Smart Cities

SESSION III: Lecture 2: Online Public Networks: Communications Data

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@jmichaelbatty

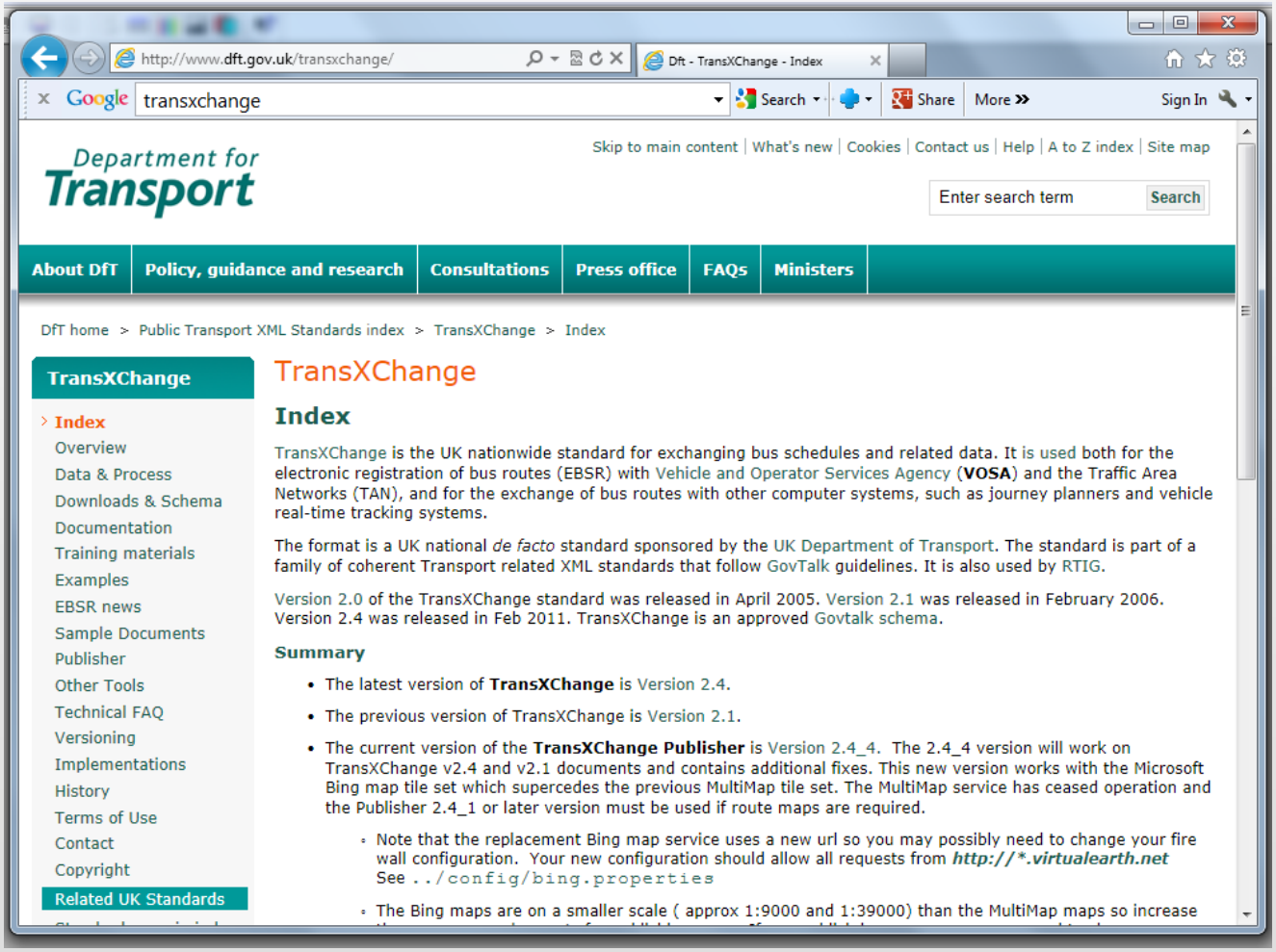
http://www.spatialcomplexity.info/

http://www.casa.ucl.ac.uk/

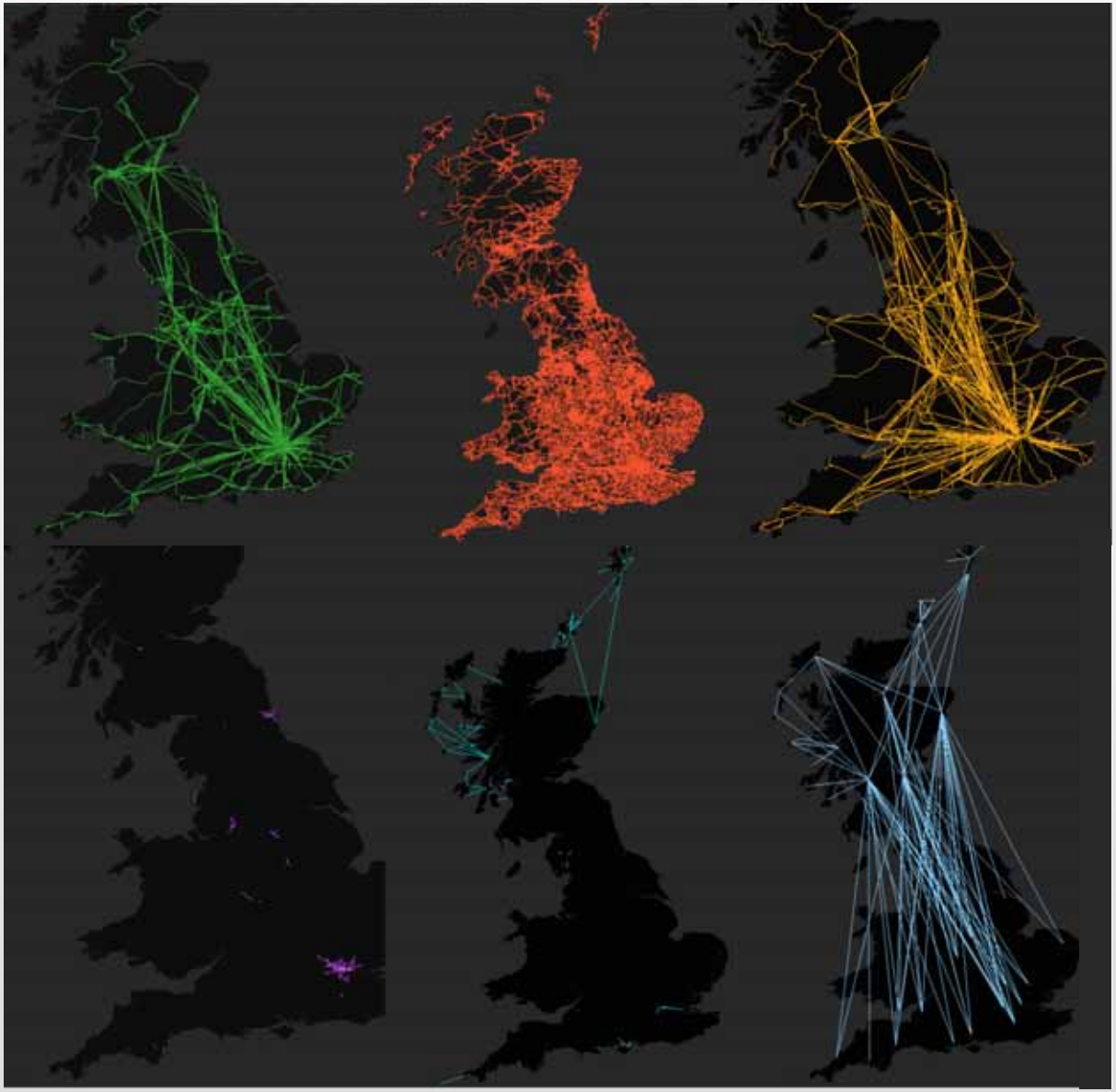
Outline of the Lecture

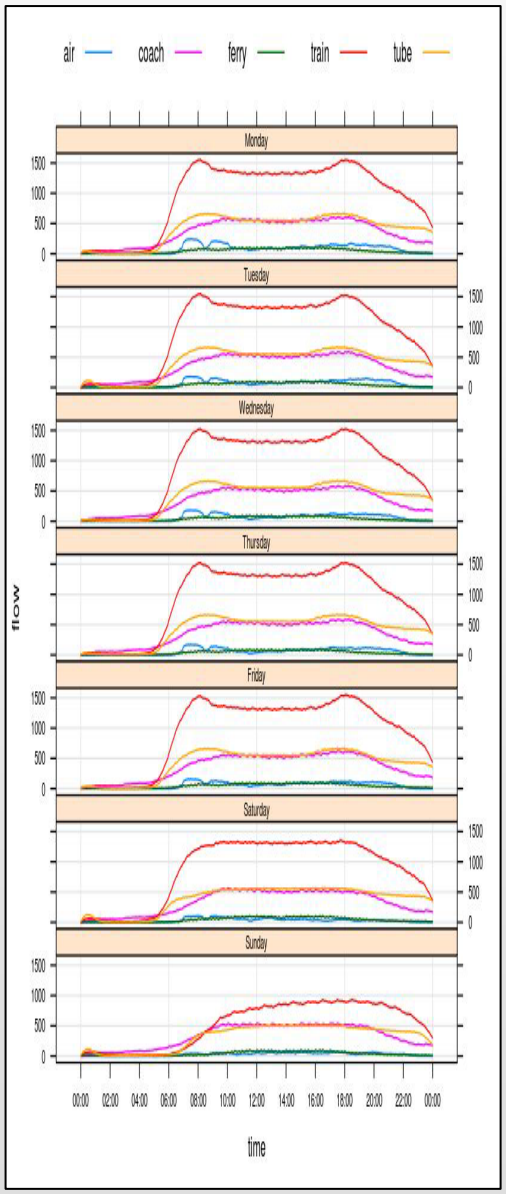
1. More Collections of Flow Data from the Public Domain and its Visualisation: National Patterns
2. The Bikes Projects: Online Data
3. The Barclays, now Santander Cycle Hire London Project
4. The Website: Real Time Visualisation of Origins and Destinations Activity
5. Initial Analyses

