Pembrokeshire Green Infrastructure Assessment

Urban Tree Planting and Pollinator Strategies

Pembrokeshire County Council and Pembrokeshire Coast National Park Authority

Final report

Prepared by LUC

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1.1 Trees and woodlands are an essential element of our urban environment and crucial to sustainable growth and development. A healthy, well managed 'urban forest' has the potential to perform a range of environmental functions and provide multiple benefits for people and nature.

1.2 Pembrokeshire's urban tree planting strategy promotes a strategic approach to tree planting and management across 11 Pembrokeshire settlements. This will ensure that additional planting will deliver the greatest benefits and help to protect and enhance the distinctive character of the county's settlements into the future.

1.3 Whilst there is a resource implication to increasing the amount of urban trees across Pembrokeshire, the benefits that may be derived from this positive investment are many and varied. Increasing tree 'canopy cover' is a priority of the UK and Welsh government and comprises a central pillar in efforts to reach net zero emissions. Increasing woodland cover is an underpinning principle of the Welsh government's 2022 woodlands for Wales action plan **[See reference 1]**:

1.4 'Optimise the sustainable benefits that forestry, woodlands and trees can provide across rural, peri-urban, and urban areas to meet the needs of people and local communities.' (Woodland for Wales action plan, Cymru 2022).

1.5 Both mitigating and adapting to the effects of a changing climate are themes that are associated with many of the potential benefits of trees.

Components of Pembrokeshire's Urban Tree Planting Strategy

1.6 Pembrokeshire's urban tree planting strategy promotes a strategic approach to tree planting and management across 11 Pembrokeshire settlements.

1.7 Individual strategies for urban tree planting have been developed for each of the 11 settlements included within the strategy.

Overarching Principles

1.8 All of the individual settlement strategies are underpinned by a set of overarching principles. The overarching principles will guide the design and delivery of all tree planting projects across the settlement.

Tree Planting Zones and Sub-Principles for 11 Settlements

1.9 A spatial strategy for tree planting in each settlement has been developed. This comprises strategic tree planting zones that have been established for each settlement. Each tree planting zone has a set of accompanying sub-principles, which build on the overarching principles and provide more detail on where and how tree planting projects will likely need to come forward in each zone.

1.10 A set of set of tree planting typologies has been developed. Information on where the planting typologies and species recommendations may be used to develop project plans is indicated as part of the tree planting zones for each settlement.

Delivery

1.11 A framework and further guidance on delivery is also provided. This includes:

- The key steps required for bringing tree planting projects forward;
- Overview of standards for planting and maintenance; and
- Species recommendations and a framework for species selection.

The key benefits of urban trees

1.12 Trees provide a wide range of environmental, social, health and wellbeing benefits.

1.13 Benefits of the project, as depicted in Figure 1.1 below, include:

- Providing natural shade and urban cooling.
- Improving air quality and noise regulation.
- Reducing the risk of flooding and improving water quality.
- Aesthetic value and reinforcing sense of place.
- Carbon sequestration and mitigation climate change.
- Helping create social spaces & may increase sense of safety.
- Space for biodiversity and improved resilience.
- Economic benefits & improved visitor experience.

Figure 1.1: The key benefits of urban trees

Trees enhance our environment

1.14 Trees provide natural shade and cool air.

- Trees provide shelter and reduce wind speed. Trees have been shown to have a cooling effect and reduce the surface temperature in some European cities by up to 12 degrees in some regions. In contrast, green spaces without trees have a negligible effect on surface temperature. **[See**

reference 2] Trees have been found to reduce the risk of heat related morbidity and mortality and improve thermal comfort in outdoor spaces **[See reference** 3**]**.

1.15 Trees release the oxygen we breath and absorb carbon dioxide.

- A mature tree can store 22 kilograms of carbon every year. An average tree will uptake around 1 tonne of CO2 in its lifetime. **[See reference** 4**]**

1.16 Trees provide shelter and food for wildlife.

- Shelter belts, avenues and tree lined streets can provide important linear wildlife corridors that are integrated into the urban setting. Trees can provide a range of habitat from nesting sites to food such as nectar, seeds and berries. One mature oak can support over 280 different species of invertebrates.

