score than others. More information: <https://www.gov.uk/government/statistics/english-indices-of-deprivation-2019>

Examples of these include:

- the [3-30-300 rule](#) (Konijnendijk, 2023): a simple, internationally-used concept which suggests that every home, school and workplace should have at least three trees in view, that neighbourhoods should have at least 30% tree canopy cover and every home should be within 300 m of a publicly accessible greenspace.
- the [Fields in Trust's Green Space Index](#) (Fields in Trust, 2025): assesses provision of playgrounds and parks in terms of the total area in a neighbourhood; the area per person; and the proportion of people that live within a given distance of greenspace. This is widely used by UK councils and planning authorities.
- the [Woodland Trust's Tree Equity Score](#) UK: identifies neighbourhoods in greatest need of trees, taking into account existing tree canopy cover as well as measures of environmental need (neighbourhood temperature relative to local average, and air pollution) and socio-economic deprivation (health, income, employment data).
- [Natural England's Accessible Greenspace Standard](#) (AGS): size-proximity standards for access to greenspace by households in England (Table 1). There are associated criteria for capacity (at least 3 ha of accessible greenspace per 1000 population) and quality (greenspace should meet the Green Flag Award criteria and demonstrate best practice in accessibility for all).

**Table 1 Natural England's Accessible Greenspace Standards (AGS). All households should meet EITHER the Doorstep OR Local standard, as well as all of the standards for larger spaces.**

Name	Minimum size	Maximum distance	Maximum journey
Doorstep	0.5 ha	200 m	Under 5 min walk
Local	2 ha	300 m	5 min walk
Neighbourhood	10 ha	1 km	15 min walk
Wider Neighbourhood	20 ha	2 km	35 min walk
District	100 ha	5 km	15-20 min cycle
Sub-regional	500 ha	10 km	30-40 in cycle

- To illustrate the extent to which these standards are met, and visualise other elements of green infrastructure provision and equity, Natural England have produced a freely available, interactive mapping resource, the [Natural England Green Infrastructure map](#).
- The [Green Infrastructure Equity Index](#) (Heckert & Rosan, 2016), developed by US researchers using the city of Philadelphia as a case study. It combines



socioeconomic factors with environmental factors that can either be addressed by GI (e.g. proximity to traffic and associated noise and air pollution) or are a direct measure of the need for GI (e.g. access to parks).

We identified a need which is not covered by existing metrics and standards: a metric that brings together multiple elements of green infrastructure, including green space and tree canopy, as well as local environmental and socioeconomic needs, to support local councils in England to identify neighbourhoods with the highest green infrastructure inequity. Including multiple elements of green infrastructure means that we are taking into account green spaces that people visit, such as parks or nature reserves, as well as the general 'greenness' of an area, such as the tree canopy cover and the ratio of manmade to natural surfaces.

We present this novel methodology – the Assessment of Green Infrastructure Equity (AGIE) metric, a desk-based method using publicly available data – using Plymouth City Council and its administrative area as a case study.

## **The AGIE methodology (Assessment of Green Infrastructure Equity)**

### **Overview and purpose**

The aim was to produce a method that could assess green infrastructure equity using publicly available data sets, allowing councils across England to explore equity of access to green infrastructure in their own areas to support GI policy and delivery. The metric brings together the [Tree Equity Score](#) UK (Woodland Trust, 2023) with a set of metrics for identifying [greenspace-deprived neighbourhoods](#) developed by the University of Oxford (Crockatt et al., 2024). The Tree Equity Score was developed in the USA, and adapted for the UK by a partnership of American Forests, the Woodland Trust and the Centre for Sustainable Healthcare, to assess urban tree canopy cover and its benefits in relation to socio-economic status and climate resilience. The Oxford metrics assess equity of access to other (non-tree) GI elements (parks, gardens, footpaths, etc.), building on Natural England's existing national GI maps, to create a tool for use at the local authority level. Using these two systems as a base we have developed a suite of metrics that can support local authorities in considering, developing and integrating policies and strategies, such as Local Plans, climate change, green infrastructure and public health policies, that promote equitable access to the benefits of GI and target efforts and funding to areas with greatest GI inequity (see Discussion for more detailed potential uses of the AGIE methodology).

AGIE provides a desk-based assessment of GI equity that focuses largely on the physical presence (or absence) of greenspace and GI and does not take into account preferences of local communities, or greenspace characteristics. For example, access to greenspace goes beyond simply living within a certain distance of a space – there are a range of seen and unseen factors that can influence greenspace use. These

include factors such as whether a greenspace contains particular facilities (e.g. dog waste bins, benches, toilets), the standard and quality of the space (e.g. litter, maintenance of playground equipment or benches, attractiveness, nature-richness), suitability for people with different needs (e.g. accessible toilets, step-free access, play equipment for differently-abled children), and the “feel” of the space – whether people feel welcome and safe there. Community members have different lived experiences which may influence the type of greenspace in which they feel comfortable.

As such, the AGIE methodology should not be used in isolation, but as part of a decision-making process that includes organisations and individuals with local knowledge. The outputs are intended to be a starting point, rather than a standalone decision-making tool. Policies and actions to improve GI quantity, quality and use in identified areas should be developed in collaboration with local government officers and, crucially, with the local community (taking into account that some sectors of society find it harder to engage with public consultations; see Troiano et al., in review).

### Project team and stakeholder group

The project was carried out by University of Oxford in close collaboration with the Woodland Trust and Plymouth City Council.

In order to ensure that the AGIE methodology is useful and fit for purpose, we convened a stakeholder group of potential end users and those with relevant interest and experience. This included ten individuals representing local authorities, government organisations and charities / NGOs.

Stakeholders were recruited through professional contacts of the project team, with efforts made to recruit representatives of local authorities from beyond Plymouth and Oxford, where the majority of contacts were held. This was partially successful, with a representative of one local authority in the south-west outside Plymouth. However, other stakeholders regularly worked with a wide range of local authorities, so it was felt that diverse local authority voices were captured.

A summary of the project and what feedback we were looking for was circulated to stakeholders in advance of a two-hour online workshop, in which we asked for input on:

- Purpose and impact of the methodology: Does our purpose fit with stakeholder needs? Will this actually be useful? What are potential use cases? What would make it more useful / impactful?
- Component metrics: Are we including the right elements of green and blue infrastructure and socioeconomic indicators? Is there anything missing that should be included, or anything that could be excluded for simplicity?

- Using the methodology: Are the data sources as accessible as we think they are?  
Do organisations have the capacity and skills to run the methodology?

Stakeholder input influenced the component metrics used, provided ideas on potential uses and reinforced the importance of making the AGIE methodology as simple to use as possible.

### How the AGIE score is calculated

The overall AGIE score is derived from a suite of nine individual metrics (Table 2) which were selected by the project team to cover all the key aspects of green infrastructure equity including:

- Distribution of different types of green infrastructure
- Environmental need
- Socioeconomic need

Metrics were selected according to their use in assessing green infrastructure equity, data availability and data reliability. The selection process drew on published literature, the project team's experience and knowledge and substantial input from the stakeholder group.






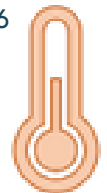



Data for the metrics was sourced from Natural England's Green Infrastructure dataset (Natural England, 2025b), and data freely downloadable from the Tree Equity Score and Defra websites.

The nine separate metrics were normalised and summed to provide a single overall score (the AGIE score), which is calculated for each neighbourhood (LSOA) relative to all neighbourhoods in the local authority area. This was done without any weighting, as there was no evidence for prioritising any one metric over the others.

Neighbourhoods in an area are ranked in four categories (quartiles) according to their AGIE score, from highest need to lowest need for improved GI equity. This single aggregated ranked score presents a simple way of identifying the neighbourhoods in greatest need, while exploring the nine component metrics can help understand why the neighbourhood is in that category, and what its needs may be.

Spreadsheet and GIS software were used in calculating the metrics and AGIE score, and for creating maps. Full details are available in the Methodology appendix, and we provide an accompanying spreadsheet containing worked examples and a list of data sources.

**Table 2 Green infrastructure metrics. Data sources: Defra = Defra's access to nature close to home dataset; NE GI = Natural England Green Infrastructure data; TES = Tree Equity Score, census = 2021 census data. Full details of metrics and data sources are available in the methodology appendix.**

		Green infrastructure metric	Rationale	Data source
Distribution of green infrastructure	1 	<b>Greenspace access</b> The number of homes which have accessible greenspace nearby*	Having greenspaces nearby makes them easier to visit	Defra
	2 	<b>Greenspace provision</b> The amount (m2) of accessible greenspace per person	More greenspace per capita means more of the benefits provided by greenspace, and less chance of overcrowding/overuse	NE GI
	3 	<b>Tree canopy cover</b> Percentage of the neighbourhood that is under tree canopy	There are proven links between tree canopy cover, health and wellbeing, plus cooling, shading, noise and air pollution mitigation	TES
	4 	<b>Manmade surfaces</b> Percentage of the neighbourhood that is manmade surfaces	A proxy for overall "greenness" of a neighbourhood; closely linked to flood reduction and cooling	NE GI
Environmental need	5 	<b>Air quality</b> A combined measure of small particulate matter and NO2 concentrations	Trees and greenspace help reduce air pollution – areas with poorer air quality have a greater need for GI	TES
	6 	<b>Heat disparity</b> How much a neighbourhood varies in heat extremes in relation to the local authority average	Trees and greenspace provide shading and cooling; warmer areas have a greater need for GI.	TES
Socioeconomic need	7 	<b>Indices of Multiple Deprivation rank</b> A neighbourhood's rank relative to England's 32,000 neighbourhoods; 1 is the most socioeconomically deprived	Communities experiencing greater socioeconomic deprivation receive greater health and wellbeing benefits from GI.	English Indices of Deprivation (2025)
	8 	<b>Age dependency ratio</b> Proportion of the population that is under 17 or over 64	Children and older people are more vulnerable, and have particular need of the benefits provided by GI	census
	9 	<b>Minoritised ethnicity</b> Proportion of the population that is of minoritized ethnicity	People of minoritized ethnicity can have poorer health outcomes and life chances, and therefore have greater need of GI benefits	census

\*Households that have a large green space (at least 10 ha) within a 15 min walk (1km) of their home, AND have a smaller greenspace nearby (either a space of at least 0.5 ha within 200 m (under 5 min walk) OR a green space of at least 2 ha within 300 m (5 min walk)). This is Defra's Partial-combined access to greenspace scenario.

### How this could be repeated in other areas in England

We intend to create and make available a dataset presenting the AGIE scores for all urban areas in England within the next year, but AGIE scores can also be generated for your own area of interest using the methodology document (Crockatt et al., 2025). All required data are freely available on public websites but users need access to and familiarity with GIS software and spreadsheets.

Unfortunately, not all of the required datasets are available for Northern Ireland, Scotland and Wales, so at present the AGIE methodology is applicable to England only.

Much of the data is also available only for urban areas; it is therefore not possible to conduct the full AGIE methodology for rural areas. As rural neighbourhoods often face different challenges in accessing greenspace and green infrastructure, it would be more appropriate to adapt the AGIE methodology for use in rural areas than to apply it partially and ineffectually to rural areas in its current form.

### Applying the AGIE methodology to Plymouth

#### The Plymouth case study area

Plymouth City Council is a unitary authority in Devon with a population of 264,700 (Office for National Statistics, 2022). It is a coastal city with strong industrial heritage and an important international port and naval dockyard. The city was rebuilt and expanded in the post-war decades after being badly damaged during the 1940's – this has implications for the layout and design of the city's infrastructure today. There are high levels of socio-economic deprivation in some areas of the city, but with an emerging ambitious growth agenda linked to the dockyard and a new town within the City Centre. The city has a Joint Local Plan (with neighbouring local authorities) and a Plymouth Plan, both approved in 2019. They include as part of their vision for the city that "the natural environment is fully considered and embedded in the delivery of the city's vision for growth" and that "The city will ensure the health and wellbeing benefits of Plymouth's natural environment will be optimised". These city-wide strategies are supported by a newly adopted strategic delivery plan – Plymouth Plan for Nature and People (Plymouth City Council, 2025) - which sets out more detailed GI targets, outcomes and actions such as:

- Greater equity of natural spaces, in terms of tree cover and access to natural spaces, with an aspirational target for all residents to live within 400 m of an accessible natural space.
- Identifying a prioritised pipeline of natural space improvements, linked to funding, to deliver greater equity of access to natural space.