More Collections of Flow Data from the Public Domain and its Visualisation: National Patterns



From Joan Serras work posted in Vimeo: http://vimeo.com/21351764 and you can get all this from our Simulacra blog www.simulacra.info, I think

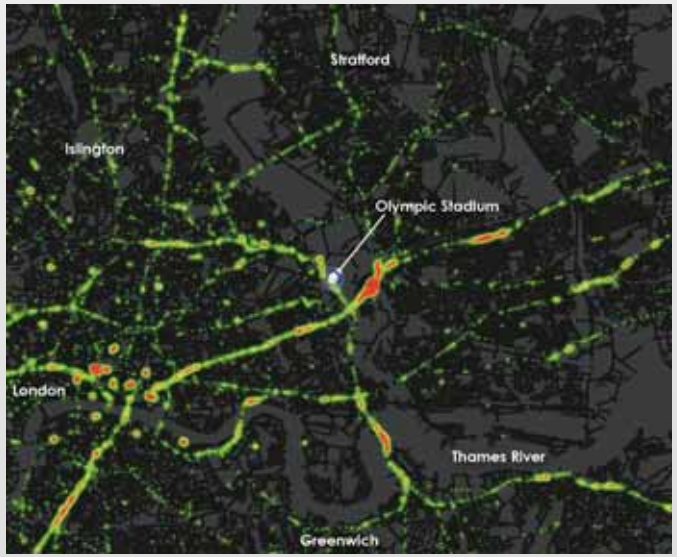



air
coach
ferry
train
tube
Monday
Tuesday
Wednesday
Thursday
Friday
Saturday
Sunday
flow
1500
1000
500
0
00:00
02:00
04:00
06:00
08:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
00:00
time

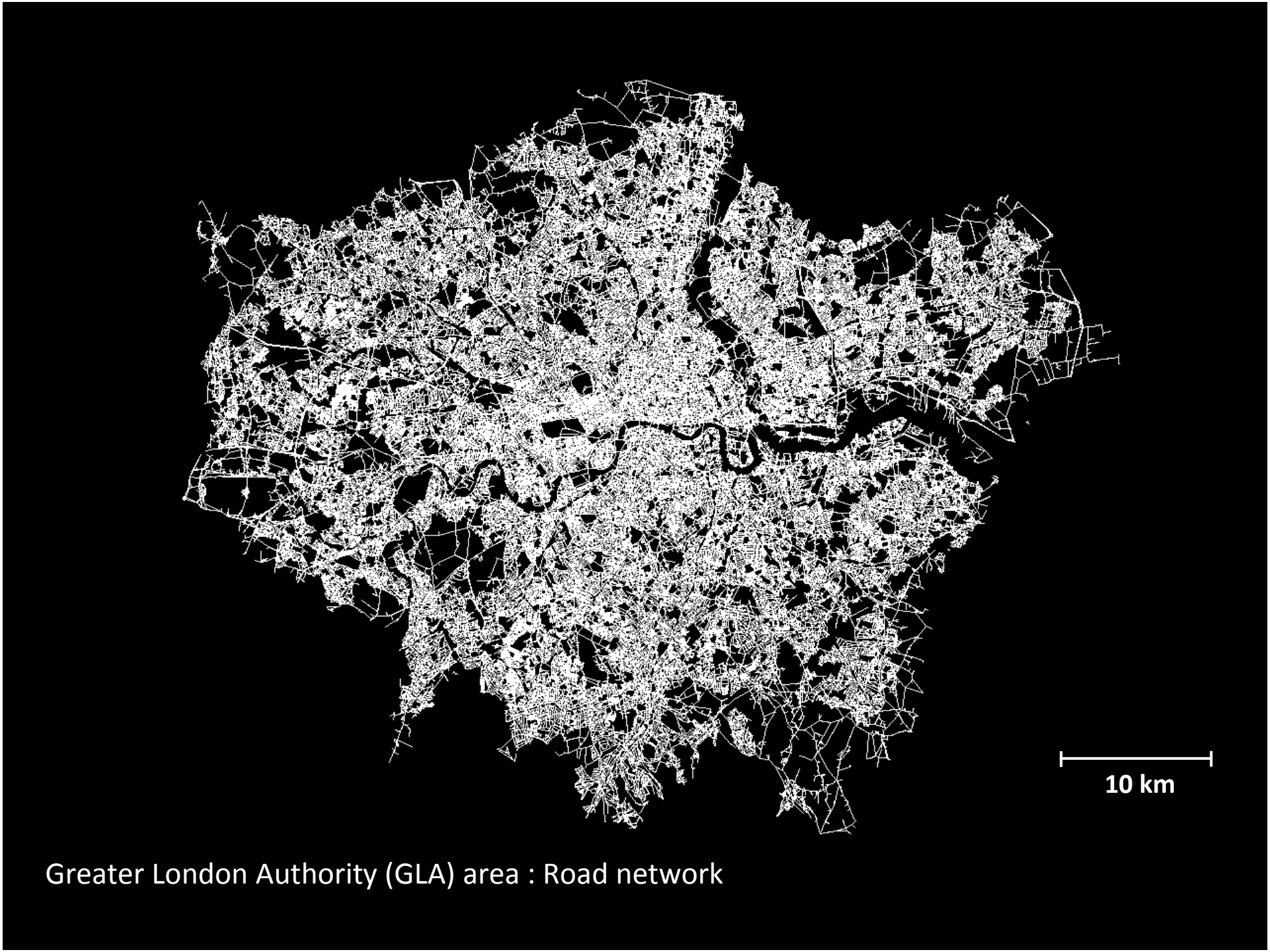
Best to show these animations from simulacra as this let me point you to related things

http://simulacra.blogs.casa.ucl.ac.uk/

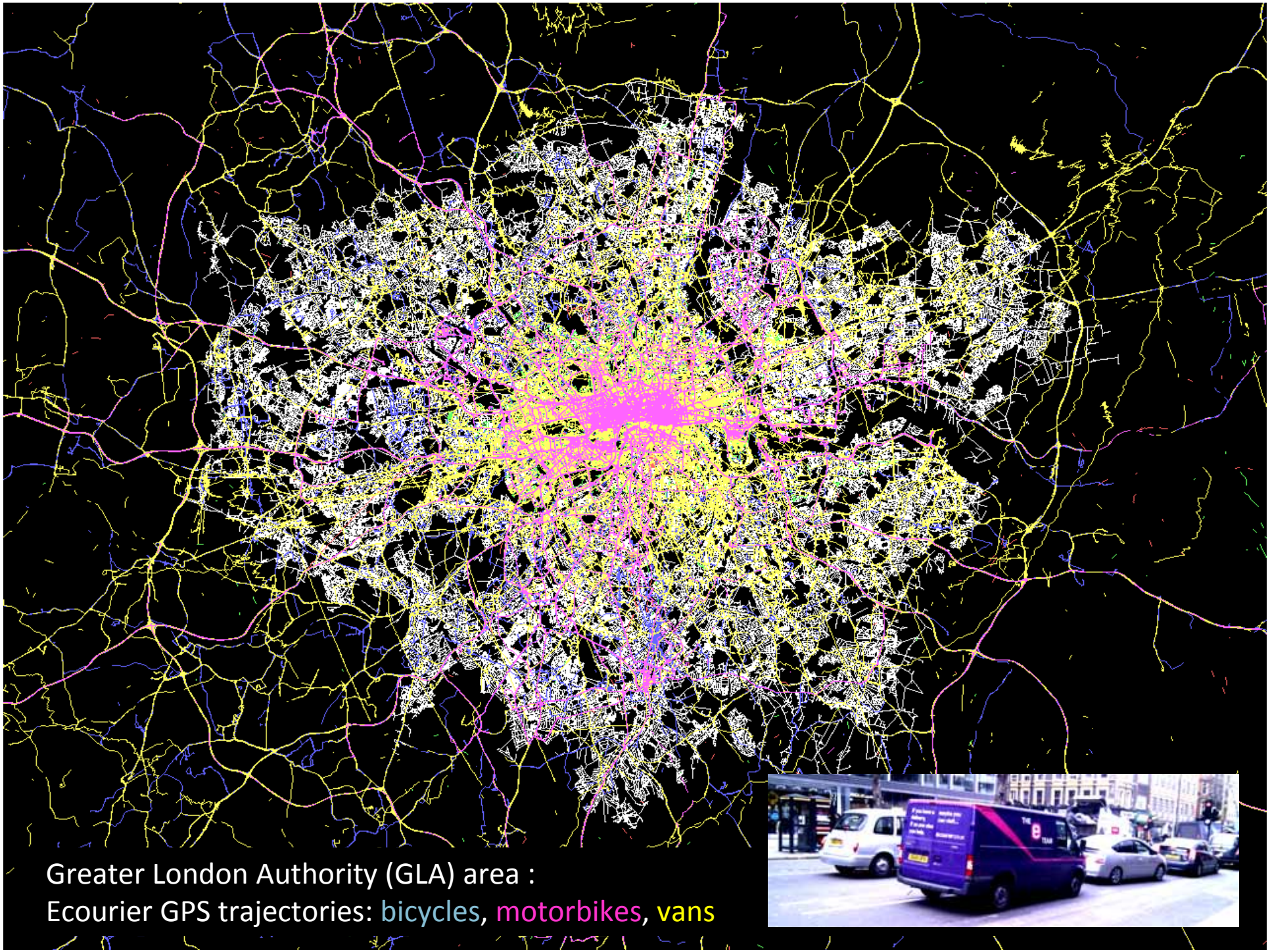
And also worth noting that we are also working with electronic data and courier data all coded – from the courier data we have done some hypothetical simulations of disease spread



