

GREATER LONDON AUTHORITY

REQUEST FOR MAYORAL DECISION – MD2393

Title: Urban analytics: further development of the London simulator

Executive Summary:

The London Simulator is a computer model of the city – expressed in over 140 datasets covering aspects such as jobs, population, housing, public expenditure, tax, carbon emissions and business space – that has been developed by Greenwood Strategic Advisors, following an OJEU competition in 2017/2018. It is a strategic asset for the GLA which enables the quantified, long-term assessment of strategic investment decisions and policy options under a range of scenarios which can be specified. Further funding will enable new investment projects to be assessed and with greater geographical detail. This will help build the case for London in advance of the spending review and assess the potential for new funding and financing mechanisms for major projects.

Decision:

That the Mayor approves:

1. TfL's payment of a revenue grant to and the GLA's acceptance of the same in the amount of £50,000;
2. Expenditure of up to £149,000 during the remainder of this financial year and next on specialist services from Greenwood Strategic Advisors which are required to make improvements to the London Simulator and use it to assess various new investment projects (including but not limited to investment in the South London metro, Bakerloo Line Extension, Sutton Tram, Crossrail 2 and other major projects set out in the Mayor's Transport Strategy) and their funding and financing; and
3. A related exemption from the requirement of the GLA's Contracts and Funding Code to procure such services competitively.

Mayor of London

I confirm that I do not have any disclosable pecuniary interests in the proposed decision and take the decision in compliance with the Code of Conduct for elected Members of the Authority.

The above request has my approval.

Signature:



Date:

27/11/18

PART I - NON-CONFIDENTIAL FACTS AND ADVICE TO THE MAYOR

Decision required – supporting report

1. Introduction and background

- 1.1. The London Simulator is a computer model representation of London as a socio-economic system—expressed in over 140 datasets, such as jobs, population, housing, public expenditure, tax, carbon emissions and business space. Greenwood developed the initial London Simulator for the GLA following a full OJEU competition in 2017; it uses ‘system dynamics’, an approach to computer modelling invented in the 1950s at the Massachusetts Institute of Technology and recently applied by Greenwood to urban areas. The model is created independently of, but calibrated against, many historic datasets to reflect London as a complex socio-economic system. The simulator provides a neutral test bed for assessing the dynamic effects of investment decisions and other policy choices, both individually and in combination. The unique qualities of the simulator are:
- The number and range of high level data modelled independently and within an integrated system;
 - The faithful reproduction of the statistical record of London on many data over the last twenty years;
 - The capacity to assess counterfactuals;
 - The capacity to test a range of policies and investments in combination under different conditions and show results across the whole range of data; and
 - The combination of all the above in a single model.
- 1.2. Having such an understanding of how investments and policy choices impact the city (including London’s economy and tax yields) and operate collectively, is vital for a strategic authority such as the GLA, not least given the value of the GLA’s investments, and widespread impact of policies and strategies. Beyond this, the development of the simulator has supported identification of additional applications of outputs; including potential use of insights generated to justify and support new financing arrangements for infrastructure, in partnership with government and the private sector. The GLA has the rights in perpetuity to use the simulator, and over the last three years the team has worked to develop the simulator as a decision support tool alongside a range of complementary urban analytic models and tools produced by TfL and various teams within the GLA.
- 1.3. A prior information notice was issued in the OJEU inviting comments from firms with regard to the development of a system dynamics-based model of London and fourteen firms had responded. A full specification was drafted after considering the outcome of this exercise and a procurement exercise was conducted in accordance with the Public Contracts Regulations 2015 in 2017/18 after the issue of a contract notice in the OJEU. Greenwood Strategic Advisors were the only bidder and, its bid having met the required criteria, were awarded a contract for the supplies and services required.
- 1.4. In July 2018, the GLA published a report by Greenwood Strategic Advisors (Greenwood) entitled ‘Mind the Gap’, which described the first outputs from using the London Simulator on infrastructure investment in London, which sparked significant stakeholder interest. Greenwood’s report described how the simulator had been used to assess the potential impact of future investments in five key projects set out in the London Plan and Mayor’s Transport Strategy (and agreed with the GLA), namely extending Crossrail 1 eastwards, Crossrail 2, extending the Bakerloo Line, extending the Croydon Tramlink to Sutton, and investment in the Royal Docks to support business expansion. It demonstrated how these investments could lead to significant uplifts in housing, population,

economic output and national tax yield. The results of the analysis were supported by London First and Transport for London.

