Using historical maps to support the development of sustainable, resilient building stocks, and to increase accuracy in dynamic forecasting

Colouring London https://colouringlondon.org/.

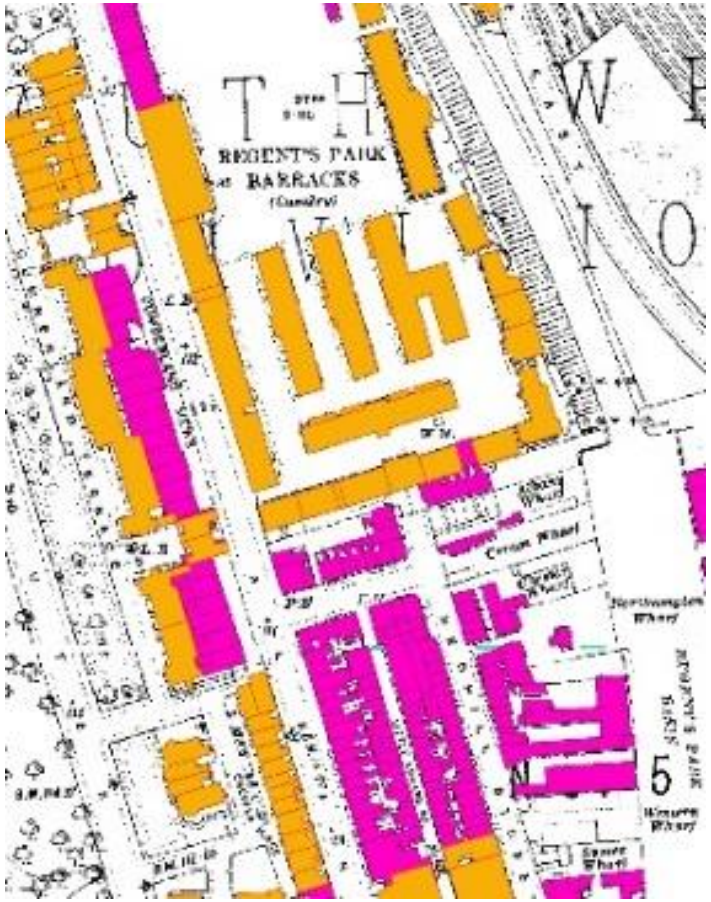
Polly Hudson, CASA, UCL

Need for longitudinal data to measure urban metabolism- material flows, energy, waste and lifespan calculation. Material needs to be kept stocked for as long as possible and rate of flows reduced.

See for example Hashimoto and Tanikawa, use of historical maps in urban metabolism analysis 2010
https://www.tandfonline.com/doi/abs/10.1080/09613210903169394

And Kohler, Hassler and Steadman 2009
https://www.tandfonline.com/doi/full/10.1080/09613210903189384

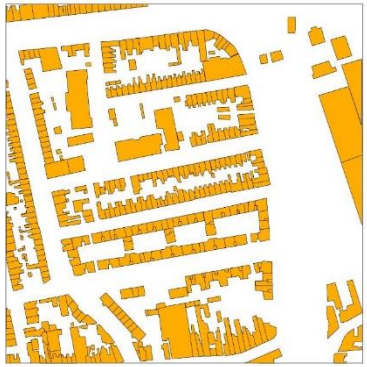
UK needs to start analysing demolition rates. 73% Loss of stock in central Camden 1916 to 2016 (c9000 footprints manually vectorised)



Demolition in central Camden pink 1916-2016 (c9000 building footprints manually vectorised), loss of 73% buildings over a century – some bomb damage but mainly as a result of planning/public health policies. Polly Hudson 2016.