- Sustaining and growing partnership programmes such as Plymouth Sound National Marine Park and Plymouth and South Devon Community Forest, to enable the city's natural environment to have a positive impact for communities and the economy of the city.

### Key AGIE findings for Plymouth

Within the city there are 29 square km of green and blue space, representing 37% of the total area (Figure 1). Of this green and blue space, 30% (869 ha / 8.7 sq km) is publicly accessible, i.e. open to the general public without payment (Figure 2; numbers from Natural England Green Infrastructure dataset)[1]. This equates to a mean of 30 m<sup>2</sup> per person, ranging from 0 to 653 m<sup>2</sup> per person in different neighbourhoods (LSOAs) across the city (Metric 2). Plymouth has a tree canopy cover of 17-18% (Rogers & Handley, 2017; Tree Equity Score, 2024), which is typical of urban areas in England (mean canopy cover from TES data is 17.4%). However, canopy cover ranges from 3.8% to 48.1% in different Plymouth neighbourhoods (Metric 3) (Figure 3). Plymouth has a high proportion of socioeconomic deprivation: 42 of Plymouth's 164 neighbourhoods are among England's 20% most deprived neighbourhoods (ONS, 2025; Figure 4; Metric 7); these areas are primarily in the south- and north-west of the city, with less deprived areas in the east.

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[2] These numbers differ to some extent from those presented by Plymouth City Council in relevant policy. Further details and a discussion of implications is presented in Appendix 10.



Figure 1 Green and blue infrastructure within Plymouth City Council area.

This includes both publicly accessible features, i.e. Accessible Greenspace, and private or inaccessible features. It does not include all green infrastructure – smaller areas such as verges and areas that are likely to be of mixed surfaces, such residential gardens, are not included. Based on Natural England's Green and Blue Infrastructure data © Natural England 2025. Contains OS data © Crown copyright and database rights 2025. Contains, or is based on, information supplied by the Forestry Commission 2025.



Figure 2 Accessible greenspace within Plymouth City Council area (used for Metric 2). Based on data from Natural England's Green and Blue Infrastructure data © Natural England 2025. Contains OS data © Crown copyright and database rights 2025. Contains, or is based on, information supplied by the Forestry Commission 2025.





0 0.5 1 2 Kilometers

### Percent tree canopy cover

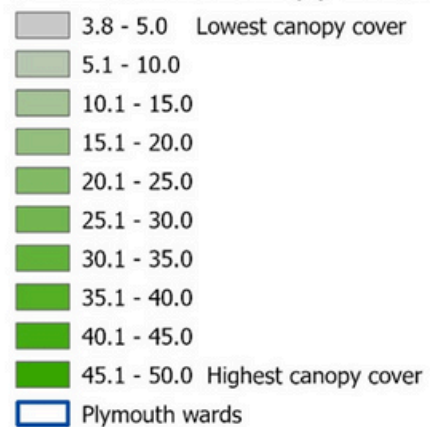


Figure 3 Neighbourhood tree canopy cover across Plymouth (Metric 3).  
Canopy cover data obtained from the Tree Equity Score.

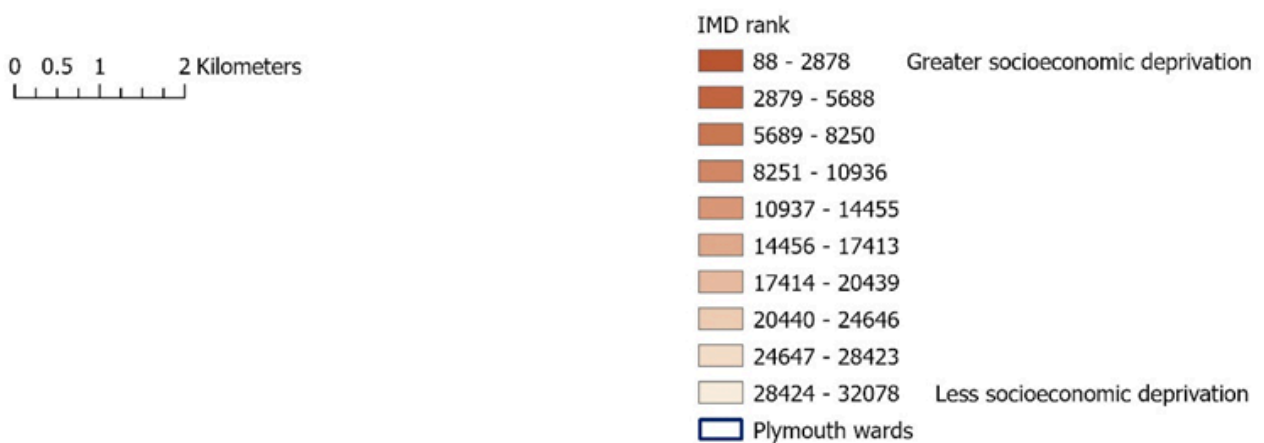
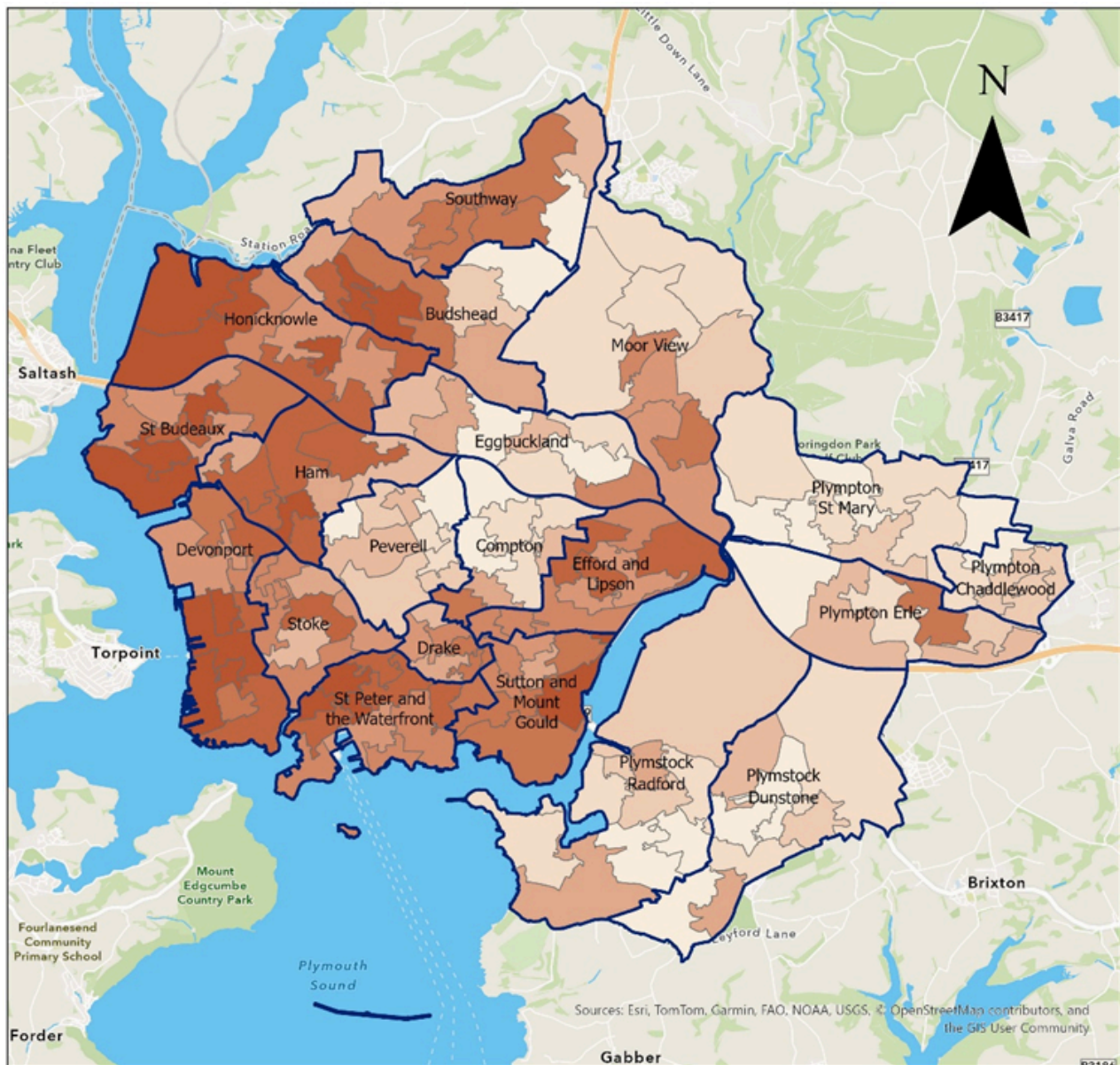
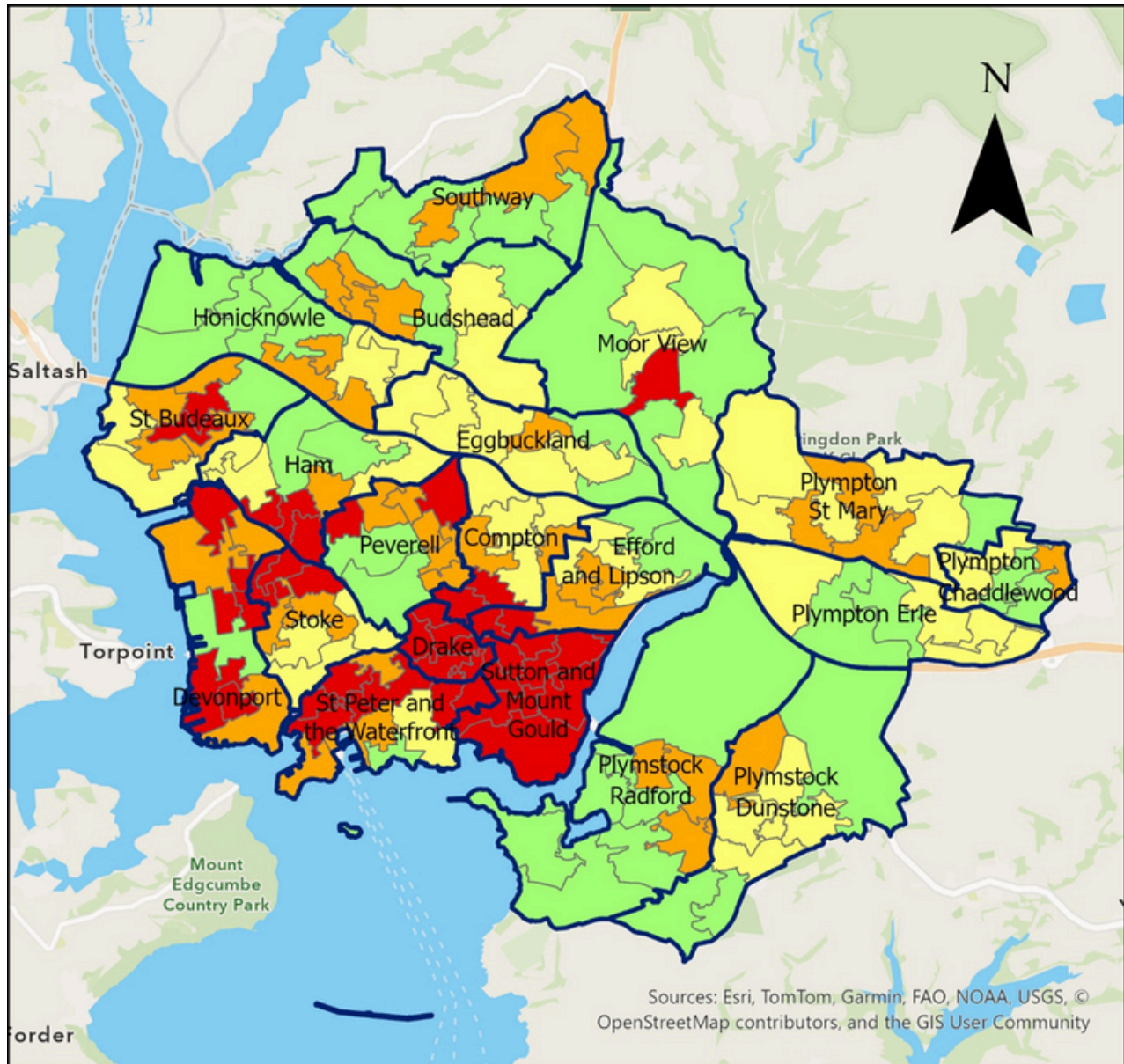


Figure 4 Neighbourhood socioeconomic status in Plymouth. Neighbourhoods with lower IMD rank have greater socioeconomic deprivation relative to all of England(Metric 7).  
Based on IMD 2025 data (MHCLG, 2025)



Highest priority neighbourhoods, i.e. those with the top 25% of AGIE scores and lowest GI equity, are all in the south west of the city (Figure 5), with clusters within the wards of Drake, Devonport, St Peter and the Waterfront, Stoke, and Sutton and Mount Gould. Low priority neighbourhoods are found more in the east and north of the city than the west, including in the wards of Moorview, Plymstock Radford, Plymstock Dunstone and Plympton.



