

Slough Digital Urban Forest



Current Status

Season 20/21 – Final Phase of Planting
Trees planted as of February 2021

1,523 Standard & feathered trees

5,360 Whips



Programme Status

Planting programme is on schedule and within budget at halfway stage.

URBAN TREE CHALLENGE FUND

Sites completed to date (1st February 2021)

Godolphin Rec, Farnham Lane, Scafell Park, Harvey Park, Faraday Rec, The Cherries, Northborough Rd, Cumberland Ave, High St Chalvey, Kedermister Park, Lismore Park, St Laurence Way, Cippenham Lane, Long Readings Lane, Sutton Lane, Wexham Rd, Copthorne Junction, Oatlands Drive*, Botham Drive *, Langley High St, Langley Mem park, Stoke Poges Lane, Chalvey Rd West*, Baylis Park Orchard

Trees planted to date (1st February 2021)

Standard and small feathered trees	1,523
Whips	5,360

Remaining Season 2 (November 20-March21) Completed by week commencing 15th March 2021

Whitby Road, Diamond Road, Lodge Close, Laburnum Grove, North & South Greens, Common Rd *, A4 London Rd Foxborough*

Tree planting remaining

Standard and small feathered trees	648
Whips	1,375

*Sites relocated due to restrictive underground services, resident opposition, land ownership issue, proposed development.

Slough Digital Urban Forest



Project Profile

Regular reporting in local and national press

Regularly featured on Defra and Forestry Commission Website

Featured on European Green Technology Websites

Acknowledged by Forestry Commission as one of the most successful in the UK

Invitation received from Forestry Commission for subsequent bid in 21/23 on the 8th January 2021



Slough Digital Urban Forest



Community Engagement

Link established on SBC website

<https://www.slough.gov.uk/urbantree>

Ongoing formal and informal consultations with residents

Release of Citizen Science Mobile App In Spring/Summer 2021.

Major education installations for Environment and Technology in selected sites with appropriate spatial conditions

SLOUGH DIGITAL URBAN FOREST

WHAT:
Slough Borough Council in partnership with Defra and Forestry Commission are implementing a joint funded boroughwide tree planting initiative. The Digital Urban Forest Initiative will maximise Slough's resilience and resilient delivery relating to Climate Change.

INITIATIVES:

- Focusing on the understorey and herb layers within the plantations and their contribution to carbon capture and biodiversity enhancement.
- Reversing the sites from close mowing maintenance regimes in order to increase diversity to the base of the plantations and to monitor carbon storage levels. These Carbon Capture Areas (CCAs) will be maintained as wildflower areas.
- To develop Europe's first plant installed fuel cell (PI-MFC) powered phenology monitoring system recording seasonal change.
- Introduce environmental sensors to capture data on tree health, and air quality.
- CCAs will be used as pilot sites to investigate extending biodiversity enhancement measures across the Borough. Areas including existing verges, traffic islands and housing greenspaces will be designed for the application of similar landscape treatments and management where appropriate and over time.

WHERE:
The sites are located throughout Slough (see map above).

WATER ATTENUATION: These are effective in water attenuation which helps mitigate flood risk.

COMMUNITY ENGAGEMENT: Initiatives to involve the sites and enhance the relationship between community and their part of the forest.

TEMPERATURE REDUCTION: These actively reduce surface and air temperature (particularly effective during heatwave months).

IMPROVED AIR QUALITY, CARBON SEQUESTRATION: Trees improve air quality by effectively filtering various pollutants. These both sequester and store carbon dioxide from the air.

INCREASE TREE PLANTING: Increasing tree planting in the area aims to increase positive benefits for both the environment and local communities.

COMMUNITY CARE: This project invites local communities to participate in the care of their local trees and data collection extracted from this project.

DIGITAL LAYER: Installation of data loggers and sensors for community monitoring and long-term care of each site.

COMMUNITY ACTIVITIES: This project aims to increase the provision of attractive spaces for community to engage in both exercise and relaxation.

ONLINE RESOURCES: Localised climate data will be extracted and made accessible to the public.