- 1.5. The report also considered a major investment conundrum facing governments and cities, namely that infrastructure is necessary for growth and often yields very high returns, yet such projects appear to be hard for governments and cities to fund under current arrangements. It explored the potential of newly emerging financial instruments to meet the funding gap, including Credit Participation Certificates (invented by UFT Commercial Finance), and recommended that “the GLA, Transport for London, Greenwood and UFT Commercial Finance work with appropriate lenders in assessing the feasibility of [significant] financing of new public infrastructure investments in Greater London.” The Bakerloo Line Extension (BLE) and Crossrail to Ebbsfleet (C2E) projects were subsequently identified as being the most appropriate for a feasibility study.
- 1.6. As part of the procurement of the development of the model, the GLA commissioned an external review of the simulator. The GLA also held a ‘deep dive’ independent review of the modelling approach, involving various city and national experts. Both approaches found that the simulator is fit for purpose. The model is a ‘white box’ system such that, in theory at least, all outputs from the model can be traced back to causations within the model. It is a uniquely strategic model that links up all the key elements of the city’s systems.
- 1.7. The GLA and TfL have concluded that there would be further benefit from developing the model and applying it further as set out below.
- 1.8. Officers acknowledge the need to procure services with a value of the expenditure proposed competitively. In this instance officers are of the opinion that section 10 of the GLA’s Contracts and Funding Code applies in that an exemption from that requirement may be justified where a supplier has had previous involvement in a project or the continuation of existing work cannot be separated from the new project/work. Here, Greenwood in providing the original supplies and services required for the development of the system have unparalleled experience of working with the GLA and its particular needs in this regard and the further development of what is a complex model and system including complex socio-economic systems including cities and have invested considerably in models of urban areas. While other modelling approaches develop in future, for now, it is apparent from research undertaken by officers that there are no other comparable models with the combination of attributes set out in paragraph 1.1. As a consequence it is considered by officers to be highly unlikely that any other supplier would be able to submit a tender for the services required now which would be more economically advantageous than Greenwood.
- 1.9. TfL have agreed to contribute £50,000 in grant to this project for the objectives and outcomes set out below.

2. Objectives and expected outcomes

- 2.1. In sequence, the objectives and expected outcomes of the £149,000 investment are to:
 - Disaggregate the simulator into a geography of inner London, outer London and outside London, with the potential to add further geographies (such as each individual borough and the central activity zone) in future. This will enable us to:
 - Enable investment projects to be simulated and appraised and for greater disaggregated detail of past, present and new appraisals. These appraisals will include but not be limited to past and present investments including the Jubilee Line Extension, Queen Elizabeth Olympic Park, Royal Docks, Crossrail 1. The purpose of testing past projects is to understand how the London system has responded as a whole to enable future assessments to be more robust.

- Quantify in all key respects the anticipated impacts, in isolation and combined, of future proposed investments including projects that have already been subject to simulation, Crossrail 2, Crossrail to Ebbsfleet (C2E), Royal Docks, and the Bakerloo Line Extension (BLE), and projects that have not been simulated before including the South London 'Metro' and other strategic projects set out in the Mayor's Transport strategy. Various scenarios will be developed as part of the work to test their robustness to a range of external conditions. The outputs will be used to help put the 'case for London' for the next spending review.
- Provide an initial assessment of the feasibility of new funding and financing options for the BLE, C2E and potentially other investment projects, using the simulator as a method for anticipating future tax uplifts and other income generated. This work would assess a potential third way for the funding and financing of infrastructure and other major assets that benefit the public, neither PFI nor public sector borrowing. The emerging innovation is as follows:
 - . Assets to be constructed or improved would be put in a temporary trust for the duration of the construction project and beyond, until they are producing funding through tax uplift and other public revenues;
 - . The construction/improvement project would be financed by private credit that is tradeable on a regulated global exchange, with fixed public contract payments that are much smaller than conventional funding commitments;
 - . The credit would be valued and its price would vary according to how well the project performs (in terms of its projected timing and out-turn costs) and how Greater London monetises social, economic, and other benefits of the new/improved assets in increased public revenues and cash flows;
 - . Both project and monetisation performance would be measured in near real-time and actively assured by cutting edge dynamic analysis tools (one being the London Simulator), as part of the financing package; and
 - . The same dynamic analysis tools would validate the increase in public revenues from the new or improved assets, and the associated timing of their guaranteed return to the public sector or other entity (e.g. a long-term trust) at the agreed fair price.
- Outline other investment choices and policy options appropriate for dynamic analysis, utilising its capability as a neutral, integrated testbed, and set out areas for developing the simulator's capability as required. Examples include quantifying the social, economic and fiscal impact of flooding and morbidity in the working age population and measuring the benefits of investments in flood risk reduction and health improvement measures. The potential would be discussed with the relevant policy teams and other stakeholders.
- Use the simulator to locate key leverage points within the London urban system, i.e. those points of potential intervention which are most likely to have a beneficial impact on a range of outcome measures.
- Promote the use of similar simulation technology to London boroughs and other organisations, where appropriate, to enable future collaborations.
- Make an initial evaluation of prospects for revenue generation from the London Simulator, for example requiring its fee-based use by developers for advance quantification of social, economic, and public fiscal impacts from large developments.

