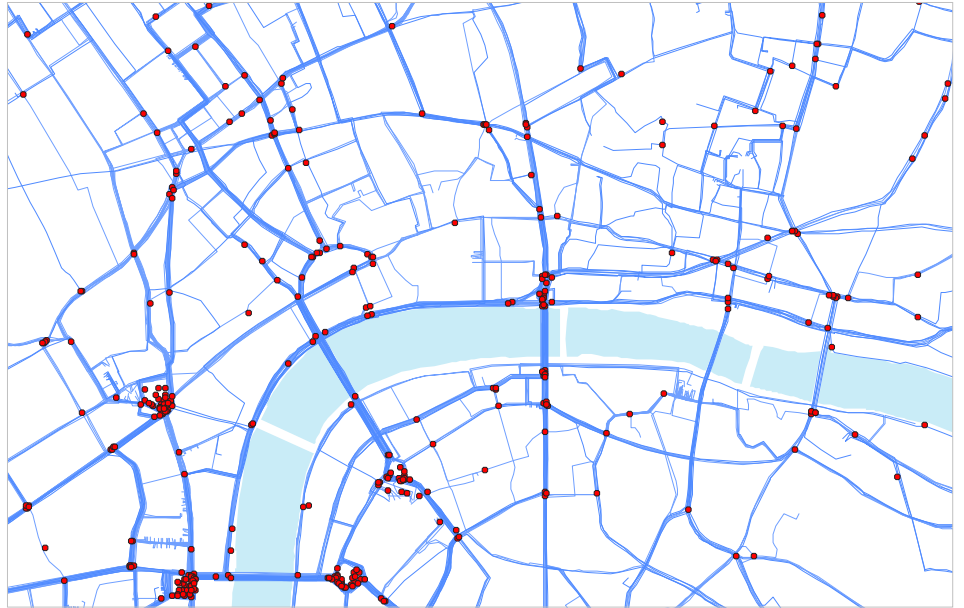# Cycle Network Modelling
A new evidence-based approach to the creation of cycling strategy

A
The Business Cycle, London, mapping of commuter cycle routes and hotspots, 2000.

A

" It is refreshing to see an approach that reflects the behavioural travel patterns of pedestrian and cyclists, so often the forgotten mode in transport modelling. "

Paul Speirs, Technical Director, WSP

Cities for all
Cycle-friendly cities are cities for all, with less traffic congestion and improved air quality; more active, accessible, inclusive streets; and an animated, user-friendly public realm.

Streetscapes with more efficient access between people and places result in more vibrant and economically-sustainable neighbourhoods. High levels of active travel, including walking and cycling, lead to healthier populations, saving large sums of healthcare expenditure.

The challenges of the cycling revolution
Cycling has moved to the forefront of the design, planning and transport agenda in recent years. Growing urban populations increase pressure on public transport infrastructure and lead to an increase in congestion, accidents and air pollution on the road network.

Travelling by bicycle offers a sustainable, low-cost, and often faster alternative to all other forms of travel. With the help of increased investment in cycle infrastructure, cycling can become a major component of sustainable urban transport systems.

Investment needs to be targeted carefully in order to optimise impact. Without a thorough understanding of how and where to focus efforts, the opportunity to create efficient cycling networks might be missed. This leads to three key questions:

Which factors most determine cyclist behaviour?

How do we identify future demand in cycling?

Where should funding go for the biggest impact?

The Space Syntax approach
Space Syntax's evidence-based understanding of urban mobility has led to the development of a unique methodology for creating policy and designing infrastructure to promote active travel.

Taking a space-based, user-focused perspective, a set of tools has been created to explain and predict cycling behaviour. By partnering these tools with Space Syntax's Pedestrian Modelling capabilities, active travel can be properly considered alongside public transport and private vehicle modes.