1.17 Tree alleviate impacts from flooding and reduce stormwater pollution.

- With appropriate siting and species choice, trees can reduce ground water run off and intercept pollution. This can in turn reduce the severity of flooding and help to protect river and marine water quality and aquatic life. It has been estimated that a 5% increase in tree canopy cover can reduce run-off by 2% **[See reference** 5**]**.Broadleaved trees have been shown to intercept around 38% of gross precipitation; slowing the flow of water during rainfall events. **[See reference** 6**]**

1.18 Trees enhance landscape character and can soften the built environment.

- The full range of planting types including street trees, parkland trees, hedgerows, community orchards or woodland all have the potential to reinforce sense of place and provide aesthetic value if planted in the right locations.

Trees provide social, health and wellbeing benefits

1.19 Trees intercept particulates and improve air quality.

- Trees can help to intercept and remove a number of pollutants from the atmosphere – including nitrogen oxide, ozone and particulates. Particulate levels can be up to 60% lower on tree lined streets than those without trees.

1.20 The presence of trees in urban areas has been associated with lower levels of crime.

- Some studies have shown that areas with high canopy trees have lower rates of crime when compared to areas with lower vegetation such as mown grass **[See reference** 7**]**. Public spaces with trees also tend be used more, and a flow of people will increase informal surveillance and sense of safety.
- The presence of trees could reduce crime levels by as much as 7%. One study, conducted in the USA, found that apartment blocks surrounded by mature trees experienced 52% fewer reported crimes than those without greenery **[See reference** 8**]**. A review of literature by Wolf et al. **[See reference** 9**]** found that trees may reduce the incidence of various types of crime, although there may be influencing factors such as tree size, location and overall health status of trees in an area.

1.21 Trees help create social spaces and foster social inclusion.

- One study has shown a positive relationship between higher tree canopy cover and higher self-reported neighbourhood 'social capital', connection and association amongst individuals. **[See reference** 10**]**

1.22 Trees help reduce noise pollution.

- It has been shown that a 30-metre shelter belt of trees can reduce noise levels by around five to ten decibels. **[See reference** 11**]**

1.23 Trees can have economic benefits.

- It has been found that people visiting business districts are generally willing to pay more for goods and services in landscaped areas when compared to non-landscaped areas. The quality of landscaping on approach routes to business districts can positively influence visitor perceptions. **[See reference** 12**]** **[See reference** 13**]**

Chapter 2
Overarching Principles

2.1 The following section sets out a range of overarching principles that will inform all tree planting within the 11 settlements. The overarching principles are supported by a set of sub-principles that apply to each settlement and strategic tree planting zones. These have been developed to ensure all future urban tree planting helps to deliver the vision and objectives for green Infrastructure (GI) in Pembrokeshire.

2.2 These have been informed by the baseline review for the study (including pressures and drivers for each settlement), site visits and consultation with stakeholders. The urban tree planting principles have also been developed to ensure alignment with existing guidance, including the Tree and Woodland guidance (supplementary planning guidance to Pembrokeshire coast national park local development plan 2 – draft approved for public consultation) **[See reference** 14**]**. This document is due to be formally adopted by Pembrokeshire coast national park authority (PCNPA) (following a report of consultations) in 2023.