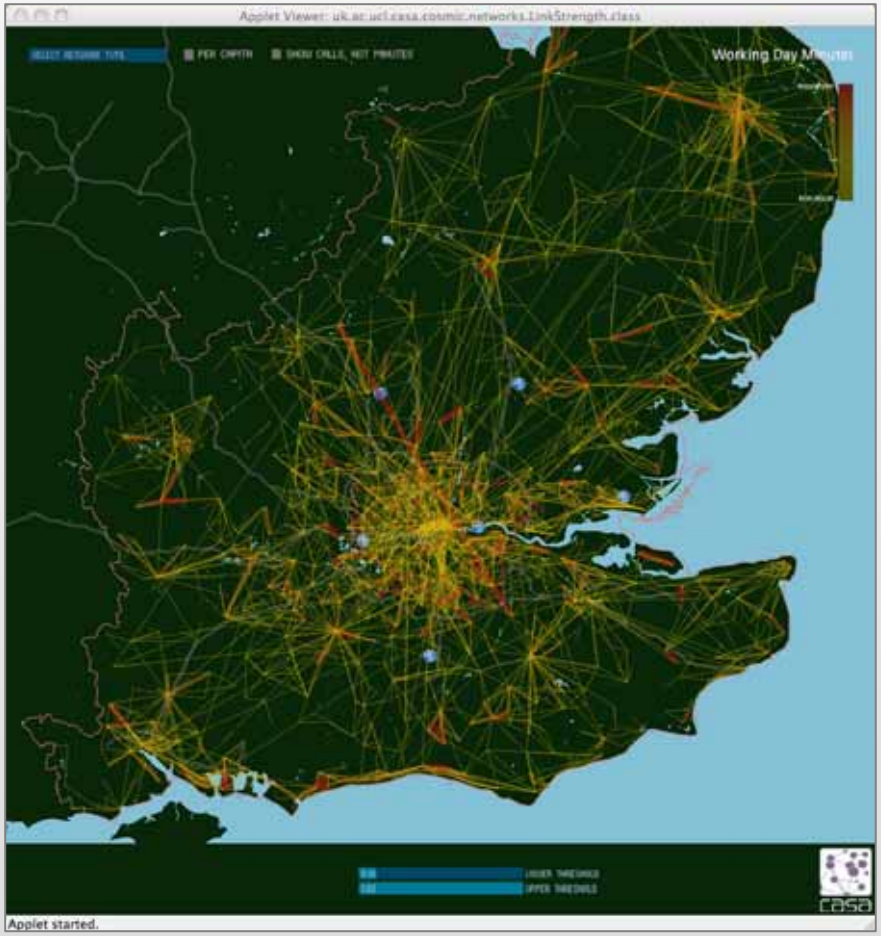
Some preliminary work at: Crowd and environmental management during mass gatherings Anders Johansson et al., (2012) **The Lancet Infectious Diseases**, Vol. 12No. 2 pp 150-156

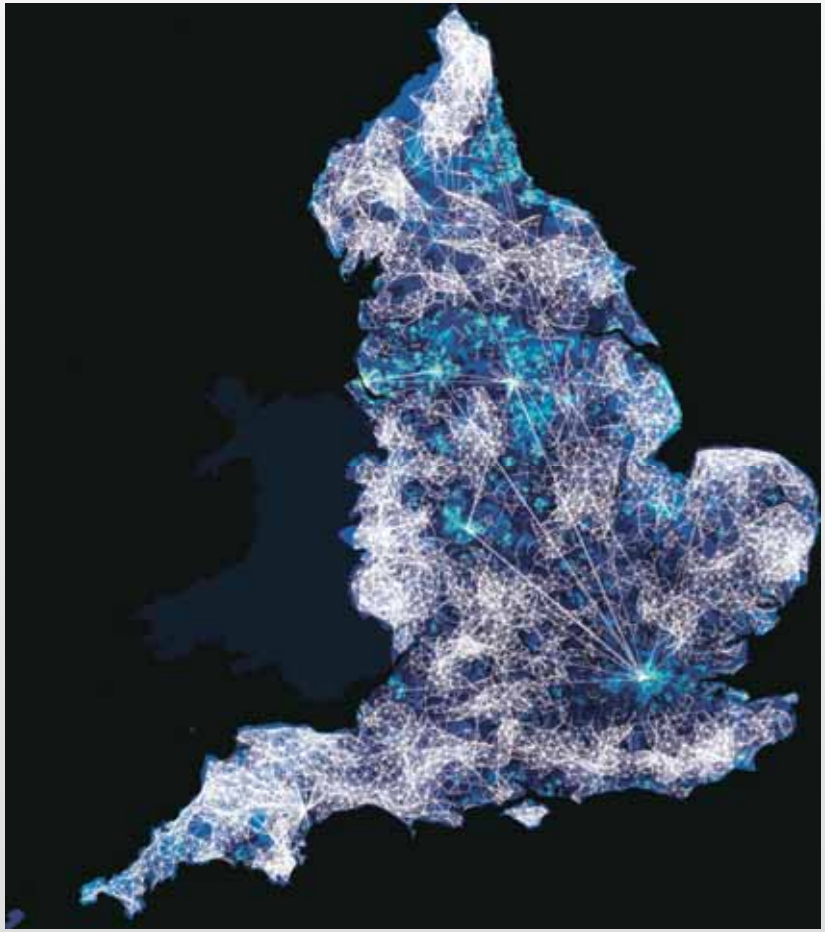


Greater London Authority (GLA) area : Road network


Greater London Authority (GLA) area :
Ecourier GPS trajectories: bicycles, motorbikes, vans

Telecoms – Jon Reades' work with a large UK telecoms provider and with Sensable City Lab at MIT; an article in PLoS One 2012





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RESEARCH ARTICLE

Redrawing the Map of Great Britain from a Network of Human Interactions

Carlo Ratti, Stanislav Sobolevsky, Francesco Calabrese, Clio Andris, Jonathan Reades, Mauro Martino, Rob Claxton, Steven H. Strogatz

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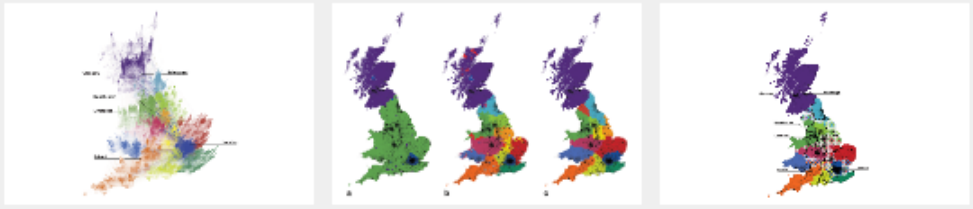

Hide Figures

Abstract
Introduction
Results and Discussion

Abstract

Do regional boundaries defined by governments respect the more natural ways that people

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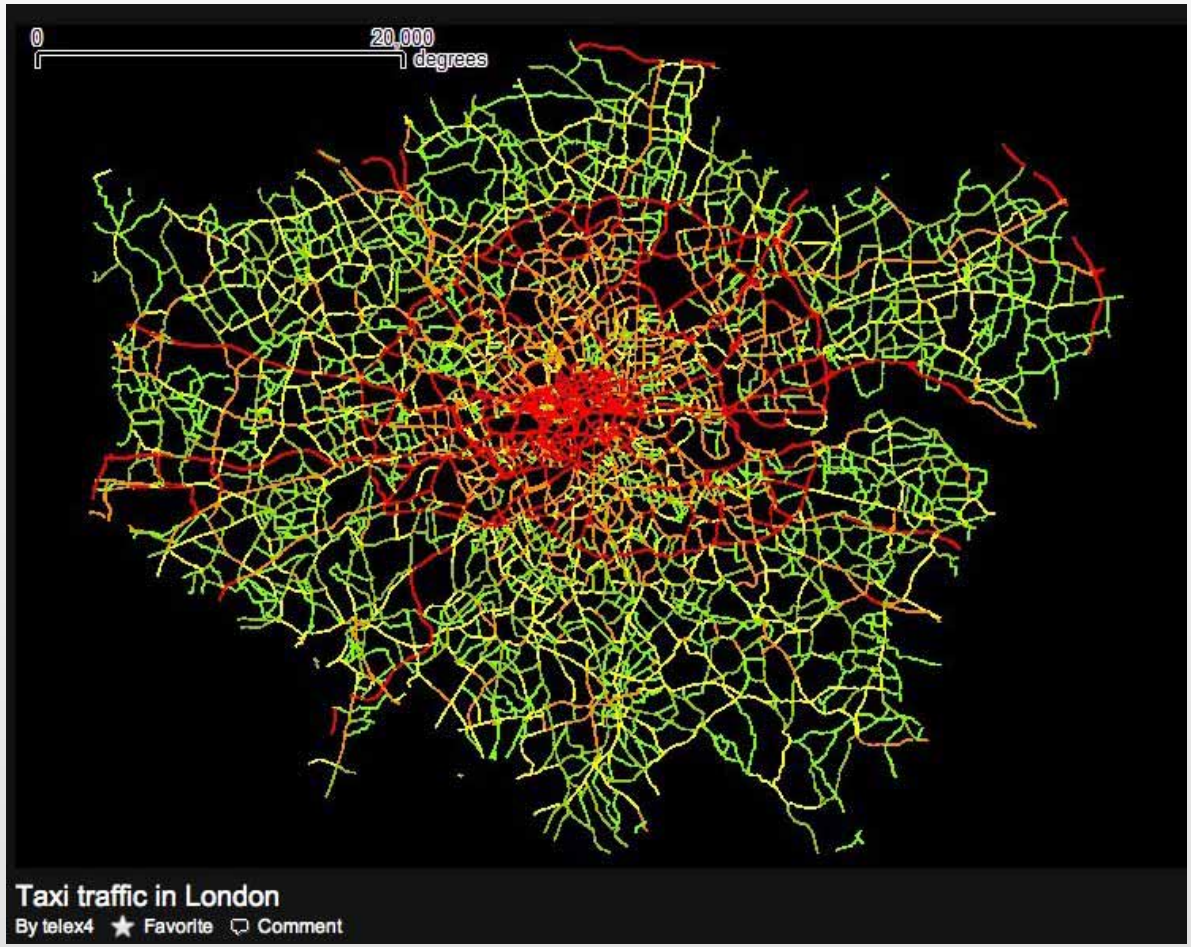
PLOS

Redesigned PLOS Journals



And Ed Manley from CASA has a nice blog where he has lots of visualisations of his online limo service data for London –

The Bikes Projects: Online Data

"The number of cyclists in London is growing, especially during peak periods, and on significant cycle commuter routes often exceed 10% of total vehicle flow" (from TfL Traffic Modelling Guidelines, 2010)

