The Vale's Trees

Understanding the Vale of Glamorgan's Tree Resource: Summary Report

VALE of GLAMORGAN
BRO MORGANNWG

Treeconomics

Forest Research

i-Tree

About this Report

This project has been undertaken on behalf of:

Vale of Glamorgan Council

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This report forms part of a set of documents produced as part of the 'i-Tree Eco Vale of Glamorgan' project. These include:

• Understanding the Vale of Glamorgan's Tree Resource: Technical Report

•Guiding Future Tree Planting
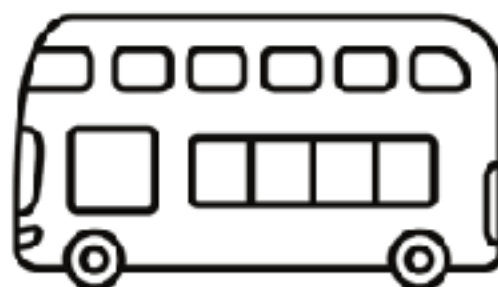
•Trees in the Vale of Glamorgan (Infographic)

Image Credits: taken on behalf of the Project by Devon Tree Services (Sep 2021)

Tree Benefits in the Vale

Number of trees is

more than 1 tree per person

living in the Vale

Pollution removal is equal to

3

double-deck busses each year

Flood prevention is almost

30

olympic swimming pools each year

Carbon sequestration is equal to

4,180

people driving a car each year

1. Project Background

Trees form a core component of our urban and rural spaces, they have a unique ability to deliver environmental and societal benefits on a scale greater than many forms of engineered infrastructure[1].

From improving air quality, alleviating flooding, storing and sequestering carbon to reducing temperatures in urban areas, trees provide a plethora of benefits to our natural environment, local communities and our economy.

Typically, leaf area, the total surface area of a tree canopy, is directly related to the amount of benefit provided. So for example, the larger the surface area of the tree's canopy, the greater the amount of air pollution or rainfall can be held in the canopy of the tree. It is with this in mind that protection and good management of those larger, mature trees should be prioritised to enable them to function to their greatest potential, alongside the planting of new trees to increase canopy and to replace trees as they become over-mature and die.

With vast areas of urban spaces dominated by hard impermeable infrastructure it's no surprise that urban spaces are looking for solutions to filter air pollution, reduce temperatures, provide shade and allow the drainage of surface water, all of which are benefits provided by trees. Trees in rural areas provide the same benefits as those in urban areas, but their impact is felt very differently. Over 80% of the UK population live in towns and cities[2] and due to the density, the impacts are felt very closely. Trees in rural areas provide character and local distinctiveness, they are effective in capturing pollution alongside rural roadsides, and alleviate flood risk through reducing surface-

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[1] https://www.tdag.org.uk/uploads/4/2/8/0/4280686/tdag_tihl.pdf

