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Green wedges - are there alternatives to greenbelts?

Mingfei Ma asks if there is a half-way house between greenbelts and no greenbelts.

The great greenbelt debate

Greenbelts are one of the urban containment policies most favoured by national and local politicians and planning authorities. They are considered a way to stop excessive urban expansion and to control fringe growth in a sustainable way.

Greenbelt policies are common in the UK's Town and Country Planning System. Established in the 1930s, London's greenbelt has long been considered as one of the most successful urban containment practices in the world. Other European cities including Paris, Frankfurt and Vienna have followed the same practice. It has also been implemented in the Asian-Pacific region, for example in Melbourne, Sydney, Hong Kong, Tokyo and Seoul. Portland in the US, with its strict urban boundary, is also well-known. Cities in emerging economies also implement greenbelt policy to form a compact urban pattern, with Sao Paulo, Bangalore and Beijing being good examples of this.

Although many argue that greenbelts provide many environmental benefits, the debates on the economic effects are ceaseless. A greenbelt will have economic impacts on the whole urban area and its performance cannot solely be assessed by only looking within the greenbelt boundary. People have questioned: does a greenbelt support compact development or prevent sufficient land supply? Does a greenbelt prevent environmental degradation or discourage positive land use in the urban fringe? Does it encourage long distance commuting? The fundamental questions are: what exactly are greenbelts for, what aims do they intend to achieve, and how far are they successful in achieving them (Hall, 1974)? In short, are they malign or benign?

The author argues that a successfully implemented greenbelt (which is not necessarily a belt) can act as a guide for urban development with land use and transport integrated policies, instead of a purely negative break on urban expansion. As a large scale urban land use policy, a greenbelt designation should avoid being a myopic development incentive, but should think about longer term effects and should adapt to development pressure and demographic change. The unprecedented scale of urbanisation has brought an even sharper focus on the role of greenbelts. As well as the most common 'ring' shape, other configurations should be considered, in order to adapt to strong future growth.

1. Alternative configurations

There have been alternatives to the ring shaped greenbelt. For example green wedges are distinctive features in Copenhagen's Finger Plan. There are five fingers, or

corridors, of urban development along suburban railway lines from the centre. Each planned suburb is linked to the next one and onto Copenhagen's Central Business District (Knowles, 2012). Green wedges are kept for farmland between each built-up finger and also stretch into the urban core to maximise its accessibility.

The hypothetical Uxcester Garden City also proposed green wedges to form the snowflake urban form, in order to accommodate growth (Rudlin & Falk, 2014). The North-west Cambridge Development project already established a built-up wedge in the greenbelt, following the Green Swap proposal in the Cambridge Futures (Echenique, 2000)(Cambridge futures, 2004).

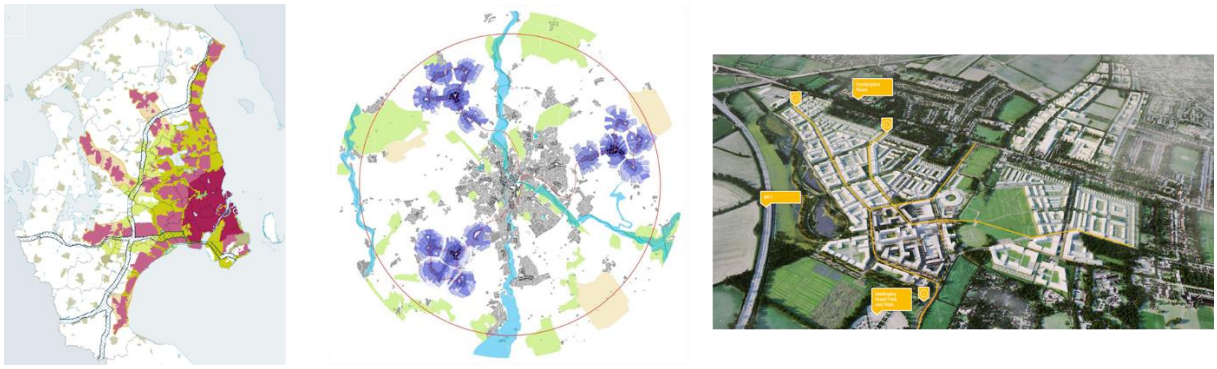

Figure 1 alternatives to greenbelts. Left: Copenhagen Finger Plan; Middle: Hypothetical Uxcester Garden City; Right: North-west Cambridge Development.