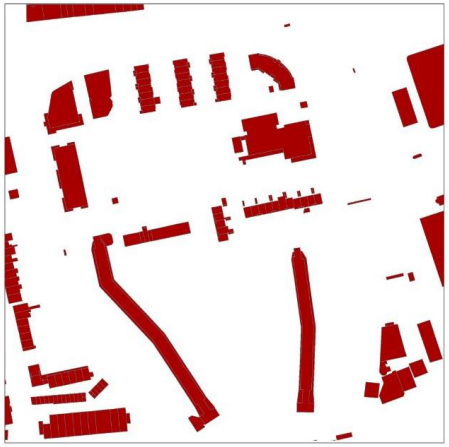
Need to identify systemic problems/ locked in patterns, vulnerability in stocks – here repetitive patterns of demolition found over 100 year + period.
Esp. relevant to large-scale social housing/high value commercial development.
Need vectorised building footprint data. (see also work of both Dorling, and Noble on poverty and health using Booth maps)

Pre 1875



1910

1960



2017

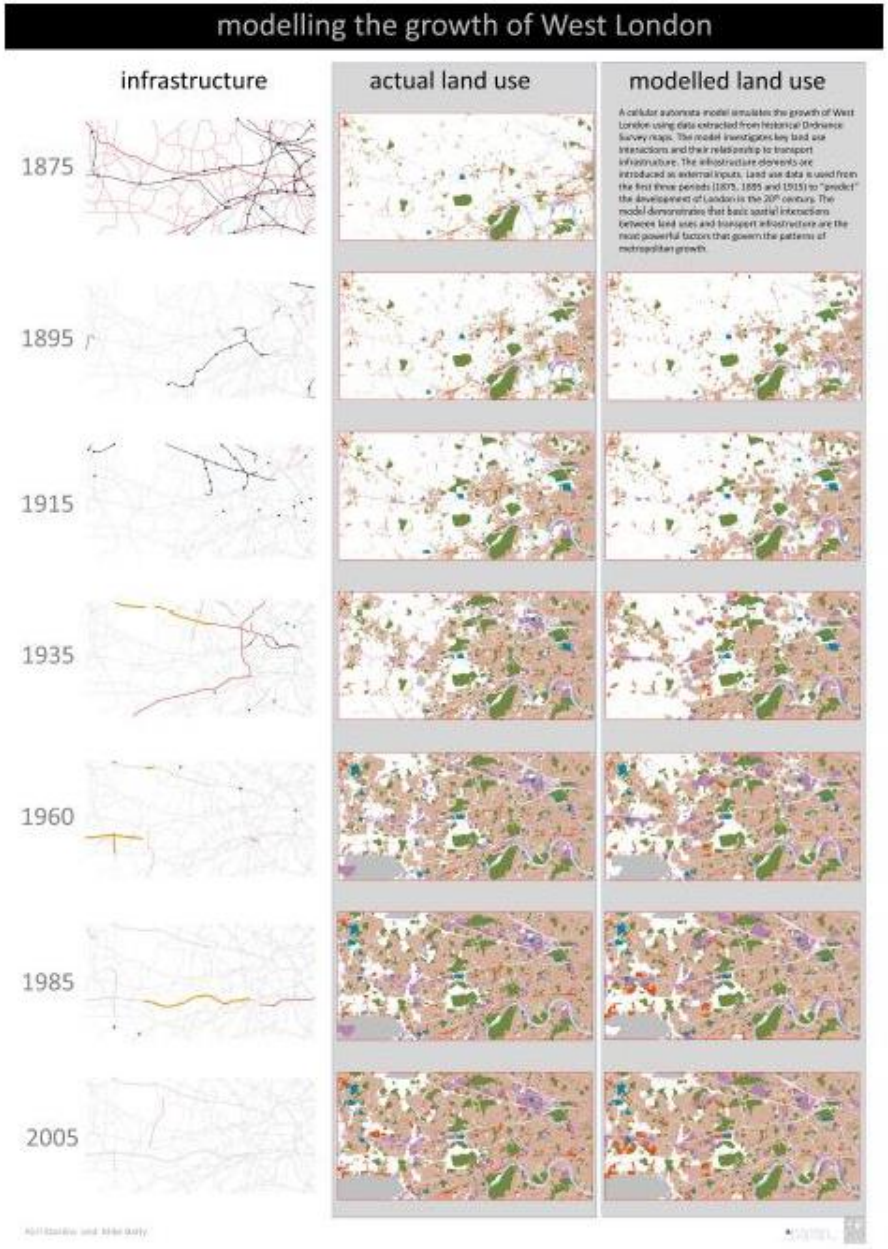
	% Demolition by 2017 of stock built 1800-1875	% Demolition by 2017 of stock built 1876-1910	% Demolition and condemned by 2017 of stock built 1911- 1960	% Demolition and condemned by 2017 of stock built 1961-2016	
Aylesbury	100%	75%	100%	18%	82% due to be demolished
	(49,397 m^2)	48,611 (m^2)	42,253 (m^2)	To be quantified	
Poplar	98%	100%	67%	73%	
	74,938	80,885	59,698	31,783	