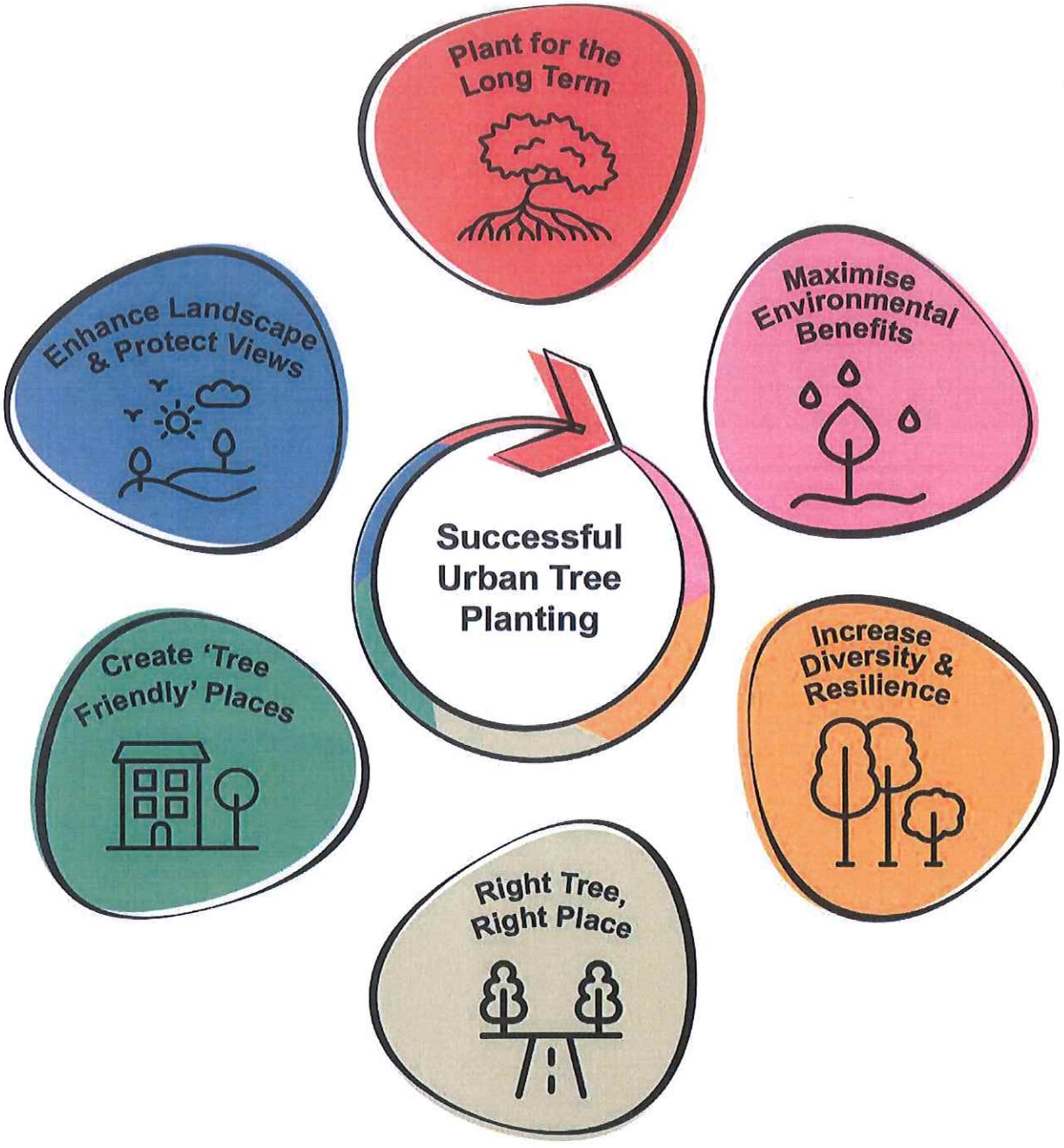
2.3 The overarching principles recognise that trees can provide multiple benefits for people, biodiversity and the wider environment. Trees that are able to reach full maturity, and trees with large canopies, provide greater benefits. In order to deliver healthy, mature trees, new urban tree planting must:

- Be well selected, planted and maintained.
- Have sufficient rooting space with uncompacted, fertile soil; and
- Have physical space to reach full maturity, without excessive pruning requirements.

2.4 The overarching principles also acknowledge that trees may potentially have disbenefits, which can be avoided with good planning and tree selection.

2.5 The overarching principles are set out under several headings. These are divided into those primarily relating to the design stage of a project, and those primarily relating to the delivery stage of the project.

Figure 2.1: Overarching Principles for Successful Tree Planting



Plant for the long term

Design

1a.Tree planting projects should deliver long lived, mature trees. Opportunities for planting large canopy trees will be prioritised.

1b. Planting methods and tree pit design should be informed by recognised industry standards and guidance.

1c. The maximum possible rooting environment should be sought in hard landscape to allow trees to reach their full maturity.

Delivery

1d. Arrangements for ongoing maintenance should be agreed and confirmed prior to planting.