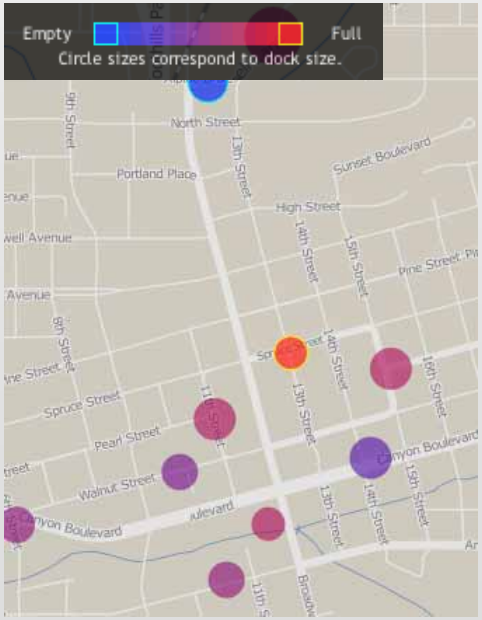
World-wide case study from Ollie O'Brien:

70 cities, 2 years of data

- Docking station status
- Journey records

Looking at cultural behaviour

- Each docking station shown by a circle
  - Blue = empty, Purple = ~50% full, Red = full
- Normally two graphs
  - Weekday (normally Wednesday 6th June)
  - Weekend (normally Saturday 9th June)
- Live versions at http://bikes.oobrien.com/



The Barclays/Santander Cycle Hire London Project

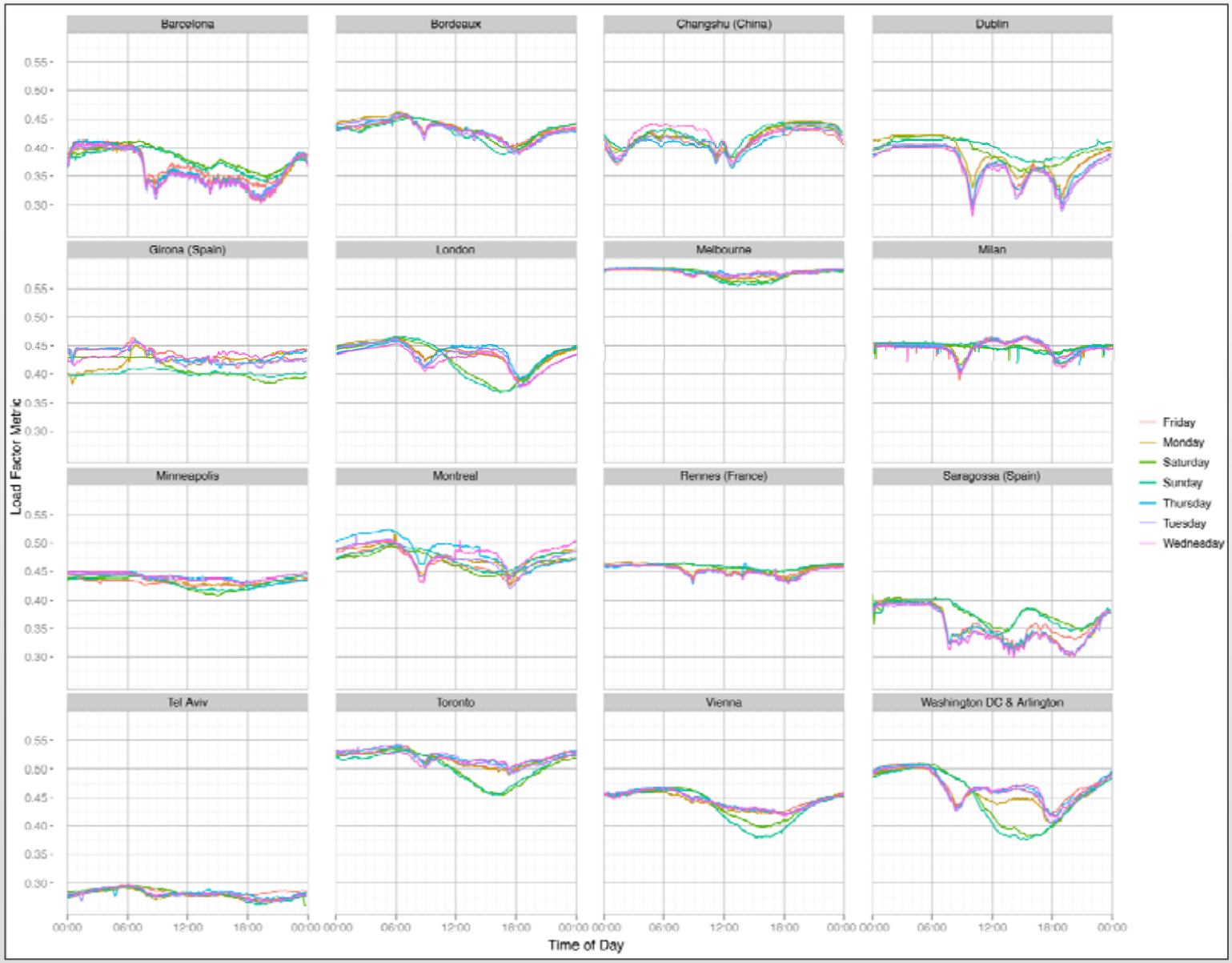
BCH commenced operations in July 2010 with **5,000 bicycles** and *315 docking stations* distributed across the City of London and parts of eight London boroughs.[10] The coverage zone spans approximately 17 square miles (44 km2), roughly matching the Zone 1 Travelcard area.

Currently there are some **8,000 'Boris Bikes'** and *570 docking stations* in the BCH scheme, which has been used for over *19 million journeys* to date

City	Official Name	Installed	System	# of Bikes
London	Barclays Cycle Hire	July 2010	Bixi	4,300
Barcelona	Bicing	March 2007	Bikemi	4,200
Milan	Bikemi	December 2008	Bicing	1,100
Saragossa	Bizi	May 2008	Bicing	800
Girona	Girocleta	September 2009	TNT	100
Washington DC and Arlington	Capital Bikeshare	September 2010	Bixi	650
Montreal	Bixi	May 2009	Bixi	4,200
Minneapolis	Nice Ride	June 2010	Bixi	600
Denver	B-cycle	April 2010	B-cycle	350
Melbourne	Bike Share	June 2010	Bixi	400

Cycle Hire

Rank	City	Country	Bikes
1	Wuhan	China	70000
2	Hangzhou	China	60600
	Bejing	China	50000
3	Paris	France	18000
	New York	United States	10000
4	Taizhou	China	10000
5	**London**	**Great Britain**	**7200**
6	Yantai	China	6000
7	Shanghai	China	5700
	Chicago	United States	5000
8	Guangzhou	China	5000
9	Barcelona	Spain	4700
10	Kaohsiung	China	4500
11	Montreal	Canada	4220
12	Foshan	China	4000
13	Lyon	France	3400
14	Zhangjiagang	China	3200
15	Munich	Germany	3000
16	Wuham/Qinshan	China	3000
17	Toulouse	France	2500
18	Brussels	Belgium	2180
19	Seville	Spain	1950
20	Changshu	China	1700


Barcelona
Bordeaux
Changshu (China)
Dublin
Girona (Spain)
London
Melbourne
Milan
Minneapolis
Montreal
Rennes (France)
Saragossa (Spain)
Tel Aviv
Toronto
Vienna
Washington DC & Arlington
Load Factor Metric
0.55
0.50
0.45
0.40
0.35
0.30
00:00
06:00
12:00
18:00
Time of Day
Friday
Monday
Saturday
Sunday
Thursday
Tuesday
Wednesday

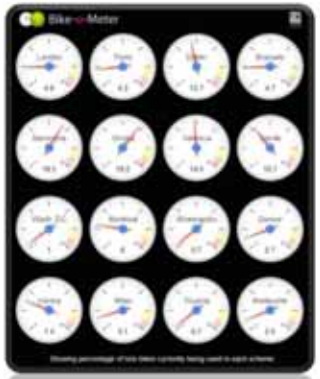
Let's Visualise Them!

```
'id:"([0-9]+?)".*?name:"(.+?)".*?lat:"(.+?)".*?long:"(.+?)".*?nbBikes:"([0-9]+?)".*?
nbEmptyDocks:"([0-9]+?)".*?installed:"(.+?)".*?locked:"(.+?)".*?temporary:"(.+?)".*?'
```

- Obtain the data from the operators' websites
  - Some provide XML/JSON/KML
  - Lots of Regex parsing
  - Velib-based systems require two stages
- Store it for analysis
- Stick it on a map
  - OpenLayers has some nice vector styling for points
  - OpenStreetMap-based background
  - Charts of historical trends via the Google Chart API

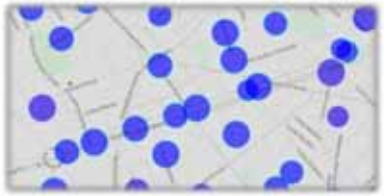
Bike-o-Meter
casa.ucl.ac.uk/bom

- Tweet-o-Meter for bikes
  - Steven Gray (@frogo)
  - Using Google Gauges
- See the real life Tweet-o-Meters at the new British Library "Growing Knowledge" exhibition
  - Should be easy to hack to show the Bike-o-Meters instead ☺