0 0.5 1 2 Kilometers

AGIE priority category

- Highest
- High
- Moderate
- Low
- Plymouth wards

Figure 5 Neighbourhood AGIE scores across Plymouth.

There are striking differences in green infrastructure provision and environmental factors between neighbourhoods in the low and highest priority categories. On average the highest priority category neighbourhoods have (Table 3; Figure 6):

- less than a tenth of the accessible greenspace per person compared to the low priority neighbourhoods;
- less than half the canopy cover of low priority neighbourhoods;
- more than double the percentage of manmade surfaces compared to low priority neighbourhoods;
- temperature extremes of over 3 °C greater than the low priority neighbourhoods

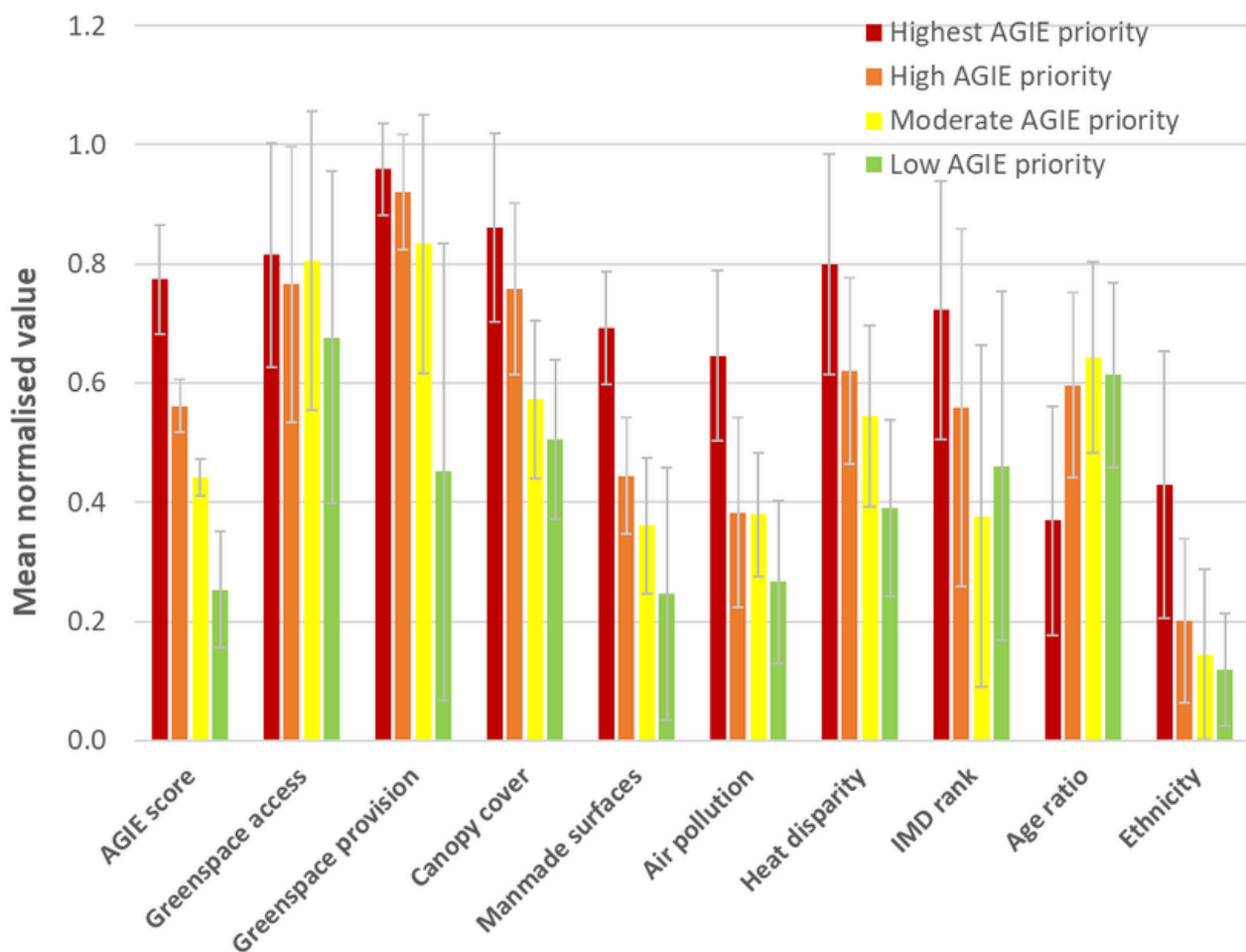


Figure 6 Mean normalised values of green infrastructure metrics by priority category. Normalised values have been reversed as appropriate so that for all metrics a higher value equates to greater need. Error bars are standard deviations.

**Table 3 Mean values for green infrastructure metrics by priority category (quartiles of AGIE score).**

	Priority category mean ( $\pm$ standard deviation)				All neighbourhoods Min – max; mean
	Highest	High	Moderate	Low	
AGS access % of households	17.7 ( $\pm$ 18.2)	22.5 ( $\pm$ 22.1)	18.9 ( $\pm$ 24.3)	31.1 ( $\pm$ 26.9)	0.0 – 96.4; 22.6
AGS provision m2 per person	4.1 ( $\pm$ 7.7)	7.9 ( $\pm$ 9.7)	16.8 ( $\pm$ 22.1)	89.6( $\pm$ 119)	0.0 – 653.0; 29.6
Canopy cover %	9.5 ( $\pm$ 11.4)	15.9 ( $\pm$ 9.5)	22.1 ( $\pm$ 9.6)	25.9 ( $\pm$ 9.8)	3.8-48.5; 18.4
Manmade surfaces %	64.4 ( $\pm$ 3.7)	45.9 ( $\pm$ 4.7)	39.0 ( $\pm$ 5.7)	31.2 ( $\pm$ 9.4)	13.2 – 86.5; 45.2
Heat disparity oC	2.5 ( $\pm$ 1.5)	0.9 ( $\pm$ 1.5)	0.1 ( $\pm$ 1.1)	-1.3 ( $\pm$ 1.3)	-5.1 – 4.5; 0.57
Air pollution	0.35 ( $\pm$ 0.0)	0.29 ( $\pm$ 0.0)	0.28 ( $\pm$ 0.0)	0.26 ( $\pm$ 0.0)	00.19 – 0.44; 0.30
IMD rank	8,958 ( $\pm$ 6,934)	14,194 ( $\pm$ 9,618)	20,017 ( $\pm$ 9,154)	17,338 ( $\pm$ 9,379)	88 – 32078; 15,128
Age dependency ratio	0.46 ( $\pm$ 0.20)	0.69 ( $\pm$ 0.16)	0.74 ( $\pm$ 0.16)	0.71 ( $\pm$ 0.16)	0.08 – 1.11; 0.65
Minoritised ethnicity % of population	10.3 ( $\pm$ 5.1)	5.7 ( $\pm$ 3.0)	4.0 ( $\pm$ 3.0)	3.6 ( $\pm$ 2.1)	1.0 – 23.0; 5.9

Neighbourhoods, the scale at which data are presented, are defined by population numbers rather than area of land, all neighbourhoods having a roughly similar number of households. This can cause misleading interpretation of mapped data. For example, in Figure 5 there is a much greater area of land in the low than the highest priority category, but the population density in those areas is lower. Similarly, the higher population density in previously industrial areas leads to neighbourhoods being smaller in those areas, so there are actually similar number of households across both categories. We therefore present the number of people living in each priority category by ward (Figure 7), which indicates where taking action on GI would support the greatest number of people who currently have lowest GI equity.

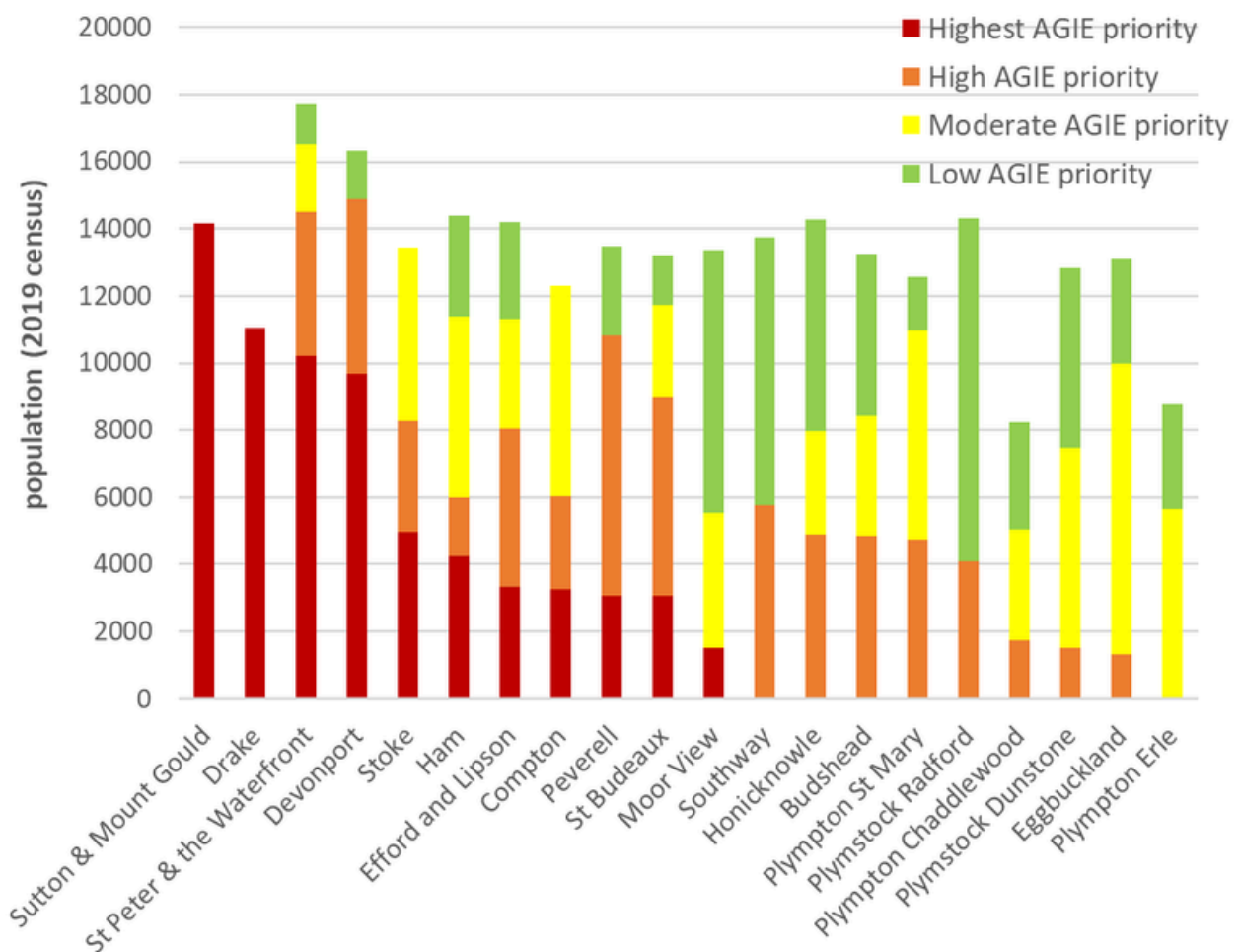


Figure 7 Population living in AGIE priority category neighbourhoods by ward

#### Focal wards

The wards of St Peter and the Waterfront (SPW), Devonport (DP), Drake, and Sutton and Mount Gould (SMG) have the most people living in highest-priority neighbourhoods, so PCC requested more detailed analysis of these four focal wards, which include 26 of the 41 highest priority neighbourhoods (Figure 5; Figure 7). This clustering of neighbourhoods with low GI equity means that there is less potential for deficiencies in one neighbourhood to be offset by GI in adjacent neighbourhoods, but also that there is potential to support multiple communities through single projects.