Slough Digital Urban Forest projected outcomes (1)



Fig 8. Amersfoort temperature cluster on example mobile screen.

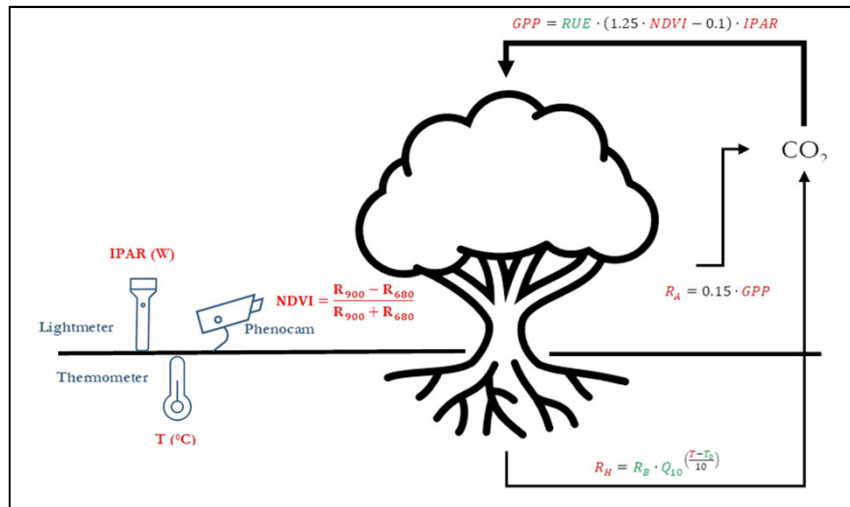
**Establish Citizen Science Open Source LoRa
platform with Borough wide coverage
Summer/Autumn 2021**

Residents, Employees and visitors able to
access data relating to :-

- Real Time Air Quality Measurements
- Real Time Temperature Measurements
- Real Time Soil Moisture Content
- Overall Health Status of the Urban Forest
- Overall Health of particular sectors and some individual specimens

Slough Digital Urban Forest projected outcomes (2)

**Establish 3 prototype STEM learning
LABS in preparation for further LEP
funding and Urban Forest Extension**



Sample of the development phase of the world's first
Pmfc powered phenology sensor which is able to
measure carbon capture levels

STEM LAB : Diamond Road
STEM LAB : Baylis Phenology Orchard
STEM LAB : Foxborough Digital Labyrinth
External STEM LABS are used to assist
with Science, Technology, Engineering
and Mathematics learning.

Key partners on these initiatives

- Reading University
- Wageningen University (N.L)
- Edinburgh University
- University of Lancaster

Slough Digital Urban Forest projected outcomes (3)



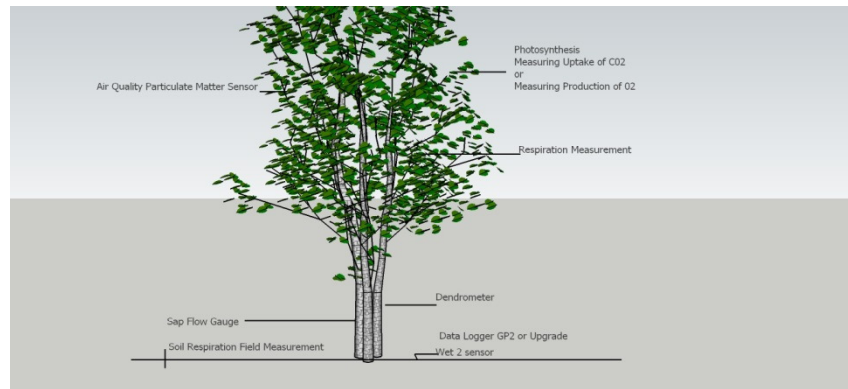
Establish Post Covid Training and Volunteer Programme

The Forest contains 'Coppicing Paddocks' to facilitate formal and informal training.

