to include the energy necessary to sustain the structure throughout its life. It includes the following components:

(1) The environmental capital inherent in the construction – that is, the energy and resources expended in the manufacture and transportation of the materials, the energy required to prepare and service the site, and then construct the building.
(2) The energy footprint extends to include the energy used to sustain and maintain the development and its daily service requirements once it is occupied. This energy which Vale and Vale (1991) call 'revenue energy', may be as much as three times the energy used in construction, the 'capital energy'.
(3) A further component of the footprint is the energy that the occupants expend in moving between the development and the rest of the city, together with the energy required to feed the occupants.
(4) Finally there is the energy required to demolish the development and clean the site once it has reached the end of its useful life.

2.1a

2.1b

2.1c

Figure 2.1 Pollution caused by the car. (a) Quarry to provide the materials for road construction; (b) estaleiro: storage of materials for road building and infrastructure development, once the site of an extensive vineyard; (c) dump for used cars

Building operations affect the environment in another important manner. The extraction and processing of raw building materials has an immediate and clearly visible effect on the landscape. The quarries for the production of aggregate for concrete, and those for brick-making clay, have a particularly devastating effect on the environment. They can remain eyesores for decades, often in the most impressive landscapes. The routes to and from such quarries can expand the devastation into surrounding areas (Figure 2.1). Hidden from immediate view is the effect of imported materials: hardwood, for example, when taken from the great rain forests, does damage to an irreplaceable resource, which in turn provides an environmental service as a vast carbon sink helping to cleanse the atmosphere of man's polluting waste.

The complete nature of the energy impact of a development is indicated by an analysis of the construction's 'energy footprint', and this is the starting point for the design of sustainable buildings.

A TIMELESS WAY OF BUILDING

We do not have to search far for ideas for sustainable building: they are all pervasive in our lost constructional traditions. The solutions to present environmental problems, however, are probably not to be found in the traditions of 'great architecture'. It is more likely that they will be associated with the 'prose of architecture', as Summerson called the everyday buildings that have always formed the greater part of towns and cities. Monumental architecture of the past with its profligate use of resources does not act as a suitable model for Green Architecture for the twenty-first century (Vale and Vale, 1991). It is the vernacular or 'A Timeless Way of Building' to which the urbanist must turn for inspiration and guidance (Alexander, 1979a). Good urban design – that is, the organization of public space – results not necessarily from the juxtaposition of great works of architecture, but often from the pleasant arrangement of the homes of the not so powerful, together with the structures that house commercial, educational and other institutions which make the city work. One aim of this chapter is to discover the lessons that can be learned from the timeless ways of building that can be found in the native traditions of the vernacular. Such building traditions in the past have produced many delightful urban environments, which have formed the backcloth for an occasional glittering monument (Figures 2.2–2.5). This is not a treatise in pursuit only of a functional design philosophy, important though that may be: it is concerned also with the poetry of sustainable development or the quality of the environment.

2.2a

2.2b

Figure 2.2 Vernacular architecture. (a) Cottage in Chipping Campden; (b) Main Street, Chipping Campden

CONSERVATION

In pre-industrial society, with the exception of the monumental buildings of political, civic or religious importance, construction work was carried out very much as a case of necessity. A new structure, the replacement of an existing structure or its extension was