Green Infrastructure provision in the focal wards was characterised as follows:

- Notable areas of accessible greenspace include Devonport Park, Hoe Park and Tothill Park (Figure 1; Figure 2).
- Access to greenspace and provision of greenspace of neighbourhoods varies across wards, according to proximity to AGS, and whether the AGS falls within the boundary of the neighbourhood (Appendices 1 and 2).
- In contrast to the north and east of the city, there is a lack of woodland and nature reserves in these wards (Figure 1; Figure 2).
- The wards are characterised by low tree canopy cover (Figure 3), and a high percentage of manmade surfaces (Appendix 3).

Environmental factors:

- Neighbourhoods with the greatest air pollution index are in SMG, around Astor Park, and DP (Appendix 4). Some neighbourhoods on the south coast have much lower air pollution.
- Neighbourhoods along the coastal margin are cooler than the Plymouth average, but those further inland have the greatest heat disparity, being up to 3 °C warmer on average than adjacent neighbourhoods that have large areas of greenspace (Appendix 5).

Demography:

- All neighbourhoods in these focal wards are in IMD decile 5 or lower, i.e. they are all in the 50% most deprived neighbourhoods in England (Figure 4). Seven of Devonport's 10 neighbourhoods are in IMD decile 1, i.e. in the 10% most deprived neighbourhoods in England, and all but one of SPW's 11 neighbourhoods are in the 20% most deprived neighbourhoods in England.
- The Age dependency ratio is low in these wards compared to the rest of Plymouth (Appendix 6), indicating a relatively high proportion of the population being of working age (16-64 inclusive), i.e. these wards have lower populations of more vulnerable children and older people.
- A relatively high proportion of the population across the four wards are of minoritised ethnicity, compared to the rest of Plymouth (Appendix 7). The neighbourhoods with the highest minoritised ethnicity populations in Plymouth occur exclusively in these four wards, in a cluster across around Drake, SPW and SMG.



## Discussion

The AGIE methodology shows clear disparities between different parts of Plymouth, highlighting parts of the city in which planning and action can be prioritised to address inequity in green infrastructure provision. How such findings are applied defines the value of the AGIE methodology. The following points describe how Plymouth City Council envisage using these findings, thus illustrating potential applications of the AGIE methodology.

### How could Plymouth City Council use these findings?

- The findings broadly represent and back up the pre-existing approaches to prioritisation of activity and interventions in natural spaces and the programmes around this. They align well with Plymouth's pre-existing delivery plans and strategies such as Plymouth's Plan for People and Nature.
- The four focal wards are those with the greatest level of pre-existing interventions. The findings from the AGIE metric back this up and provide further justification for interventions in these areas.
  - Importantly, this framework gives PCC a stronger evidencable approach to identify specific intervention requirements, e.g. differentiating between street tree planting or providing access to neighbourhood green spaces, dependent on the needs of neighbourhoods and the ability to co-design these programmes with communities.
  - The findings provide a robust tool for PCC to be able to monitor and report on the impact of interventions. Further, AGIE provides a framework to enable PCC to build an evidencable investment prospectus and work with investors and funders to deliver socially and environmentally impactful projects.
- PCC will be able to use this report and its findings to pro-actively work with colleagues and partners across sectors to evidence and build work programmes that address the equity issues highlighted by this report. This methodology will also be useful when reviewing the evidence base updates required for PCC's next local plan up to 2028.
- PCC need to build on this with the recognition and development of methodology to incorporate accessible blue spaces as key assets for the city.
- PCC will also be able to feed this into work they are collaborating on at a national level through the Nature Towns and Cities programme and work with Natural England on continued development of their GI mapping.

Many of these anticipated use cases will take time to be realised, but there is precedent for use of similar metrics in local policy: Oxfordshire County Council are including urban priority neighbourhoods within their Local Nature Recovery Plan mapping informed by the assessment of greenspace deprivation in Oxfordshire on which the AGIE methodology was based (Crockatt et al., 2024).

### How else could the AGIE methodology be used?

We suggest a number of ways in which the AGIE methodology could be used by actors in different situations (Table 4); these ideas were developed based on discussions with the stakeholder group.

**Table 4 Potential uses of the AGIE methodology, informed by the stakeholder group**

User group	Uses
Local authorities	<ul style="list-style-type: none"><li>• Supporting policy development (green equity, climate, health, planning) as a part of a broader evidence base</li><li>• Targeting or prioritising investment and interventions around climate resilience, green equity and public health</li><li>• Local authority baseline comparisons</li><li>• Help to justify investment in green infrastructure</li></ul>
Other local actors	<ul style="list-style-type: none"><li>• Community advocacy and funding bids</li><li>• Other organisations such as environmental, community or health charities may find the information valuable</li></ul>
Other	<ul style="list-style-type: none"><li>• For any actors, being able to quantify green infrastructure inequity makes the issues measurable and actionable</li><li>• The methodology turns national datasets into locally actionable insights</li><li>• Researchers can use the metric to explore patterns of GI inequity in relation to socioeconomic and demographic factors</li></ul>

### Limitations and caveats of the AGIE methodology

We recognise that there are a number of limitations in the AGIE methodology in its current form. Some limitations are inherent within the methodology, others are specific to Plymouth, especially those around inclusion of blue space.

- Green infrastructure and accessible greenspace data are based on Natural England's national dataset – there may be features missing, or wrongly categorised which can skew findings (see examples from Plymouth in Appendix 10). The Natural England data draws from the Ordnance Survey (OS) mapping which in Plymouth we know has some anomalies and gives some false representations about some natural spaces. PCC plan to update this database with OS in the coming years to ensure that this source data is as accurate as possible for Plymouth. This could serve as a template for other locales contributing data to OS.

- Blue space, an important component in delivery of health and wellbeing and environmental benefits of green infrastructure, is not currently included in the AGIE metric. Careful consideration was put into incorporating blue space into the AGIE metric, but due to time constraints, data availability and more challenging methodologies the decision was taken to keep blue space out of scope in this iteration. The absence of blue space within the metric is significant in the context of Plymouth as a coastal city; Plymouth's coastline, estuaries and water bodies such as the Hoe, Sutton Harbour and the estuaries have major impacts on the city in terms of recreation, mental health benefits, cooling, air quality, biodiversity opportunities and flood mitigation. In some built up areas such as Devonport, access to the waterfront can have similar benefits to access to greenspace. We recognise the limitations this places on the present study, although it is interesting to note that even without the inclusion of blue space, the focal wards identified by the AGIE metric agreed with PCC's existing priorities for supporting green infrastructure provision and access.
- Land with permissive access owned by the National Trust and Wildlife Trusts is not included in Defra's assessment of access to greenspace, i.e. is not taken into account in our AGS access metric. However, we were able to include it in the AGS provision, which leads to the two AGS metrics being based on slightly different datasets. (The only land that falls into this category in Plymouth is an area of permissive National Trust woodland in Moor View ward, meaning that access to greenspace is under-estimated in adjacent neighbourhoods.)
- Because the AGIE score has nine equally weighted components, it may be that some neighbourhoods in the highest priority category have, according to some measures, good green infrastructure provision, e.g. being adjacent to a large park, or having high canopy cover. It is therefore important to use the AGIE score as a starting point for further investigation and consideration, taking into account the individual components of the AGIE metric, as well as the actual situation on the ground – there is no single correct set of actions to take in a neighbourhood that is in the highest priority category.
- Also, neighbourhoods in the low priority category may actually require further green infrastructure support e.g. a neighbourhood that is socioeconomically affluent and has a low percentage of manmade surfaces may lack children's play areas.
- We have not included measures of AGS quality or characteristics, e.g. the naturalness of a space, provision of facilities such as toilets or benches, or opportunities for open views such as of the coast. It is important to consider the opportunities and benefits provided by different types of AGS, e.g. sports pitches allow physical exercise and will contribute to local cooling; a nature reserve is more likely to provide opportunities for nature connection. There are options for including some measure of this within Natural England's Green Infrastructure dataset, but it was felt that further consideration was required before including any one of these.

## Next steps for the AGIE methodology

In the near term:

- Explore how to include blue space, footpaths and some element of “naturalness”. (It is likely that Defra’s Access to blue space in England dataset (Defra, 2025b) will be used.)
- Generate AGIE scores for urban areas across England.
- Explore potential for collaborating with other organisations to continue developing AGIE, and potential real-world applications of the metric.
- Collaborate with Ordnance Survey to update mapping at city scale.
- In the longer term:
  - Enable customisable thresholds for local authorities, e.g. setting a minimum amount of greenspace per person, or targets for canopy cover.
  - Enable end users to correct errors in, or update mapped data, e.g. adding AGS that are missing from the data or have been newly created.

## Conclusions

We have presented the AGIE methodology, which is intended to support local authorities and other interested organisations in exploring green infrastructure equity in urban areas of England. The methodology is timely, given recent and proposed national policy developments. Unlike other similar methodologies, we assess a wide range of green infrastructure, including both accessible greenspace and tree canopy cover, as well as environmental and demographic measures which quantify the relative need of a neighbourhood for green infrastructure equity.

The case study of Plymouth provides a real-world example of how the metric can inform local authority policy and practise. It is important to remember that AGIE is a starting point in GI equity considerations – a desk-based exercise which should be interpreted through the lens of local knowledge. In Plymouth, local knowledge is particularly important for considering access to blue space, given the significance of the coastline and estuaries within the city.

In the process of applying the analysis to Plymouth and through working with the stakeholder group we have discovered important ways to develop the methodology further so that it can be valuable to more local authorities, and other interested organisations, in assessing GI equity. We welcome comments and feedback, which should be addressed to: [martha.crockatt@ouce.ox.ac.uk](mailto:martha.crockatt@ouce.ox.ac.uk), or [treeequity@woodlandtrust.org.uk](mailto:treeequity@woodlandtrust.org.uk)

## References

- Choi, C., Berry, P., & Smith, A. (2021). The climate benefits, co-benefits, and trade-offs of green infrastructure: A systematic literature review. *Journal of Environmental Management*, 291, 112583.  
<https://doi.org/10.1016/J.JENVMAN.2021.112583>
- Crockatt, M., Burrow, C., Gent, J., Hirons, M., McDermott, C., Rowe, R., Smith, A., & Whitney, M. (2024). *Oxfordshire's greenspace-deprived neighbourhoods*. Oxfordshire County Council.  
<https://naturerecovery.ox.ac.uk/news/oxfordshires-green-space-deprived-neighbourhoods/>
- Defra. (2023). *Biodiversity net gain*.  
<https://www.gov.uk/government/collections/biodiversity-net-gain> Accessed July 2025.
- Defra. (2024). Policy Paper: *The Nature Recovery Network*.  
<https://www.gov.uk/government/publications/nature-recovery-network>. Accessed July 2025.
- Defra. (2025a) Nation to benefit from two new national forests backed by £1 billion investment in tree planting. <https://www.gov.uk/government/news/nation-to-benefit-from-two-new-national-forests-backed-by-1-billion-investment-in-tree-planting>. Accessed 3/12/2025
- Defra. (2025b) data set: Access to blue space in England.  
<https://www.gov.uk/government/statistics/access-to-blue-space-in-england>. Accessed October 2025.
- Ferguson, M., Roberts, H. E., McEachan, R. R. C., & Dallimer, M. (2018). Contrasting distributions of urban green infrastructure across social and ethno-racial groups. *Landscape and Urban Planning*, 175, 136–148.  
<https://doi.org/10.1016/J.LANDURBPLAN.2018.03.020>
- Fields in Trust. (2025). *Green Space Index*. <https://fieldsintrust.org/insights/green-space-index>. Accessed July 2025
- Grace, M., Smith, A., Mell, I., Houghton, J., & Neal, P. (2025). A menu of standards for green infrastructure in England: Effective and equitable or a race to the bottom? *Frontiers in Environmental Science*, 12.  
<https://doi.org/10.3389/fenvs.2024.1456519>

