

elsewhere about sustainable development. The pursuit of unwanted and wasteful choice in service provision will do little to achieve sustainable development with all that term implies for inter- and intra-generational equity (Schwartz, 2004). Regionalism, decentralization and devolved power is once again on the political agenda holding out the prospect and opportunity for Britain to organize the political and administrative structure of the country so that the result of development is more likely to be sustainable regions comprising cities, towns and villages maintaining a closer balance with the rural hinterland.

### **THE BIOREGION AND HUMAN SETTLEMENT**

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The sustainable settlement is one that is in ecological balance with the territory on

**Figure 4.7** Teotihuacan, Mexico



which it is located. That is, the ecological footprint of the city and the boundary of its hinterland is coterminous. For this reason no large metropolitan city or group of related cities can be sustainable in the long term without considerable ecological inputs and services from beyond its boundaries. The past is the story of the rise, decline and fall of successive civilizations: many former magnificent cities now lie in enigmatic ruin hinting at a glorious past. The wonderful archaeological sites of the cities of the great civilizations of meso-America are evidence of once-powerful regimes: some in less than three generations were deserted. Magnificent Mexican cities such as Monte Albán and Teotihuacan, built over centuries by hand labour without the use of the wheel or the beast of burden, declined, no longer able to sustain their activities. The riches endowed by the environment, if overexploited, can soon be withdrawn and natural vegetation soon envelops even the greatest of structures (Figures 4.7–4.9; see also Figure 6.7). Nearer home in North Africa the ‘food basket’ of the Roman Empire is now the inhospitable Sahara: it should be a salutary lesson.

### **URBAN METABOLISM**

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The world’s cities occupy about 2 per cent of global land surface, but they use 75 per cent of the world’s resources and release about the same percentage of global wastes (Giradet, 1992). It has already been noted that more than 50 per cent of the world’s population will soon be living in cities, contributing to a massive consumption of global resources. The modern city is an ‘open system’. That is, cities are not self-contained, they are maintained by exchanges of materials, energy and information with areas

beyond their periphery. The concept of 'metabolism' can be used to form an understanding of this process. As applied to people, metabolism refers to the processes which we use in producing food and energy to conduct our daily lives. 'Urban metabolism refers to the material and energy inputs needed to meet the living and non-living components of urban systems. . . . When we have used these inputs, we have what is commonly referred to as waste' (Keen, in Birkeland, 2002). In natural ecosystems such as the rainforest, the waste from one process becomes a resource input for another process. For example, animal droppings and rotting vegetation serve as nutrients for plant life. The wasteful process associated with city metabolism is linear in form. That is, the city consumes goods, energy and food at high rates and pollutes the environment heavily with organic wastes, noxious fumes and inorganic wastes (Figure 4.10). It has been suggested that this linear urban metabolism should be converted to a form of 'circular metabolism' through the actions of design and management (Figure 4.11) (Giradet, 1996; Roelofs, 1996). Circular metabolism approximates to the systems found in nature where waste products are integrated into the wider ecosystem – that is, new inputs of energy and output of waste are minimized through the process of recycling.

### **THE BIOREGION AND THE COMPACT CITY**

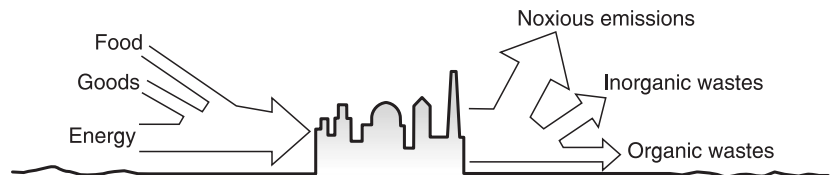
Rogers suggests that it is the 'compact' or 'dense city' model that can be adapted to a circular metabolism, that is, 'where consumption is reduced by implementing efficiencies and where re-use of resources



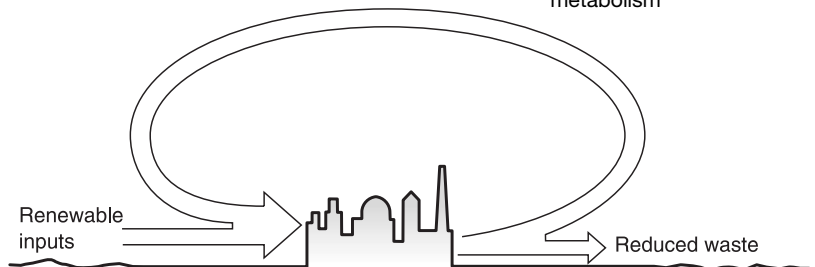
**Figure 4.8** Monte Albán, Mexico



**Figure 4.9** Uxmal, Mexico



**Figure 4.10** The city: linear metabolism



**Figure 4.11** The city: circular metabolism