Potential areas of interest to public volunteers (active) and unemployed (up skilling) are:-

- Woodland Management Skills
- Woodland Crafts (Coppicing, Pollarding Hedge Laying)
- Horticultural Science (in conjunction with Citizen Science App)
- Biodiversity and Habitat Creation

Slough Digital Urban Forest projected outcomes (4)



Design in Income Generation – Solar

Income generation for future maintenance and development of the Forest.

Establish solar micro grids in selected sites to power sensors and data loggers.

Sell back surplus power to National Grid to fund future maintenance and development.

The approach work for this initiative is underway for : -

Baylis Phenology Orchard

Foxborough Digital Orchard

Other sites to be added where appropriate.



Slough Digital Urban Forest

Merging Slough Digital Urban Forest and SCH2020

Slough Canal Horizon 2020 (SCH 2020)

The SCH 2020 project was accepted into the LEP funding pipeline in Autumn 2020.

The project title anchors the initiative in the year of Covid 19, as a testament to Slough's continued pursuit of its environmental and developmental innovation.

Negotiations with Thames Valley LEP board are ongoing. The project was proposal was received with enthusiasm and is highly regarded for its innovation and vision.

The following 2 slides will provide further explanation

Slough Canal Horizon 2020 (SCH 2020)

Key Proposals -

- Complete refurbishment of the 5km towpath of the Slough Canal

To establish a Slough Digital Urban Forest Hub and Field Centre for the administration, development, education and employment offer of the combined projects.

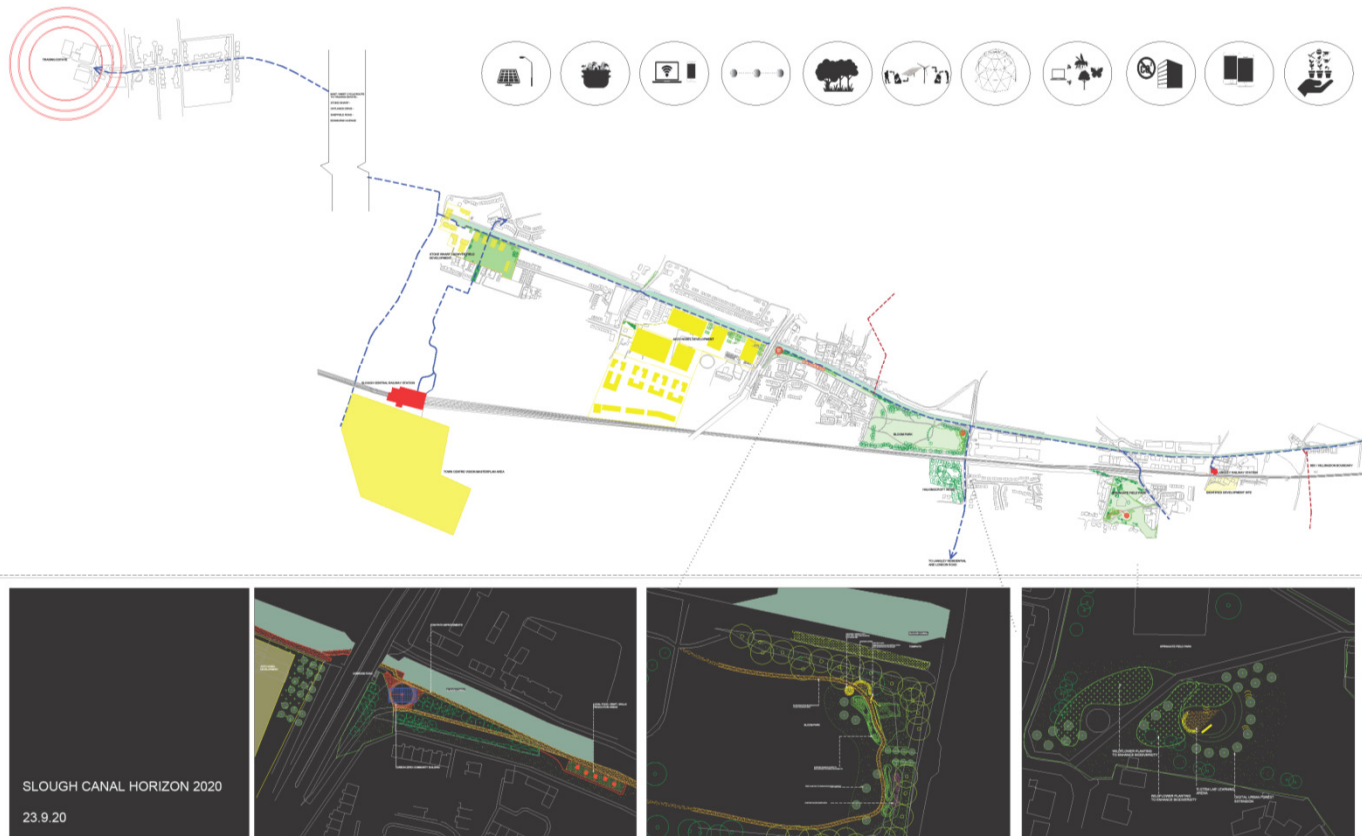
To Establish a regional STEM learning LAB