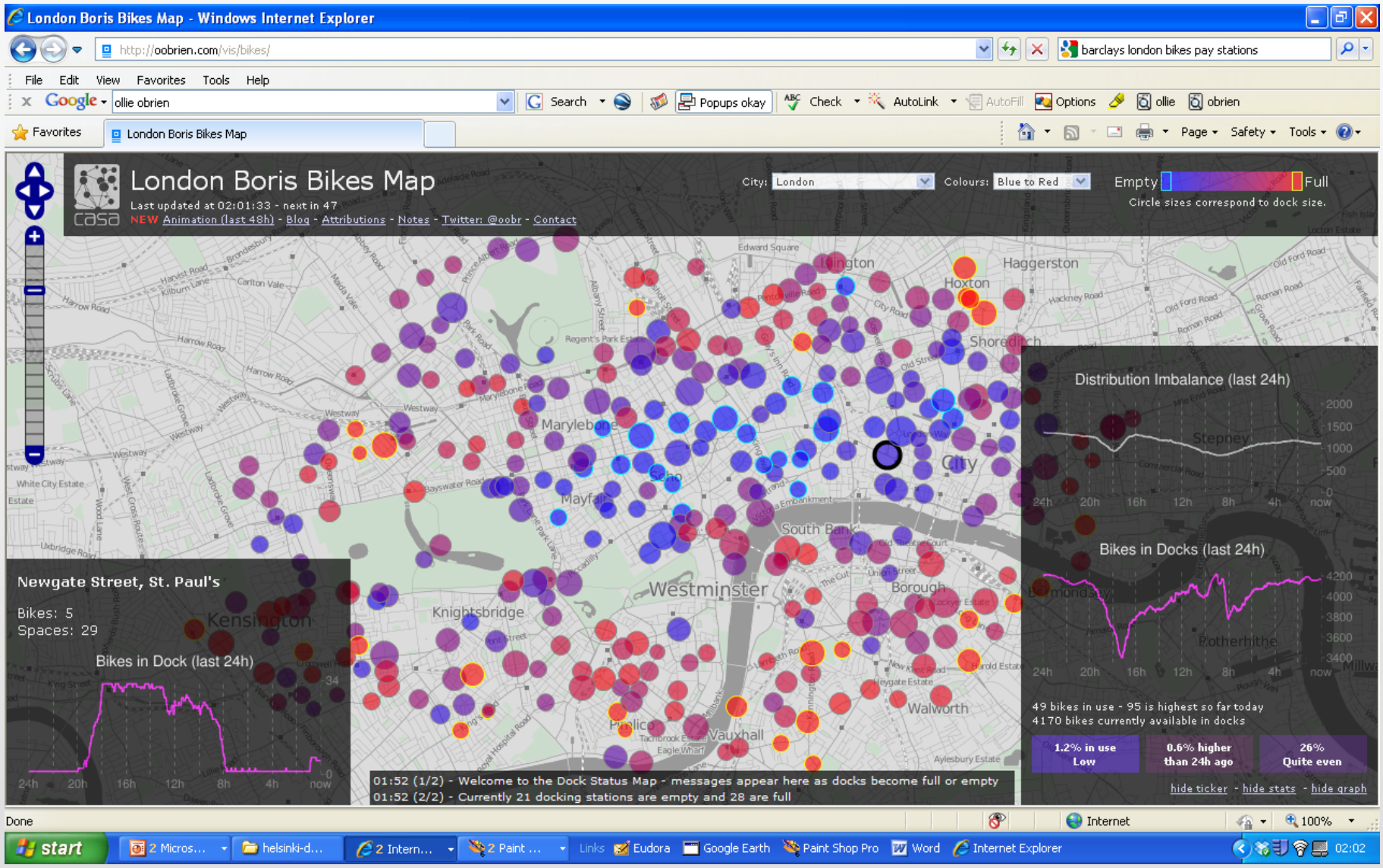


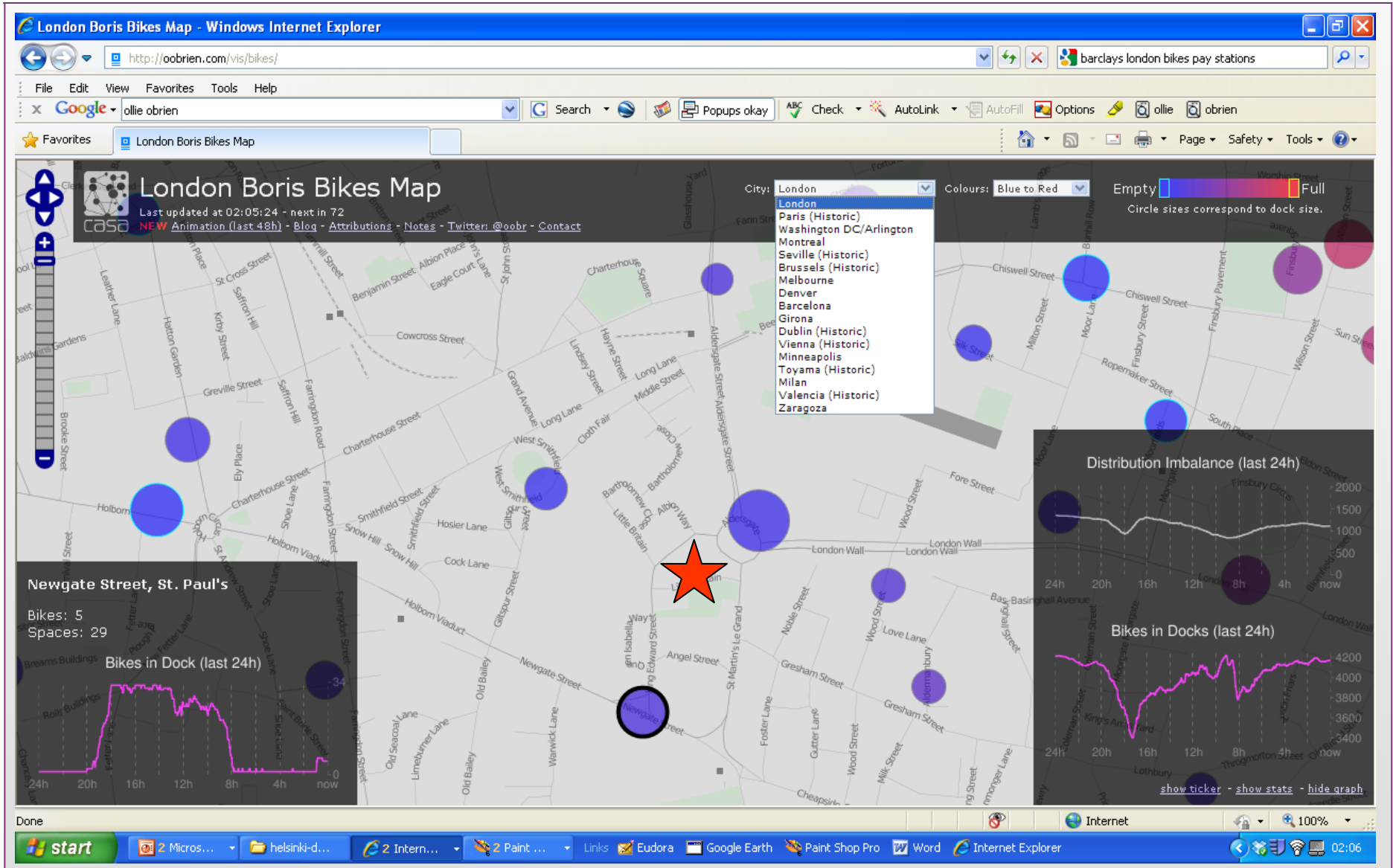
Bike/Dock Ratio

- No of bikes per 100 docks
  - Based on max availability at around 5am ("no" usage)
  - Averaged over a few weeks

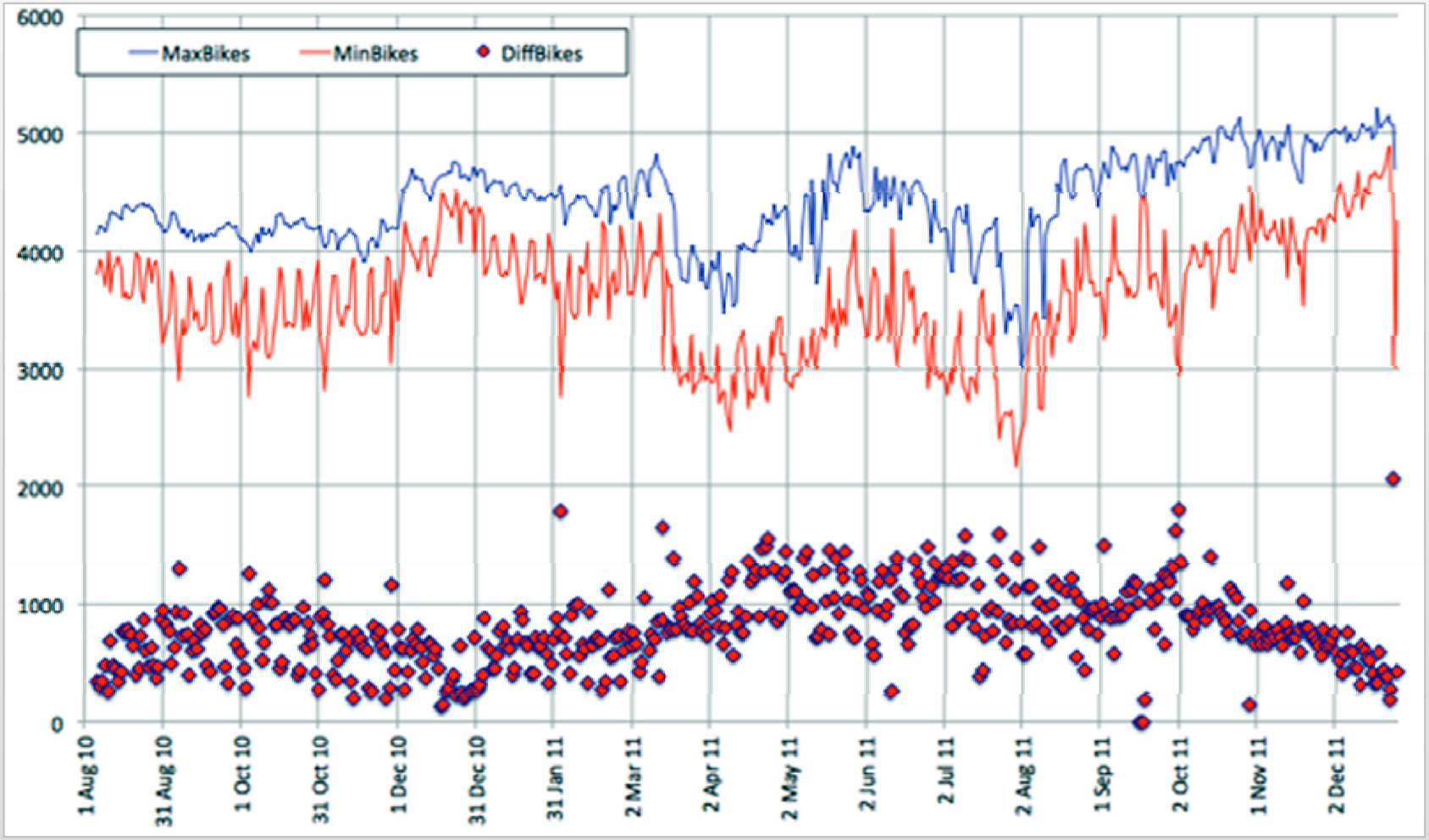


City	Ratio/100
Melbourne	60
London	**56**
Montreal	56
Denver	54
Milan	52
Dublin	51
Minneapolis	50
Toyama	50
Barcelona	49
Washington DC	49
Girona	48
Paris	47
Vienna	47
Brussels	46
Seville	42
Valencia	39
Average	**50**

