Ian Gordon and Christine Whitehead

Why else is density important? London plan density research project 5

Project report

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LONDON PLAN DENSITY RESEARCH PROJECT 5

IAN GORDON AND CHRISTINE WHITEHEAD

LSE London

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Executive Summary: Why Else is Density Important?

- The current London Plan's objective of optimising densities is directed essentially at securing a number of additional dwellings within London that is closer to the housing supply target, while sustaining appropriate residential quality and accessibility in the neighbourhoods where development would occur;
- Other salient concerns which might also be assisted by higher density standards for new development include: enhancing economic productivity, encouraging more sustainable patterns of travel, facilitating a more suitable mix of new dwellings and increasing occupational densities to support a more productive workforce.
- Encouraging higher densities within new developments may contribute to these other policy goals via two distinct routes: by raising overall population and density levels across the metropolis as a whole (*the macro-route*); and/or by achieving those outcomes within specific local areas where they would yield particularly positive effects (*the micro-route*).
- Housing type and tenure initiatives depend mainly on the micro-route, while for the potential productivity and travel sustainability effects there are both micro- and macro-routes to be considered.
- For the macro-type impacts, the relevant region across which increases in the scale/density of activity are relevant to economic productivity and/or environmental sustainability may extend well beyond the GLA area covered by the London Plan.

Macro-impacts

- In relation to ***economic productivity levels***, there are reasons to believe that increased overall employment within the metropolitan economy would enhance overall national productivity. This is not simply because it has levels of output per head which are well above average. Rather it is because evidence suggests that in a range of London's key sectors (mostly advanced services) a larger overall scale of activity is associated with substantially higher levels of real productivity from the various assets/factors that it uses.
- Some of this higher productivity arises from specialist concentrations within relatively small areas, and others from more diverse sources across wider areas. Because the relevant labour markets are far from localised, impacts from denser residential development come via enlargement of the labour pool available across London's functional region (including the outer metropolitan area, as well as Greater London).
- Analyses across British city-regions suggest that the scale of population across areas within 80 minutes access-time to the urban centre has a significant positive effect on overall productivity. Impacts are proportionately greater from that within 30 minutes – but the outer ring naturally contains a much larger area, and hence a large fraction of the relevant population. The particular complexity of the metropolitan economy is also likely to mean that areas further away from the core play a much stronger role than for other British city-regions
- Even so, the proportionate impact of additional population growth may still be rather modest, not least because most of this population will not be associated with the most scale-sensitive activities. Estimates of these proportionate effects for cities in general vary substantially, but a typical finding is that doubling a city's population might raise productivity by 5%. Thus if densification in London could add say 5% to

the population of its functional region then it might raise productivity by something like 0.25%.

- The higher economic productivity in larger cities is often offset by extra costs, in terms of congestion, pollution, stress etc. Deliberately boosting the scale of established cities does not necessarily produce net overall benefits, unless non-market constraints (e.g. on land supply) have 'unnaturally' held back growth, or there is good reason to believe that the importance of agglomeration economies has recently and considerably increased. The first of these exceptions might apply to the London case (though less to its wider economic region), but if so the better response would be to address that constraint.
- The National Productivity Plan makes specific references to the London case, but entirely in relation to addressing the housing supply problem for its existing/expected population rather than any action to reinforce its agglomeration economies. Given the government's concerns to rebalance the economy, explicit attempts to enlarge the London region's employment and workforce are unlikely to be favoured as a route to raising productivity levels.
- In relation to encouraging more ***environmentally sustainable travel patterns***, by reducing per capita emissions from land-based travel by residents, there is also a simple accessibility-related argument, with some empirical support. In this case, the relevant macro-level variable is a measure of average residential density, with higher densities shortening travel distances and enabling a greater proportion of travel to be accomplished by modes other than the private car.
- Common versions of this argument are too crude, ignoring the tendency for accessibility and urban scale to stimulate extra travel demands. They also exaggerate the degree to which density variations are responsible for international differences in urban travel patterns.
- British evidence does support some impact of simple density variations and urban form on emission levels per head – particularly in relation to employment concentration. As with economic productivity, however, proportionate effects are relatively modest once differences in population mix are taken into account.
- A 5% increase in the metropolitan region's population (and hence its residential density) might conceivably reduce carbon emissions from personal travel by about 0.33% - maybe desirable but utterly trivial in relation to the climate change challenge.
- As in the productivity case, it should be noted that effects of this kind can also be achieved (potentially on a larger scale) by development within the Outer Metropolitan Area, rather than its displacement to the margins of the Wider South East.

Micro-impacts

- Returning to the possibility of positive **economic productivity** pay-offs from densification, the potential micro-route focuses on how densification in specific localities might achieve local gains which are not simply at the expense of other parts of the city.
- This depends on situations where it is the local concentration of residents, of a type favourably disposed to higher density living, which impacts on scale-sensitive kinds of local economic activity. The most likely general cases are where a local service cluster has a minimum viable size to function at a level which can attract and sustain higher value functions.

- A relevant example here is that of medium level shopping centres, particularly in suburban areas, with falling demand for retail space, and the role proposed for housing intensification in the recovery strategy recommended by the OLC and taken up in the Mayor's Town Centres SPG.
- The counterpart to this approach in relation to ***sustainable travel patterns*** is the existing policy (embedded in the Plan's density matrix) of particularly favouring higher density development in 'ped-sheds' around suburban centres, or in areas with superior access to the public transport network (signalled by high PTAL values).
- This approach makes sense, though it is very hard to judge what effect it actually has, both because concentration of denser development in such locales seems to reflect market choices at least as much as a policy steer, and because of a lack of convincing evidence of the impacts on modal split.
- Finally, there is the relation between higher density standards in particular areas and implementation of the Government's ***innovative housing initiatives***, including in particular Starter Homes, Help to Buy, Build to Rent and RTB replacements. Their capacity to boost construction of housing London depends significantly on the kind of higher density developments which have been promoted by the Plan.
- Some of the forms of development likely to be required lend themselves to factory-based construction methods which could boost productivity within the London housebuilding industry. However as yet they have not generated significant increases in completions.
- Some innovative planning changes have directly increased housing investment both through home extensions and more directly through change of use from commercial to residential. There could in principle be some agglomeration and productivity losses from permitted development but these are likely to be highly localised and offset by gains in housing supply for working households.
- In any case, additions to housing supply will be insufficient to make more than a tiny impact on price and affordability. Population increases will be mainly achieved through increased densities of occupation Progress would then depend on changes in built form, tenure and occupancy rates.
- Incentives are in the right direction to support better and more appropriate housing for working households including lower paid key workers, with a greater emphasis on purpose built private renting potentially improving speed of delivery and occupancy rates. Impacts, at least in the shorter term, cannot be great.
- Density policy should really be about the longer term – and over any term it cannot be a substitute for taking a spatially wider view, and bringing substantially more land into/along the supply chain.
- This is the case in relation to the housing supply concerns which have been central to the London Plans' encouragement of higher densities. But it applies also to most of the additional productivity and sustainability arguments addressed here.