[2] https://www.tdag.org.uk/uploads/4/2/8/0/4280686/tdag_treestownscape2021.pdf

runoff from roads and agricultural fields. Trees which form part of hedgerows have the ability to provide stock enclosure and reduce spread of disease[3].
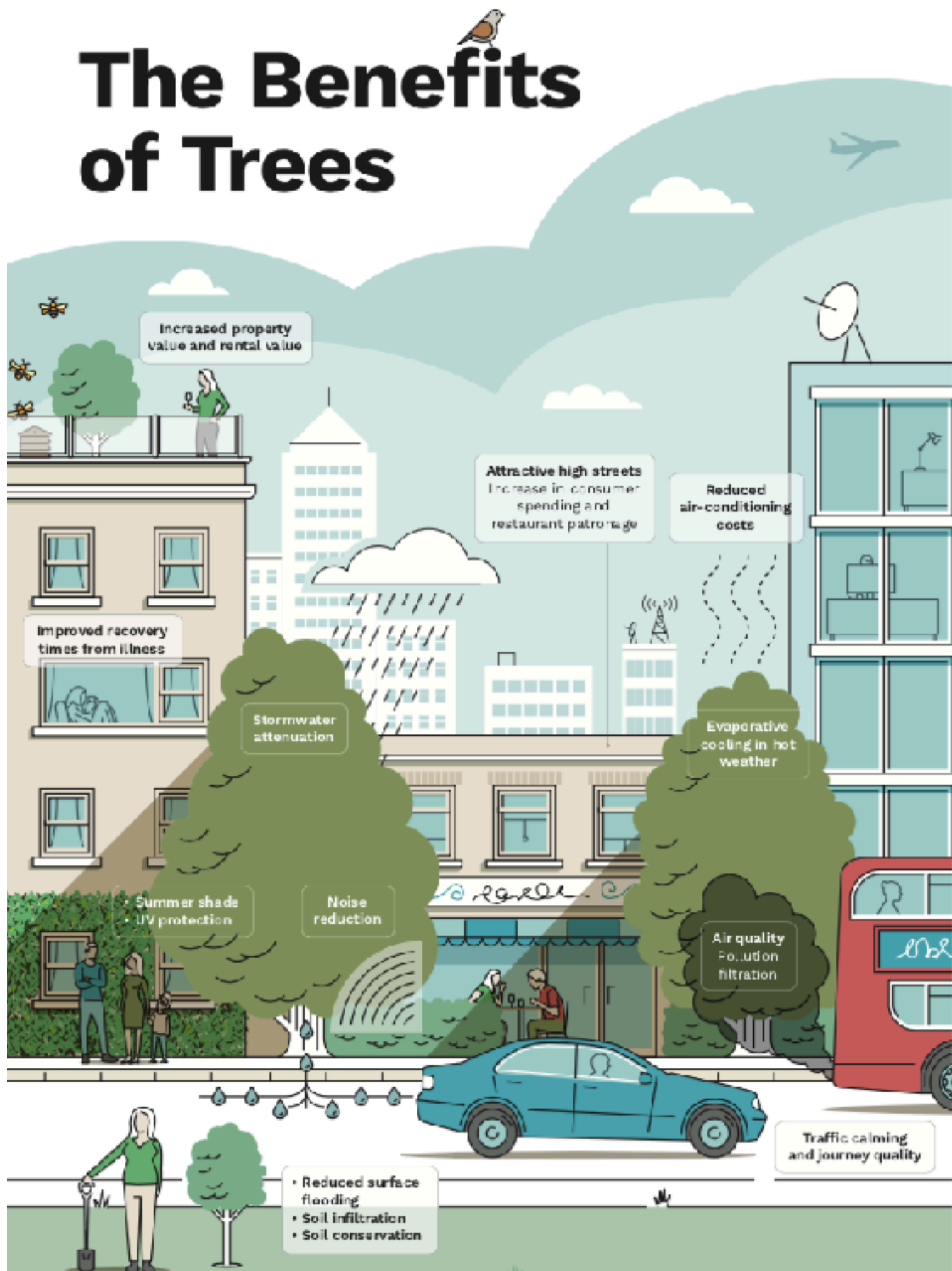
Understanding the structure and composition of the trees within the Vale provides the opportunity to explore the current asset's species diversity, size distribution and susceptibility to pests and diseases. This information forms a clear baseline which can be used to guide future tree planting and highlight opportunities to further diversify the population. With the Vale incorporating large areas of rural land, this study will quantify (kg) and value (£) the ecosystem service provision of the whole vale in its entirety, and will also illustrate the value of urban areas separately to those in rural areas.
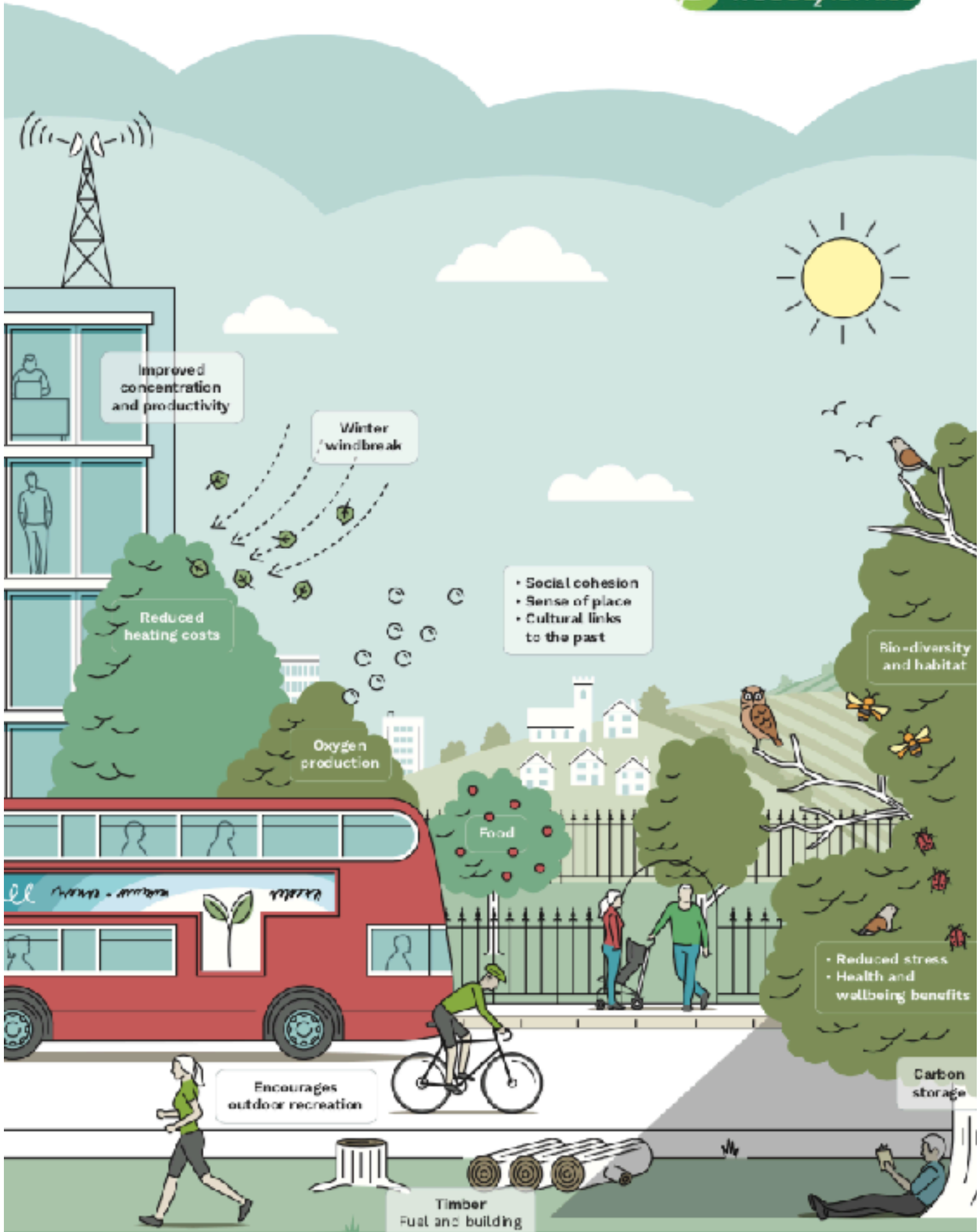
This study was commissioned by the Vale of Glamorgan Council to help inform future environmental policy such as the Local Development Plan and Tree Strategy leading to the urban forest's role in Project Zero, the Vale's response to the Climate Emergency. https://www.valeofglamorgan.gov.uk/en/living/Climate-Change/Project-Zero.aspx