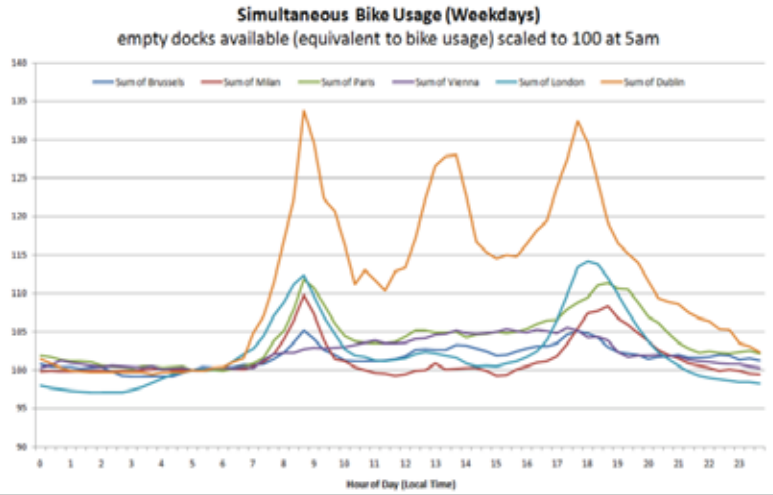

London Boris Bikes Map - Windows Internet Explorer
http://oobrien.com/vis/bikes/
barclays london bikes pay stations
File Edit View Favorites Tools Help
ollie obrien
Favorites
London Boris Bikes Map
Page Safety Tools
London Boris Bikes Map
Last updated at 02:01:33 - next in 47
NEW Animation (last 48h) - Blog - Attributions - Notes - Twitter: @oobr - Contact
City: London
Colours: Blue to Red
Empty Full
Circle sizes correspond to dock size.
Distribution Imbalance (last 24h)
Bikes in Docks (last 24h)
49 bikes in use - 95 is highest so far today
4170 bikes currently available in docks
1.2% in use Low
0.6% higher than 24h ago
26% Quite even
hide ticker - hide stats - hide graph
Newgate Street, St. Paul's
Bikes: 5
Spaces: 29
Bikes in Dock (last 24h)
01:52 (1/2) - Welcome to the Dock Status Map - messages appear here as docks become full or empty
01:52 (2/2) - Currently 21 docking stations are empty and 28 are full
Done
Internet
100%
start
Eudora
Google Earth
Paint Shop Pro
Word
Internet Explorer
02:02



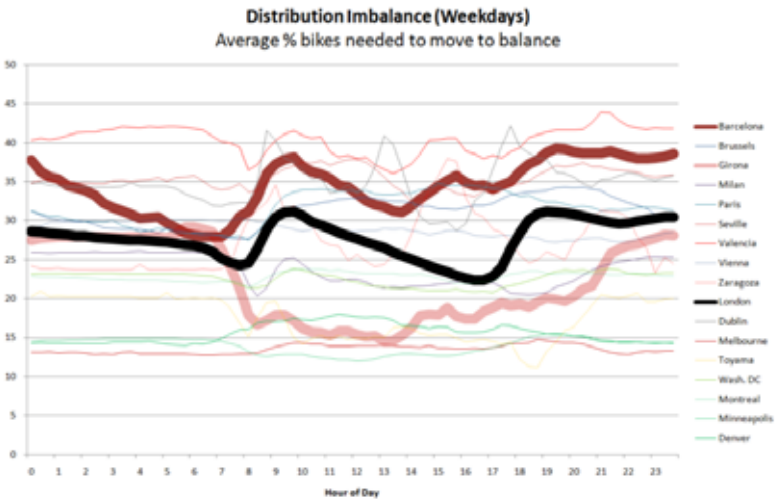
As yet no records of demand from people logging on, so no management capabilities, but could happen probably from an App based software but maybe from the server


MaxBikes
MinBikes
DiffBikes
6000
5000
4000
3000
2000
1000
0
1 Aug 10
31 Aug 10
1 Oct 10
31 Oct 10
1 Dec 10
31 Dec 10
31 Jan 11
2 Mar 11
2 Apr 11
2 May 11
2 Jun 11
2 Jul 11
2 Aug 11
1 Sep 11
2 Oct 11
1 Nov 11
2 Dec 11

Weekday Use – 1. Europe ex-Spain

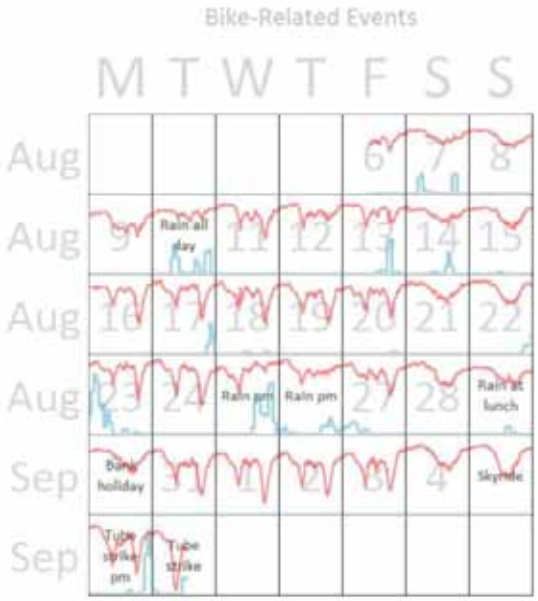


Redistribution Effectiveness



More Analysis

- **London**
- Graph shows number of bikes available to hire
- Effect of rain
  - Using the CASA weather station
- Effect of the tube strikes



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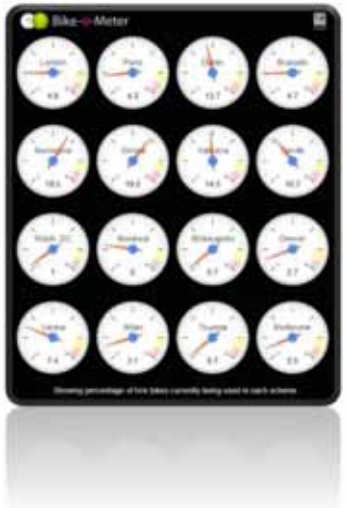
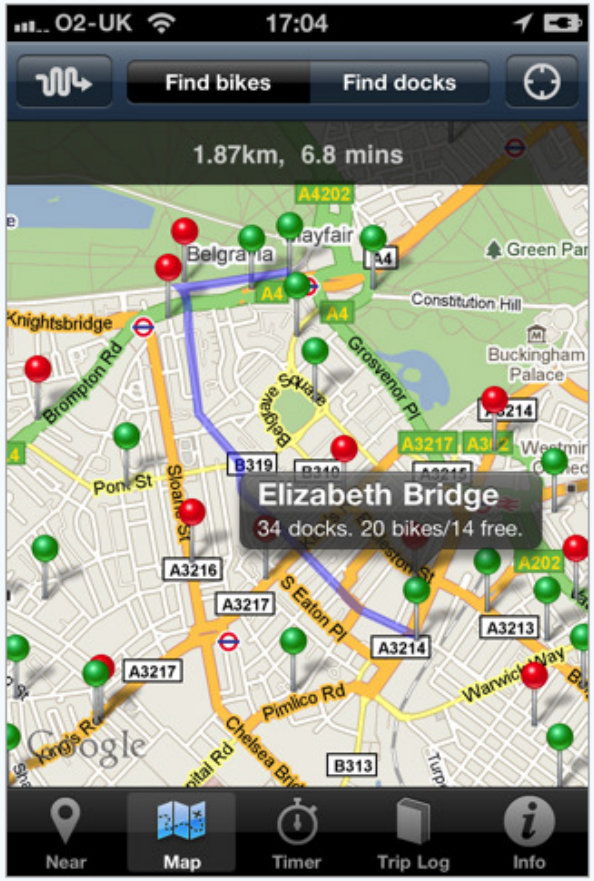
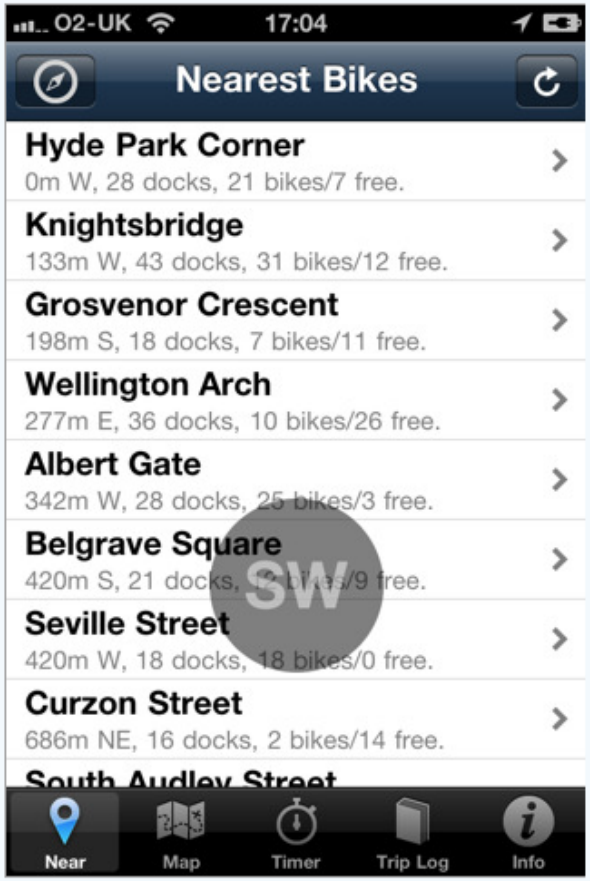
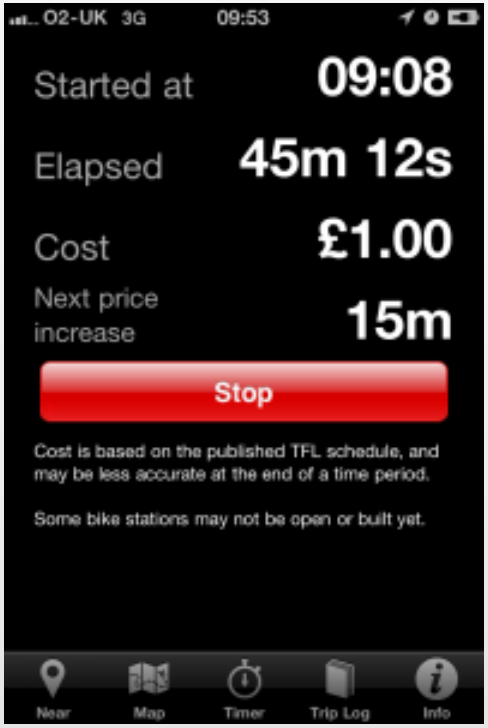


