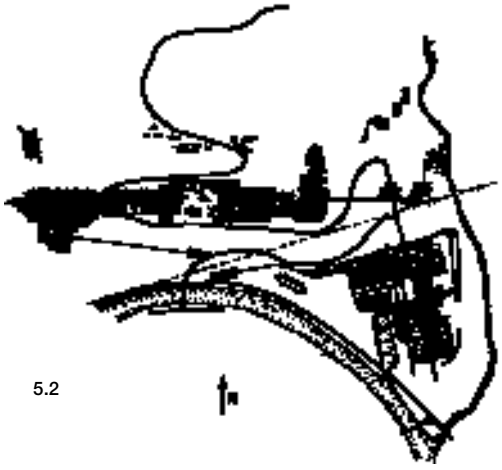
Figure 5.1 Linear city by Soria y Mata.

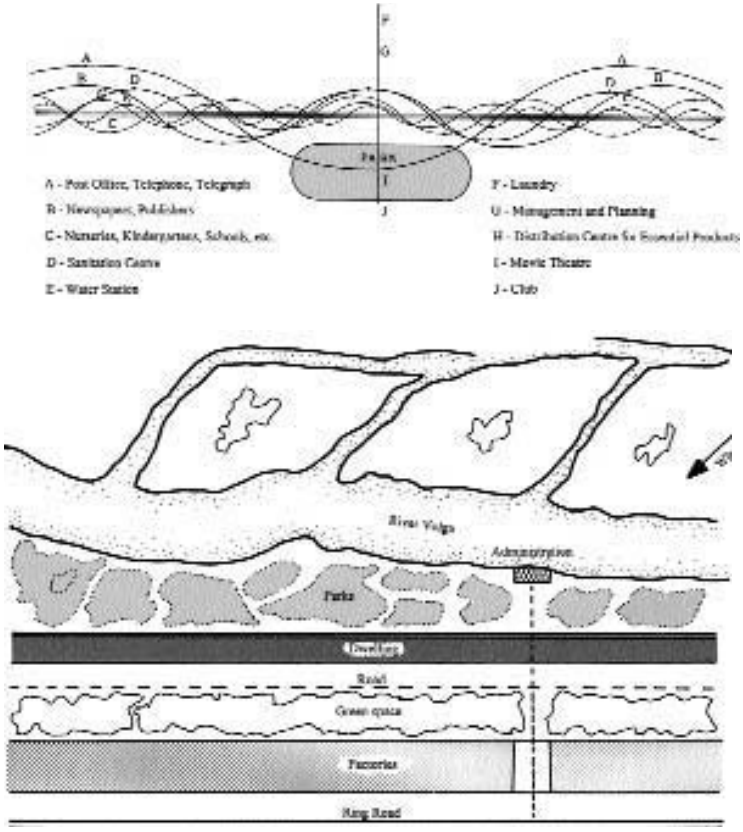
Figure 5.2 Cité Industrielle by Garnier.

5.1



5.2

Figure 5.3 The linear city of Miliutin.



tion to the magical path of the sun. The idea of the city as a machine is not purely a twentieth-century phenomenon – its roots lie much deeper. This century, however, the idea has been developed and elevated to a predominant position by movements such as Futurism and the writings of Le Corbusier, particularly his project for the Radiant City.[2] Other landmarks in the development of this idea of the city as a machine are the linear suburbs for Madrid by Arturo Soria y Mata in 1894 and the *Cité Industrielle* by Tony Garnier (Figures 5.1 and 5.2).[3] In contrast, followers of Geddes and Mumford describe the city in organic terms. For them the city is an organism which is born, grows and dies: it can be healthy or diseased.[4] Concepts of the city, in part, have their origins in one of these generic ideas and can only be understood when seen against this larger picture.

The city, when thought of as a machine, is composed of small parts linked like cogs in a wheel; all the parts having clear functions and separate motions. In its most expressive form it can have the clarity of a crystal or it can be a daring exposition of rationality. The early work of Le Corbusier exhibits these heroic qualities. It can also appear coldly functional with undertones of social engineering and state control. Miliutin develops the machine theme

in his ideas for Sotsograd.[5] He uses the analogy of the power station or the assembly line for his city, separating it into autonomous parts of separate land uses connected by a rationally designed transport network (Figure 5.3).

The idea of the city as a machine is as old as civilization itself, pre-dating the nineteenth century and the industrial revolution: it is not based only on recent ideas, such as the complex assembly line made famous by Chaplin in *Hard Times*, but also parallels the use and development of simple ancient machines such as the lever, the pulley and that great invention, the wheel. The concept of the city as machine can be found taking a most inhuman form in the workers' villages in Pharaonic Egypt (Figure 5.4). The plan is based on the use of the regular grid; all the parts being repeated in a regular pattern.

The third metaphor, and the most relevant for the sustainable city, is the analogy of an organism. Using this metaphor the city is seen as being composed of cells which can grow, decline and die. This city metaphor is associated with developments in the biological sciences during the last 200 years. It can be regarded as a reaction to the worst features associated with the industrial revolution and the growth of cities. As an idea for city development the organic model is associated with Howard, Geddes, Mumford and Olmstead. In this country Unwin and Perry gave architectural form to these ideas. In North America Frank Lloyd Wright's work during the early part of this century set a pattern for an organic architecture wedded to the landscape.[6] Alexander in his writing also emphasizes the organic nature of environmental design: '... natural or organic order emerges when there is a perfect balance between the individual parts of the environment and the needs of the whole'.[7]

The main principle of organic planning is the structuring of the city into communities, each of which is a self-contained unit for the immediate necessities of life. The sustainable city would also be self-contained for much of its energy needs and would recycle day-to-day waste products, reducing the export of pollution to a minimum. Co-operation rather than competition is emphasized in the organic model of the city. Community members are interdependent within a unit of collaboration and offer mutual support. A community, when healthy, is a group of diverse individuals tending towards some optimum balance necessary for the smooth working of the community. The organic city is organized into a hierarchy of units within which are sub-units, which in turn are composed of smaller sub-sub-units.

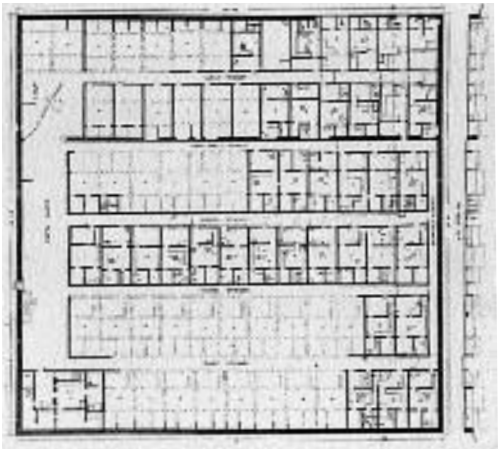


Figure 5.4 Workers' village, Amarna, Egypt.

The organic city has an optimum size: the city is born and, like organisms, comes to maturity, persists if healthy, or declines and dies if diseased. The aim of sustainable development is to prolong the life of healthy cities, that is, those cities which provide the basis of a good quality of life for their citizens without, at the same time, destroying the global environment. City health is maintained only while the balance within and between its components are maintained. Excess growth is managed and maintained by the birth or propagation of new settlements or colonies. How much growth, or indeed if any growth, can be maintained at the global scale is debatable. Some scholars see population growth as a major cause of the problems which