The Vale will face many challenges in both the urban forest and the wider Climate Emergency response. However its ambitious targets to improve canopy cover, include 'greener' features in developments and appropriate rural plantings will progress multiple aspects of the environmental agenda.

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[3] https://www.woodlandtrust.org.uk/media/1702/benefits-of-trees-outside-woods.pdf

The Benefits of Trees

Increased property value and rental value

Attractive high streets
Increase in consumer spending and restaurant patronage

Reduced air-conditioning costs

Improved recovery times from illness

Stormwater attenuation

Evaporative cooling in hot weather

- Summer shade
- UV protection

Noise reduction

Air quality
Pollution filtration

Traffic calming and journey quality

- Reduced surface flooding
- Soil infiltration
- Soil conservation

Treec$o_2$nomics

Improved concentration and productivity

Winter windbreak

Reduced heating costs

- Social cohesion
- Sense of place
- Cultural links to the past

Bio-diversity and habitat

Oxygen production

Food

- Reduced stress
- Health and wellbeing benefits

Encourages outdoor recreation

Carbon storage

Timber
Fuel and building materials

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2. Undertaking the Project

Using a state-of-the-art tool i-Tree Eco, we are able to take all of the data collected, and provide estimates for the whole of the area within the black boundary in Figure 1.

i-Tree Eco uses a plot-based method of sampling, whereby plots (circular areas of land of 0.04ha in size) are distributed throughout the survey area. It is within these plots that data are collected. i-Tree Eco software then extrapolates this data to represent the entire study area.