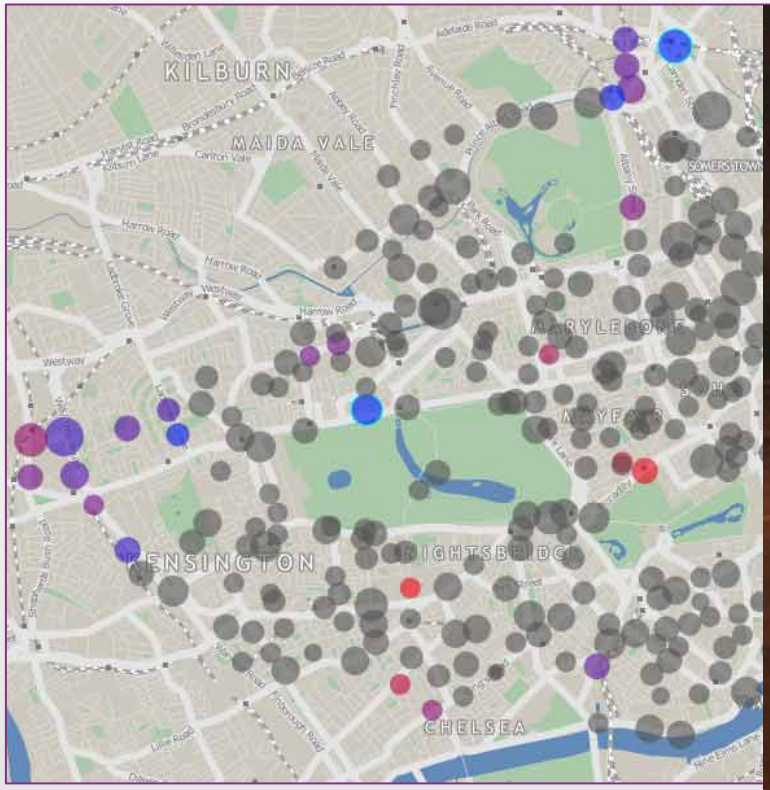
iPhone Screenshots







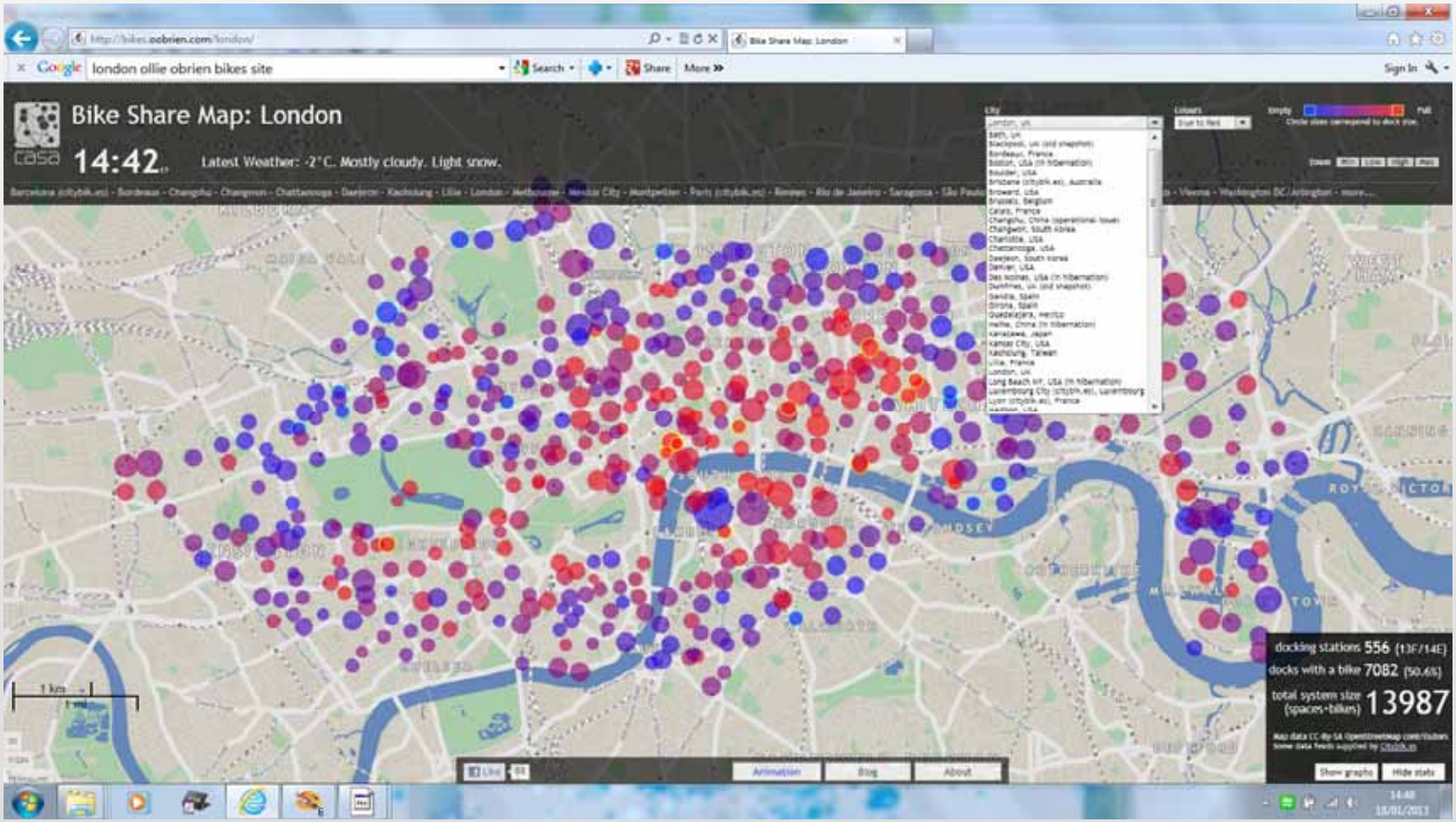
http://oobrien.com/vis/bikes/

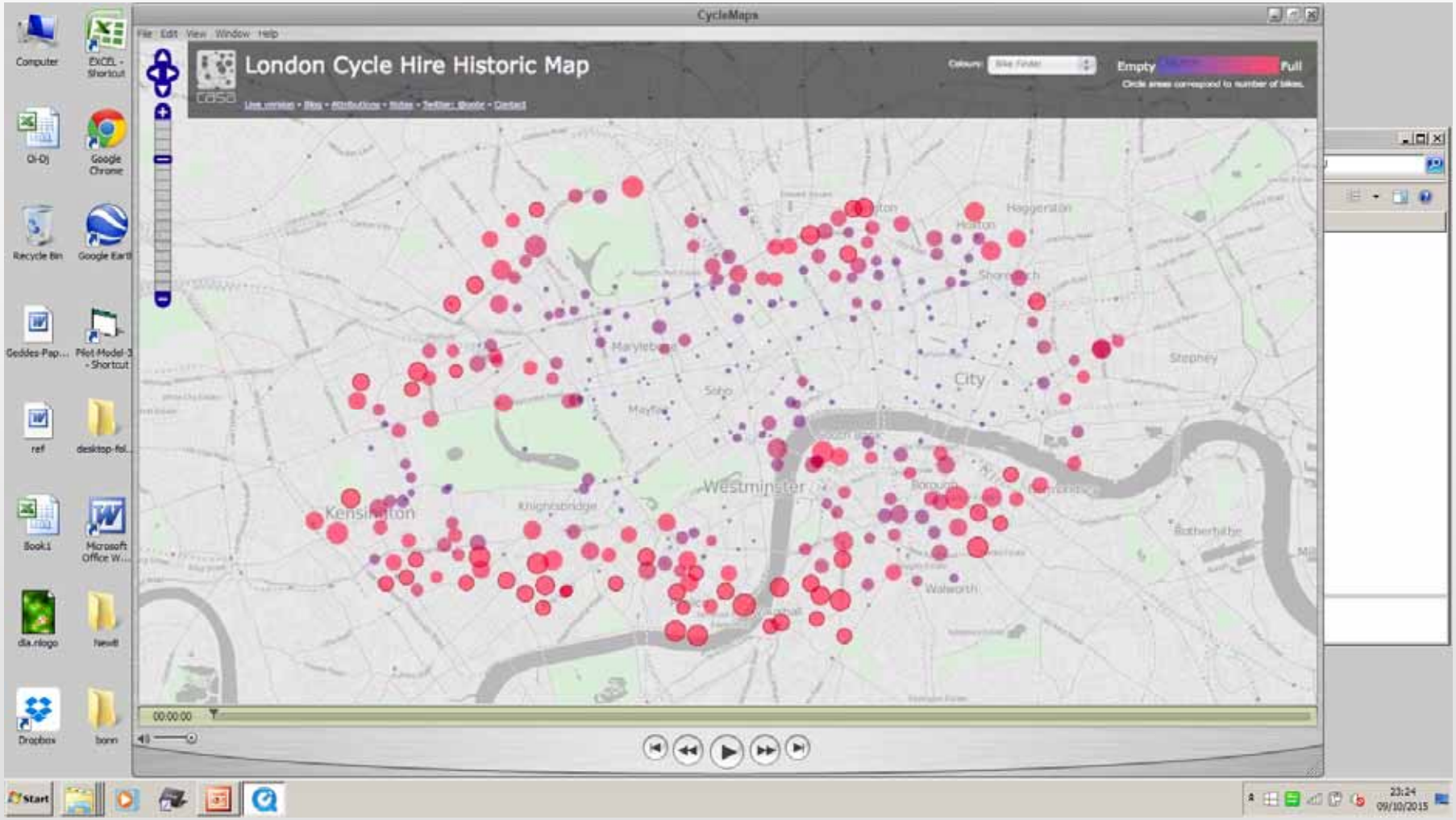

KILBURN
MAIDA VALE
KENSINGTON
CHELSEA

Transport for London
Barclays Cycle Hire
extends east
from 8 March
tfl.gov.uk/barclayscyclehire
MAYOR OF LONDON
catch up with
BARCLAYS