Unpublished ground floorspace loss 1875-2017 Poplar- Illustrations by Polly Hudson showing manually vectorised historical data produced as part of PhD research.

Need for more accurate long-term forecasting models for domestic and non-domestic stock.

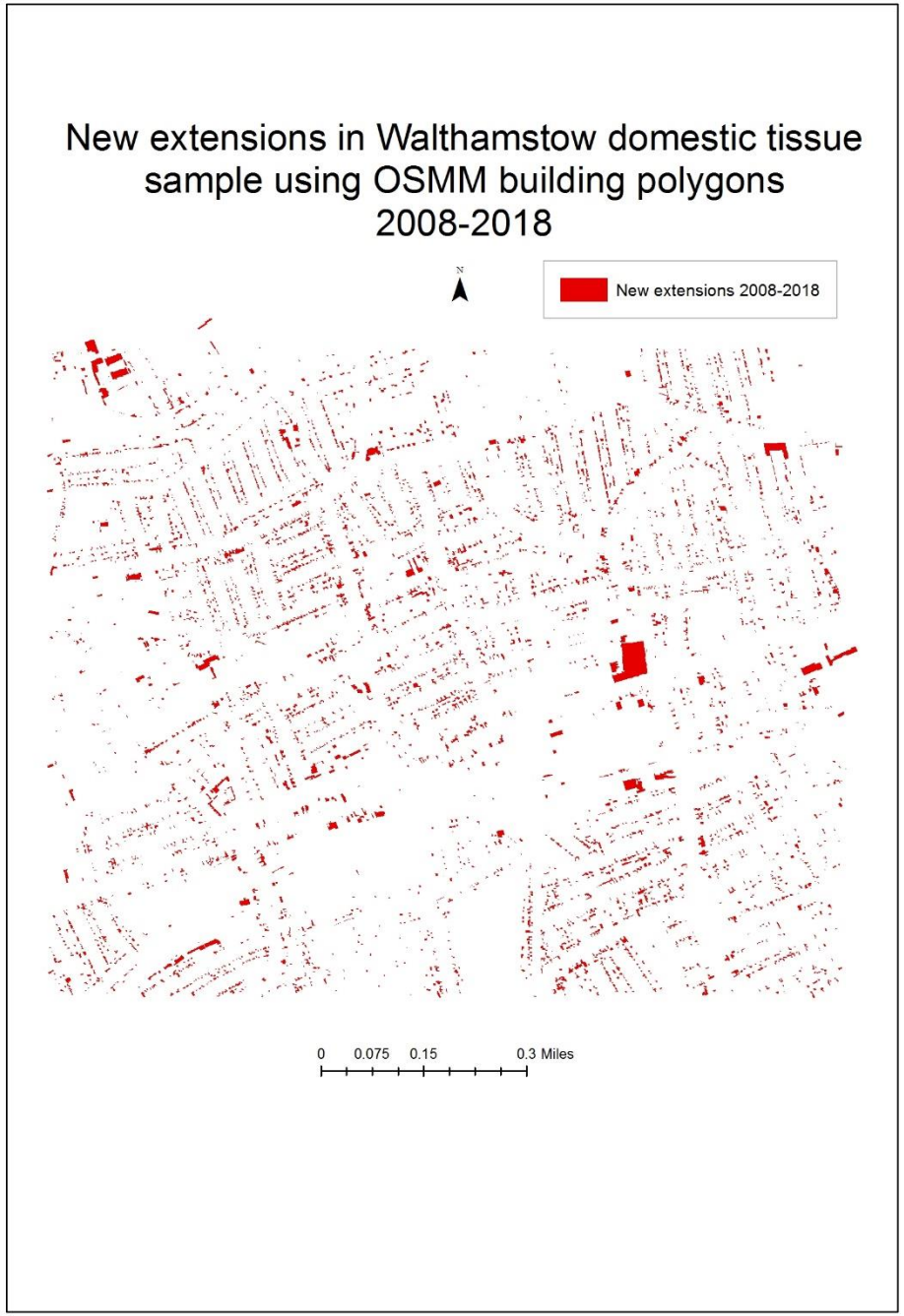
Andto build on approach/ findings from Kiril Stanilov and Mike Batty (2011) use of historical data in predictive models on urban growth. Image from https://onlinelibrary.wiley.com/doi/abs/10.1111/j.1467-9671.2011.01254.x