Section 1: The Research: Why Else is Density Important?

This analysis is the last of an interlinked set of research projects commissioned by the GLA to examine issues related to London Plan density policy, intended to inform the forthcoming full review of that Plan. The particular focus for these studies was the Plan's Policy 3.4 'Optimising Housing Potential' and its implementation through the 'sustainable residential quality' (SRQ) matrix. Other studies in the set investigated:

- alternative definitions and measures of density in relation to issues of urban form, local population numbers and strategic understanding of housing capacity (no. 1);
- lessons for future development and policy to be drawn from the performance (relative to Plan objectives) of developments with densities above those specified in SRQ terms for a particular type of area (no. 2);
- development/maintenance costs, (commercial) viability and the contribution to affordable housing of denser types of development, in various settings (no. 3); and
- ways of understanding the relationship between the character of new development and that of surrounding areas, and how that could be taken account of in determining appropriate density for a site (no. 4).

The general brief for this particular project – embodied in the question 'why else is density important' – thus involved examining *other* significant respects (beyond those addressed in these reports) whereby maintaining/raising the density of development and intensity of space-use might be important in relation to London Plan objectives. More explicitly, the brief asked for identification of the linkages between urban form, agglomeration economies and overall *economic productivity*, and their implications for density policies that might enhance productivity. Taking an extended view of productivity, allowing for *environmental externalities* also, the report similarly examines the significance of the linkages between urban form, travel patterns and (carbon) emissions. A third topic specified in the brief is that of how density policy may enhance the effectiveness of *new housing initiatives* in relation to starter homes and PRS – for which denser sites offer specific productivity advantages for those housing types which could secure the supply of key types of worker to sustain high productivity levels in London's economically dynamic sectors.

In relation to these issues, the project was expected both to:

- review strategic linkages; and
- provide and evaluate options as to how density policy might help manage these in relation to Mayoral and national objectives.

For each of these three issue areas, which we address in turn, we consider 'density policy' at two levels, relating respectively to:

- *city-wide objectives* of residential intensification and broader Mayoral commitments to an economic growth agenda; and
- more specific strategies, guidance and standards for *local-level implementation* of the Plan's intensification policies, in relation to development control and site planning.

Because of the breadth of the issues involved (and in relation to the housing initiatives, their early stage of development) we rely almost entirely on analyses grounded in existing research/professional literatures and established frameworks, rather than any significant new empirical work (either statistical or case-study-based).

Previous reports in this set – which have addressed the role of density policies in relation to closing the projected numerical gap in overall housing provision, and environmental/quality of life implications for new and existing residents in areas of residential development – will have discussed the general relationship between policy, actual density patterns in new development and achievement of Plan Policy 3.4. We will draw on some of these analyses, as well as referring readers across to the discussion within those reports.

The fact that key productivity and transport sustainability arguments for this report have been framed and pursued at a broad metropolitan scale, and raise particular issues about allowing for distinctive features of the capital/world city economy, means that we also have to address the relationship between these and the city's position in a wider context. The report starts by doing this, briefly sketching a basic framework drawn from the mainstream economic literature on urban size, development, competition, spatial externalities and the potential significance of planning (section 2); and two important analytic issues for identification of effects (section 3) – before turning to discuss, in turn, the salience to London density policy of specific issues about economic productivity (section 4), transport sustainability (section 5) and economically targeted housing initiatives (section 6), with a short concluding summary of their key policy implications (section 7).

Section 2: Density, Size and the Economics of Urban Growth

The emergence of distinctively urban settlements (rather than simply clusters of farm houses) is usually associated with prior achievement of an agricultural surplus, and the development of specialised government, symbolic and market/service activities requiring and stimulating centres in which to undertake these[1]. From the (pre-capitalist) outset then, it seems that:

- urban centres embody both market and more authoritative roles;
- crucially, they provide and depend upon agglomeration economies (i.e. external benefits to all from being part of a spatial cluster of activities); and that
- they engender new activities, specialisms and roles, which are both advantageous for customers/clients and (in many cases) reinforce the economies of urban scale, and advantages for still larger agglomerations.

None of that is news, despite the great burgeoning of economic research on urban scale economies, and renewed enthusiasm for cities as hearths of creativity and dynamism over the past 15-20 years. The significance of scale economies was commonly taken for granted rather than made explicit (as e.g. in central place theory); not rigorously tested/measured; and sometimes assumed to have become much less relevant. But growth poles, predicated on such urban scale economies were a key idea element in regional policy debates from the 1960s (and practice in continental Europe); the UK's Long Term Population Distribution exercise of that period was planning on the basis of developing substantial new cities to productively accommodate anticipated rapid population growth (until that projection faded away); and in the early 1970s there was a very active debate about optimum city sizes, in

[1] Some, from Jane Jacobs (1969) on, have claimed a stronger role for some of these settlements (notably Catal Hoyuk) as the place in which the key technological innovations were forged that underpinned achievement of an agricultural surplus – though this is disputed by most archaeologists.

which increasing returns to scale in productive sectors were a key element (Richardson, 1973).

The notion of an optimum size arose, because there were also recognised to be a set of negative externalities of urban size, notably in forms of congestion/pollution and housing/transport costs to be set against the higher earnings accruing from productivity effects in private activities. In actually existing cities, it was presumed that the positive externalities more than balanced these negative effects (else the population would not have come/remained); but that the latter increased more rapidly as the city population grew, leading to a point where they intersected. Or rather two points: one representing the point at which *total/average* costs came into balance, when the (net) incentive for additional people to move in would be expected to disappear, marking a point of equilibrium for the population level; and the other, at a significantly lower level, when (more rapidly rising) *marginal* costs caught up with the marginal benefits of additional size, marking the point of (socially) optimum size. For several reasons (some to be discussed below) the idea of an identifiable optimum size proved a chimera. But the (cautionary) proposition - that *neither* potential for further increases in returns to scale in marketed activities, *nor* actual population growth are adequate reasons to assume that big cities *should* grow further – still stands. Recently, however, there has been more emphasis on the tendency for a regulation-induced inelasticity of housing supply to mean (even in some US cities including New York) that urban success shows up in higher (money) incomes rather than in population growth (Glaeser et al., 2005; Glaeser and Gottlieb, 2009) - potentially constraining city sizes to below either optimum.