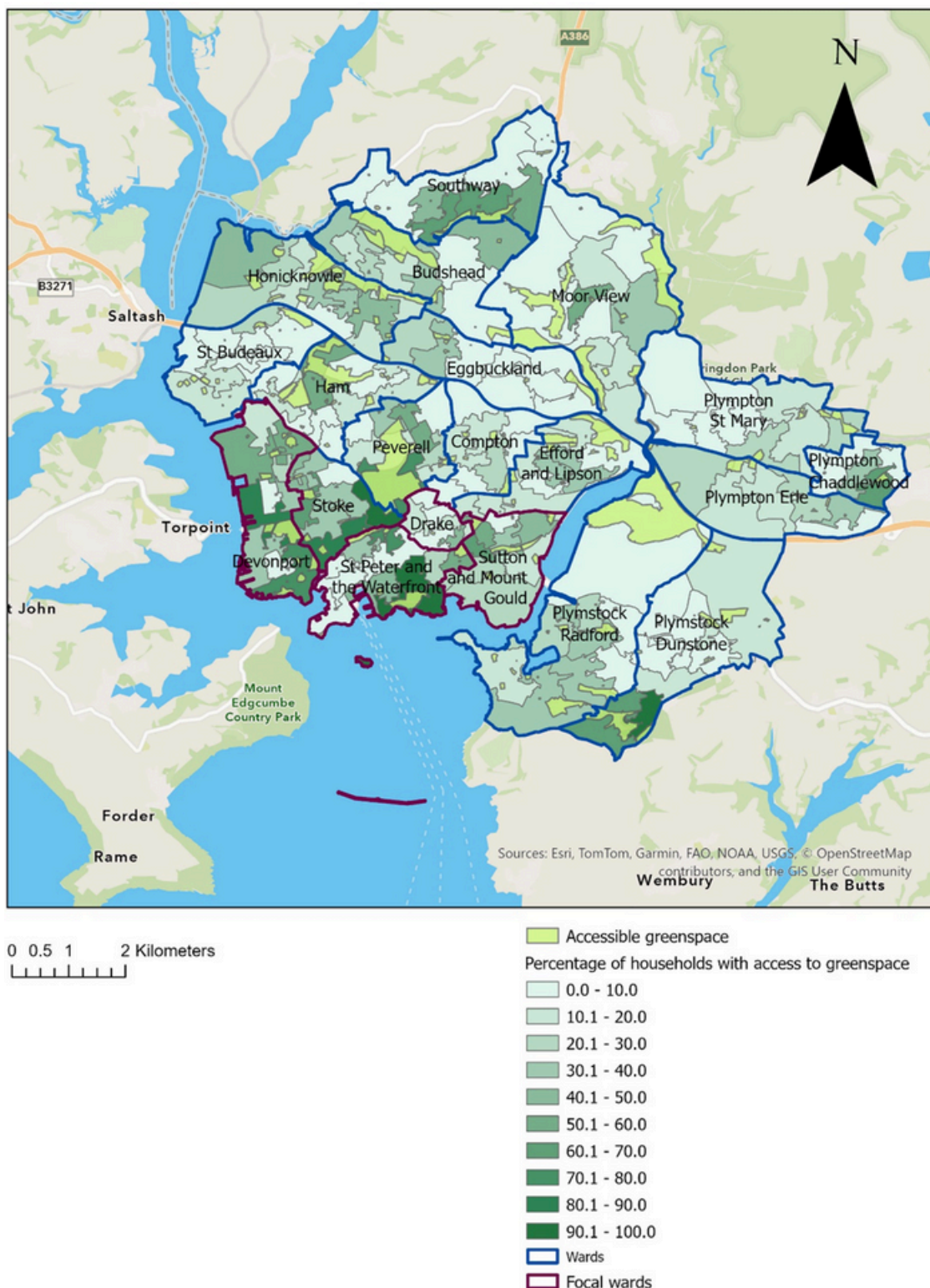
- Heckert, M., & Rosan, C. D. (2016). Developing a green infrastructure equity index to promote equity planning. *Urban Forestry & Urban Greening*, 19, 263–270. <https://doi.org/10.1016/J.UFUG.2015.12.011>
- Jones, A., Hillsdon, M., & Coombes, E. (2009). Greenspace access, use, and physical activity: Understanding the effects of area deprivation. *Preventive Medicine*, 49(6), 500–505. <https://doi.org/10.1016/J.YPMED.2009.10.012>
- Konijnendijk, C. C. (2023). Evidence-based guidelines for greener, healthier, more resilient neighbourhoods: Introducing the 3–30–300 rule. *Journal of Forestry Research*, 34(3), 821–830. <https://doi.org/10.1007/s11676-022-01523-z>
- Lamont, R. A., & Hinson, C. (2024). A narrative review of reviews of nature exposure and human health and well-being in the UK. NEER030. In 2024. <https://publications.naturalengland.org.uk/publication/5939107801595904>
- Lombardía, A., & Gómez-Villarino, M. T. (2023). Green infrastructure in cities for the achievement of the un sustainable development goals: a systematic review. *Urban Ecosystems* 2023 26:6, 26(6), 1693–1707. <https://doi.org/10.1007/S11252-023-01401-4>
- McDougall, C. W., Hanley, N., Quilliam, R. S., & Oliver, D. M. (2022). Blue space exposure, health and well-being: Does freshwater type matter? *Landscape and Urban Planning*, 224, 104446. <https://doi.org/10.1016/J.LANDURBPLAN.2022.104446>
- MHCLG, Ministry of Housing, Communities and Local Government (2024) Housing targets increased to get Britain building again. <https://www.gov.uk/government/news/housing-targets-increased-to-get-britain-building-again>. Accessed 3/12/2025.
- MHCLG, Ministry of Housing, Communities and Local Government (2025). English Indices of Deprivation 2025. <https://www.gov.uk/government/statistics/english-indices-of-deprivation-2025>
- Natural England. (2025a). *Green Infrastructure Framework*. <https://designatedsites.naturalengland.org.uk/GreenInfrastructure/Home.aspx>. Accessed October 2025.



- Natural England. (2025b). Dataset: Green and Blue Infrastructure (England). <https://www.data.gov.uk/dataset/f335ab3a-f670-467f-bedd-80bdd8f1ace6/green-and-blue-infrastructure-england>. Accessed June 2025.
- Office for National Statistics. (2022). *Plymouth population Census 2021*. <https://www.ons.gov.uk/visualisations/censuspopulationchange/E06000026/>. Accessed July 2025.
- Plymouth City Council, 2025. Plymouth plan for people and nature 2025-2030. <https://www.plymouth.gov.uk/sites/default/files/2025-11/Plan-for-nature-and-people.pdf>
- Rigolon, A., Browning, M. H. E. M., McAnirlin, O., & Yoon, H. (2021). Green Space and Health Equity: A Systematic Review on the Potential of Green Space to Reduce Health Disparities. *International Journal of Environmental Research and Public Health*, 18(5), 1–29. <https://doi.org/10.3390/IJERPH18052563>
- Rogers, K., & Handley, P. (2017). *Plymouth Policy Area Tree Canopy Cover Assessment*. <https://www.treeconomics.co.uk/wp-content/uploads/2018/08/Plymouth-Canopy-Report.pdf> Accessed 4/12/2025.
- Sicard, P., Pascu, I. S., Petrea, S., Leca, S., Marco, A. de, Paoletti, E., Agathokleous, E., & Calatayud, V. (2025). Effect of tree canopy cover on air pollution-related mortality in European cities: an integrated approach. *The Lancet Planetary Health*, 9(6), e527–e537. [https://doi.org/10.1016/S2542-5196\(25\)00112-3](https://doi.org/10.1016/S2542-5196(25)00112-3)
- Smith, N., Georgiou, M., King, A. C., Tieges, Z., Webb, S., & Chastin, S. (2021). Urban blue spaces and human health: A systematic review and meta-analysis of quantitative studies. *Cities*, 119, 103413. <https://doi.org/10.1016/J.CITIES.2021.103413>
- Statistical Digest of Rural England*. (2022). [www.nationalarchives.gov.uk/doc/open-government-licence/version/3/oremailPSI@nationalarchives.gsi.gov.uk](http://www.nationalarchives.gov.uk/doc/open-government-licence/version/3/oremailPSI@nationalarchives.gsi.gov.uk)
- The Health Foundation (2024). *Indicator: Inequalities in access to green space*. <https://www.health.org.uk/evidence-hub/surroundings/inequalities-in-access-to-green-space> Accessed 1/8/2025.

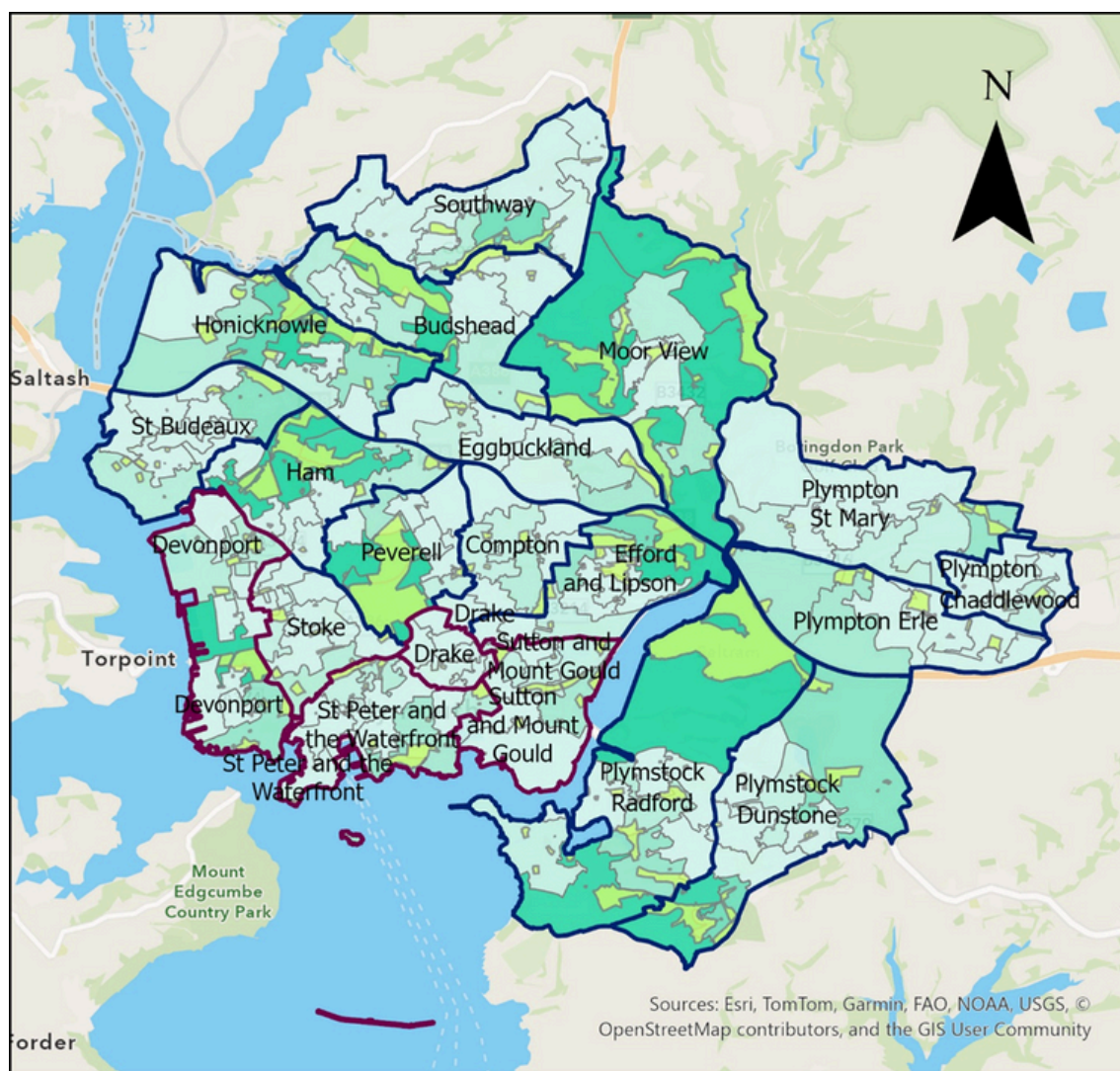
- Troiano, M., Crockatt, M.E., Hirons, M. In review. Equity in urban green space access and governance: the critical importance of recognitional equity. *Landscape and Urban Planning*.
- Twohig-Bennett, C., & Jones, A. (2018). The health benefits of the great outdoors: A systematic review and meta-analysis of greenspace exposure and health outcomes. *Environmental Research*, 166, 628–637. <https://doi.org/10.1016/J.ENVRES.2018.06.030>
- UNECE. (2021). *Sustainable Urban and Peri-urban Forestry - An Integrative and Inclusive Nature-Based Solution for Green Recovery and Sustainable, Healthy and Resilient Cities* . <https://unece.org/forestry-timber/documents/2023/02/informal-documents/policy-brief-sustainable-urban-and-peri-urban>
- Wheeler, B. W., White, M., Stahl-Timmins, W., & Depledge, M. H. (2012). Does living by the coast improve health and wellbeing? *Health & Place*, 18(5), 1198–1201. *Plymouth City Council, 2025. Plymouth plan for people and nature 2025-2030.* <https://www.plymouth.gov.uk/sites/default/files/2025-11/Plan-for-nature-and-people.pdf>
- White, M. P., Alcock, I., Wheeler, B. W., & Depledge, M. H. (2013). Coastal proximity, health and well-being: Results from a longitudinal panel survey. *Health & Place*, 23, 97–103. <https://doi.org/10.1016/J.HEALTHPLACE.2013.05.006>
- Woodland Trust. (2023). Tree Equity Score UK. <https://uk.treeequityscore.org/> Accessed July 2025.