Across the Vale of Glamorgan 681 plots were randomly distributed, 164 in urban areas and 517 in the rural surroundings. These plots are the circular shapes seen on Figure 1, each plot is the same size and is a circular area in which we surveyed the ground cover, the current land use and the trees and shrubs within.
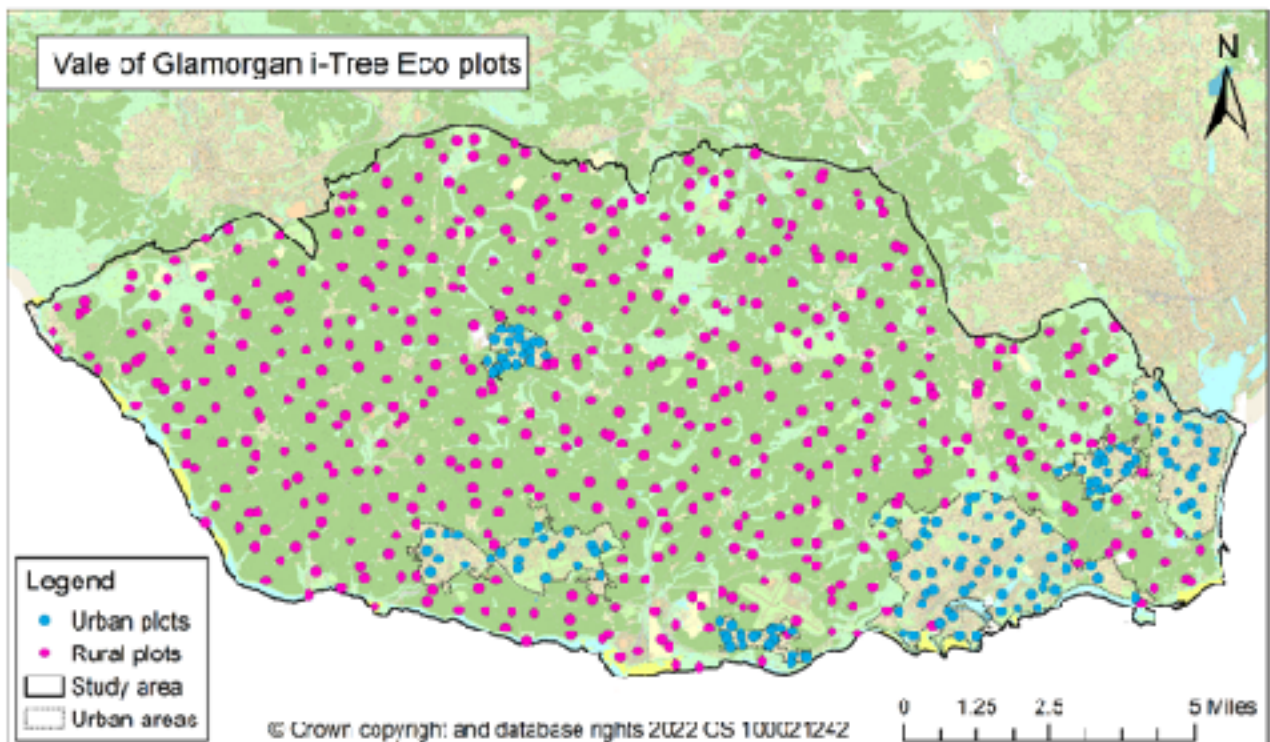

Figure 1 - Map of the total study area, with plot distribution for both urban and rural areas

For a more detailed methodology, please see our technical report.

3. Project Findings

Headline Figures		
	Urban	**Rural**
Estimated Total Number of Trees	143,000	1,600,000
Most Common Species	Common ash, Sycamore, Common Hawthorn	Common ash, Common Hawthorn, Sycamore
Replacement Cost	£126 million	N/A
CAVAT Valuation	£1.6 million	N/A
Species Recorded	59	40
Amounts and Values		
Carbon Storage	8,500 tonnes	£7,730,000
Pollution Removal	3 tonnes	£292,000
Carbon Sequestration	207 tonnes	£188,000
Avoided Runoff	6,120m³	£5,570
Total Annual Benefits	£486,000	

Table 1 - Headline Figures

Trees in the Vale's countryside

The estimated total number of trees in the Vale of Glamorgan's countryside is 1,606,000, approximately 47 trees per ha. 40 tree species were recorded and the most common of these species are Ash, Hawthorn and Sycamore. The blue dashed line in Figure 2 refers to the recommended 10% maximum for a single species according to Santamour's 10-20-30 rule.
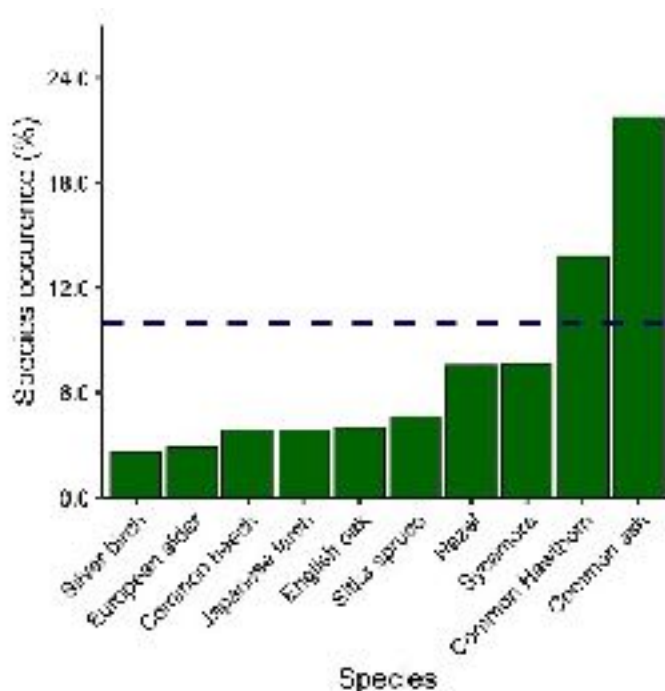

Figure 2 - Top 10 species in the Vale's rural trees.