One simple argument against the idea of *an* optimum city size was that it would have to depend on the activities in which a place specialised, since simple common sense suggests that the potential for increasing returns to scale (of urban centre) varies enormously. It's not just agriculture/mining versus everything else. Since sectoral specialisation (the urban division of labour) is determined across (at least a) national set of urban areas, it was/is a simple step to infer that any optimum would have to be thought about in terms of the distribution of settlement sizes (and specialisations) within a national *urban system*, encompassing centres which *should* have very different sizes and quite different levels of productivity (or congestion) too.

One familiar version is that of the central place system (as developed by Christaller or Losch) which distinguishes sets of urban activities, of higher and lower 'levels' – implicitly ones with higher/lower returns to scale, in terms of the sizes of market area required/available to make them viable - and then proceeds to derive an equilibrium geography of urban centres of different 'orders', with the higher level activities only figuring in (progressively) larger/more spatially separated centres. Provided that this is competitively arrived at, without significant sources of market failure there would be no good reason either to boost the higher order centres, as being the most productive or the most overblown.

Another version stems from the observation that city-size distributions, in population terms, tend to follow a common, statistically skewed form – more or less that of a log-normal distribution, which is expected in situations where over time many independent factors combine multiplicatively to determine the size of individual centres. In this case, one common diagnostic test is to look at how strongly a version of this (the rank-size rule) holds amongst the set of larger cities, distinguishing cases where the largest of these are very much bigger than would be expected from the normal rule – with a suspicion that such 'primate' cities might reflect historic concentrations of state power, rather than pure competitive advantage. The significance of orderly city size distributions and of departures from these is still a

subject of substantial debate. In the UK/English case, where the gap in size between London and second-order cities is striking, inspection of the data actually suggests that what may be odd is not London's size, so much as the modest size of England's second tier cities (Overman and Rice, 2008)[2].

Though couched in terms of (population) size, these lines of discussion and analysis are also about density, both because

- effective urban size involves the scale of activity *within* some set of effective bounds to what is reachable ('city limits');and because
- competing attempts to access the heart of the interacting city lead to higher occupation densities near there, and thus also on average across the area of the city.

Section 3: Two Significant Analytic Issues in Identifying Density Effects

In order to bring empirical evidence to bear on the significance for density policies of such urban scale economies - in relation both to economic productivity and environmentally sustainable travel patterns - two particular analytic issues need to be faced, involving appropriate:

- control for confounding effects from the *different mixes* of activities, workers and residents locating in areas of different size or density, rather than direct effects of these variables; and
- *spatial scale*s of analysis, and their relation to those of intervention.

These are inter-related, but need some separate discussion.

Heterogeneity, Segregation and Mix Effects
Both people and economic activities vary greatly, in terms of: how much different locational attributes, including centrality, matter to them; and also in their budgetary constraints. Competitive processes in product and property markets (including the quasi-market for social accommodation) thus lead more or less naturally to substantial differences across areas in terms of what types of people (by economic position, family status and lifestyle etc.) live where, and similarly what types of business (by target market, business size, functional role, dependence on transport types, and salience of different face-to-face interactions) locate there. Differences in the mix of occupants in these kinds of terms are one of the significant influences (along with strength of competition) of how densely spaces are occupied in practice, on population/employment measures. But, together with other more directly access-related factors, these (self-)selection effects also strongly influence measured productivity and travel behaviour (as well as patterns of housing occupancy/tenure). Separating out density effects requires some strategy for controlling the influence of the selection effects – not least when the aim is to gauge impacts of density policies, from evidence for cities and neighbourhoods which fulfil different roles. .

Spatial scales.

[2] This finding relates to population data for continuously urbanised areas rather than the functional urban regions which are arguably more appropriate (see e.g. Berry and Okulicz-Kozary, 2011) and would attribute a much larger population to London (Cheshire and Gornostaeva, 2001). .

Though formulated and presented in a London-wide strategic document, the Plan's density policies are operated on a more localised and differentiated basis, firstly through the standards specified for different area types in the SRQ/density matrix, and then through case-specific judgements made (with more/less reference to these) by borough planners or the Mayor. Relevant effects may not be so clearly localised, however, both because:

- on the supply-side, intensified development in some areas may partly serve to defer construction of similar accommodation elsewhere, and because
- on the demand-side, of vacancy chains as a self-selected group of new occupants move from housing elsewhere – and displacement chains among those for whom current areas of residence become unaffordable or less desirable.

For both productivity and sustainability issues the preferred scale of analysis is actually that of the metropolitan or functional urban region. This is largely because they are designed to be consistent in basis (in notable contrast to conventional administrative units) and because the more obvious biases in measurement of spatial externalities come from an under-(rather than over-)bounding of observation area. Where residence data is to be used, it is also clearly important to ensure that commuter areas get properly included, both to measure scale appropriately, and because missing them can provide a quite distorted view of the mix of population characteristics. These are strong arguments, particularly for a general appreciation of how far urban size matters, though they do not mean that important effects cannot arise from *sub-regional* concentrations of population and activity, within the functional/metro area.

Approaches which have been used[3] to deal rather more explicitly with spatial relations, while also trying to control for some selection or mix effects typically involve starting from more micro-data (for firms, individuals or just smaller areas) and addressing agglomeration and/or urban form effects by using:

- measures of concentration within specific travel-time bands around their location;
- summarising accessibility in terms of the distance to, and mass of, all other areas, in an indicator of market potential (as a kind of averaged density measure); or
- expressing different forms of concentration within a FUR in terms of employment or population-weighted averages of neighbourhood level densities, and shares of core and peripheral rings.