Tried and tested in numerous project applications over many years, this approach supports the design and development of integrated urban environments that balance the needs of all users.
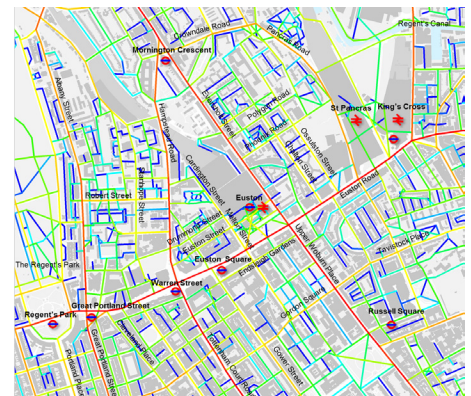
Space Syntax

Map, Measure, Model, Make
A science-based process for the creation of cycling policy and design proposals

Cycle lane/track
Cycle route intermittently marked
Combined bus/cycle lane (signed)
Off-road routes (canal / park routes)
Shared surface
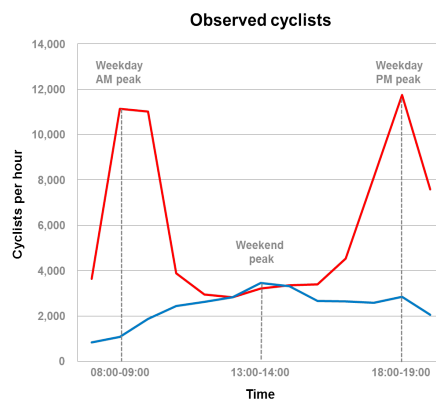
Observed cyclists

Weekday
Weekend

Spatial Accessibility
High
Low

B
Existing cycle infrastructure around Euston station.

C
Observed cyclist flows around Euston station both during the week and at the weekend.

D
Spatial accessibility model of area around Euston station.

Map
Space Syntax's cycle network analysis begins by mapping existing cycle infrastructure to evaluate network capacity, legibility and character.

This approach is underpinned by a well-established method of analysing the wider spatial layout hierarchy as well as the location of transport nodes and other attractor land-uses which influence cycling behaviour.

Measure
Patterns of vehicle and pedestrian movement are also examined and conflicts are studied. Spatial and temporal patterns in movement are identified and analysed.

Model
Ideas for change are then modelled to evaluate their impact.

Space Syntax models create a unique understanding of how physical and spatial factors interact to influence the way that all roads users – including cyclists and pedestrians – move, interact and transact in streets.

Make cycling policy and design proposals
Space Syntax's models are used to highlight key issues and predict future demands in order to identify what and where investment is needed.

Applications include evidence-based cycle policy and strategic network development as part of integrated, multi-scale and multi-modal public realm design concepts.

Cycle Network Modelling
Service Offer

Strengths

High legibility is achieved through the overlap of street segments with high levels of accessibility. Additional benefits come from clear signage and road markings.

A **safer route** is one with cycle tracks (4), cyclist only routes (5), traffic speed reduction measures (6) and cycle crossings (11).

A route with **good infrastructure** provision has advanced stop lines (10), cycle crossings (11) and provision of cycle hire (12).

A route with **good character** has active frontages, entrances and mixed land uses (15) facing onto it.
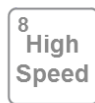
Weaknesses

Routes with **low legibility** are those with multiple direction changes (1) and one-way systems (2).
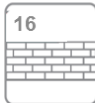
A **less safe** route has segmented sections (7), a high speed vehicle environment (8) and is close to parked cars or parked vehicles on the cycle lane (9).

A route with **poor infrastructure** provision has a lack of cycle parking (13) and cycle crossings (14).

A route with **poor character** has inactive frontages, entrances (16) and residential land uses (17) facing onto it.

E
Cycle network assessment, Elephant and Castle, London.

Baseline Studies

Cycle network analysis
Spatial layout attraction
Multi-scale and multi-mode journey potential.

Public transport attraction
Distribution of bus, rail, cycle stations and passenger volumes/capacities.

Cycle infrastructure attraction
Cycle lanes, London Cycle Network, cycle signage and road markings, cycle parking, advance stop lines, crossings, cycle hire.

Cycle environment attraction
Number and speed of vehicle lanes.

Land-use attraction
Building land use and street quality.

Cycle route capacity
Cycle comfort and capacity of lanes.

Cyclist movement analysis
Surveys of existing movement flows (cycle, pedestrian, vehicle).

Data collation and graphical representation.

Statistical analysis of spatial and temporal patterns.

Cyclist movement modelling
Multi-variable network modelling to test the influence of the attraction variables on cycling behaviour.

Strategy development and impact assessments
Policy creation
Creation of cycling strategies and production of policy recommendations.

Design development
Opportunities and constraints analysis. Integrated cycle network development. Public realm strategies.