To facilitate the Berkshire Green Industry community with available expertise in data management, software development, environmental and climate facing innovation.

Slough Digital Urban Forest projected outcomes (5)

Merging Slough Digital Urban Forest and SCH2020

SLOUGH CANAL HORIZON 2020



Slough Digital Urban Forest projected outcomes (5)

Merging Slough Digital Urban Forest and SCH2020

SLOUGH CANAL HORIZON 2020

MASTERPLANNING PRINCIPLES

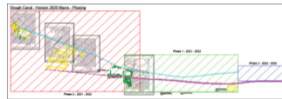


Fig 1. Horizon 2020 Macro-Planning

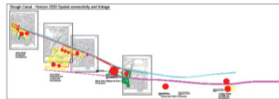


Fig 2. Horizon 2020 Spatial Connectivity and Linkage

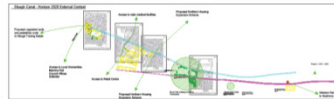


Fig 3. Horizon 2020 External Context

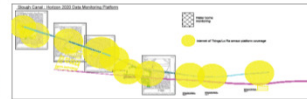
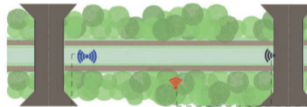


Fig 4. Horizon 2020 Data Monitoring Platform

E-STEM LAB

A group of environmental sensors will continuously collect data across the three sites shown.

- The data will be made available through interpretation panels as accessible visualisations that show variations in the local ecology over the days, months, and years.
- These visualisations will also be available online.
- The sensors will be of an open source design that can be replicated by other groups, such as schools, for monitoring their own environments.



Bridge
Fixed sensors will collect data regarding the changing levels of activity among birds, bats, and other animal wildlife throughout the day and night. Environmental variables that require attention, such as light, temperature and humidity will also be monitored. The sensors will be housed in a pendant suspended 4-6m above and in front of the mouth of the bridge.

Canal
Sensors will continuously collect data regarding waterflow, turbidity, temperature, suspended solids, and other components. The sensors will be housed in a floating laboratory on a tethered buoy that has probes and sensors beneath the waterline.

Vegetative Margins
Tree-based sensors will measure changes in height, girth, sap flow, photosynthesis, and respiration. These sensors will be distributed amongst a group of newly planted trees and will show their development over a period of years.

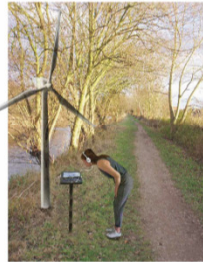


Fig 6. National Wind Turbine Power Demonstration Area

Precedent: 'Pond Station' Zehi Puff



Fig 7. National Hydropower Demonstration Area

Precedent: ZED Factory



Fig 8. National Solar Power Demonstration Area & Data/Sensor Platform

MACRO DATA VISUALISATION

Notional examples of macro-data visualisation art projects.