Diversity scores are an indication of the forest's ability to provide benefits and be resilient to changes. It is derived from a combination of species richness and evenness. The rural areas of the Vale vary in diversity scores depending on land use. The lowest scores come from utility, institutional and commercial/Industrial land use and the highest from agricultural, vacant and residential land. Overall for the Vale's rural area the score is 2.8, on this scale 1.5 is low and 3.5 is considered high.

In the Vale's countryside the canopy cover is 14%, 1% above the urban areas canopy cover. 43% of the rural trees in the vale are in good condition or better. 73% of the the trees surveyed in the rural areas are native to the UK, with a further 9% are considered naturalised.

Size class distribution shows a substantial number of trees in the lower size category, size is usually a good proxy for age and ecosystem services provision. Therefore this is promising as there should be plenty of younger trees to replace the existing stock, however the current level of mature trees providing ecosystems services is

proportionally low. Opportunities to protect and enhance such trees would be helpful in maintaining a balanced population structure and would be particularly beneficial for wildlife.

Agricultural land makes up the highest percentage across the whole of the Vale of Glamorgan's rural area, at 81%. Of the 352 plots that contained agricultural land, 83 of these contained tree cover. Institutional land (e.g. schools, colleges, hospitals) hold the greatest proportion of larger trees per land use (Figure 4), but lack some intermediately sized trees (DBH 20-40cm). The proportion of young and/or small-stature trees (DBH 7-20cm) was relatively similar across the different land uses.

Understanding the impact of pests and diseases is particularly important where trees are grown on a commercial basis and in woodland planting. Outbreaks of pathogens can have a significant economic cost, with a direct impact on the local economy and further implications for the wider forestry sector.

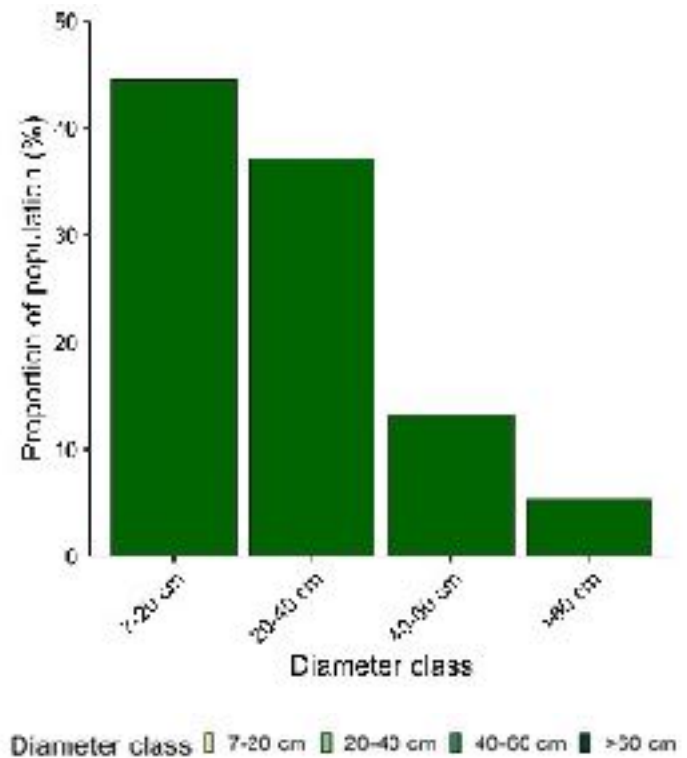Diameter class ▢ 7-20 cm ▢ 20-40 cm ▮ 40-60 cm ▮ >60 cm

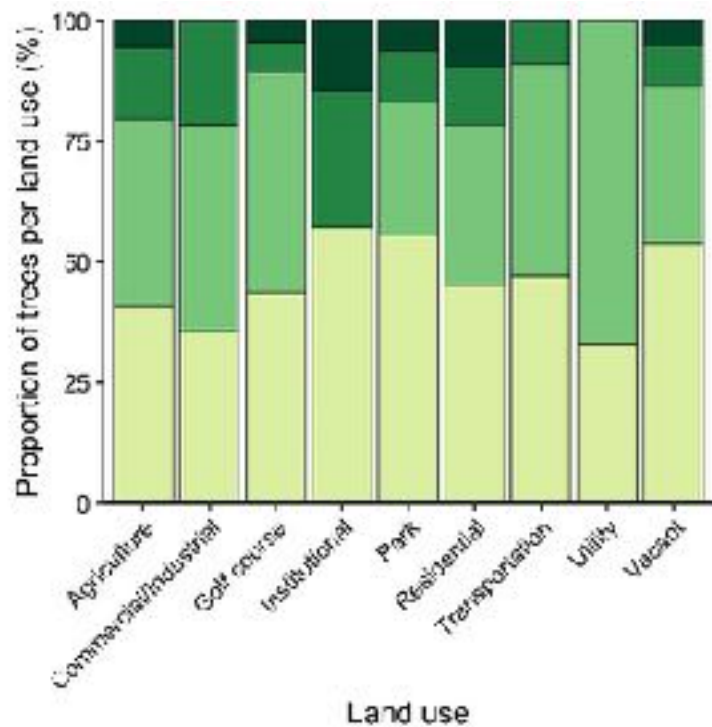Figure 3 - Proportion of the Vale's tree population by size class (diameter at breast height).