3. Equality comments

3.1. In line with the policies of the Mayor, the simulator can assess the degree to which investment choices and policies can improve aspects of London related to equality, including the availability of jobs and housing for different income levels. Results from the simulator will be used only to inform investment choices and policy options and will not supplant decision-making as other critical aspects of equality are not yet modelled within the simulator. The simulator would only aid the equality assessment of investment and policy options which would of course continue to be required to comply with the relevant legislation on a case by case basis. Among the data simulated are ones relevant particularly to income equality in London including: unemployment rate; housing availability to low income residents; the number of low income households; the proportion of low income jobs relative to total jobs; in/out migration; workforce relative to jobs for low income earners; social housing and private housing (for low income and other income levels) – the stock, additions and demolitions; and housing capacity relative to population (at different income levels).

4. Other considerations

4.1. Risk Assessment:

Risk	Mitigation / Response	Probability	Impact
Insignificant or irrelevant outputs	<ul style="list-style-type: none"> The results from the first model runs demonstrated the 'self financing' potential of all the major investments proposed; the relative insensitivity to Brexit of such investments; the benefit of decarbonising programmes and the cost to the environment of not investing in such programmes; and other non-trivial and unanticipated results. Further developments of the simulator are likely to yield similar quantified insights. Appropriate workshops to ensure integration and alignment of analysis to GLA Group priorities. 	LOW	LOW
CPC financing will never take off	<ul style="list-style-type: none"> Innovation inevitably carries risk and there is certainly a very high risk that CPC financing will not take off. However, the current situation is that we are currently reliant on Government support for the funding of either the BLE or C2E. Both projects – and others – would have materially significant beneficial impacts along the lines of route and for London and the UK as a whole. The potential benefit that arises from unlocking new funding and financing mechanisms is therefore very significant. The downside risk is relatively low as we would still obtain useful results from the simulator to help identify and promote the case for traditional sources of finance. 	HIGH	LOW
Other methodological flaws will be found	<ul style="list-style-type: none"> Due diligence on the methodology to date has been significant and will continue. In part, the developments of the model proposed are in response to methodological improvements that have already been identified. 	LOW	HIGH
Simulation technology used inappropriately	<ul style="list-style-type: none"> The simulator is a sophisticated analytical tool. Training and awareness raising sessions will be developed as part of the work to increase understanding of this and other 'urban analytics' technologies, and the situations for which they are appropriately used within the GLA. 	MEDIUM	MEDIUM

4.2. Links to Mayoral Strategies and Priorities:

Strategy	Links
Transport Strategy	<ul style="list-style-type: none"> Promotion of Crossrail 2, the Bakerloo Line Extension, South London Metro, Crossrail to Ebbsfleet and other investment projects.
The London Plan and Housing Strategy	<ul style="list-style-type: none"> Help to accelerate housing delivery in areas of London that are poorly served by existing infrastructure.
Economic Development Strategy	<ul style="list-style-type: none"> Ensure that London remains a world-leader in planning and delivering new infrastructure, and maintaining existing infrastructure, to promote positive perceptions of the city internationally.
Environment Strategy	<ul style="list-style-type: none"> Improve air quality and ensure adequate flood defences that are resilient to future shocks.

5. Financial comments

- 5.1. The estimated cost of this proposal is up to £149,000 spanning two financial-years as follows:
- 2018-19 - £90,000; and
 - 2019-20 - £59,000.
- 5.2 In terms of funding, for 2018-19, Transport for London will contribute £50,000 by way of revenue grant with the balance of £40,000 being contained within the Intelligence Unit's budget for 2018-19. For costs that fall in 2019-20 (£59,000), this will be funded within the existing Growth & Infrastructure (£44,000) and Intelligence Units (£15,000) revenue budgets, subject to the budget process for 2019-20, currently underway.
- 5.3 Any future expenditure on the development of the London Simulator will be subject to further approval via the Authority's decision-making process.

