represented by changing the supply of dwellings and business floor space in each location and also by adapting the supply of networks connecting the locations.

Outputs from the model in any particular time period cover the location of households and firms, the price paid for dwellings and floor space of each zone and the transport flows between zones (e.g. journeys to work, to school, etc.). Transport flows are then inputted into a transport model, which estimates the likelihood of a journey being made by various modes of transport.

The output of the multi-modal transport model is subsequently entered into the highway assignment model SATURN, a proprietary traffic model developed for Cambridgeshire County Council. SATURN assigns vehicular traffic to individual roads and calculates delays at junctions due to traffic and congestion. The MENTOR model was calibrated using the 1991 Census (i.e. all parameters governing the relationship between the factors are modelled). It includes a large classification of firms and households. In addition, the model relates firms and households to four buildings types (industrial, office, retail and residential). The results of the model in any particular time period give the monthly rent levels of the buildings in each location. The model thus reacts to policy changes by producing new rent levels in each zone, which in turn affect the cost of living for households and the cost of production for firms. These costs influence the location of households and firms, alter trip patterns and affect levels of road congestion. MENTOR outputs reproduced the values of the 1991 Census and produced an estimate of rent levels for each zone in the study area. Results for 1996 were validated against partial data for that year.

The Cambridge Highway Transport Model is a detailed model that covers the Cambridge sub-region. With the ability to assign matrices (the data associated with origin to destination movements produced by MENTOR), the model is an ideal partner to the land-use modelling undertaken by MENTOR. The network is split into a rural area, where traffic loading relative to the road capacity determines the appropriate speed on the link, and also within the urban area where individual junctions are modelled. In the urban area, delays are calculated based on the traffic at priority, roundabout or traffic-signal control junctions. The validity of the model is verified by comparing the traffic flows predicted by the model against observed traffic counts conducted in the area covered by the model. The counts are

conducted annually (such as the counts on all the routes entering Cambridge city) and provide a good source of data, as changes through time can be readily identified.

Results

The result of the options as modelled above illustrate the need for policy modification by present and future administrations. The modelling indicates trends within the defined options and provides a means of comparing the effects of each policy option. Other factors that have not been accounted for, such as taxation, could, of course, significantly affect each modelling prediction, but do not generally undermine the basis of comparison between options. External influences are extremely difficult to predict and would imply a need to review and re-model policy options regularly in future years.

The quantitative results produced by the model were translated into three-dimensional illustrations of the options (see Figure 6.3). The illustrations were animated to represent a view of the area before and after the implementation of each policy. The main results are summarized as follows.

Option 1: Minimum Growth

- **Substantial cost of living increases within the city and south Cambridgeshire**
- **Displacement of traditional jobs in the city by more competitive high-tech and private-service jobs**
- **Increased imbalance in the social community in the city and south Cambridgeshire (e.g. disparity between wealthy and poor inhabitants)**
- **Employer's costs rise, putting the competitiveness of the region at risk**
- **Good protection of the city and green belt at the expense of increased use of greenfield sites elsewhere**
- **Increased commuting results in a rise in emissions and pollution in the access roads to Cambridge**

Option 2: Densification

- **Cost of living stabilizes within the city but continues to rise elsewhere**
- **Improved prospects for employees in traditional jobs in the city, with more socially balanced community**