Hierarchy level	Name	Planning and management area
I	Ecodomain	global biosphere, inter-continental
II/III	Ecoregion	continental/ sub-continental
IV	Bioregion	regional landscapes
V	Landscape	sub-regional, landscape ecosystems
VI	Patch	ecosystem component

Figure 4.15 Hierarchical framework of ecological units

and internal'. Later, he applies this organic way of thinking specifically to the natural region: 'Unlike the old-fashioned political areas they have not – except in the case of isolated islands, oasis, or high mountain areas – any definite physical boundaries. The region may be defined and delimited in thought; but this is largely a practical convenience.' As far as regional size is concerned, Mumford seems to echo the views of Aristotle on city size: 'In conceiving of a region, then, it is necessary to take an area large enough to embrace a sufficient range of interests, and small enough to keep those interests in focus and to make them subject to direct collective concern' (Mumford, 1938, pages, 367, 303, 315 and 314.)

Recent writers are divided on the nature of the bioregion. One school of thought sees natural regions as a series of nesting bioregions while others see them as a series of overlapping functional regions. Brunkhorst supports the idea that natural forms, whether they are coastlines or organisms, reflect miniscule, self-similar building blocks: 'These basic elements of form are called fractals by those who study geometric shapes in nature. Fractal geometry is based on the remarkable relationship between form and its elementary building block.' Brunkhorst cites as an example the fern frond, where the elements of the frond are smaller and smaller groups of similar frond-shaped forms (Brunkhorst, 2000). He suggests the following regional ecological framework, starting at the largest unit the 'Ecodomain' or global biosphere; the 'Ecoregion' at the scale of the continent or sub-continent; the 'Bioregion' or the large regional landscapes; the 'Landscape' or sub-regional landscape ecosystem; and finally the smallest building block, the 'Patch' or the ecosystem component (Figure 4.15).

This view of a system of nesting ecological units, whilst offering a neat and elegant explanation of natural forms, is nevertheless not universally accepted as being practically useful by many espousing a green philosophy. Birkeland (2002) suggests that the idea of overlapping and fluid boundaries represent the actual state of ever-changing ecosystems as opposed to rigid human-constructed boundaries. Such boundaries set in stone may be an impediment to a true analysis of the relationship between man and his use and abuse of natural resources. It is argued that bioregional planning to be truly effective for sustainable development must be based on boundaries that reflect the transient realities and characteristics of ecosystems. From this starting point, it appears that it would be better to map critical issues of sustainability such as water, energy, waste treatment or those factors considered to be the most fundamental limiting systems in the region. Using Geographic Information Systems (GIS), it is now possible to map these crucial systems separately and analyse areas of conflict and potential synergies.

BIOREGIONAL PLANNING

Despite differences in approach, in general terms bioregional planning begins from a different premise from that of conventional planning. Conventional planning is a process for choosing between developments according to the best or most economic use of land, accommodating growth in the sense of transforming nature, though the process may attempt to accommodate some conservation if the price is acceptable or if it is politically expedient. In contrast, bioregional planning starts from, '... the recognition that humans are biological entities and therefore need systems for living that are designed to meet their cultural, economic, and physical needs, but in ways that foster symbiotic relationships with complex ecological systems in the bioregion. Human cultures have co-evolved with nature, a relationship which has been integral to both human survival and biological evolution. Thus, humans are dependent on the integrity of the food chain (e.g. without the bacteria in our stomachs, we might be unable to live). Therefore, lifestyles, cultures, industry and even systems of governance are rooted in and should conform with, the natural conditions of the region' (Birkeland and Walker, in Birkeland, 2002). The basic differences in emphasis between conventional and bioregional planning is illustrated in Figure 5.2.

Almost by common agreement, the region is seen as a flexible concept and its size and boundaries vary according to its purpose. Any regional system of government, therefore, will have its anomalies. For good governance fixed boundaries are necessary, and for continuity they should have a degree of permanence. In this country, eight to ten elected regional governments would serve the purpose of sustainable development: the boundaries associated with the areas served by the Regional Government Offices seems as reasonable as any other option (see Figure 4.6). Within these regional governments, ideally there should be a further set of subsidiary administrations based on thirty to forty city regions similar to those advocated by Senior in 1965. Such city regions would be well suited to structure and manage a sustainable public transport system serving commuter movements. Even a cursory examination of Regional Guidance in this country illustrates the need for, and the possibility of, considering small special environmentally fragile areas within a large region or those areas and issues of sustainability that extend beyond regional boundaries (GOEM, 2003). The demarcation of a fixed regional boundary for administrative purposes should, therefore, cause few problems for governance in the pursuit of sustainable development.

Sustainable development in rural areas of the bioregion cannot be considered in isolation from the total rural and urban settlement pattern. If one takes a narrow homocentric stance, the *raison d'être* of the rural hinterland is to service the urban settlements: a 'deeper green' view would emphasize sustaining the biosphere of which human beings and their settlements are but a part. The city of Hamburg has embedded a landscape strategy into the planning of its urban structure: landscape corridors stretch from all directions deep into the heart of the city (see Figure 4.16). *Towards an Urban Renaissance*, articulates