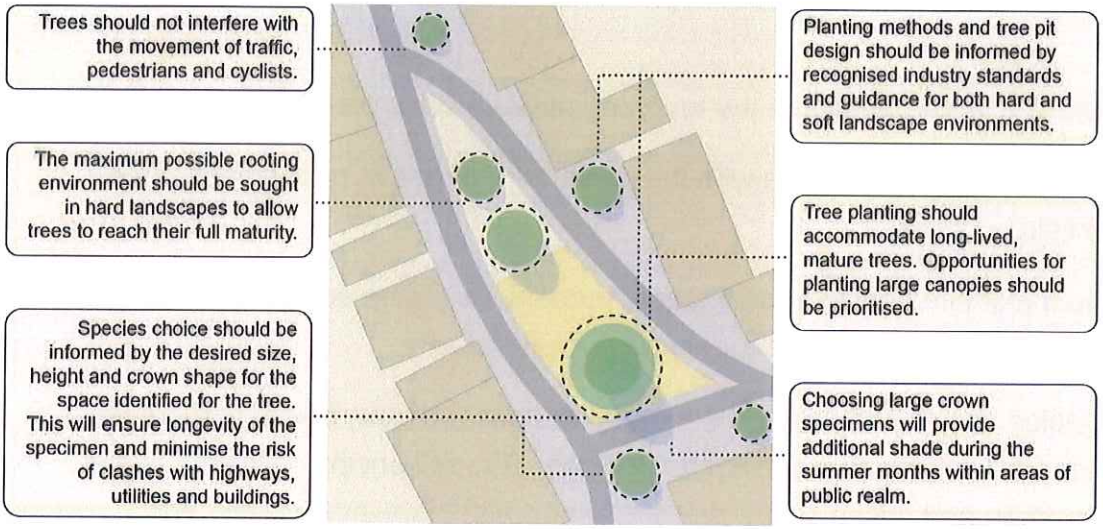
1e. Felled trees should be replaced at a 1:1 ratio as a minimum. The causes of the tree loss, i.e. disease, suitability of species, location should be considered when planning replacement planting. Ideally replacement planting should be located as close to the original tree(s) as possible, with the aim of restoring or increasing canopy cover in each settlement and locality. Individual trees or groups of trees that are planted as replacement for trees that have been removed or lost should ideally be Standard or Heavy Stand trees, unless it is deemed more appropriate to replace lost

trees with larger areas of woodland that may be best established with smaller tree stock (i.e. whips).

2.6 Figure 2.2 below highlights the following points for this principle:

- Trees should not interfere with the movement of traffic, pedestrians, and cyclists.
- The maximum possible rooting environment should be sought in hard landscapes to allow trees to reach their full maturity.
- Species choice should be informed by the desired size, height and crown shape for the space identified for the tree. This will ensure longevity of the specimen and minimise the risk of clashes with highways, utilities and buildings.
- Planting methods and tree pit design should be informed by recognised industry standards and guidance for both hard and soft landscape environments.
- Tree planting should accommodate long-lived, mature trees. Opportunities for planting large canopies should be prioritised.
- Choosing large crown specimens will provide additional shade during the summer months within areas of public realm.

Figure 2.2: Principle 1- Plant for the long term



Maximise environmental benefits

Design

2a. Integrate sustainable urban drainage (SuDS) with urban tree planting where possible.

2b. Species choice should be informed by likely water availability (i.e. tolerant of drought or periodic inundation).

2c. Integrate species that are good at intercepting pollution and particulates.

2d. Prioritise species that provide food and shelter for wildlife.

2e. Place trees to provide shade where needed without blocking light for residents.

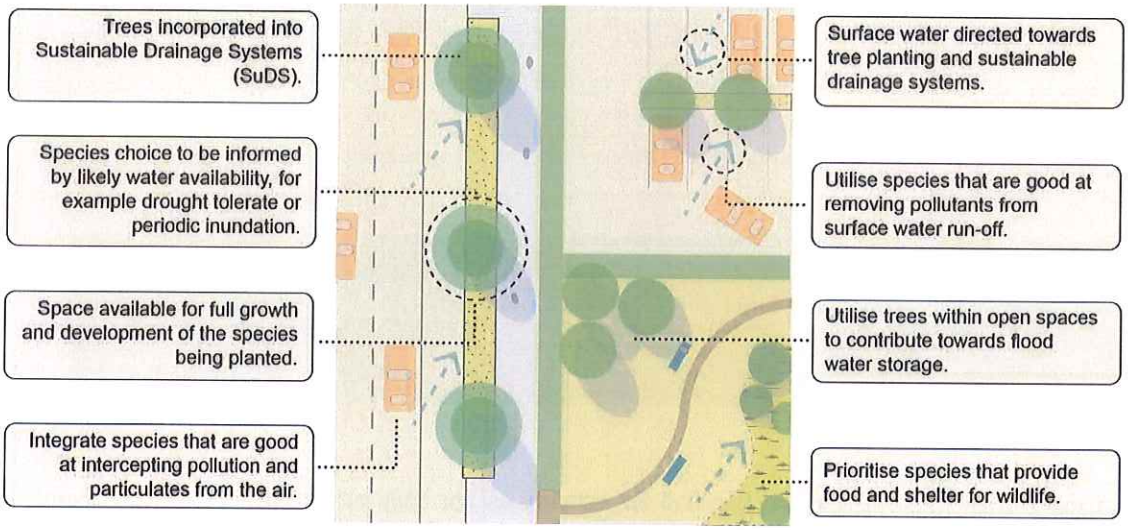
Delivery

2f. Involve specialist practitioners (such as drainage / flood engineers) and work collaboratively to deliver effective schemes.