Section 4: Effects on Economic Productivity

The consensus from a wide range of empirical studies in the UK and internationally (including contexts with a much larger set of city-regions for comparison) is that more populous city-regions enjoy/contribute significantly higher levels of productivity in the mainstream economy. On average a doubling of urban size is seen as yielding around 5% higher productivity(see e.g. Rosenthal and Strange, 2004; Rice et al., 2006), though a meta-analysis of available studies records a large variability around this (Melo et al, 2009);

[3] In studies cited in the following sections.

Such scale/density effects are understood to reflect enhancement of three particular kinds of process (*sharing* resources/facilities, *matching* in labour/collaborative and product markets and, *learning* about possible/available products and techniques; Duranton and Puga, 2004). Apart perhaps from the sharing of physical facilities (notably for communications) each of these depends upon human interactions, with a face-face element as the key justification of (continuing) in what become high rent areas[4]. In some of these, the scale of the local market (for consumers or potential workers) is an element with a residential dimension to it. But, much more typically the locational bases between which interaction occurs are going to be places of *work*. Hence scale effects will generally involve spatial concentrations of jobs, rather than residents, with the latter being relevant only indirectly, as an enabler of the agglomeration of employment/economic activity.

None of the agglomerative processes are likely to operate consistently across all kinds of activity and all sets of areas within a city. There are clarificatory questions which have needed investigation, both about the types of activity in which agglomeration economies are most relevant, and about the spatial ranges over which effective interactions can occur.

In relation to the first of these, simple reasoning suggests that the types of activity, firm, occupation and process (within firms) which could be expected to benefit most from agglomeration are those which are: least routinized, self-contained and settled in their products/markets; and more strategic, dynamic, market-facing, specialised, internationally-oriented, and/or uncertain in the environments in which they operate. Empirical studies have so far been largely confined to the sectoral dimension of variation, with Graham (2009) offering a notable UK example.

Using micro-data at the firm level, this study started from the distinction between effects on productivity associated with proximity to others in the same sector ('localisation'), and a broader 'urbanisation' effect reflecting pure scale. The latter, which is the relevant one for density policy, was reported as being much the more important factor overall. It was found to be generally more important in services, though the sectors with strongest responses actually included electronic goods, as well as finance, consultancy, public services, the media and transport services. Estimated urbanisation coefficients for these sectors implied that a doubling of the scale of overall employment in surrounding areas[5] could increase productivity by around 30% (as compared with 19% for all services and 7% for manufacturing). Graham's analysis was restricted to (relatively small) single-establishment firms. But, for larger firms in these sectors, where the more routine activities have progressively been hived off, over several decades, for dispersal (or out-sourcing) to cheaper locations, we might reasonably expect what remains in London to display even stronger urbanisation effects. Given London's pattern of sectoral specialisation, we might then expect that urbanisation economies would be much more than averagely important here.

In relation to the second (spatial) question, the range over which such effects may operate is clearly important in relation to what (if any) kind of density policy could be relevant. As already noted, empirical studies have tended to focus on a scale of functional urban region (FUR) modelled on that of US Standard Metropolitan

[4] Place-based reputations for specialised activities, only partly based-on continuing interaction, may also play a significant role, as in the West End of London, where customer expectations of where suitable suppliers have been reported as the major benefit of clustering in a set of consumer-service activities (Gordon and McCann, 2000)

[5] Using market potential measures explained below and/or above.

Statistical Areas (SMSA), for reasons as much of consistency and avoidance of the more obvious biases of *under*-bounding, as of particular understandings of the relevant processes. In our judgement, however, SMSA-based procedure, grounded in analyses of densities and commuter flows, yields a reasonable general approximation. In the London case (as employed by Cheshire/Gornostaeva, 2001) produces an area approximating to the metropolitan region originally defined by planners in the 1960s (i.e. Greater London plus a surrounding Outer Metropolitan Area (OMA) some 30 miles wide, cf. Buck et al., 2002). There is, however, another view that agglomeration over a substantially wider region is relevant for this type of 'global city', involving a Mega City Region (MGR), with sources of dynamism spread over a large network, seen in the London case as covering a 150km radius version of the Greater South East (Hall (2009). There is some support for this extended version of the agglomeration in analyses of the territorial scale across which an enhanced occupational 'escalator' operates (Gordon et al., 2015).

In relation to productivity, several micro-data-based studies (summarised in Rosenthal and Strange, 2004) have shown significant, within-sector, 'localisation' economies over quite short distances. Graham (2009) tests for these at several ranges, finding significant effects at generally shorter distances in manufacturing (down to 1km for a majority of sectors) and a wider range in services (with 10 kms. as the modal value). For urbanisation, however, he sticks with a single 'market potential measure' in which the proportionate impact of employment in other areas is presumed to fall off in proportion to their distance away. A simple (geometric) point to note, however, is that successive distance bands will typically include a larger number of jobs, so employment over quite a wide radius can be important. It is not easy however, to translate this into judgements as to what size of spatial field has real importance and how these would equate with FURs.

A bit more light is cast on this by Rice et al's (2006) study which used more aggregated data and looked at how drive-times 'distances' conditioned the effects on productivity of population numbers in surrounding areas. They find that the size of this 'mass' across areas up to 80 minutes away contributes significantly to productivity levels, though impacts are stronger from those within 30 minutes. Overall they suggest that a 10% reduction in drive times might add 1.2% to productivity nationally (though a bit less in London, at 0.95% than in the GSE/Midlands, ranging between 1.4% and 1.45%).

Other kinds of evidence also suggest that effects in/around London might be more regional than local. In the days when London Business/Employer surveys asked about the significance of proximity to related businesses[6], only a small minority of respondents reported positively about this, with just two notable groupings, in the West End (already referred to) and in the City (notably among foreign-owned firms valuing access to financial intelligence). Another observation is that with good rail access to the centre, an unusually broad area of high commercial rent levels and the discontinuity introduced by the Green Belt, many sophisticated/innovative firms that interact strongly with others across the agglomeration, though not with very great frequency for most staff, have chosen to locate in the OMA (and beyond), particularly on the west side, creating an extended network of agglomeration economies not simply tied to Central London (Gordon and McCann, 2000, 2005; Buck et al., 2002).

These offer good reasons, at least, for accepting something like the metropolitan area/FUR as the relevant scale for agglomeration effects on productivity, even with

[6] Neither proximity nor relatedness are pre-defined, although the former might typically relate to borough scale.

densities mapped on a workplace basis. For residence-based concentrations, the case is clearer, given the scale and complexity of commuting networks and labour markets around London. The exception, to which we shall return, is for lower 'level' types of service, located in lower 'order' central places within the region, where much more localised residential concentrations of potential consumers might be critical to viability, vitality and productivity. Otherwise, the economic significance of (locally implemented) density policies rests on how much they contribute to the *total* mass of the potential labour force across the FUR, *and* the elasticity of employment in relevant sectors to this labour supply.