## Appendices



### Appendix 1. Metric 1: Household access to greenspace.

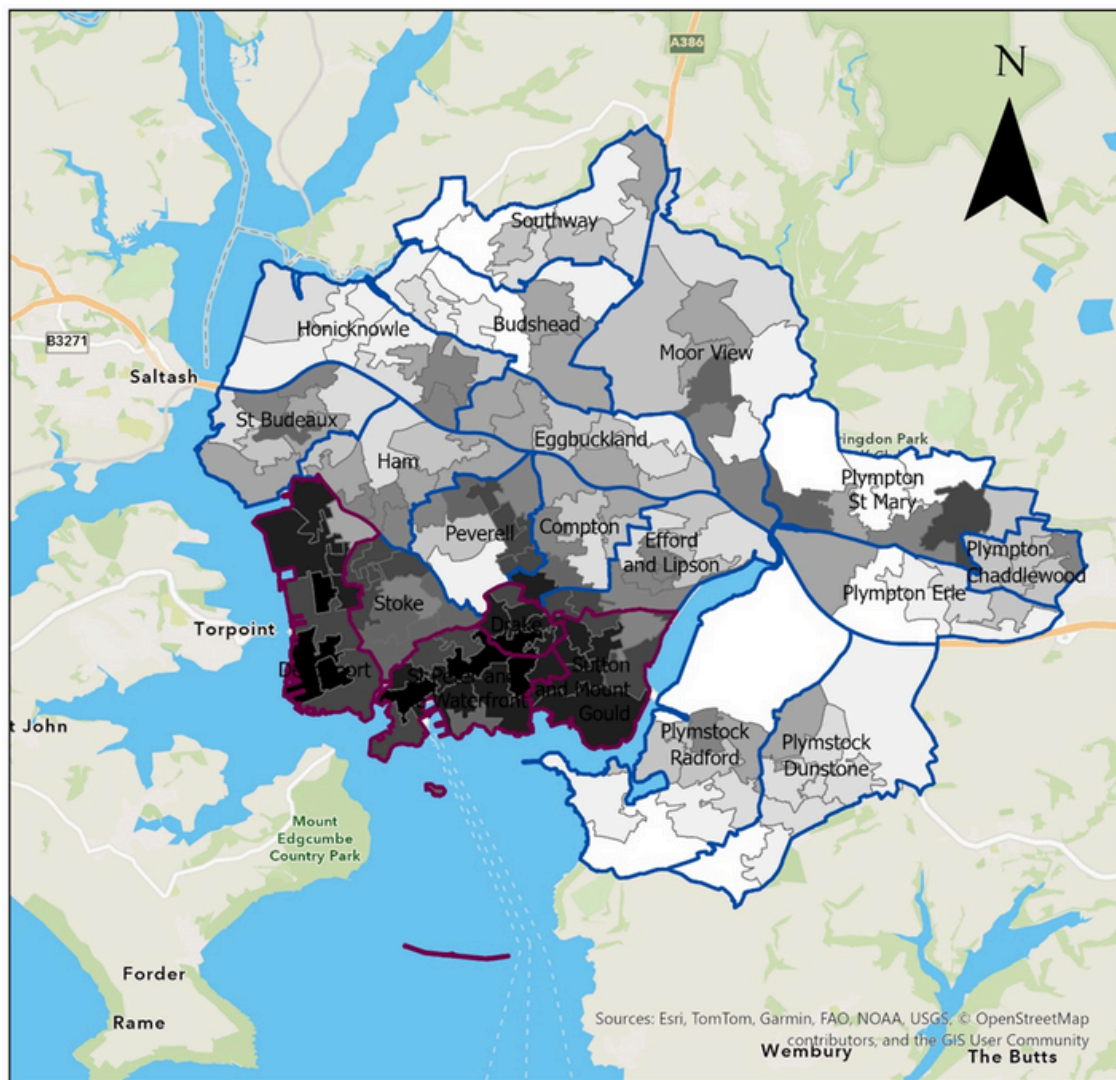
Based on Defra's Access to Greenspace in England: contains OS data - © Crown copyright and database rights [2023] OS [AC0000805307] © Improvement and Development Agency for Local Government copyright and database rights [2023]



## Appendix 2. Metric 2: Accessible greenspace Provision.

Based on Natural England's Green Infrastructure data V2.2: © Natural England 2025. Contains OS data © Crown copyright and database rights 2025. Contains, or is based on, information supplied by the Forestry Commission 2025. Contains data supplied by National Trust; © Natural England

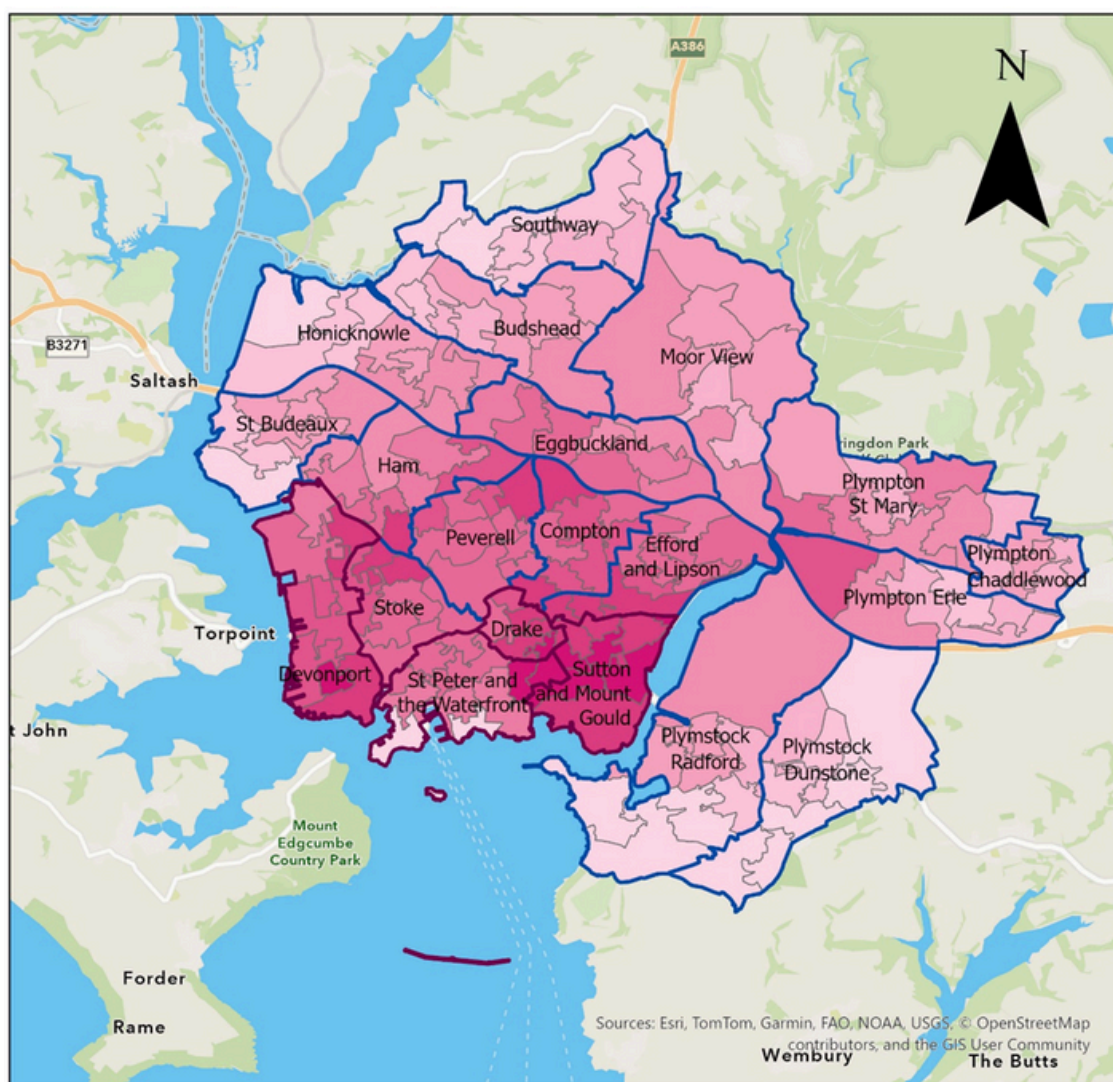




### Appendix 3. Metric 4: Percentage Manmade surfaces.

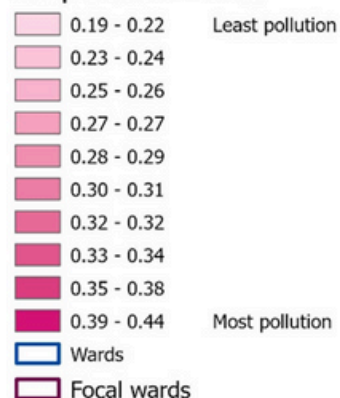
Based on Natural England's Green Infrastructure data V2.2: contains data supplied by Ordnance Survey; © Natural England