2.7 Figure 2.3 below highlights the following points for this principle:

- Trees incorporated into sustainable drainage systems(SUDS).
- Species choice to be informed by likely water availability for example drought tolerate or periodic inundation.
- Space available for full growth and development of the species being planted.
- Integrate species that are good at intercepting pollution and particulates from the air.
- Surface water directed towards tree planting and sustainable drainage systems.
- Utilise species that are good at removing pollutions from surface water run-off.
- Utilise trees within open spaces to contribute towards flood water storage.
- Prioritise species that provide food and shelter for wildlife.

Figure 2.3: Principle 2- Maximise environmental benefits



Increase diversity and resilience

Design

3a. Increase the diversity of tree species across each settlement to develop resilience to pests, disease and climate change.

3b. Tree species will be informed by an understanding of the existing tree stock.

3c. Trees should not be planted on existing high value habitats, such as semi-natural wildflower grasslands or heathland where planting would be detrimental to habitat quality.

Delivery

3d. New tree planting and tree management should follow robust biosecurity measures.

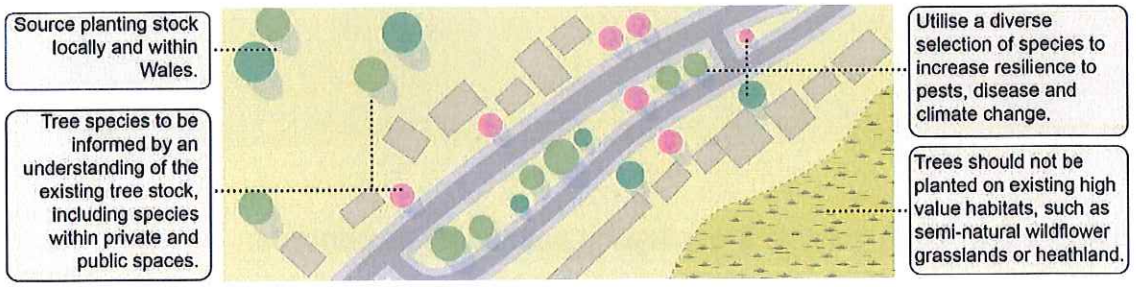
3e. Source planting stock locally and within Wales.

3f. Where necessary, consult Natural Resources Wales concerning designated sites or existing high value habitats when planning tree planting projects.

2.8 Figure 2.4 below highlights the following points for this principle:

- Source planting stock locally and within Wales.
- Tree species to be informed by an understanding of the existing tree stock, including species within private and public spaces.
- Utilise a diverse selection of species to increase resilience to pests, disease and climate change.
- Trees should not be planted on existing high value habitats, such as semi-natural wildflower grasslands or heathland.

Figure 2.4: Principle 3- Increase diversity and resilience



Right tree, right place

Design

4a. New tree planting should be informed by an understanding of site constraints, local conditions and landscape character.

4b. Species choice should aim to limit the need for unnecessary additional maintenance or excessive pruning requirements.

4c. Trees with narrow (or fastigiate) canopies should be specified on sites where wide spreading canopies would present a maintenance issue.

4d. Potential nuisance issues from trees should be considered, including allergenic properties, fruit drop and honeydew.

4e. Select planting sites and trees species to reduce risk of damage to infrastructure and property.

Delivery

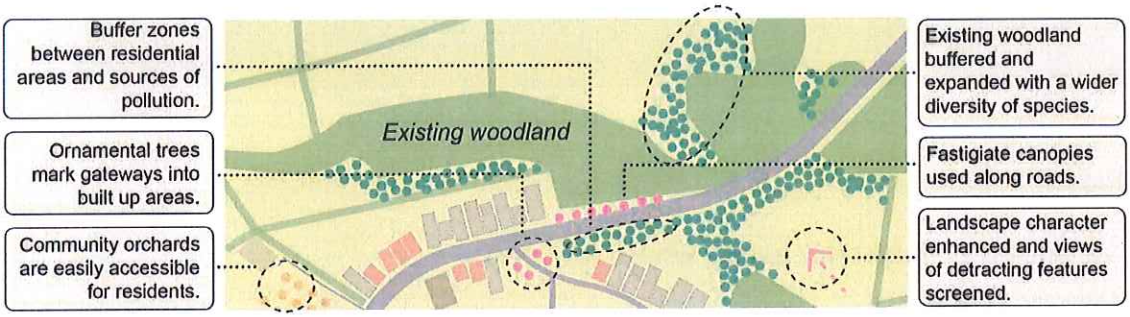
4f. Consult with the wider community early to ensure plans are understood and sufficient opportunity is provided for stakeholders to contribute.