Figure 4 - Land use types and their associated proportions of trees that fall within the different DBH size classes

Table 2 - Pests and diseases affecting the Vale's rural trees.

Trees in the Vale's urban areas

Urban Trees - Headline Figures	
Estimated Number of Trees	143,400
Tree Density	40 trees per ha
Number of Species Recorded	59
Most Common Species	Ash, Sycamore, Hawthorn
Tree Canopy Cover	13%
Replacement Cost	£126 million
Amenity Value	£1.6 million

Table 3 - Headline figures for the Vale's urban areas

Urban areas often have higher density and higher diversity. Whilst it may seem counter-intuitive that the healthiest forests are in our most built-up areas, modern agricultural techniques mean rural areas must often rely on hedgerows or managed woodland for ecosystem services. In contrast the abundance of private gardens, recreational parks and street trees often make urban forests superior. The diversity of the urban forest, derived from a combination of species richness and evenness, varies

Figure 5 - Top 10 species in the Vale's urban trees.

from the most diverse areas (residential land) to the least diverse (cemeteries). Overall the urban area scored 3.4, on this scale 1.5 is considered low, 3.5 is considered high.
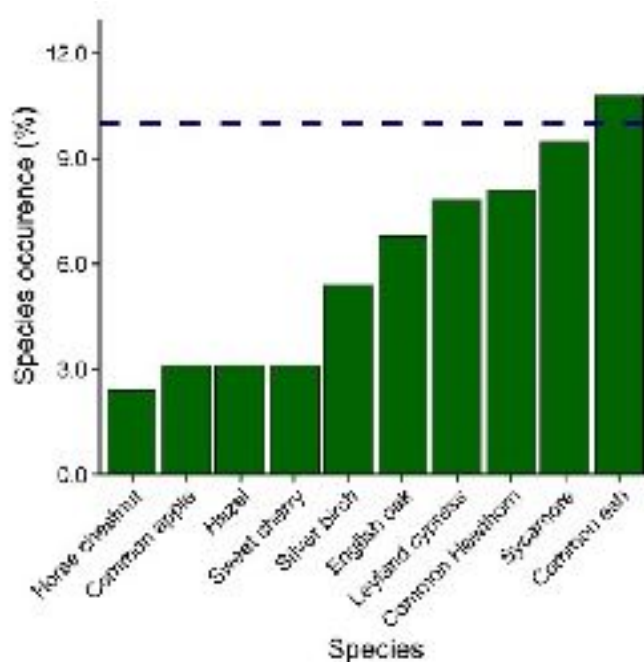
Residential land makes up the highest percentage across the whole of the Vale's urban areas, at 49%. This is also the land use with the greatest proportion of treed

plots (58%). The percentage of treed plots found on publicly owned land is estimated to be 18%. Future tree policies that consider the management of trees including those in private residences, would be beneficial.

Measuring the diameter of a tree gives an indication to its size and can be used as a proxy for age. Larger, mature trees tend to provide the greatest amount of benefit. As shown in figure 6, the lower size classes have the greatest proportion of the population, indicating a promising future as smaller trees mature, it's also important to manage trees well to ensure they thrive and reach their full potential.
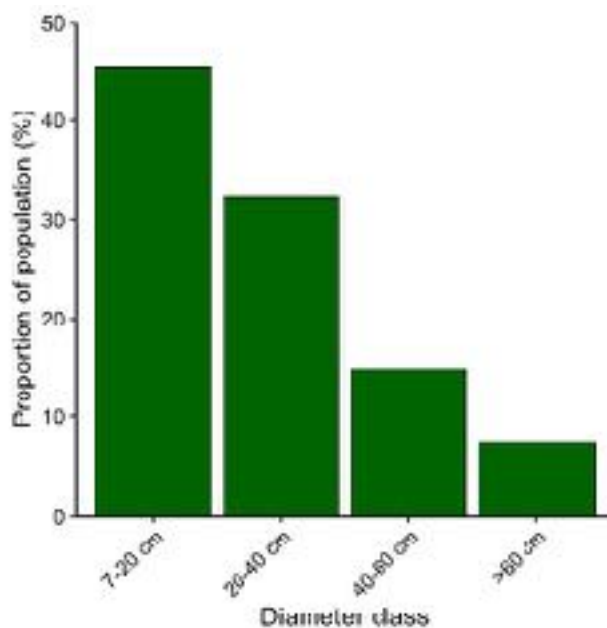

Figure 6 - Proportion of the Vale's tree population by size class (diameter at breast height).