Vast collection of manually vectorised data exists for London generated by study-parcels, transport networks for 9 time slices including road networks for 1786.



Need to investigate plotsprawl not just urban sprawl. To understand also capacity of types of urban tissue to adapt and survive- to reduce flows & increase resilience - historical footprints needed. Right extensions only are shown, built over a 10 year period

Images Polly Hudson generated as part of as yet unpublished PhD work



Building footprints from multiple time slices (mid 19th to today) also required to inform dynamic rules within stock for Flora Roumpani's parametric modelling/sustainable planning work at Turing = Procedural London. Also working with UCL Energy Institute and Fani Koustorou.

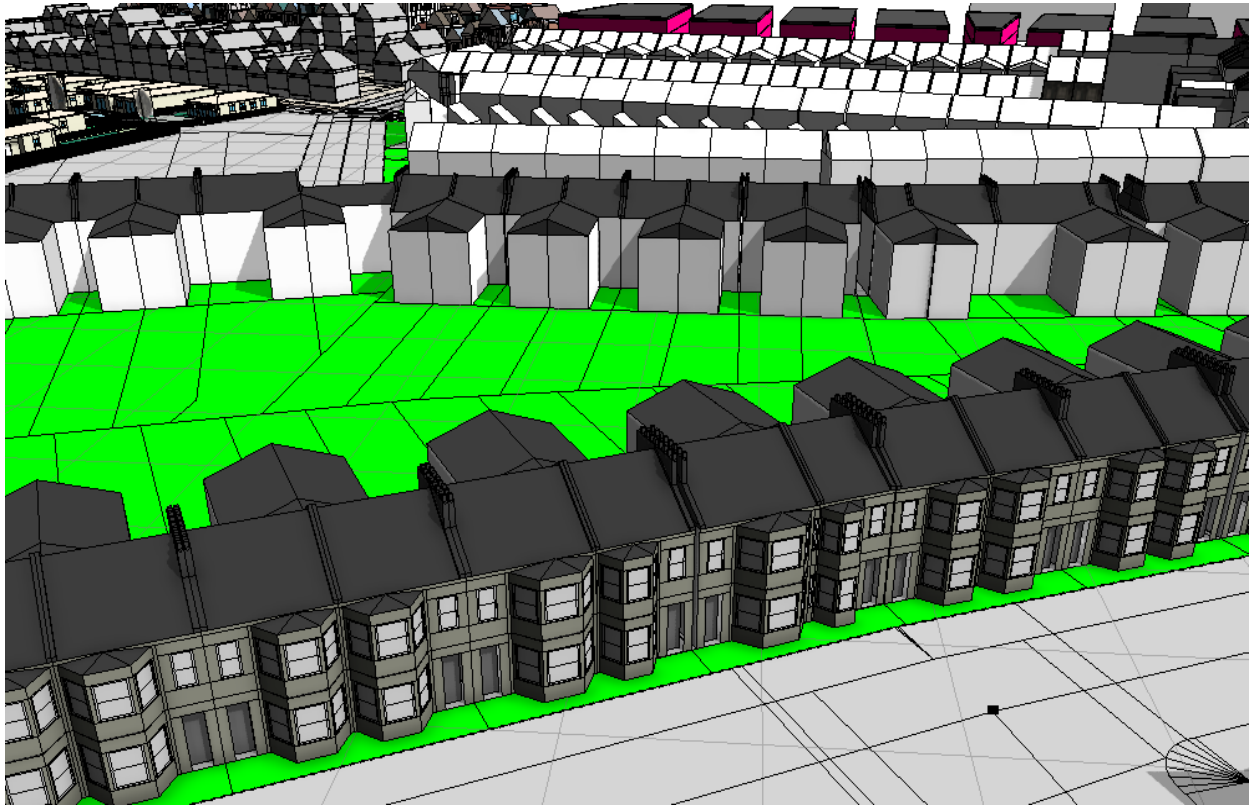
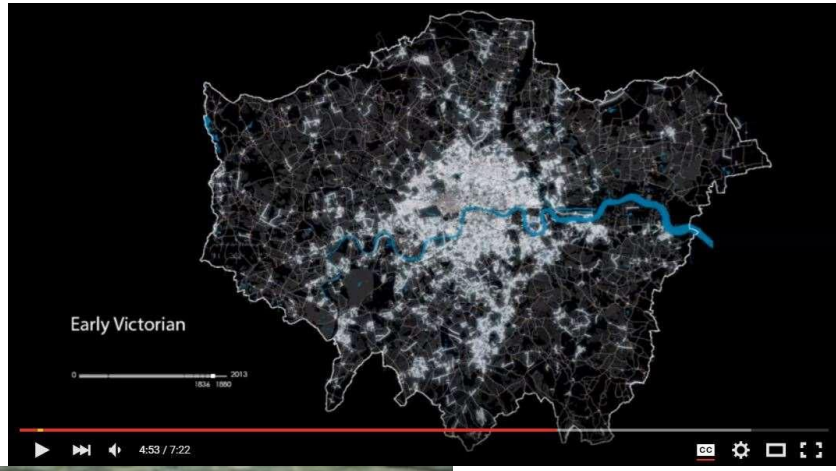