The last point is made, because (although the distinction does not yet appear in statistical analyses) all jobs are clearly not of equal significance to the generation of agglomeration economies. Rather it seems that the kinds of activities, roles and occupations that we have suggested as being potentially most sensitive to urbanisation economies are also likely to be proportionately more significant as contributors to these. If so, we might then expect that they would figure less, and agglomeration economies be less damaged, when with a continuing shortfall in housing supply more jobs are squeezed out of London. That is speculative view, but it would suggest that promotion of generally higher residential densities within London might not do too much for productivity, unless the denser new developments disproportionately housed workers closely involved in activities that are central to the realisation of urbanisation economies.

Significance for density policy

In relation to productivity related policy objectives we see two levels at which density policies might possibly make a difference. The first is a *macro-issue*, involving raising (or at least sustaining) the level of productivity across the London economy, which could be seen as potentially contributing to current national economic priorities. The second is a *micro-issue,* relating to targeted impacts in particular areas across the city, adding an economic (productivity and service viability) dimension to the concept of sustainable residential quality.

We start, however, with the first of these, and the question of how density/agglomeration issues in London fit with the government's Productivity Plan (HMT, 2015). This Plan addresses several themes of relevance to this report, and highlights a number of recognised links between urban density, productivity and policy. Its point of departure is an increasingly conspicuous underperformance of the UK economy relative to key international competitors. HMT's overall diagnosis of the substantial shortfall in UK output per hour as compared with France/Germany and the US focuses in the first case in input factors (notably a lack of investment, particularly in R&D) and in the latter making less good use if these (for various reasons including weaker diffusion of innovations, and market size limits on scale economies). For the effective halting of productivity growth since 2007, the specific problem dimensions it identifies, include a continuing impairment of resource allocation as a result of the financial crisis, cheapened labour discouraging labour saving investment, and some sector-specific factors. The latter relate to a couple of goods-handling sectors (distribution and transport/storage), but also to three advanced producer service sectors of particular salience to London (financial services, ICT and professional services), partly attributed to unsustainable pre-crisis trends (HMT, 2015, Annex A).

Agglomeration economies are cited in relation to the vital role of transport investment in making cities work, exemplified by a commitment to world-class transport links between the cities of the Northern Powerhouse, enabling effective clusters and innovative interactions to occur between the centres. This is integral to a regional

rebalancing strategy, reducing reliance on the capital as a source of growth, by creating other strong city regions, rather than pulling down the capital city.

In relation to the capital itself, the key references (except in relation to a promised decision about the airport) are in relation to housing supply, and specifically to more devolution of planning powers to the Mayor, allowing them to calling-in of projects involving 50 homes or more and support applications to help meet London's need. In support of a Mayoral strategy of' building up' on brownfield land, by increasing density, initiatives are proposed to remove the need for planning permission where adding storeys would just bring the height up to that of an adjoining building (subject to consent of neighbours). Finally, to better exploit the potential of higher-density residential development around commuter transport hubs[7], the possible use of development corporations in London (and other areas with devolved powers) will be explored.

We have reviewed the content of the Productivity Plan in some detail (even where its content has since been developed more fully), to establish that the government's expectations in relation to the density-agglomeration-productivity link in the London case seem only to run as far as trying to secure a flow of housing to meet currently assessed needs – rather than to seek significant productivity gains through additional expansion of elements of the London economy.

This relates to our own observation about the density productivity link. As we see it, in order for density-raising policies to have real significance for productivity levels in the London economy they would have to proceed by making a substantial difference to the size of the available workforce, across something like the FUR, and thereby to aggregate employment in London. That is probably not an acceptable policy objective in the context of a national strategy of rebalancing. But the scale of expansion needs to be substantial to make a noticeable difference because the gearing of the agglomeration effect is so low. Even if it turns out to be substantially higher in the London case than the typically reported 5% average (as we would suspect), it is still likely to be too low to make this an important add-on to the basic objective of reducing the housing supply gap – especially given our doubts (from report no. 1) about how strongly (stated) density policies actually impinge on what is built.

Turning, more briefly, to the micro-issue, we are substantially more convinced by the strategy and line of argument about the role of housing intensification in the revitalisation of (middle level) London town centres advanced in OLC (2014) and substantially reflected in both the FALP and the Town Centres SPG. Without rehearsing this fully here, in essence the argument is that:

- intensified competition has left these centres with excess retail capacity and threat of further decay in their offer;
- they still play important roles for their communities and have the potential for reorientation to a wider range of service activities and facilities (public and private) which could be viable and mutually supportive;
- a significant part of the surplus space, at the margins of the centres, could productively and effectively be redeveloped as high density (if not high rise) residential properties, in locations where this would be potentially very

[7] A more ambivalent view is conveyed by Deloitte (2015) (in a report which twice alludes to possible productivity effects, the other being an eastward extension of the CAZ). They note that, while such development could enhance productivity via a reduction in travel times, it could also reduce the agglomeration benefits of having more commercial space.

attractive, more acceptable in terms of urban form, and sustainable in transport terms;
- this would be particularly so, for target groups, if the service offer of the centres were reinforced – which should be feasible if the housing was occupied by residents with a strong interest in using such a range of local services.

In our view this was and remains one realistic and potentially valuable way of linking the delivery of density policy (at a local scale), rather than its general formulation, to a productivity enhancing function – albeit not to one of London's core traded sectors, but to clusters of activities capable of sustaining local communities, and enhancing their general residential attractiveness.

Section 5: Density and Transport Sustainability via Emissions Reduction

As briefly discussed in our first report (No. 1) the argument for more 'compact' cities, reversing what was characterised as the 'sprawl' of many North American (and Australian cities) originally emerged in the 1990s as a means of reversing the growth of carbon emissions from use of the private car[8]. Other interests contributed to its support, such as those which underlay 1930s opposition to London's rapidly spreading suburbs, stimulating British urban containment policies. But in the context of stirring international concerns about global warming, the emissions reduction argument was, and remains, the most objectively grounded basis for the case against spatially extensive forms of urban development.