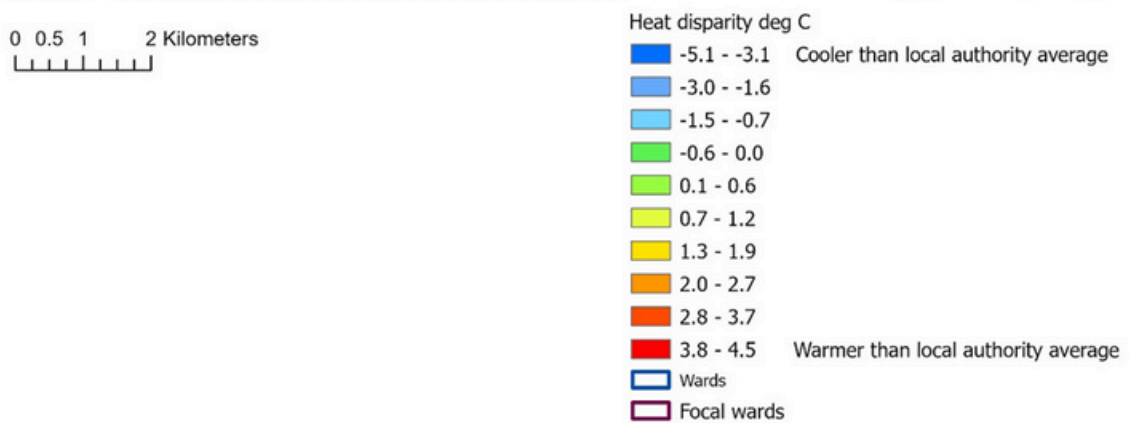
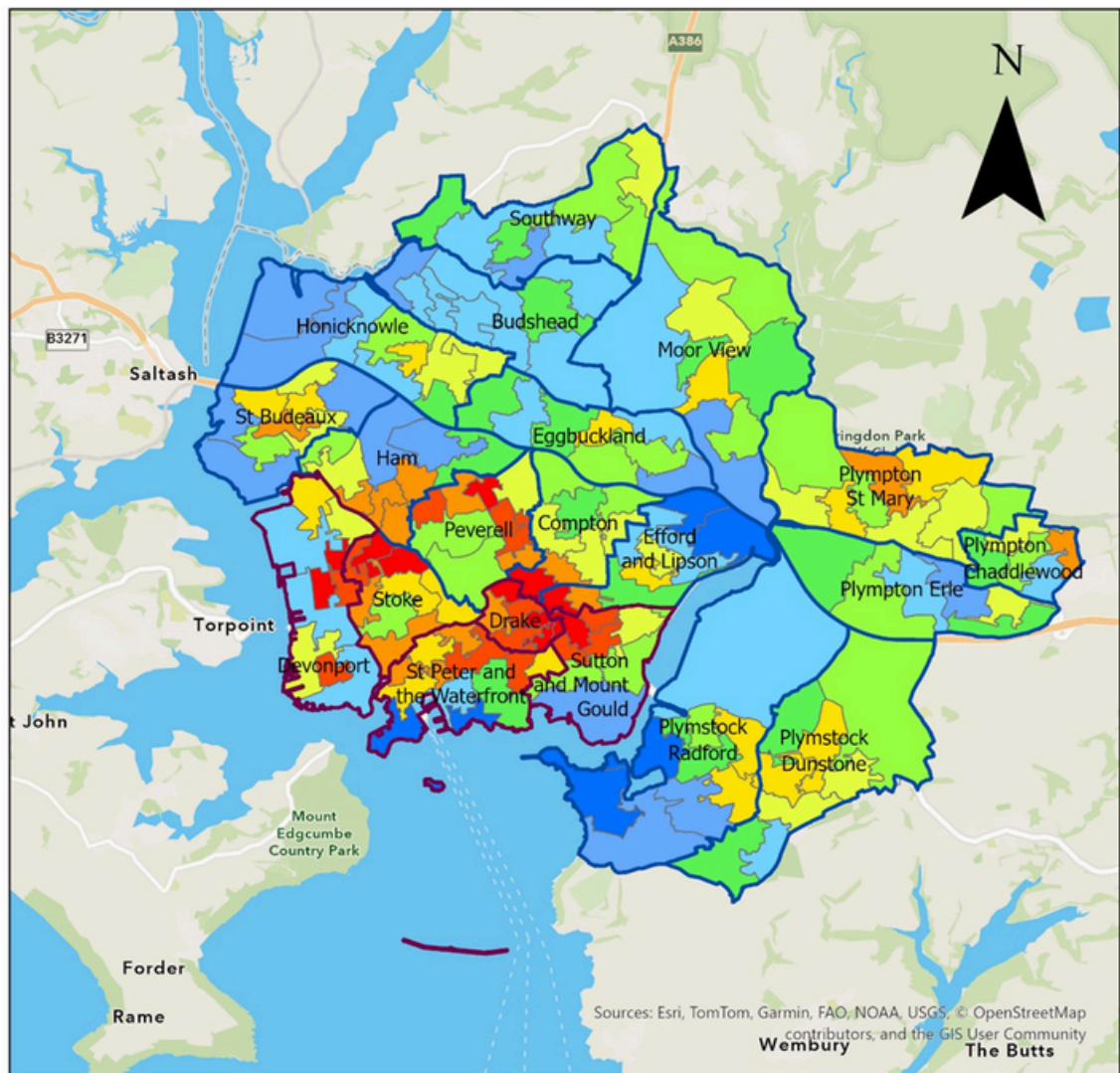
0 0.5 1 2 Kilometers

#### Air pollution index



#### Appendix 4. Metric 5: Air pollution index.

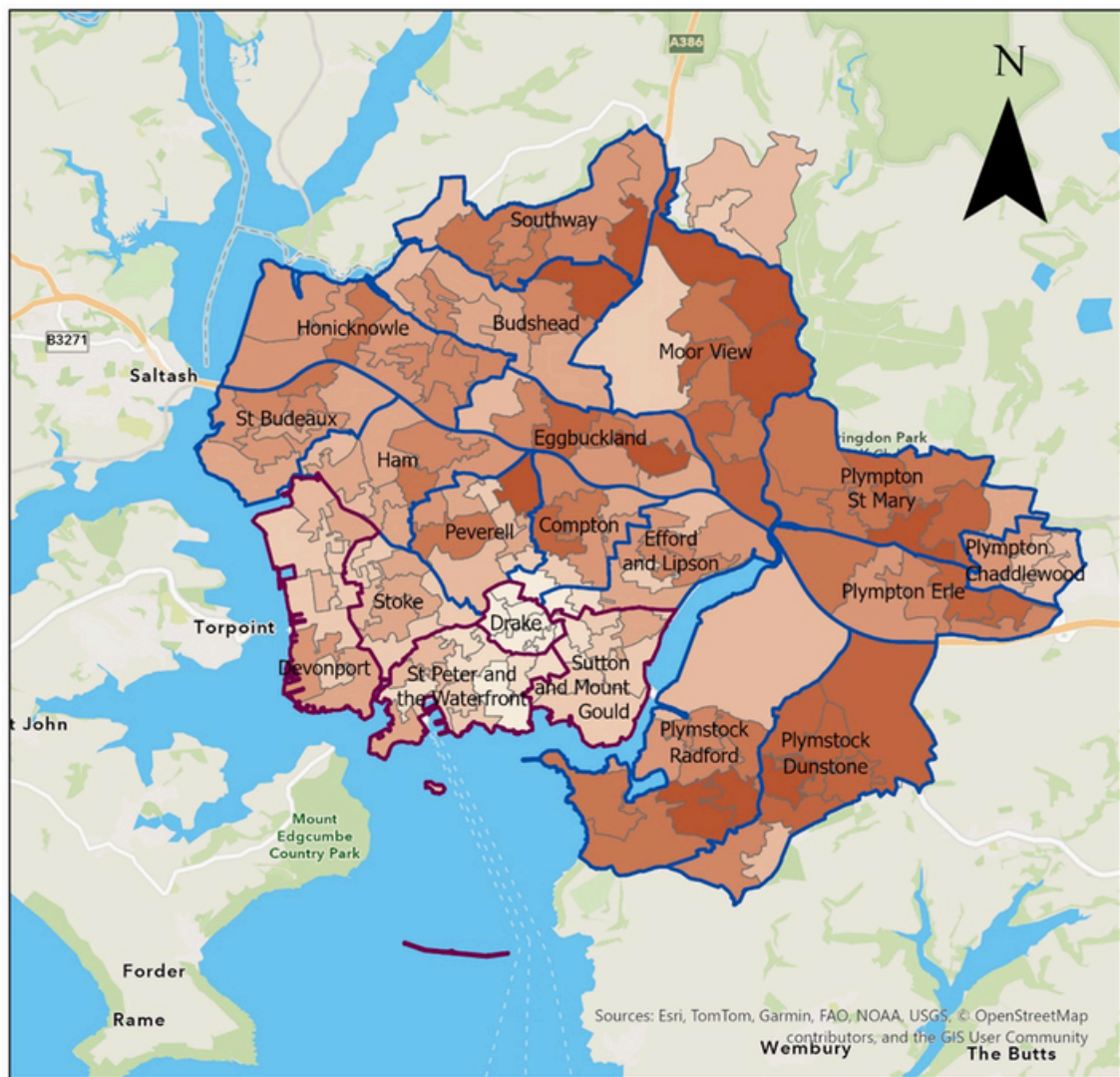
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## Appendix 5. Metric 6: Heat disparity.

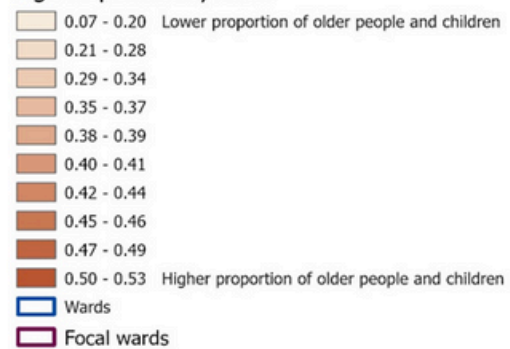
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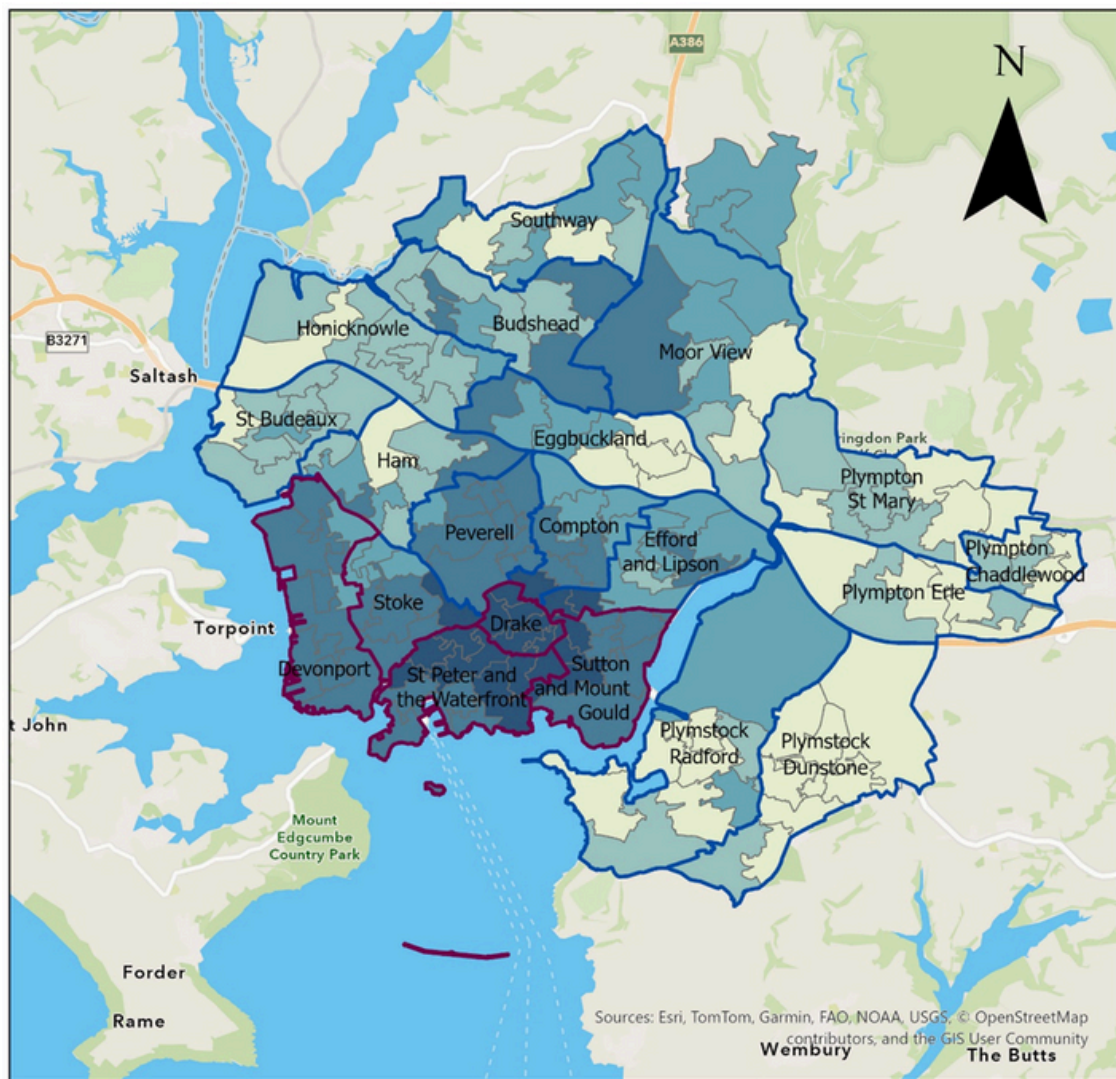
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#### Age dependency ratio



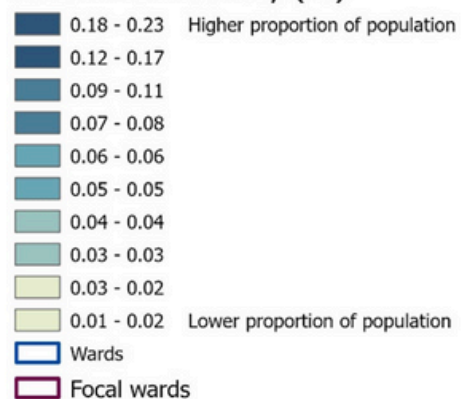
#### Appendix 6. Metric 8: Age dependency ratio.