6. Legal comments

- 6.1 The foregoing sections of this report indicate that:
- 6.1.1 The decisions requested of the Mayor concern the exercise of the GLA's general powers, falling within the statutory powers of the GLA to do such things as may be considered to further, and or be facilitative of or conducive or incidental to the fulfilment of the GLA's principal purposes; and
- 6.1.2 In formulating the proposals in respect of which a decision is sought officers have complied with the GLA's related statutory duties to:
- (a) Pay due regard to the principle that there should be equality of opportunity for all people;
 - (b) Consider how the proposals will promote the improvement of health of persons, health inequalities between persons and to contribute towards the achievement of sustainable development in the United Kingdom; and
 - (c) Consult with appropriate bodies.
- 6.2 Section 121 of the Greater London Authority Act 1999 (the "Act") provides that TfL, as a functional body, may with the consent of the Mayor, pay a grant towards meeting revenue expenditure incurred or to be incurred by the GLA for the purposes of, or in connection with, the discharge of its functions.
- 6.3 Section 9 of the GLA's Contracts and Funding Code ("Code") requires that contracts with values of this level be awarded following competitive procurement activity. However, section 10 of the Code also provides that an exemption from this requirement may be justified where a service provider has had previous involvement in a specific current project or where the continuation of existing work which cannot be separated from the new project or work. Officers have indicated in section 2 of this report that this is the case. Therefore, the Mayor may approve the proposed award and exemption if satisfied with the content of this report.
- 6.4 In taking the decisions requested, the Mayor must have due regard to the Public Sector Equality Duty; namely the need to eliminate discrimination, harassment, victimisation and any other conduct prohibited by the Equality Act 2010, and to advance equality of opportunity and foster good relations between persons who share a relevant protected characteristic (race, disability, gender, age, sexual orientation, religion or belief, pregnancy and maternity and gender reassignment) and persons who do not share it (section 149 of the Equality Act 2010). To this end, the Mayor should have particular regard to section 3 (above) of this report.

6.5 If the Mayor is minded to make the decisions sought officers must ensure that appropriate contract is put in place and executed by the GLA and Greenwood prior to the commencement of the services in question.

7. Planned delivery approach and next steps:

7.1. A project team with personnel from TfL and GLA is being established. The below table provides an indicative timeline of the project:

Workstream	Timeframe for delivery
New contract	November/December 2018
Workshop to determine scope of work, workstreams and priorities	December 2018
Fortnightly project meetings to review progress and adjust workplan in an agile manner	December 2018-June 2019
Draft outputs and associated materials	April 2019
Final outputs and associated materials	June 2019

Appendices and supporting papers:

Annex 1: Mind the Gap – press release (August 2017)

Annex 2: Mind the Gap: Funding and financing city investments in the 21st century, full report

Public access to information

Information in this form (Part 1) is subject to the Freedom of Information Act 2000 (FoIA) and will be made available on the GLA website within one working day of approval.

If immediate publication risks compromising the implementation of the decision (for example, to complete a procurement process), it can be deferred until a specific date. Deferral periods should be kept to the shortest length strictly necessary. **Note:** This form (Part 1) will either be published within one working day after it has been approved or on the defer date.

Part 1 - Deferral

Is the publication of Part 1 of this approval to be deferred? NO

Part 2 - Sensitive information

Only the facts or advice that would be exempt from disclosure under FoIA should be included in the separate Part 2 form, together with the legal rationale for non-publication.

Is there a part 2 form - NO

ORIGINATING OFFICER DECLARATION:

Drafting officer to confirm the following (✓)

Drafting officer:

Jeremy Skinner has drafted this report in accordance with GLA procedures and confirms the following:

✓

Sponsoring Director:

Lucy Owen has reviewed the request and is satisfied it is correct and consistent with the Mayor's plans and priorities.

✓

Mayoral Adviser:

Jules Pipe has been consulted about the proposal and agrees the recommendations.

✓

Advice:

The Finance and Legal teams have commented on this proposal.

✓

Corporate Investment Board

This decision was agreed by the Corporate Investment Board on 26 November 2018.

EXECUTIVE DIRECTOR, RESOURCES:

I confirm that financial and legal implications have been appropriately considered in the preparation of this report.

Signature

[Handwritten Signature]

Date

26-11-18

TOM MIDDLETON ON BEHALF OF MARTIN CLARKE

CHIEF OF STAFF:

I am satisfied that this is an appropriate request to be submitted to the Mayor

Signature

[Handwritten Signature]

Date

26/11/2018.