Figure 2.20 NMB Bank Headquarters, Amsterdam

Figure 2.21 NMB Bank Headquarters, Amsterdam

the production of very little waste. The analogy of the cyclical nature of natural processes has been the impetus for the development of Life Cycle Assessment techniques (LCA). LCA or 'cradle to death and rebirth' analysis of buildings is a form of 'design for deconstruction' and, being wider in its remit than purely energy considerations, is the holistic method most appropriate for ecological design.

BUILDING DESIGN

A number of factors other than the building materials from which it is made, determine the degree to which a building is green. The shade of the green label which can be assigned to a building reflects its sustainability over a long lifespan with low energy inputs. It is dependent upon the location of the building in relation to its accessibility, the geometry of the building envelope, the relation of the building to its site, and also on the ways in which the users and the builders themselves are affected by the building.

Access to buildings will be dealt with more thoroughly in Chapter 3, in which transportation in the city is examined. It is sufficient to point out here that the 'green building' set in a park on the periphery of a city served only by roads used entirely by the private motor car is a contradiction in terms. Any energy savings made by the greening of the building would be lost during the building's lifetime through the expenditure of energy in maintaining the essential links with the users. The first requirement of the green building – however pale the shade of green – is a satisfactory location; that is, it should be in close proximity to the public transport system and sited within walking and cycling distance of important connected activities. Any other location is less sustainable because it increases transport energy costs.

A building which can be used for many different purposes and is easily adapted to serve many different activities during its lifetime has a flexibility that reduces the need for demolition and rebuilding to serve changing needs (Bentley *et al.*, 1985). Buildings are usually designed to meet the specific requirements of one particular owner or organization. This results in highly specialized buildings created by a designer for his or her clients. During the building design process, thought may be given to the current users and their needs, but very little to the general public and none at all to future generations. A building designed in this way

to accommodate specialized activities is often difficult to adapt to changing needs. This is in marked contrast to the flexibility that is often a feature of traditional building design. Behind the ordered classical facades of the Georgian and Regency terrace is an interior which, despite the constraint of a load-bearing structure, has proved flexible enough to be adapted for offices or for multi-family occupation. Such flexibility in internal planning has been termed 'robustness'. A fine example of 'robust' design is Abercrombie Square, Liverpool, where three sides of the square's Georgian terraces have been converted for the use of The University of Liverpool (Figure 2.22). The green approach to urban design supports and fosters architectural solutions that exhibit the flexibility typical of the Georgian terrace – that is, building designs – which, because of their geometry and internal structural organization, are capable of a variety of uses.

Achieving a sustainable and flexible built form poses a great challenge to the designer: an examination of some of the traditional forms developed in the past, both in the temperate climatic zones and in the tropical regions of the world may present some useful ideas as a starting point in the search for an innovative but essentially simple urban architecture.

The first limitation imposed by a strict interpretation of the discipline of sustainability is a maximum building height normally of four stories: there may indeed be cases for exceeding this limit in the centres of some of our great cities, but generally speaking if sustainability is the aim, then four storeys is a reasonable maximum building height for most urban development. At this height, most activities — including residential — can be accommodated without the need for the able-bodied to use a lift. It

Figure 2.22 Abercrombie Square, Liverpool

may, however, be necessary to organize the structure so that those with special needs are catered for on the ground or first floors. The width of a building in temperate climates should be determined by the conditions necessary to achieve good natural lighting in all main rooms. Since the best-lit areas in the building are within 4 metres of the external walls, the optimum width of the building is between 9 and 13 metres (Bentley *et al.*, 1985). A 9-metre-wide building permits the planning of two well-lit rooms on either side of a corridor, while a building greater than 13 metres wide with deep floors has an excessive amount of badly lit space in its middle section. A plan shape, 9 to 13 metres wide, is capable of a number of different arrangements, and so can accommodate different activities. Incidentally, plan shapes of these dimensions not only ensure good lighting conditions but can also be ventilated naturally.

A number of authors have suggested that the sustainable city is one where mixed land uses is the norm, as opposed to the