Its basis lies in a pair of arguments:

- that the *need* for lengthy personal travel trips (other than for recreation), or indeed business ones, would be substantially less if trip destinations were located closer to trip origins, e.g. jobs/services closer to homes, as would be the case if urban densities were higher (and/or if neighbourhoods were planned to include a mix of residences and jobs/services); and
- that higher densities within cities increase the probability of trips being made by modes other than private cars, since there will be a larger proportion of short trips which can be easily undertaken on foot/bicycle, and denser passenger catchments make provision of a good standard of public transport more economic.

The second of these arguments is a reasonably straightforward one, given an institutional basis will for providing public transport. The first is less obviously sensible than it initially seems, however, since the relevant consideration is travel *demand* rather than travel *need*[9], and one of the highly valued features of large/compact cities is practicable access to a wider range of diverse employment and service opportunities. A social benefit of more compact cities is thus likely to be a greater proportion of trips not being made to the nearest opportunity but to a preferable one - yielding more personal benefit/satisfaction – but a more modest saving in vehicle miles/emissions than might initially be expected.

[8] While this was the case in the 'anglo-saxon' nations, Newman and Kenworthy (1989) suggest that an ongoing European interest in re-urbanisation was motivated by more qualitative economic and social benefits.

[9] Broadly speaking it is planners without any economic background who have conceptualised this issue in terms of need, and economists who have emphasised the very strong role of choice in shaping travel patterns.

One very visually striking and influential piece of evidence in favour of compaction yielding strong benefits in terms of emissions savings came from Newman and Kenworthy (1989) who graphed a pair of variables (from the substantial cross-national database they had built up) against each, in a way that suggested a doubling of the population density of a metropolitan region could lower emissions by a half (representing an elasticity of -1).

The many policy actors who copied this diagram into their plans somehow missed two (rather clear) problems with drawing that inference from it. One is that the conspicuously low emission cases were not just dense, but also in low income (Hong Kong and Singapore) or communist countries (as Moscow was at the time). The other is that in some countries (notably the US) *both* high car mileages and sprawling city-regions reflect a common economic factor (cheap fuel, alongside high incomes) – not just, or primarily, the influence of one on the other.

Controlling for these factors, using the authors' own data-set, and also looking at the influence of fuel prices on metro densities (alongside topography) confirmed that there might still be a very significant influence of density on emissions levels, but that its quantitative impact was only one third of that originally suggested (with an elasticity of -0.24 only). A more focused analysis of commuting travel in British city-regions, allowing for control also of the socio-demographic mix in different areas (as another factor affecting both choice of more/less dense locations and travel behaviour) suggested that, in the UK context at least a more realistic estimate of the elasticity would be just -0.07. In that case a doubling of city-regional population density would yield only a 5% reduction in emissions. The only more important relation with urban form to be found was one with a weighted measure of employment density, showing (plausibly enough) that greater spatial concentration of job opportunities increased the proportion of commuting by public transport. Nothing as significant was found with measures of residential concentration (Gordon, 1997; 2008).

Whatever the 'correct' estimate might be, there are other (equally obvious) questions to be asked about what it could mean in practicable, policy-relevant terms to talk about the effect of a doubling of residential densities across a city-region could be – without considering in what circumstances such an effect (or a more modest percentage income could actually be achieved). Even imposing a well enforced Green Belt around an economically dynamic city does not ensure that densities inside the Belt actually increase, as the first 40/50 years of the London Green Belt showed. Maybe land occupancy could be heavily taxed. But, if the point is actually to reduce emissions from personal travel, there would it would make much more sense to tax that more heavily, relying on market forces then to stimulate re-compaction – allowing planning to find more efficient/orderly forms for this to take (Gordon, 1997). Or, sticking with the idea that the overall density of the region needs raising, perhaps in the London case that could be pursued by partial removal of the Green Belt (Evans, 2012).

Without being so radical (and bearing in mind the OLC's (2016) conclusion that *both* further intensification and some city-regional extensions are required, the relevant questions are:

- how much side-benefit in terms of emissions reductions could realistic levels of new development inside Greater London be expected to secure?
- are there more specific forms of densification within this area that would offer more gains in these terms, rather than simply pushing up the total population (and hence the mean density)?; and

- more specifically, at a local level, how much benefit in terms of mode switch away from private cars can be secured by a direct application of the PTAL criterion from the Plan's density matrix in determining planning applications for residential development?

The first of these questions is the *macro-issue* in the transport sustainability context, to which on the evidence we have available, the answer seems to be 'not very much' additional benefit from a general densification policy. As in relation to economic productivity, the point is that while there seems to be a significant causal connection its gearing is not very strong – possibly because higher densities across the region can offer a greater variety of attractive destinations for travel outside the immediate locality.

The second (meso) issue is one on which we see little specifically helpful evidence. What we are aware of, beyond the fact that in the city-region modelling attempts to find relations between emissions and other indicators of urban form were generally unsuccessful[10], and that the SOLUTIONS project's simulation of compaction, dispersal and planned expansion scenarios for the Wider South East suggested only small differences in CO2 emissions. Over 30 years it projected increases ranging between 33% for the compaction scenario, 37% for dispersal and 34% for planned expansion – despite big differences in land use[11] (and hence residential densities; Echenique et al., 2012).

At the micro-level, the a priori case seems stronger – in relation to a continued and possibly reinforced concentration of densification on sites with better public transport access – though hard evidence on this seems lacking. As noted when we discussed the logic of the Plan's density matrix in our first report, there is a double logic in expecting higher development densities in localities with better access to the public transport network. On the one hand, higher PTALs should be quite a good *predictor* of where more people could be attracted to live in high density developments – specifically among those who give more weight to accessibility than to space. On the other hand, since good public transport access should encourage people to make less use of the private car, which is a *policy aim,* densification in higher PTAL localities should help in securing this aim. The balance between these two causal links is quite unclear a priori, but if the latter effect were strong, local scale densification in such areas could make a significant (and specific) contribution toward the desirable modal shift more vaguely expected to follow from a raising of average densities.