2.9 Figure 2.5 below highlights the following points for this principle:

- Buffer zones between residential areas and sources of pollution.

- Ornamental trees mark gateways into built up areas.
- Community orchards are easily accessible for residents.
- Existing woodland buffered and expanded with a wider diversity of species.
- Fastigiate canopies used along roads.
- Landscape character enhanced and views of detracting features screened.

Figure 2.5: Principle 4- Right tree, right place



Create 'tree friendly' places

Design

5a. Ensure the layout and design of new developments and infrastructure can accommodate the growth of mature, large canopy trees.

5b. Ensure new tree planting does not interfere with infrastructure. Ensure new utilities maximise growing space for trees.

Delivery

5c. Ensure new tree planting is considered as part of all public realm, infrastructure, and development projects.

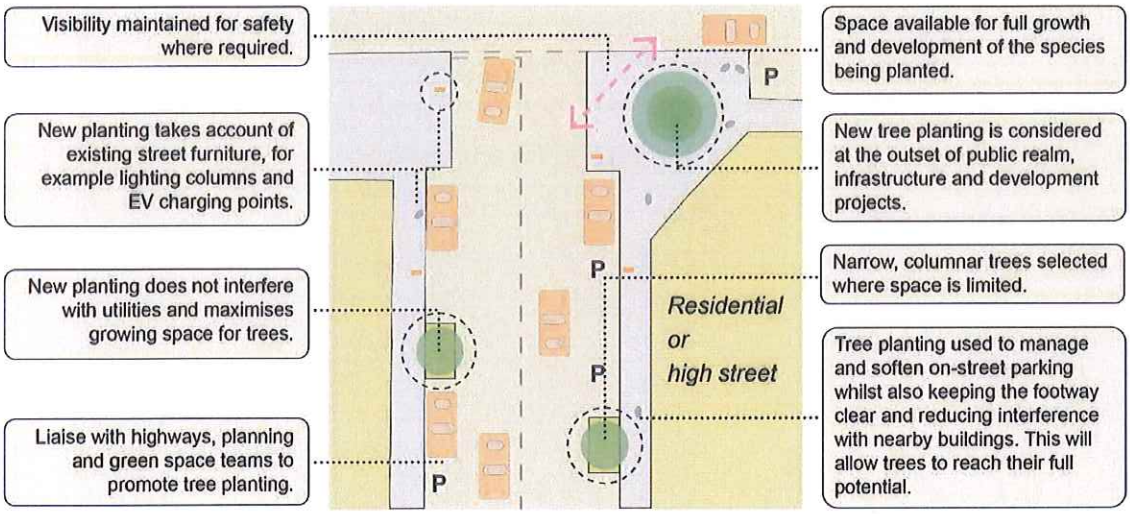
5d. Ensure trees are considered from the start of all design and development projects.

5e. Liaise with green space teams, planning departments and highways to promote tree planting.

2.10 Figure 2.6 below highlights the following points for this principle:

- Visibility maintained for safety where required.
- New planting takes account of existing street furniture, for example lighting columns and EV charging points.
- New planting does not interfere with utilities and maximises growing space for trees.
- Liaise with highways, planning and green space teams to promote tree planting.
- Space available for full growth and development of the species being planted.
- New tree planting is considered at the outset of public realm, infrastructure, and development projects.
- Narrow, columnar trees selected where space is limited.
- Tree planting used to manage and soften on-street parking whilst also keeping the footway clear and reducing interference with nearby buildings, this will allow.

Figure 2.6: Principle 5- Create 'tree friendly' places



Enhance landscape and protect views

Design

6a. Ensure tree planting enhances and doesn't detract from, or negatively impact, heritage features or townscape character. Sufficient consideration will need to be given to Listed Buildings and features, Scheduled Monuments, archaeology, and Locally Listed features.

6b. Trees are used to frame views and vistas.

6c. Maintain key views that are valued by the community or protected by policy.