Therefore, this essay intends to answer the following questions: which alternative greenspace configuration performs better in terms of economic well-being? Where and how much should the greenbelt land be progressively reshaped or released as the city grows?

2. Methodology

In order to answer such questions, we developed a new land use-transport interaction model to examine the alternative futures of greenbelts. Such models have previously been applied to assess policies in London (Department of Transport & ME&P, 2002), Cambridge (Cambridge Futures, 2004), Seoul (Jun, 2011), and cities in California (Waddell, 2013). This model focuses on a macro level simulation and explores interactions between urban activities, transport demand, land supply and infrastructure supply.

On the land use side, urban activities generate travel demand so that people and goods can move within and between different zones. On the transport side, travel costs affect people's locational choice and therefore affect land use patterns. Traffic flows generated by the land use model are substituted into the transport model. At the same time, the transport model generates updated travel times, costs and distances which feed back into the land use model. In this way, an equilibrium is reached.

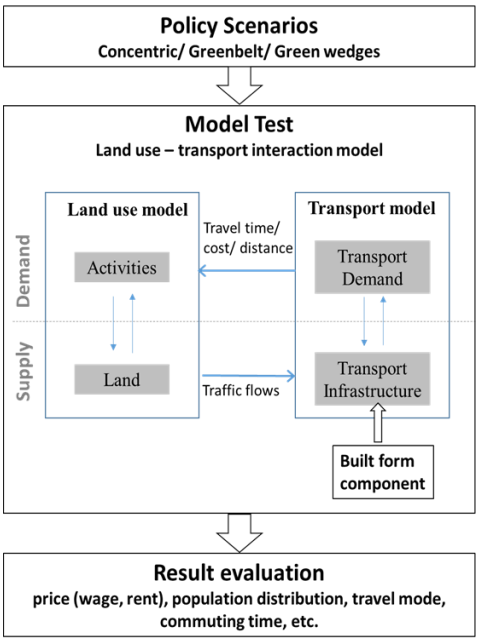

Figure 2 model structure

3. Case study

We can apply this model to a fast growing city, Greater Beijing. It is in many ways a typical example of the cities in emerging economies which attempt to establish a greenbelt to engender more compact growth. But for Beijing the process has faltered: the greenbelt is under the pressure of urban expansion and part of it has disappeared. Beijing's greenbelt has faltered not because its environmental value has not been widely accepted, but because it is not economically feasible or well-enough integrated with land use and transport policies. Therefore, planners and policy makers are questioning the role of the greenbelt in the city's rapid growth and are debating whether it should be preserved in the future master plan.

In this light, we establish the model to test the performance of the greenbelt versus two other options; firstly concentric expansion (building upon the greenbelt); and secondly green wedges (permitting development in certain areas within the greenbelt at a higher density). The model is calibrated using 2010 data and applied to predict the population distribution, wages and rents, job distribution and travel modes in 2030 under three different policies. This model quantifies the economic and social impacts through pairwise comparisons of the scenarios in 2030.