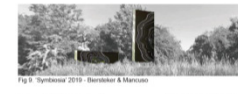


Fig 9. Synthesizer 2010 - Oberholzer & Marocco



Fig 10. Animatec 2020 - Fig Thomson

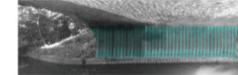


Fig 11. 'Traffic Lights' 2010 - Andrea Puhl

CITIZEN SCIENCE

'Citizen science' is the involvement of the public in scientific research for a multitude of projects, local or global.

- The Slough Canal measures your city project is based in Amsterdam and provides a platform that enables citizens to participate in measuring climate change locally.
- The project offers an infrastructure for participants/volunteers to develop and build measuring hardware to measure and analyse personal climate data.



Fig 9. Amsterdam temperature cluster on example mobile screen

MICRO DATA VISUALS

Data visualisation as an art form enables the expression of measurement to travel from the spreadsheet to the digital screen. The screens can be integrated into the public realm (see already) and become a useful learning aid as well as the components of an open air gallery attracting visitors from all sections of the public.

- There are various formats for the display of machine data. Digital expressions of collected data from a wide range of parameters relating to atmospheric, environmental or water based monitoring can be expressed on the images seen below. All the precedents shown below are connected by the idea of allowing people to experience changes in the local environment over time, ranging from days to decades.
- The sensors will be of an open source design that can be replicated by other groups, such as schools, for monitoring their own environments.



Fig 10. Terna Solaris project: Glass sphere records the movement and intensity of the sun onto a piece of timber.

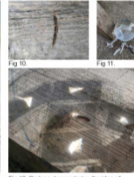


Fig 11. Prolog: Demonstrates the idea of quadrant, data made of three lenses to turn the movement of sun into data.



Fig 13. Changes in light and sound visualised over a 24-hour period. The high frequency calls of bats can be seen to emerge as dark dots (dark based) starting around 8 o'clock position.



Fig 14. Environmental variables will be monitored and visualised over long periods. This is a 3D visualisation of changing ambient light levels over a period of three days.

LEGACIES AND 'CUSTODIANS'

The database would also be openly available to anyone wishing to use it for research of their own data visualisation experiments in present day, and hopefully will continue to engage a broad demographic over generations in order to promote the recording of changes over a long period of time.

The data will be open source and available to the public including communities, schools, local organisations (e.g. Friends of Slough Canal) and various societies.

Present Communities and Future Generations



Precedent: 'Future Library' conceived by Kate Peacock

Slough Digital Urban Forest projected outcomes (6)



Urban Forest extensions

During 2020 we have implemented planting schemes outside of the 31 sites of the UTCF.

These are

- Wexham Road 73 trees
- Trelawney Avenue 15 trees
- Bloom Park 6 trees 25 whips & perennials
- Travic Road 6 trees

These sites have been designed and detailed in line with UTCF guidance including 2 years maintenance and irrigation costs.

It was agreed with Cabinet at the outset of UTCF that the project would be developed along an organic principle, distributing the Forest to every corner of the Borough.

Slough Digital Urban Forest projected outcomes (6)



IoT Irrigation systems

In the Spring of 2021 Faraday Recreation Ground will be the first park in Slough to have an automated irrigation system controlled by the Internet of Things (IoT)

We installed the infrastructure during the sites development and now are able to fund the IoT system by savings made on manual irrigation over the next 3 years.

To irrigate the rest of the Forest we have 'hired' the DSO Gully Tanker resulting in an investment in the DSO upwards of £230k over 3 years.

Forestry Commission spec = 60litres/tree

Gulley tanker capacity = 8000 litres

This means more efficient watering and a reduction in carbon emissions compared to the use of 500 litre bowsers which have proven ineffective when dealing with the Borough's full complement of trees.

Slough Digital Urban Forest conclusions



The Urban Forest is a 'Lab' in itself where new ideas and responses to changing environmental conditions can be enacted. This innovation facilitates Slough's positive profile while at the same time providing opportunities in education, retraining, environmental, health & wellbeing, and joy.