How far this is happening in practice across London, however, is unclear because of a lack of analysis of actual effects. All we have managed to find is a single short research report, for a private client, using diary data to compare the modal split of residents in 7 sizable new residential developments in locations with differing levels of access to the public transport network (PFA/BW, 2010). Its qualitative conclusion is that: 'mode choice did not appear to be influenced by the PTAL value for individual sites' .This reflects the fact that two sites with only modest PTAL values had high public transport usage, though for one at least of these the suggestion was that the PTAL criteria involved an unrealistically limit to the distance people were willing to walk to a transport node. Even if the substantive correlation between accessibility

[10] The one exception of relevance to residential densification is that greater spatial imbalances between the distributions of jobs and of worker residences tended to increase commuting distances.

[11] And in both overall economic benefits and transport economic efficiency, on which the dispersal scenario scored best and the compaction one least well in the WSE case.

and public transport use had been clearer, however, it could not have answered the question as to how far levels of access determined public transport use by residents, and how far they determined which kinds of people would choose to reside in different developments (without any necessary effect on their modal choices)[12].

Section 6: Housing Innovation, Intensification and Productivity

The government's Productivity Plan (HMT, 2015) sees housing as an important element in increasing productivity in three distinct ways:

- by accelerating housing development and so improving productivity in the construction industry;
- by saving land through building at higher densities, including taller buildings; and
- by increasing overall housing output and so enabling workers to access jobs more effectively.

This third element implicitly includes not just easier access to housing but also the relationship between housing and transportation and thus accessibility and connectivity as well as the cost of that housing. It does not specifically mention different types of dwelling and tenure. However these clearly have an impact on how housing is used and therefore the availability of suitable housing for different groups of households.

Government initiatives with respect to housing numbers and forms

Government initiatives over the last few years have directly and indirectly incentivised particular approaches to expanding output; changing the density and built form of what is provided; and determining the tenure structure of new output. As such they impact on potential productivity improvements. Many of the initiatives are around the speeding up the land use planning process and incentivising local authorities to support development (e.g. through the New Homes Bonus) - as is noted in the productivity plan. In particular many of the initiatives relate to numbers of units and thus tend to incentivise smaller units thus reinforcing the impact of the most usual approach to measuring planning density which is based on units per hectare.

One of the major constraints to building more is seen to be lack of skills (London Housing Commission, 2016; LSE London 2015). Government and other initiatives in this context attempt both to incentivise training in traditional building skills but also look to the potential to use modern off site methods of construction which can at least in principle speed up development. Such methods also influence density and built form in that they require scale; they often work best in the context of blocks of

[12] This comment also applies to the observation, drawn by TFL (2015) from a graph showing car use to have become less important in neighbourhoods (LSOAs) where residential densities had increased substantially between the last two Censuses, that 'there is some evidence of the effect of increasing population density making car use less attractive' (p. 220). Necessarily these are areas where population has changed substantially too. And whether through densification of existing properties by migrants from poor countries, or occupation of new higher rise developments by young professionals, compositional shifts in the population mix seem more likely to have affected modal split than impacts of densification on the behaviour of other residents.

apartments; and require different types of management both of the development process and the management of the resultant units. As such they tend to be seen as more suited to rental properties - both social and privately owned.

Specific initiatives which are regarded as affecting speed of output; types of units built and the tenure of these units include in particular Help to Buy; Starter Homes; and Build to Rent (DCLG, 2016; DCLG 2016a; HBF, 2015; Parliament, 2016; DCLG, 2015).

The first two are developer-led in terms of building decisions - they look in the main to expand the market for new build units and to support first time buyers and to a lesser extent those moving up from their original purchases into the owner-occupied sector. The emphasis in the main is on smaller units but ones that will be readily re-saleable. On the whole these initiatives can be expected to increase density of provision and thus use land more efficiently. However both Help to Buy and in particular Starter Homes are likely in part to substitute for market priced housing so there could be considerable deadweight loss. The estimate for Help to Buy is that around 40% could not otherwise have purchased (DCLG, 2016). The Starter Home initiative is likely, if anything, to have higher deadweight losses as it increases risk for the developer and the units are likely to be directly in competition with full market priced units. It will also negatively impact on the numbers of affordable rented homes provided which could impact negatively on the capacity of lower income working households to remain in London.

Build to Rent is a government initiative to increase the quantity of purpose built private rented units through making finance more readily available for developers and attracting institutional investors into both development and ownership market. In addition some publicly owned land will be covenanted to ensure private rented accommodation for a period. These units will be designed to be appropriate for private rental - e.g. in terms of the size of bedrooms and numbers of bathrooms and they will also be designed to reduce wasted space and to ensure cost efficient management.

A rather different initiative is the one-for-one replacement of Voluntary Right to Buy sales (and a similar intention with respect to High Value Sales of council housing). This in principle at least maintains and potentially expands the numbers of affordable units provided. The agreement in London that this should actually be two-to- one with respect to HA sales and that these should all be within London, if implemented, could increase the overall provision of affordable homes with associated benefits to the London labour market.

Taken together, these initiatives can be expected to reinforce density norms set in the London Plan by putting emphasis on increasing density measured in terms of units per hectare. More generally they will impact on the numbers of units built; the amount of land employed; the size, type and tenure of units built and the price/rent paid by the occupier. These will in turn affect the types of household likely to be accommodated, with some shift towards smaller employed households and their access to employment.

Impacts on productivity

The impact on productivity depends on the scale of change, the mix of households accommodated and the resultant occupancy densities. The impacts will work through the amount of land used - and therefore the potential for additional provision over the

longer term; the numbers of additional units provided; their tenure; the price/rent and allocation of these units; and the households who are accommodated.

There is potential for direct increases in productivity in the housebuilding industry as a result of shifts in built form to types of development that lend themselves to factory based modern methods of construction. Greater stability in output, if this can be achieved, has the potential to reduce risks and costs.

However there are two core reasons for expecting any positive impact on investment from higher density to be relatively limited. First, project 1 in this series showed clearly that over the period of the London Plan increasing density had reduced the amount of land used to provide a given number of units but had not directly led to additional units being built. Thus there is potential for longer term increases in output because more land remains available - but as yet no sign that this land is actually being put into development. So first more housing has to be built or otherwise provided (e.g. by change of use) to allow more households could live in the capital and access job more easily.

Secondly, econometric studies (e.g. Meen, 2011) show that it would require very large increases in the numbers of additional units significantly to affect affordability given reasonable assumptions about demography and income growth. This suggests that even were government initiatives together with a higher density policy to be successful in meeting or even exceeding housing numbers objectives the direct impact on price and affordability would be tiny.