Development scenario modelling
Option testing, optimisation and design development.
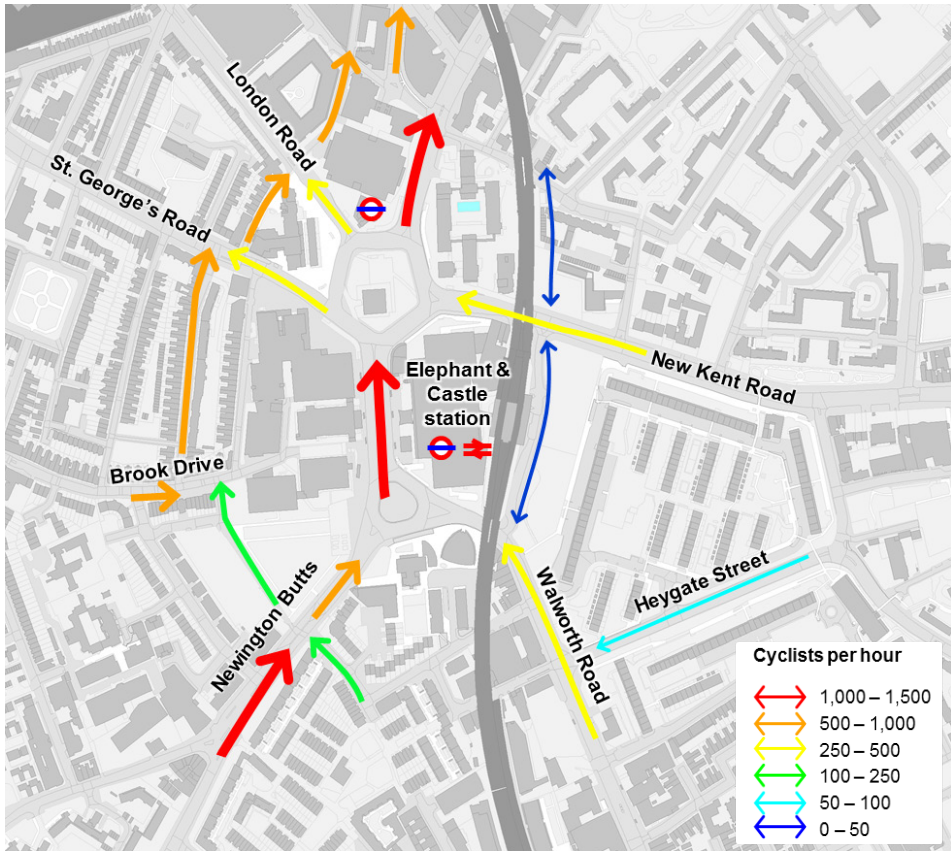Scenario impact forecast modelling.

Planning support
Attendance at stakeholder meetings. Contribution to policy documents. Contribution to planning submissions.

Selected Projects

Cyclists per hour

⟷	1,000 – 1,500
⟷	500 – 1,000
⟷	250 – 500
⟷	100 – 250
⟷	50 – 100
⟷	0 – 50

F

G

F
Morning peak cyclist movement flows around Elephant and Castle. Warmer colours indicate higher levels of cycle movement. The distribution confirms cyclists' preference for direct and highly accessible routes in the street network.

G
The Business Cycle publication, for the Central London Partnership and the Government Office for London.

The Business Cycle, London, Central London Partnership, 2000
Pioneering cycle-use survey and mapping of current and ideal routes as well as perceived 'locations of risk' in London. Key findings highlighted safety and pollution as main concerns and the preference of simple, clear and direct routes to work.

Recommendations included improvements of hazardous but well used routes and a more analytical approach to assist planning for multi-modal transport.

For the Central London Partnership and the Government Office for London.

Elephant and Castle, Heygate Estate, London, 2013
Development of a 'Cycling Network Analysis Toolkit' to provide an evidence-based assessment of cycling activity patterns, public realm design advice and recommendations for further cycle network provisions.

The project confirmed that many cyclists prefer to use major routes offering direct connections rather than less direct secondary roads, even if the secondary routes were designated, signed and designed as parts of a formal cycle network.

For Lend Lease and the London Borough of Southwark.

Euston Area Plan Pedestrian and Cyclist Analysis, London, 2013
Construction of a pedestrian and cycling movement model to evaluate the localised impacts of increased flows related to the Euston Area Plan and the introduction of HS2. Recommendations for public realm infrastructure improvements.