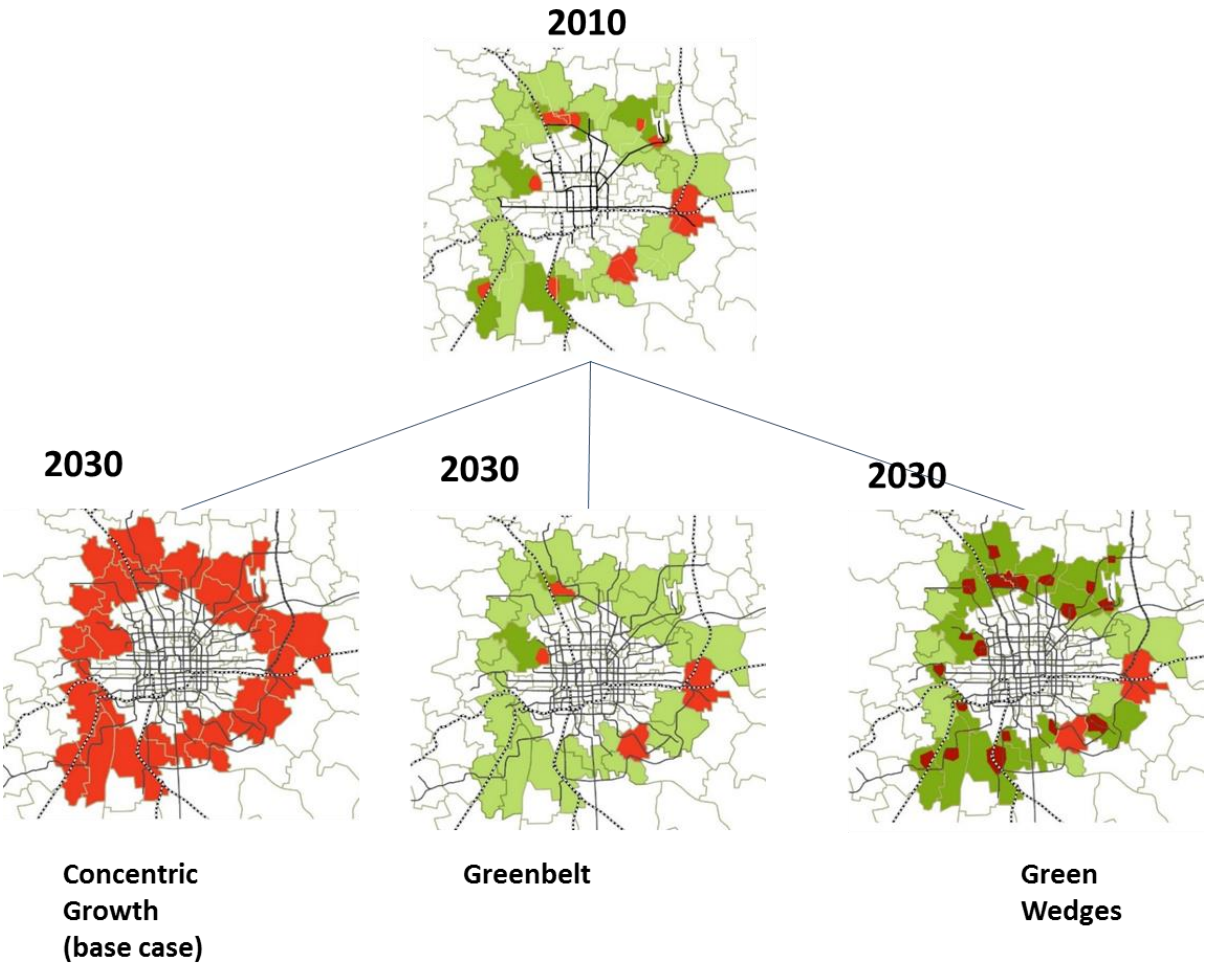

Figure 3 scenarios

The model predicts different population distributions in 2030. In the concentric growth scenario, high income residents still live in the city centre. Middle income residents distribute relatively dispersedly. Poorer residents cannot afford to commute long distances, nor the high rent in centre, so most of them live in the urban fringe. Compared to the concentric growth scenario, the greenbelt packs people into the expensive city centre. It also pushes some middle income and low income residents to the areas beyond the greenbelt. However, jobs still concentrate in the centre. Therefore, an unbalanced work-home pair is formed. The green wedges policy allows people to relocate in the designated built-up areas in the greenbelt boundary. Jobs relocate to these wedges, especially along the transport corridors.

Because the greenbelt confines population in the existing city centre, housing rent in the city increases by at least 20% in most zones. The green wedges policy shows a relatively decentralised pattern of population distribution, but housing rent still increases in the city centre by about 10%.