This suggests that any significant impacts have to come from changes in built form, tenure and occupancy rates. With respect to built form, there is a clear relationship between density and flats rather than houses and also between higher densities and smaller units. However, there does not have to be any relationship between density and tall building except when the objective is what has been called ‘super density’ (London First and Savills, 2015, Whitehead, 2008). There is also a relationship between centrality and taller buildings. Thus London can expect that more small flats will be built and probably, though not necessarily, more tall buildings. Those in the private sector are more likely to be occupied by younger households without children, including sharing households. So the shift is likely to mean higher than average proportions of adults; more working households; and more of those prepared to .live at higher occupancy densities. Equally to achieve the highest rates of return on the properties one would expect that large proportions would be in the private rented sector. This tenure outcome will be supported by government and GLA initiatives with respect to new building.

The potential for this type of development to be privately rented is particularly important. Privately rented housing tends to have higher occupation rates than equivalent owner-occupied housing. In the owner-occupied sector there is some evidence that small units are taken up at least in part by those looking for somewhere to live during the week while they live elsewhere at the weekend; or by single people and couples who can better afford the housing than family households.

Taken together, higher output levels of small flats; of private renting; and of occupancy will result in larger numbers of adults of working age being accommodated in London, especially in better connected and accessible locations. Moreover, in part because of relatively high turnover, occupancy rates are likely to remain high into the longer term. Government and GLA initiatives are helping to support these tendencies although the numbers of units involved is still very small.

However it should be remembered that the vast majority of this impact will occur in the existing stock and will not be a direct effect of increasing density norms.

The story in the social sector is likely to be different, as occupancy standards and the bedroom tax mean that households with children can be expected to be accommodated in two bedroom flats - which on past experience is the most likely dwelling type. Large proportions of those newly accommodated in the social sector are outside the labour force. However there are some employment categories which rely on local, often part time, labour, notably care home based, cleaning and some small retailers (Scanlon et al, 2016). These are key worker jobs where one would expect to find a high proportion living in social housing. Increases in such provision (including replacements for units sold under Voluntary Right to Buy) could therefore help fill a necessary niche. Over time it has been normal for occupancy rates to decline. However other policy changes such as the bedroom tax and fixed term leases may mean this is far less the case in the future.

Turning to the role of owner-occupation in the capital, the government has introduced three initiatives that may increase the numbers of owner-occupiers because they result in lower entry costs. These include the extension of Help to Buy to a 40% equity stake in London; additional support for shared ownership and the commitment to build large numbers of starter homes. All of these initiatives, while numerically small, will increase the opportunities of younger middle income households who are likely to be skilled and often professional workers. This may help to keep experienced employees in the capital for longer periods.

Government initiatives with respect to planning exemptions

The government has made a number of changes to permitted development rights which potentially impact on housing output levels (Smith 2016a). These include (with some exceptions):

- increased rights to extend existing dwellings - where the impact will be concentrated in outer boroughs;
- the right to add additional stories to buildings up to the height of surrounding buildings; and
- the right to change the use of commercial buildings into residential use without planning permission (Smith, 2016b).

The first is likely to lead to fewer moves and will normally done by smaller builders (whose role in providing new units has declined very considerably especially since the financial crisis). The second can increase densities and provide additional housing. The third has been important in increasing the speed of development and total housing supply in London - although there are concerns about the quality of accommodation provided, the difficulties of projecting demand for education and other services and the lack of financial contributions to infrastructure and services. Thus the positive impacts relate to additional housing investment with possible benefits to the labour market. However there might be concerns about reduced agglomeration economies associated with de-concentration of commercial activity as well as costs of non-optimal provision of infrastructure and services. At this stage there is no evidence on the scale of these potential impacts.

A final issue is the possibility of building in the greenbelt on land that has become more accessible as a result of infrastructure, mainly transport, investment. One of the concerns about such development is that it might be at relatively low densities. However, as the main programme is likely to be concentrated on smaller, denser,

units there is a strong case for enabling high quality accommodation for family households who can be attracted to remain working in the capital by the combination of accessibility/connectivity and a desirable environment. Thus, while these developments will not be at high density that density may still be higher than the surrounding area and meet an important need in providing for the full range of household requirements. This reinforces the argument above about the benefits of greater concentration - even if from low levels - closer to London.

Section 7: Implications for Density Policy in the Plan

In this report, we have reviewed three of potential sources of significant benefits from pursuing an active densification policy in the London Plan – over and above basic efforts to enhance housing supply and start to close the gap between housing targets and residential completions at the Greater London scale. Specifically we have looked at: the relation between density and economic productivity; that between density and transport sustainability; and more specifically at the potential for a productive relation between higher density development and new forms of housing initiative. For the first two of these we have distinguished between macro- versions of the issue (in relation to London-wide policy formulation) and micro- versions (in relation to local policy delivery). The third involves an interaction between the two levels as well as interaction with central government policy initiatives.

In relation to each of the first two we conclude that at the macro-level the relevant form of policy would be essentially the same as for the basic housing goal, mediated by the impacts on the population in Greater London and/or the London FUR. Value is likely to be added on both counts, enhancing productivity and slowing growth of emissions (at least on a per capita basis), but probably not very much, in our judgement, since the gearing in both cases is pretty low, and the achieved change in overall density too modest to make a substantial difference.

The area of interest in relation to employment and population concentration, however, stretches well beyond that covered by the London Plan, to areas within an hour or more's travel time from the centre. Encouraging and enabling more growth to take place within this part of the agglomeration (rather than being displaced to the very edges of the Wider South East), e.g. linked to the Plan's growth corridors, could potentially provide a rather bigger boost to the effective scale of the agglomeration (and thus to productivity) than likely increases inside London.

At the micro-level, however, we concluded in each case that there was significant scope for value to be added to the central housing payoffs, though in terms which are already within the Plan's policy frame (in relation to town centre revitalisation and boosting of public transport usage) – and with little hard evidence yet of the likely scale of impacts.

The same applies in the context of housing forms and planning exceptions. There is potential to increase productivity in the building industry; to accelerate residential development; and to link housing and labour markets more effectively. The incentives are mainly in the right direction to support better and more appropriate housing for working households including key lower paid workers. Expanding

purpose built privately rented housing could bring in additional institutional investment and result in higher occupational densities than similar housing in the owner-occupied sector. Permitted development could similarly speed development, although there are also potential costs. However, the impact, especially in the shorter term, cannot be great. But then density policy is about the longer term.

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