The project confirmed that cyclists largely follow the spatial layout hierarchy of the route network, which can be identified using Space Syntax's modelling approach.

The cycling model was used to forecast a 2030 scenario to inform related policy development.

With WSP for Transport for London.

Selected Projects

" Our idea has been developed and now more recently turned into a truly world-changing scenario by Space Syntax, for revolutionising cycling in London and possibly the world. "

Sam Martin,
Exterior Architecture

H

SkyCycle, London, 2014
Visionary project to develop a strategy for using railway infrastructure to create a continuous cycle network across Greater London, connecting the centre with outer boroughs and decreasing commuter journey times. With Foster + Partners and Exterior Architecture.

H

Visualisation of SkyCycle, a new approach to transform cycling in London. Following existing suburban railway corridors, a wide, secure deck would be constructed above the trains to create new cycle routes throughout London. Image courtesy of Foster + Partners.

I

10 minute catchment area of the SkyCycle network.

I

Legend:
- 10 minute catchment from SkyCycle entrance
- ● SkyCycle entrance
- — SkyCycle path
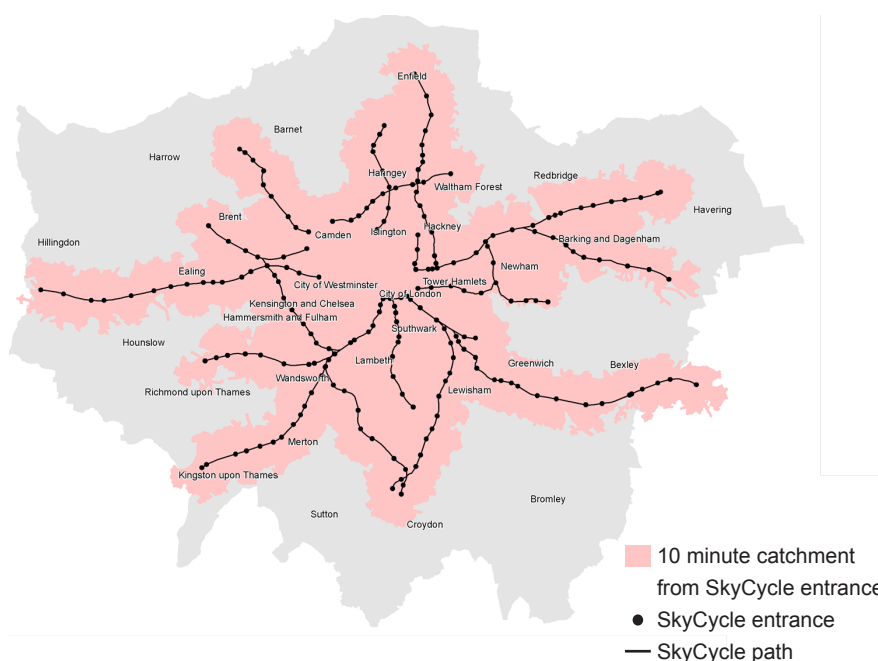
Why Space Syntax?

" The promotion of 'active modes' is a key component of the Euston Area Plan Transport Strategy. Space Syntax provided TfL with an evidence-led planning tool that allowed us to successfully test complex network and land use configurations for the Euston regeneration area. "

Phil Hawkins,
Transport for London

Cycling in integrated urban environments
The benefits for you and your team
Space Syntax's unique approach to the analysis and promotion of cycling will provide a clear and objective assessment of the current strengths and weaknesses of your project area and will help you gain the confidence that important decisions are grounded on solid foundations.

Study outputs will focus the efforts of your team on resolving strategic planning and design issues concerning cycling infrastructure. You will gain a new perspective from fresh thinking, avoid costly functional failure and develop projects resilient to changing circumstances in the future.

Space Syntax's methods have been developed based on a robust, empirically-validated approach and are backed up by experience in hundreds of projects throughout the UK and abroad. Clear recommendations, using highly visual information, are easy to understand.

This approach can provide objective evaluations as well as rankings of alternative options and their likely outcomes, even at the earliest stages of a project.

Why Space Syntax?
Space Syntax is expert, independent and widely respected for supporting public, private and community-based decision makers.

To find out how **Space Syntax** can help you, please contact:

Anna Rose
Director

info@spacesyntax.com
+44 20 7400 1320

science-based : human-focused

www.spacesyntax.com