The Design of the Land Use Economic Model Package: DELTA

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The overall aim of DELTA is to allow the development of land-use models which, in combination with appropriate transport models, enable users to study the future effects of both land-use and transport policies, singly or in combination, on both the land-use and transport markets. We use "land-use" to refer to all the social and economic activities which use land, and to the characteristics of those activities – not just to the physical use of the land by buildings, transport infrastructure etc.

DELTA consists of six urban and three regional sub-models. The urban sub-models estimate the development of buildings on land, demographic change and economic growth, changes in car ownership, location and relocation of households and jobs, employment and status changes, and changes in the quality of urban areas. The three regional-level sub-models were added to model the much larger area involving interactions between a number of major urban areas and other settlements. These sub-models represent migration between different labour market areas, investment in the regional economy (long-term decisions affecting the future location of employment), and production and trade in the regional economy (shorter-term effects on employment and freight transport).

One key characteristic of the model is that it works at two spatial levels. The upper level economic model works in terms of production and investment and drives the lower level model which works in terms of employment. The upper and lower demographic model both work in terms of households but changes are driven by different variables: mainly economic effects at upper level and housing supply effects at lower level. Most of the choice processes, especially between zones or areas, are modelled by multinomial logit models. As far as possible submodels requiring iterative solutions are avoided but have to be used for three components. These are the chain of input-output relationships in the upper level economic model, the competition for space in the lower level location model and the competition for labour in the employment status model. There are numerous links between different submodels over time which result in complex behaviour of the system.

DELTA is a dynamic model which represents land-use change over periods of time, linked to a transport model which is run to model the performance of the transport system at particular point in time. The model calculates all the information about households, population, employment and floor space which the transport model requires to generate travel. For transport studies DELTA thus replaces what is otherwise a process of preparing exogenous "planning data" input. The outputs of DELTA at the end of each time period, and the outputs of the transport model for that moment in time, are accumulated in a set of database files.