Based on data from the Tree Equity Score, which cites the data source as: England and Wales Census 2021.



0 0.5 1 2 Kilometers

### Minoritized ethnicity (%)



### Appendix 7. Metric 9: Minoritised ethnicity population.

Based on data from the Tree Equity Score, which cites the data source as: England and Wales Census 2021.

## Appendix 8 Highest priority neighbourhoods.

Highlighted neighbourhoods are in the four focal wards (St Peter & the Waterfront; Devonport; Sutton & Mount Gould; Drake).

LSOA name	Ward	AGIE score	AGIE rank	AGS access (% households with good access)	AGS provision (m2 per person)	Manmade surfaces (%)	Canopy cover (%)	Heat disparity (°C)	Air pollution index	IMD rank	Age dependency ratio	Minoritised ethnicity (%)
027G	St Peter & the Waterfront	84	1	25.0	0.0	86.5	3.8	2.93	0.44	5480	0.30	18.4
027C	St Peter & the Waterfront	83	2	4.7	0.1	84.2	7.8	2.97	0.32	3334	0.35	23.0
026A	Devonport	80	3	5.3	0.7	78.1	6.4	4.00	0.33	1267	0.58	8.6
034A	St Peter & the Waterfront	79	4	0.0	0.5	73.7	10.4	1.99	0.31	88	0.52	14.3
026E	Devonport	79	5	7.1	0.5	75.8	8.9	2.92	0.40	6828	0.48	9.8
028A	Drake	78	6	14.1	0.3	70.6	7.9	4.52	0.36	7602	0.22	16.5
028D	Sutton & Mount Gould	77	7	28.2	0.0	70.5	5.4	0.01	0.44	7253	0.41	15.4
023B	Compton	76	8	0.0	0.3	67.8	11.8	3.75	0.36	7671	0.22	13.5
025B	Efford & Lipson	76	9	13.2	0.3	64.0	9.3	3.75	0.36	10705	0.20	18.0
027B	Drake	76	10	7.6	1.1	81.4	5.9	3.59	0.37	16125	0.08	15.0
020A	Devonport	75	11	24.0	0.0	69.2	5.4	4.45	0.35	9453	0.49	7.6
023D	Drake	75	12	0.0	0.0	71.8	10.0	3.21	0.36	10613	0.15	14.1
026C	Devonport	75	13	33.1	7.0	80.9	7.0	0.93	0.33	575	0.66	8.1
034B	St Peter & the Waterfront	75	14	0.0	0.6	77.8	6.4	1.70	0.30	5577	0.36	9.2
025C	Sutton & Mount Gould	74	15	8.9	2.4	61.7	9.4	3.59	0.38	12374	0.43	9.6
024D	Stoke	74	16	0.3	0.0	63.3	5.7	4.07	0.35	17172	0.60	5.1
027A	Drake	74	17	43.9	0.0	68.2	15.9	4.04	0.40	5870	0.16	15.2
028B	Sutton & Mount Gould	74	18	60.1	1.4	69.3	8.7	3.35	0.43	9791	0.31	13.4
013D	Ham	73	19	2.5	1.0	47.5	4.0	2.44	0.32	4771	0.53	6.5
023C	Drake	73	20	6.5	0.0	62.4	7.0	4.41	0.34	20108	0.25	14.3
013C	Ham	73	21	0.8	0.0	46.3	8.8	2.10	0.32	2676	0.64	5.3



LSOA name	Ward	AGIE score	AGIE rank	AGS access (% households with good access)	AGS provision (m2 per person)	Manmade surfaces (%)	Canopy cover (%)	Heat disparity (°C)	Air pollution index	IMD rank	Age dependency ratio	Minoritised ethnicity (%)
025A	Efford & Lipson	72	22	12.5	0.1	56.4	14.5	1.95	0.37	9330	0.38	13.0
027F	St Peter & the Waterfront	72	23	51.6	26.8	69.0	18.8	1.69	0.44	6610	0.36	18.7
013A	Ham	72	24	0.0	2.6	47.9	10.7	2.33	0.35	4909	0.64	2.7
023E	Drake	71	25	11.9	0.0	69.7	9.5	2.42	0.32	12787	0.14	15.6
025E	Sutton & Mount Gould	71	26	58.9	15.6	68.2	6.0	3.91	0.38	9908	0.35	13.0
020B	Devonport	71	27	33.1	0.0	66.8	7.3	3.30	0.33	5082	0.46	5.2
028C	Sutton & Mount Gould	71	28	15.2	33.5	57.9	14.5	0.56	0.41	2628	0.49	10.3
033C	St Peter & the Waterfront	70	29	38.8	18.2	62.0	12.7	1.57	0.31	1032	0.53	13.6
014A	Devonport	70	30	12.7	0.0	67.0	13.3	1.55	0.30	8121	0.58	7.1
020D	Stoke	70	31	32.5	3.8	59.7	10.9	4.10	0.35	8828	0.48	5.6
009D	St Budeaux	70	32	0.0	0.0	52.2	11.3	1.98	0.26	3263	0.63	4.4
025D	Sutton & Mount Gould	69	33	39.9	15.6	63.7	12.0	3.29	0.42	15459	0.51	7.2
028E	Sutton & Mount Gould	69	34	20.7	7.4	71.1	6.7	-2.04	0.35	6281	0.49	7.9
009F	St Budeaux	69	35	6.9	5.4	42.6	11.6	1.85	0.27	706	0.73	3.7
020C	Stoke	67	36	46.6	9.4	59.0	5.3	3.43	0.34	10553	0.44	5.5
023A	Compton	67	37	5.7	0.1	50.2	18.3	2.24	0.34	15464	0.50	7.9
005E	Moor View	66	38	6.2	0.2	49.7	17.3	1.63	0.26	11622	0.84	4.4
011E	Peverell	66	39	4.6	0.0	46.3	10.0	3.55	0.33	30180	0.70	5.7
021F	Sutton & Mount Gould	66	40	44.8	12.1	45.4	13.1	1.16	0.37	7643	0.64	7.1
016E	Peverell	66	41	0.5	0.9	47.1	21.4	1.18	0.35	31551	0.99	8.5

Appendix 9 Lookup table for attribution of "publicly accessible" or "not publicly accessible" greenspace by using typology and source data, and identification of use in the Accessible Greenspace Assessment (AGSt).

Taken from section 3.1.2 at <https://designatedsites.naturalengland.org.uk/GreenInfrastructure/UserGuide/Section03.aspx#green-blue-infrastructure>

Dataset	Attribute	Accessible	Used in AGSt
OS Greenspace	Allotments or Community Growing Spaces	No	No
OS Greenspace	Bowling Green	No	No
OS Open Map Local	Canal	No	No
OS Greenspace	Golf Course	No	No
OS Open Map Local	Inland River	No	No
OS Open Map Local	Lake	No	No
National Forest Inventory	None	No	No
Ancient Woodland	None	No	No
OS Greenspace	Other Sports Facility	No	No
OS Greenspace	Tennis Court	No	No
OS Open Map Local	Tidal River	No	No
OS Open Map Local	Tidal Water	No	No
OS Open Map Local	Woodland	No	No
OS Greenspace	Cemetery	Yes	No
England Coast Path and Margin	Coastal Margin	Yes	Yes
Local Nature Reserve	None	Yes	Yes
Natural England open access data (including section 15)	None	Yes	Yes
Millennium Greens	None	Yes	Yes
Country Parks	None	Yes	Yes
Doorstep Greens	None	Yes	Yes
OS Greenspace	Play Space	Yes	No
OS Greenspace	Playing Field	Yes	Buffer_200 only
OS Greenspace	Public Park or Garden	Yes	Yes
OS Greenspace	Religious Grounds	Yes	No

## Appendix 10 Discrepancies in green and blue infrastructure data for Plymouth from different sources

Plymouth City Council have local data on greenspace which is likely to be more accurate than that provided by Natural England. However, the discrepancies between the two in terms of how much “natural space” or “green and blue infrastructure” are stark, particularly as to how much of this space is publicly accessible (Table A10). NE GI data has 20% less green and blue infrastructure than PCC’s “natural space” figure, resulting in NE GI mapping having 8 percentage points less coverage of greenspace than PCC. An even greater discrepancy is seen in publicly accessible space: PCC’s figure for accessible open space is ca 1.5 times larger than NE GI’s figure for accessible greenspace.

Table A10 Greenspace data from different sources

Metric	Source	Ha	% of Plymouth	Includes
Natural space	PCC Plan for Nature	3,482	43	
Green and blue infrastructure	Natural England Green Infrastructure mapping	2,900	35	<ul style="list-style-type: none"> <li>• OS Open Greenspace</li> <li>• OS Open Map Local (Woodland, Surface Water, Rivers, Tidal Rivers, Tidal Waters).</li> <li>• Natural England, Local Nature Reserves, Access Land (including Section 15), England Coast Path – Coastal Margin, Doorstep Greens, Millennium Greens, Country Parks.</li> <li>• National Forest Inventory</li> </ul>
% non-manmade surface	NE GI mapping “greenness grid”	5,030	62	topography layer from Ordnance Survey's (OS) 'Master Map' data; manmade surfaces are those that are not vegetation, water or soils.
Publicly accessible open space	PCC Plan for Nature	2,030	25	
Accessible greenspace	NE GI mapping	869	10	Greenspace types that are considered open access; see Appendix 9.
Accessible open spaces	Plymouth Policy Area Open Space Assessment	1438.4	18	Parks and gardens; natural and semi-natural green space; green corridors; amenity greenspaces; churchyards and cemeteries; provision for children and young people; outdoor sports facilities. NB the figures here are for Plymouth only, not the Plymouth Policy Area.

## Potential sources of error / discrepancy

- Definitions of “natural space” and “green and blue infrastructure” may vary, in terms of what typologies are included (e.g. school grounds, verges etc).
- There may be differences in lower limits for size of space that is included (I can’t find size limits mentioned in NE GI method statement, but it may be over 0.5 ha, the smallest size class of AGSt).
- There may be greenspaces that are missing from the NE GI data, e.g. Eggbuckland Community Woodland and Frogmore Field:
  - in the screengrab below, the community woodland is recognised as woodland (pink areas), but not publicly accessible (areas highlighted in blue).
  - Frogmore Field is not designated as Green and Blue Infrastructure, and only a small area of it, a play area, is recognised as being publicly accessible.
- Land that has informal public access will almost certainly not be included in the NE GI data as AGS.
- This is an extreme example, but there are others: Hardwick Wood (21 ha) and perhaps Chelson Meadow (70 ha) are publicly accessible, but are not included in the accessible greenspace layer from NE GI.