6d. Ensure tree planting in settlements within and adjacent to the Pembrokeshire Coast National Park (PCNP) is informed by the PCNP Tree

and Woodland Guidance. This guidance sets out opportunities and considerations for siting new trees and woodlands, informed by the sensitivities of various landscape types within PCNP. This is of particular importance for any woodlands or shelterbelts which may be considered within peri-urban areas or rural areas adjacent to the settlements considered in this study. Settlements included within this strategy that are located within the boundary of PCNP include:

- Newport
- St Davids
- Saundersfoot
- Tenby

Delivery

6e. Ensure appropriate visibility is maintained along roads and footways for safety into the future.

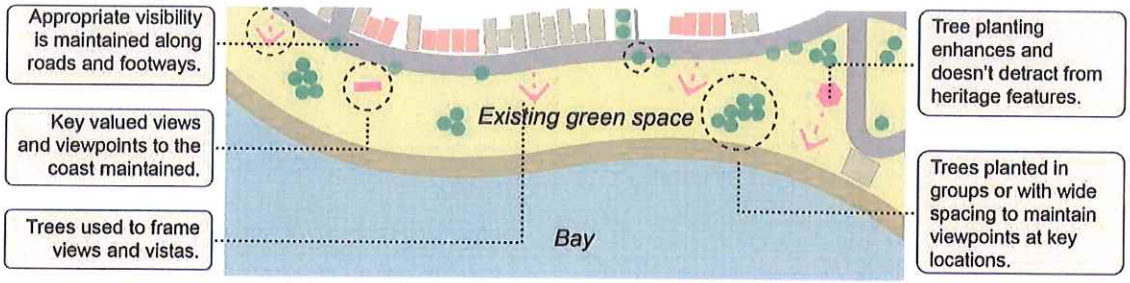
6f. All planting proposals and management of existing trees located within and adjacent to Conservation Areas should be planned in consultation with both the Historic Building Conservation Officer and Landscape Officer at Pembrokeshire County Council (PCC). Early consultation with Cadw, Dyfed Archaeological Trust (DAT), landowners and occupiers will be undertaken to understand the key historic environment considerations of individual sites.

2.11 Figure 2.7 below highlights the following points for this principle:

- Appropriate visibility is maintained along roads and footways.

- Key valued views and viewpoints to the coast maintained.
- Trees used to frame views and vistas.
- Tree planting enhances and doesn't detract from heritage features.
- Tree plated in groups or with wide spacing to maintain viewpoint at key locations.

Figure 2.7: Principle 6- Enhance landscape and protect views



2.12 Tree Planting Zones and Sub-Principles for 11 Settlements build on the Overarching Principles above and provide additional detail on planning and delivering new tree planting. Sub-Principles are set out on the Urban Tree Planting Strategy page for each settlement.

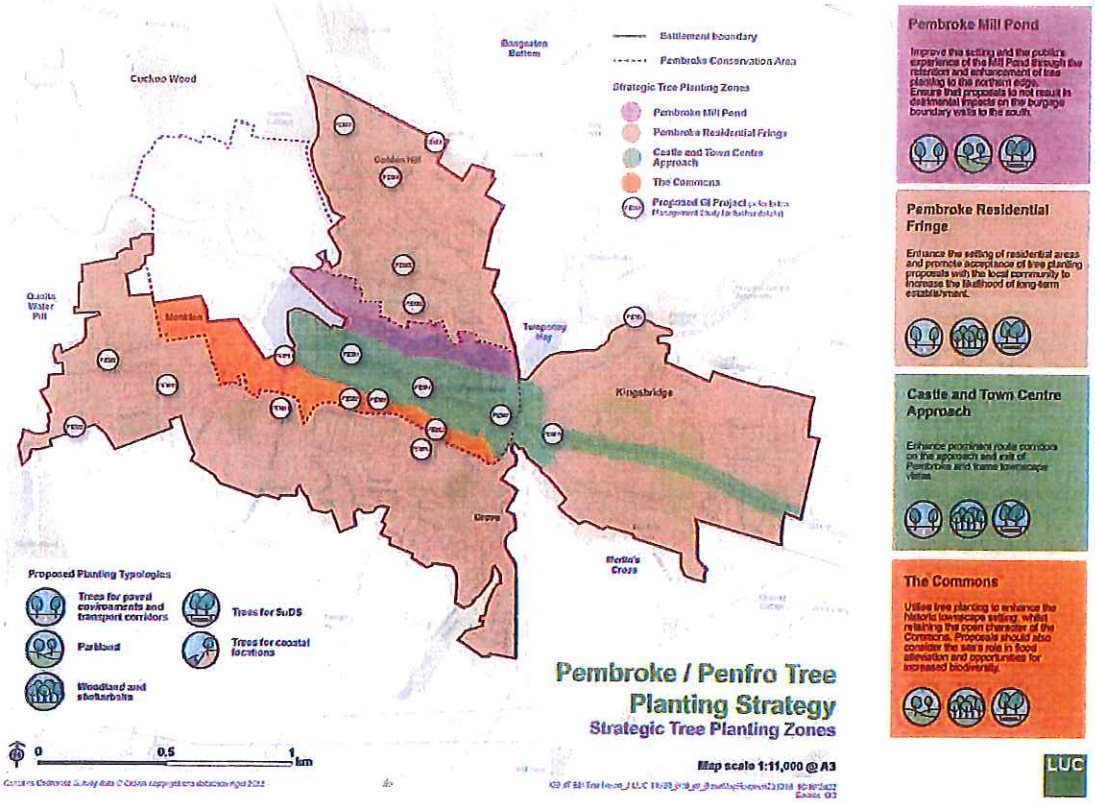
Pembroke Tree Planting Zones and Sub-Principles