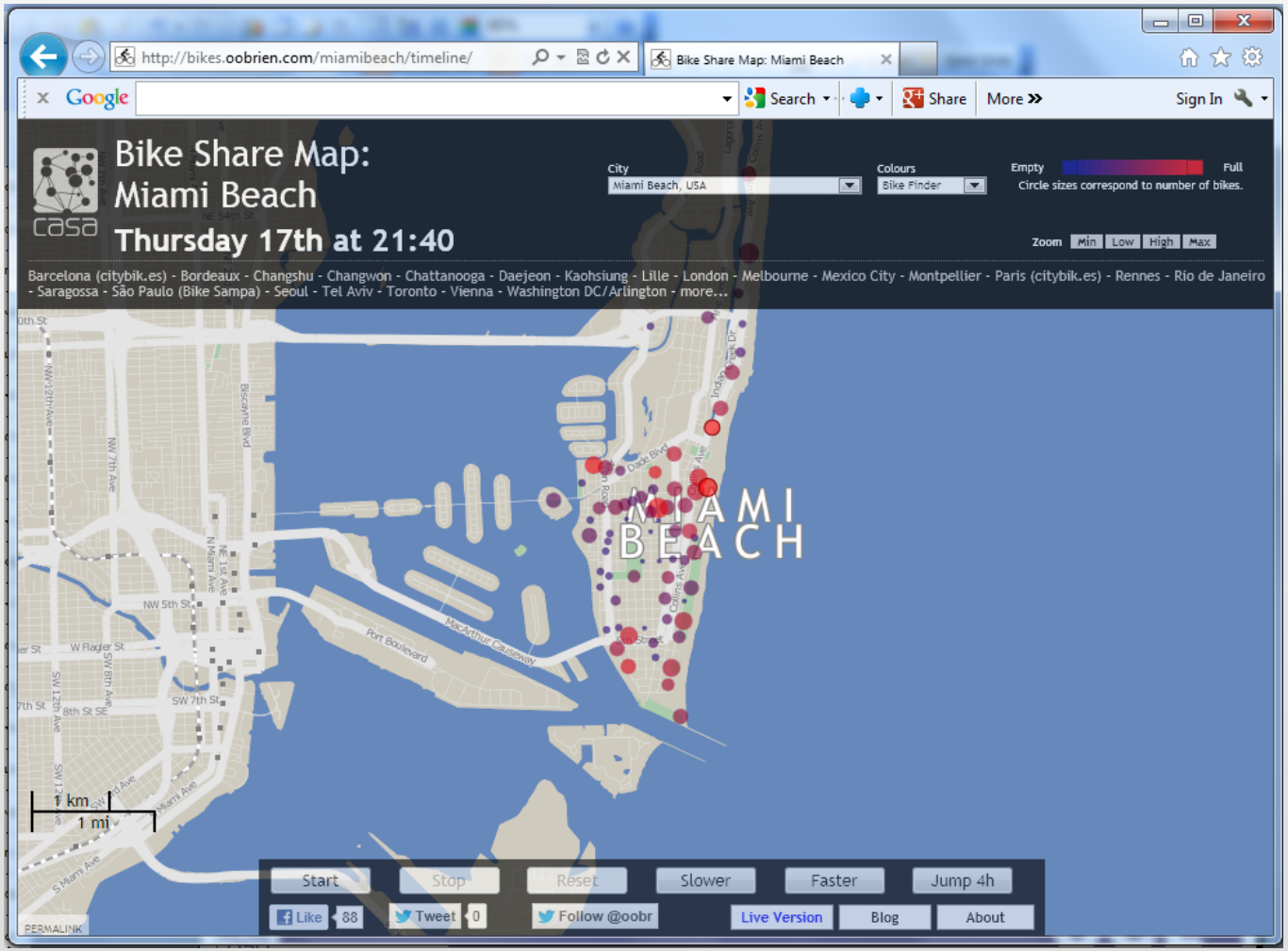
The Website: Real Time Visualisation of Origins and Destinations Activity

http://bikes.oobrien.com/london/



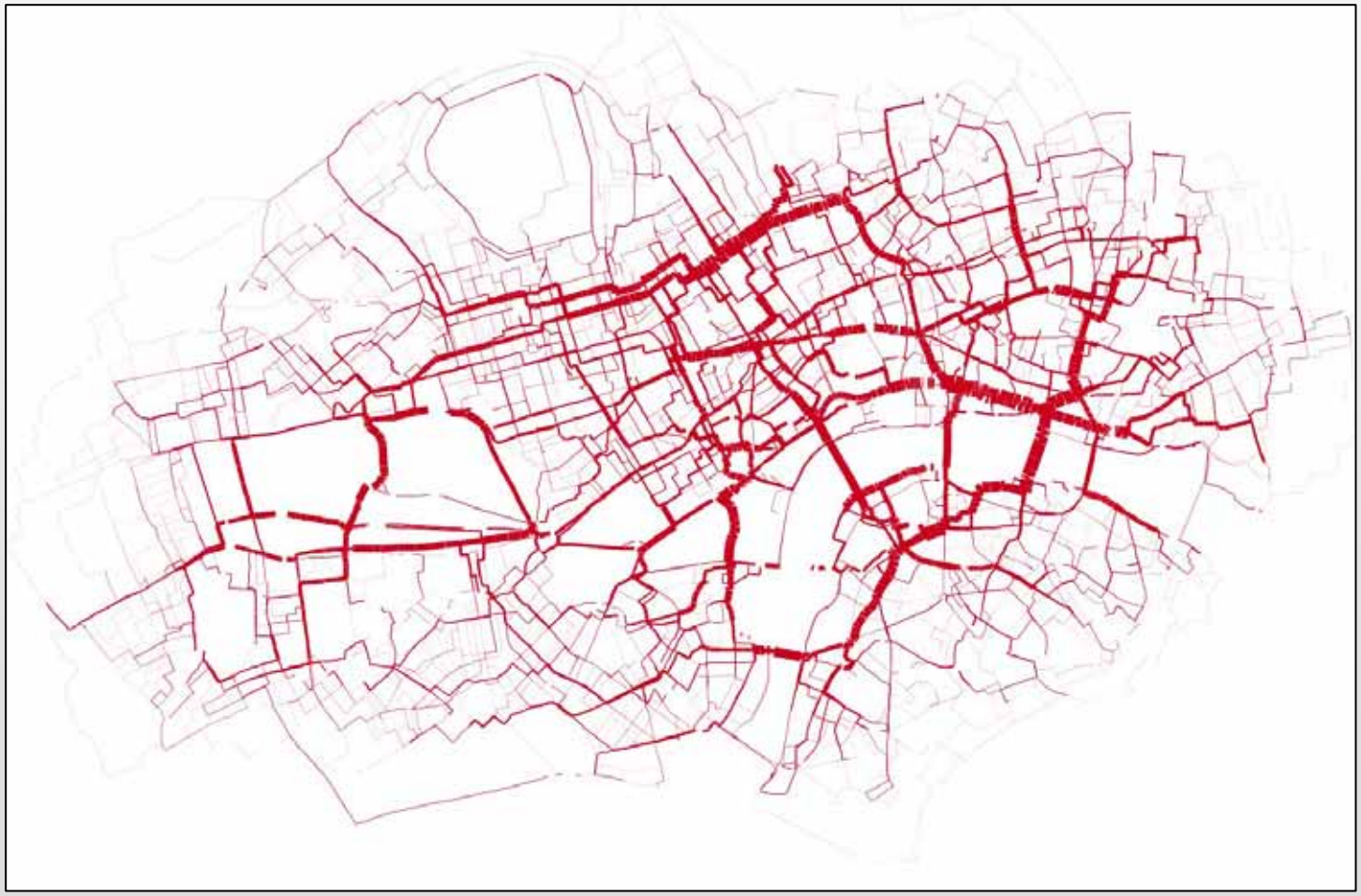

CycleMaps
File Edit View Window Help
London Cycle Hire Historic Map
Empty
Full
Circle areas correspond to number of bikes.
Computer
EXCEL - Shortcut
Oi-Dj
Google Chrome
Recycle Bin
Google Earth
Geddes-Pap...
Pilot-Model-3 - Shortcut
ref
desktop-fol...
Book1
Microsoft Office W...
dla.nlogo
NewB
Dropbox
bonn
Haggerston
Shoreditch
Marylebone
Soho
Mayfair
City
Stepney
Westminster
Kensington
Knightsbridge
Borough
Rotherhithe
Walworth
00:00:00
Start
23:24
09/10/2015

Your can play back the last couple of days from the animator for many of the cities where the data is captured online



Initial Analyses

Flows – Origins and Destinations



London Cycle Hire Journeys and Pollution
Thicker lines are more journeys
Redder lines are more polluted (PM10 2008 mean)
Data: 3.2 Million Journeys (from TfL)
Routing: Ollie O'Brien (@oobr) + OpenStreetMap cc-by-sa
Buildings: OS Opendata Crown Copyright 2011
Pollution: GLA (via LondonDataStore)
Map: James Cheshire (@spatialanalysis)

Thre are quite a few visualisations on Vimeo which have been developed by James Cheshire and Martin Austwick where they have used shortest routes methods to figure out bike paths

http://vimeo.com/19982736 And one from Jo Wood at City University http://vimeo.com/33712288