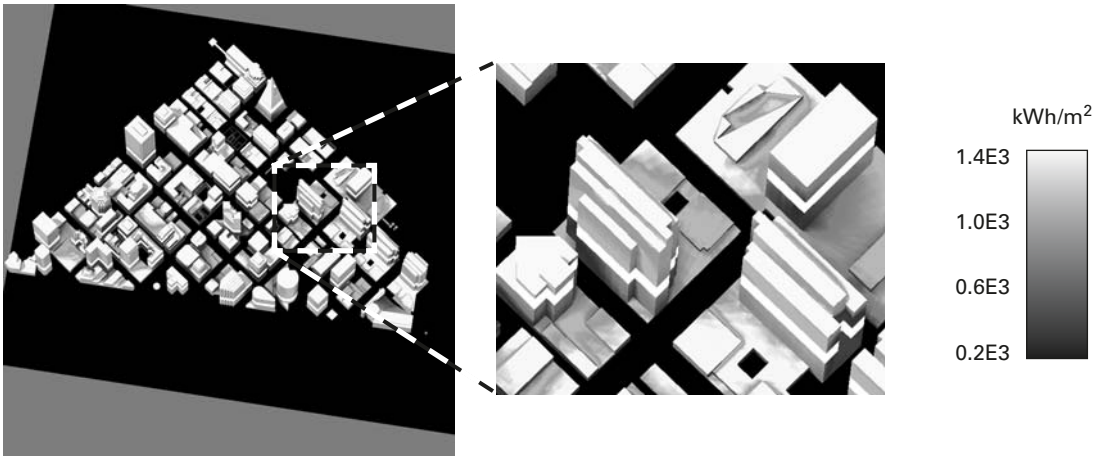

Figure 19.5
Solar access images for San Francisco. Facade areas in the height range 50–75 m are highlighted white.

map for one view is given in Figure 19.5. The data given in Table 19.1 are unprecedented both in scale and resolution.[10] ICUE can therefore be rightly described as a *strategic modelling tool*.

An architectural masterplan

The ICUE approach was used to assess a 500-m^2 section of a masterplan design for solar access at ground level (Figure 19.6). The accommodation blocks have varying height, spacing and roof slope. This produces marked variation in solar access at ground level; the region marked A has much higher exposure to daylight than region B. Whilst this could be inferred qualitatively from a 3D physical or computer model, the ICUE simulation gives a precise figure: the overall daylight exposure at B is only 15% of that at A. The colour scale shows units of total annual daylight energy (kWh/m^2) and the visible component (kLuxh).

Assessment of massing schemes

The 3D CAD modelling is now commonly used in the early stages of design to investigate massing schemes. Several of the commercial CAD packages offer rudimentary shading of 3D models.[11] Some of the packages include shadow casting to reveal patterns of shading around buildings at various times of the day or year (see Figure 19.1). In contrast, a single image showing the total annual irradiation provides an immediate insight into the solar access and how it relates to the built form. Consider the example of a group of equally sized tower blocks

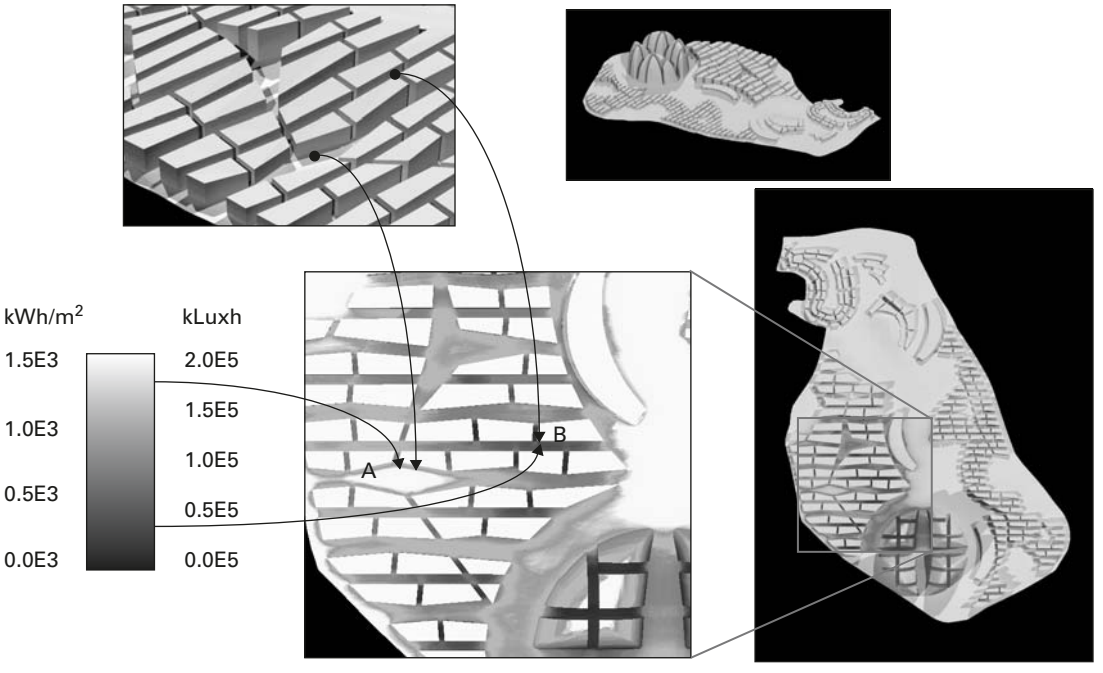

Figure 19.6
Quantification of solar access for masterplan scheme (Singapore).

with progressively increased spacing (Figure 19.7.1). The ground-level solar access viewed from above is shown in Figure 19.7.2. Here the data were processed to show the solar access as the percentage of total annual irradiation incident on an unobstructed horizontal surface.[12] The relation between the solar access and the spacing between the blocks is evident as is the difference in solar access to the north and to the south sides of the tower blocks. Notice that there is a 90% contour south of the tower blocks as well as to the north. This is mainly due to partial obstruction of northern sky from points on the ground that are to the south of the tower blocks. Several planners and architects who have seen these and other ICUE images have remarked that, not only are the ICUE graphics highly informative, but also it is actually *quicker* to comprehend an ICUE image than it is to unpick the significance of a sequence of shadow pattern images.

Changing cities: changing solar access

The cost and financing of a BIPV installation is usually based on an effective electricity producing lifetime of 20 or more years. Cities can change dramatically over these timescales with