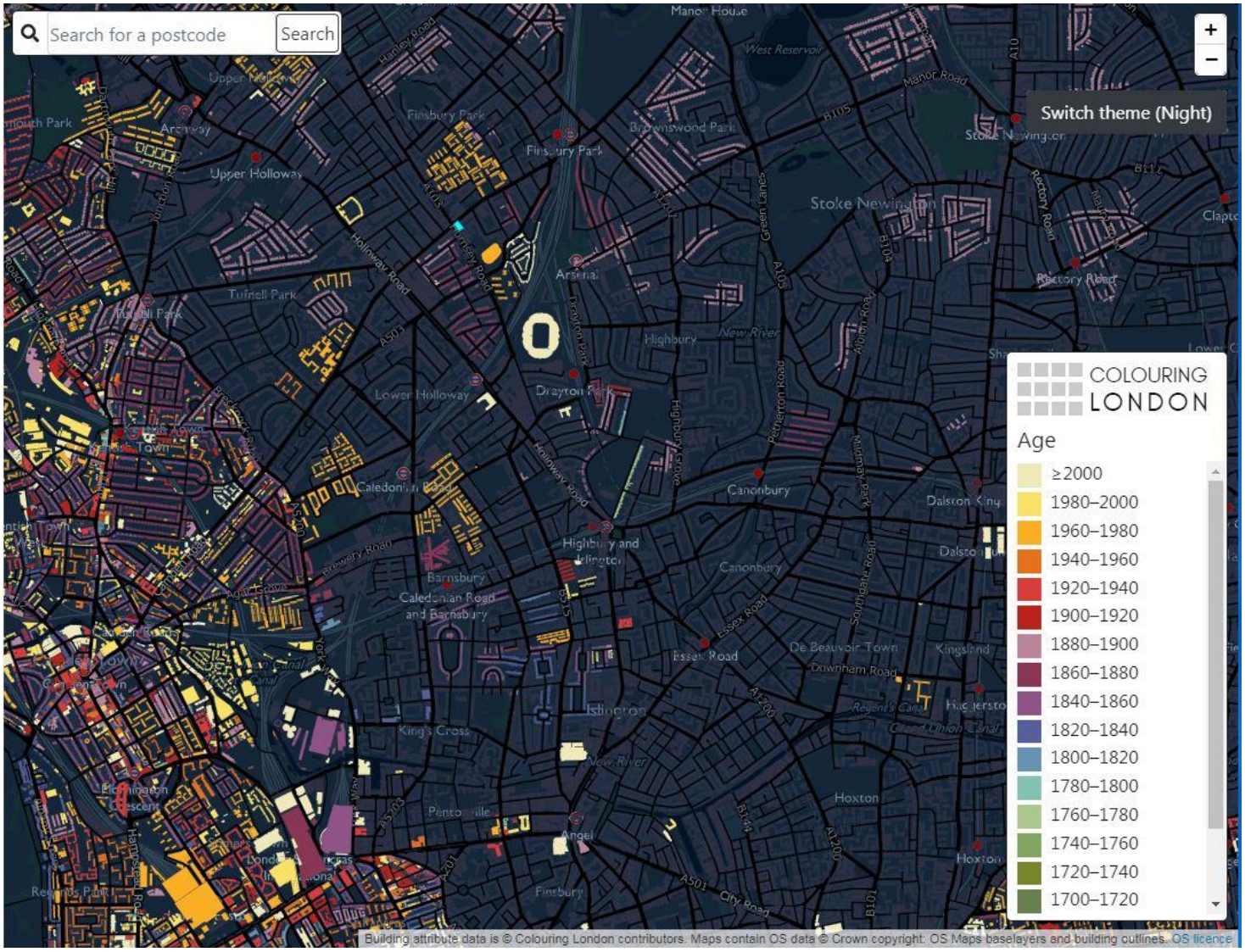
Image Courtesy Flora Roumpani, 2019. Taken from https://www.tandfonline.com/doi/full/10.1080/17567505.2018.1517142

Public engagement animations and micro simulation models e.g London historical network evolution animation https://www.youtube.com/watch?v=NB5Oz9b84jM has had c700K views showing huge potential public interest. Clapton below 1750-2004 c 40K hits