28.5% of the Vale's urban trees were in excellent condition, 43.7% in good and 16.3% in fair condition. A further 11.5% were estimated as being of poor or critical condition or were dying or dead. The land use type with trees in poorest condition was, surprisingly, parks, with 28.7% of the trees in critical or poor condition, or dead.

To assess habitat provision of the Vale's trees three aspects of biodiversity were measured: foliage invertebrate richness, blossom and pollen provision, and seed and nut provision - for the full results please see the technical report. These metrics illustrate the value of different tree species in supporting wildlife, but also demonstrate that some of the most beneficial tree species are not widely present in the Vale of Glamorgan's towns. The Vale's hawthorns, oaks and birches support the greatest number of foliage invertebrates. Some of the trees that support a greater number of insect species are not widely present in the Vale's urban areas, for example Willow spp. (0.3% of tree population) and Poplar spp. (0.7% of tree population).

Ecosystem Services & Value of the Vale's Urban Trees

Carbon Storage

57,300 tonnes
£51,500,000

This is the total amount of carbon locked away in the tree's woody structure. Maintaining a healthy tree population ensures more carbon is stored than released.

Carbon Sequestration

1,977 tonnes per year
£1,780,000 per year

This shows how much carbon is absorbed by the trees each year through photosynthesis. This process, delivered by urban forests, is key to mitigating climate change.

Pollution Removal

36 tonnes per year
£212,000 per year

Urban forests help to improve air quality by reducing air temperature and by directly removing pollutants from the air reducing health costs, and cases of respiratory disease and asthma.
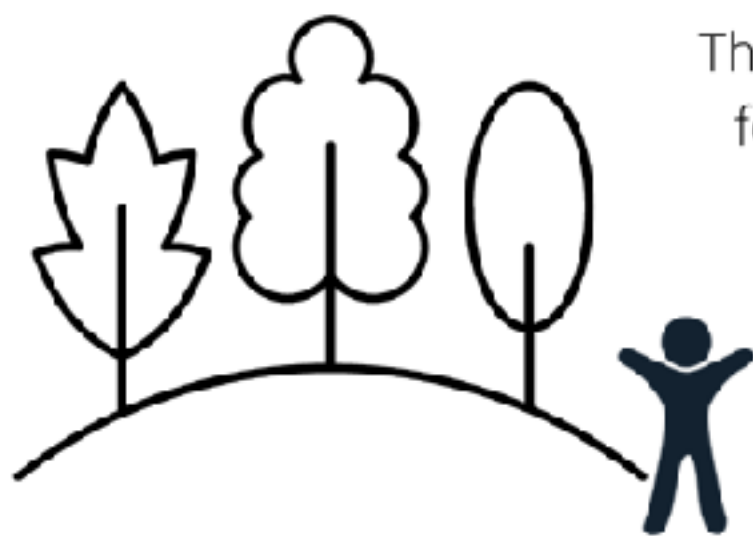
Avoided Runoff

78,400 cubic metres per year
£136,000 per year

Trees intercept rainfall, while their root systems promote infiltration and storage in the soil. In contrast to the impervious surfaces of urban areas, trees are very effective at reducing flood water and the pollution carried with it.

Amenity Value of the Vale's Urban Trees

Total Value

The public amenity asset value for the Vale's urban forestis estimated to be

£1.5 million

Top Species

Oak is the species the highest amenity value of

£289,000

Top Land Use

Residential land was associated with the greatest propotion of the amentiy value

Trees by Town

	Cowbridge	Barry & Barry Island	Rhoose	Penarth	Murch	Llanwit major and St Athan
Estimated canopy cover (%)	20	8.9	5.5	21.2	20.3	7.7
Estimated total number of trees	11,700	56,900	4,700	34,400	13,900	22,700
Estimated average tree density (trees per ha)	73	33	35	48	65	33
Number of tree specie surveyed	27	31	20	19	19	15
Top three most common trees surveyed	Sycamore (15.3%)	Leyland cypress (11.6%)	Leyland cypress and Bird cherry (16% each)	Silver birch (12.8%)	Common ash (18.9%)	Common ash and Common Hawthorn (16.1% each)

Table 5 - A breakdown of some of the key structure and composition figures for each urban locality surveyed within the Vale of Glamorgan.

Public Report I i-Tree Eco Sample Survey of Belfast's Urban Forest I 2020-2021

INSERT MAP OF THE VALE?