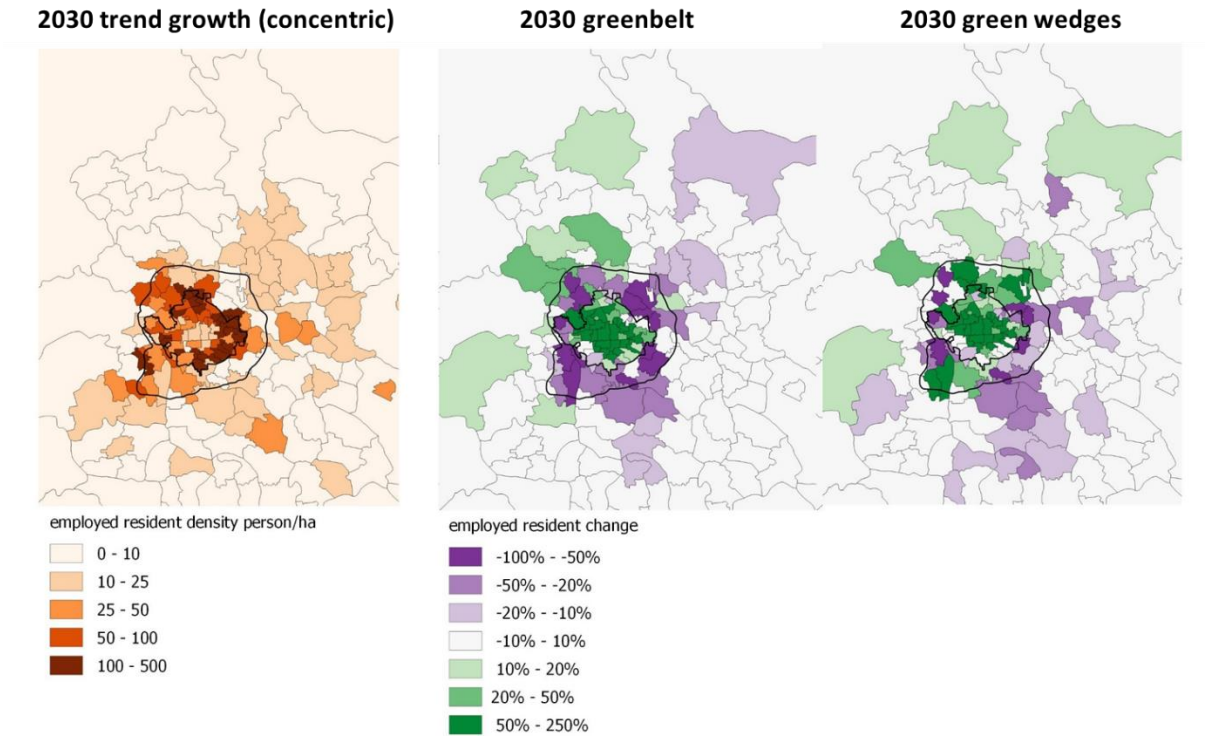

Figure 4 distribution of population. Left: population density in concentric growth scenario. Middle and right: percentage of change compared to concentric growth scenario.

Compared to the 2030 trend growth scenario, the greenbelt increases travel times and encourages travelling by cars. On the other hand, breaking the greenbelt into wedges facilitates a significant mode shift to public transport, as developments are only allowed around stations.

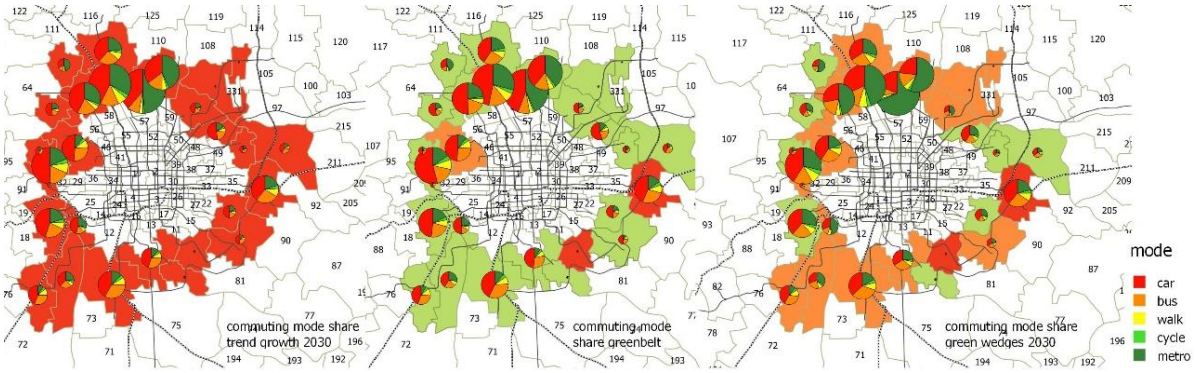

Figure 5 commuting mode share from the greenbelt zones to the city centre

4. Conclusion

The simulation results so far suggest that the alternative configurations of green spaces have significant impacts on a city's economic well-being and transport patterns. Greenbelt land should be built on, but only in certain areas where the transport conditions are good. Meanwhile the footprint of buildings should be confined within a distance to the metro stations with relatively high density. In that case, the greenfield land will be preserved and the total spatial cost will reduce. The insights point to a

reconsideration of greenbelts in fast growing cities, and also in developed cities which are re-considering their greenbelts. However, results from this paper are preliminary. They should continue to be tested rigorously on a finer scale through further empirical work.

Mingfei Ma is a Graduate Student at the Department of Architecture at the University of Cambridge. Her research area is Alternatives to Greenbelts at Beijing's Urban Fringe - Evidence from a Land Use and Transport Interaction Model.

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