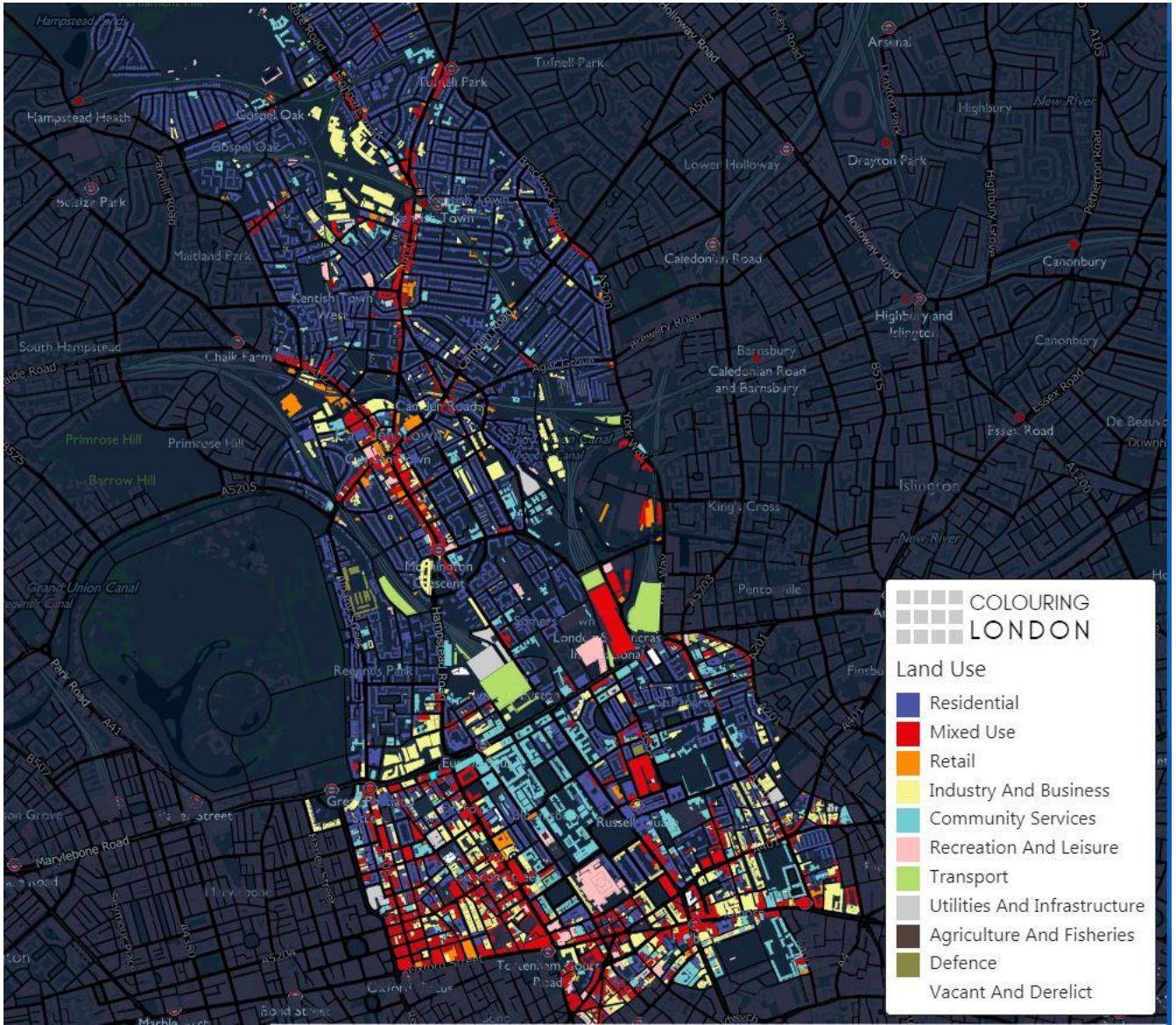
LEA: Roumpani, Hudson, Stanilov 2012. Clapton: Evans, Hudson 2004 https://www.youtube.com/watch?v=px_qakrZQ4w

Use of Stanilov's 1786 vectorised road networks tested (with Flora Roumpani) to generate open building age data (see 1880-1891 pale purple areas). Specialist verification also possible via Colouring London platform https://colouringlondon.org/.



Need historical networks to test methods in other cities. Age data critical as has multiple applications in energy analysis, retrofit targeting, resilience prediction etc. and able to infer many aspects of 3D form, materials etc.

Stanilov's 1786 vectorised road networks also found be useful in geolocating surrent land uses. Below crowdsourced open data on land use on Colouring London – crowdsourcing necessary because of current restrictions by HM Treasuring on microspatial building attribute data held by OS and VOA.



Existing informal collaboration
a) with Kiril Stanilov (access to large-scale manually vectorised datasets for London) to test hypotheses,
b) Robert Hecht & Hendrik Herold Leibniz Institute, IOER, Dresden (applying machine learning to OS maps).

Also aiming to drive vectorised historical agenda through Colouring London. Major copyright issues beginning to be addressed by Chris Fleet and generosity of NLS.

Colouring London now linked more closely with Turing, with joint working discussed with Flora Roumpani & Stephan Law as well as with LivingwithMachines programme.