Pests & Diseases

Pests and diseases are a very real and serious threat to the sustainability of the UK's urban forests. There have been a few outbreaks over the last 60 years which have had and are still having a significant impact on the UK's tree population. The widespread dieback of trees attributed to certain pests and diseases can have substantial economic costs, as well as implications for health and safety, and a loss of the benefits that trees provide. The threats associated with pests and diseases are only likely to worsen with the changing climate, as life cycles and natural ranges of new and established species change, and the risk of accidentally introduced pests and diseases becomes greater with increased probability of quick establishment.

Pest / Disease	Trees affected	Prevalence in UK	Urban forest population at risk	Amenity value of at risk trees
Acute oak decline	Various Oak species	Mainly seen in central and southern England, 1 confirmed case in Wales	7.1%	£289,626
Asian longhorn beetle	Many broadleaf species are affected	Not yet reached Wales, although is present in the UK with an outbreak in 2012 being eradicated.	59.2%	£868,274
Bronze birch borer	All species of Birch	No current prevalence in UK	6.8%	£31,803
Chalara dieback of ash	Some Ash species	Prevalent throughout the UK	10.9%	£218,568
Emerald ash borer	Some Ash species	No cases in the UK	10.9%	£218,568
Large eight-toothed bark beetle	Most Spruce species, also reported on Fir, Pine and Larch	Limited outbreaks in the southeast of England	1%	£9,328
Oak processionary moth	Oak species	Established in Greater London and home counties	7.1%	£289,626
Xylella fastidiosa subsp. multiplex*	English Oak, Wych Elm, Plane, Red Oak, Sycamore, Cherry Plum	None - one previous interception in the UK	16.6%	£420,418

Table 6 - Pest and Disease threats within the UK and the Vale

Pests and Diseases

Ash Dieback

Affected genus:
Ash (*Fraxinus*)

Acute Oak Decline

Affected genus:
Oak (*Quercus*)

Image Credit: Forest Research

Oak Processionary Moth

Affected genus:
Oak (*Quercus*)

Asian Longhorn Beetle

Affected genus:
Wide range of broad-leaved trees

7. Conclusions

- The Vale's total tree population is estimated to contain over 1.7 million trees!

- Canopy cover stands at 13% in the Vale's countryside and 14% in urban areas.

- Canopy cover varies between towns, from 5.5% in Rhoose, to 21.2% in Penarth.

- 59 species were recorded in the Vale's towns, and 40 species in the countryside.

- The three most common species in the Vale were Ash, Sycamore and Hawthorn.

- The Vale's urban trees provide benefits valued at £2.05 million every year!

- Investment in planting and maintaining trees, has the potential to have a direct and positive impact on the quality of life for the Vale's residents.

- Large stature trees are capable of providing a greater amount of ecosystem services and are integral to the landscape character and sense of place, bridging the gap between the present and the past and acting as 'living history'.

- Only 11.6% of the population was made up of large stature trees with a trunk diameter of over 60cm, and in rural areas, this figure was 6.7%.

- Tree condition was variable across the Vale, with trees in rural areas tending to be in much poorer condition than those in towns. Almost 40% of trees in the countryside were in poor or worse condition.

- Whilst the i-Tree Eco survey did not include the identification of pests and diseases, increasing the diversity of species within the population will help to reduce the impact of pests and diseases within the Vale.

- Where trees were present, they most commonly occurred on agricultural land in the countryside, and residential land in urban areas.

- Less than a quarter of all agricultural plots surveyed contained trees. The value of farming to the Vale should be considered and balanced alongside the potential to integrate tree planting which further enhances farming practices.

- In the Vale of Glamorgan's urban areas, residents are a key stakeholder in managing urban trees, and are the custodians of the most species-rich sector of the Vale's urban forest (45 species recorded in residential areas).

7. Recommended next steps:

1. Set canopy cover targets to increase overall tree cover.

2. Engage and work with a wide range of stakeholders including decision-makers, landowners and the general public.

3. Adopt a localised approach to canopy cover targets (i.e., per town) to support a more even spread of tree cover and facilitate more equal access opportunities to green infrastructure for the Vale's residents.

4. Set canopy cover targets which are realistic and attainable.

5. A repeat i-Tree Eco survey in 10 years could be a potential way to measure progress.

6. Identify priorities for tree planting to help determine where to focus efforts (i.e., at the within-town level for urban areas).

7. Undertaking a Mapping exercise which identifies potential planting sites and the potential impact upon the community and environment could be a helpful place to start.

8. Ensure that canopy cover targets are incorporated within planning policy to help protect existing trees and encourage longevity of newly planted trees in new developments.

9. Protect the existing tree resource.

10. Expanding on current understanding of the tree population through monitoring and surveys, collating data, such as street tree inventories, and utilising resources such as Treezilla (www.trezilla.org) can help to keep track of changes over time and may also help to unpick reasons for trends.

11. Engage and raise public awareness about the value and importance of trees and create opportunities for community engagement.

12. Create quality greenspaces which maintain and improve the sense of place within the Vale's towns and countryside.