3.16 Tree Planting Zones and Sub-Principles for Pembroke are shown on the map and below. They include:

- Pembroke Mill Pond
  - Improve the setting and the public's experience of the Mill Pond through the retention and enhancement of tree planting to the northern edge. Ensure that proposals to not result in detrimental impacts on the burgage boundary walls to the south.
- Pembroke Residential Fringe
  - Enhance the setting of residential areas and promote acceptance of tree planting proposals with the local community to increase the likelihood of long term establishment.

- Castle and Town Centre Approach
  - Enhance prominent route corridors on the approach and exit of Pembroke and frame townscape vistas.
- The Commons
  - Utilise tree planting to enhance the historic townscape setting, whilst retaining the open character of the Commons. Proposals should also consider the site's role in flood alleviation and opportunities for increased biodiversity.

Figure 3.7: Pembroke Strategic Tree Planting Zones



Zones and Sub-Principles

3.17 Land encompassed within Pembroke Conservation Area includes the spaces between buildings and existing trees within the designation. Pembrokeshire County Council (PCC) should therefore be contacted prior to the commencement of works on existing trees subject to a Tree Preservation Order (TPO) or those located within the boundary of Pembroke Conservation Area.

Pembroke Mill Pond

- Maintain and enhance tree cover along the northern edge of the Mill Pond as a key environmental asset, habitat and visual amenity.
- Tree planting in close proximity to the burgage wall will generally be inappropriate. Views and structural integrity of this heritage feature should not be negatively impacted by additional tree planting. Any tree planting proposals will need to be developed in consultation with relevant statutory consultees.

Pembroke Residential Fringe

- Utilise tree planting to frame views and vistas across the varied roofscape of Pembroke town centre. Consideration should be given to ultimate tree canopy size when specifying species.
- Sufficient consideration should be given to species selection and maintenance requirements to promote long-term establishment and reduce interference with buildings and services (e.g. telegraph lines / lighting columns).
- Prioritise tree planting in areas with the least site constraints, such as larger areas of amenity grassland and verges, including areas with minimal recreational value due to slope / small size etc. (e.g. Long Mains & Bush Hill).

- Avoid proposals which conflict with private vehicular access points on residential streets. Tree planting proposals should avoid obstruction of highways and Public Rights of Way (PRoW) within the residential context.

Castle and Town Centre Approach

- Tree planting proposals should have regard to existing building lines and the orientation of existing development along Main Street. This includes responding to the pattern of the streetscape in terms of bays, 'nodes' and courtyard gardens which break up the facade.
- Utilise tree planting to minimise the visual impact of parked cars on the streetscape as well as the landscape setting of historic streets and buildings.
- Use tree planting to mark routes and entrances to Main Street. Ensure new planting does not impede with the range of uses of the area, including events.
- Utilise tree planting to soften larger areas of hard landscape and areas of car parking (e.g. near West Street / Common Road). Incorporate engineered Sustainable Drainage Systems (SuDS) as part of tree pit design to maximise water storage capacity and reduce surface water run-off to nearby water courses.

The Commons

- Ensure species selection continues to enhance the diversity of trees on the Commons, a key element that contributes to the special interest and character of the Pembroke Conservation Area.
- Protect and maintain the existing population of trees. Undertake a planned programme of planting to ensure a stock of young and developing trees. Implement infill planting to enhance existing rows and avenues of trees.
- Introduce small, ornamental trees at some of the key entrances as markers and to improve the sense of arrival.