14 Settlement

'The largest single step in the ascent of man is the change from nomad to village agriculture.'

J. Bronowski, *The Ascent of Man*, 1973

Origins of settlement

About 8000 BC, at the end of the last ice age, the world's population consisted of small bands of hunters and collectors living mainly in sub-tropical lands and at a subsistence level (page 478). These groups of people, who were usually migratory, could only support themselves if the whole community was involved in the search for food. At this time two major technological changes, known as the 'Neolithic revolution', turned the migratory hunter-collector into a sedentary farmer. The first was the domestication of animals (sheep, goats and cattle) and the second the cultivation of cereals (wheat, rice and maize). Slow improvements in early farming gradually led to food surpluses and enabled an increasing proportion of the community to specialise in non-farming tasks.

The evolution in farming appears to have taken place independently, but at about the same time, in three river basins: the Tigris–Euphrates (in Mesopotamia), the Nile, and the Indus (Figure 14.1). These areas had similar natural advantages:

- hills surrounding the basins provided pasture for domestic animals
- flat floodplains next to large rivers
- rich, fertile silt deposited by the rivers during times of flood
- a relatively dry – but not too dry – climate which maintained soil fertility (i.e. limited leaching) and enabled mud from the rivers to be used to build houses (climatically, these areas were more moist than they are today)
- a warm subtropical climate, and
- a permanent water supply from the rivers for domestic use and, as farming developed, for irrigation.

By 1500 BC, larger towns and urban centres had developed with an increasingly wider range of functions. Administrators were needed to organise the collection of crops and the distribution of food supplies; traders exchanged surplus goods with other urban centres; early engineers introduced irrigation systems; and a ruling elite appropriated taxes from the agricultural and trading population to support the military, the priesthood, and 'non-productive' members of society, such as artists, philosophers and astronomers. Craftsmen were required to make farming equipment and household articles – the oldest-known pottery and woven textiles were found at Catal Huyuk in present-day Turkey – and copper

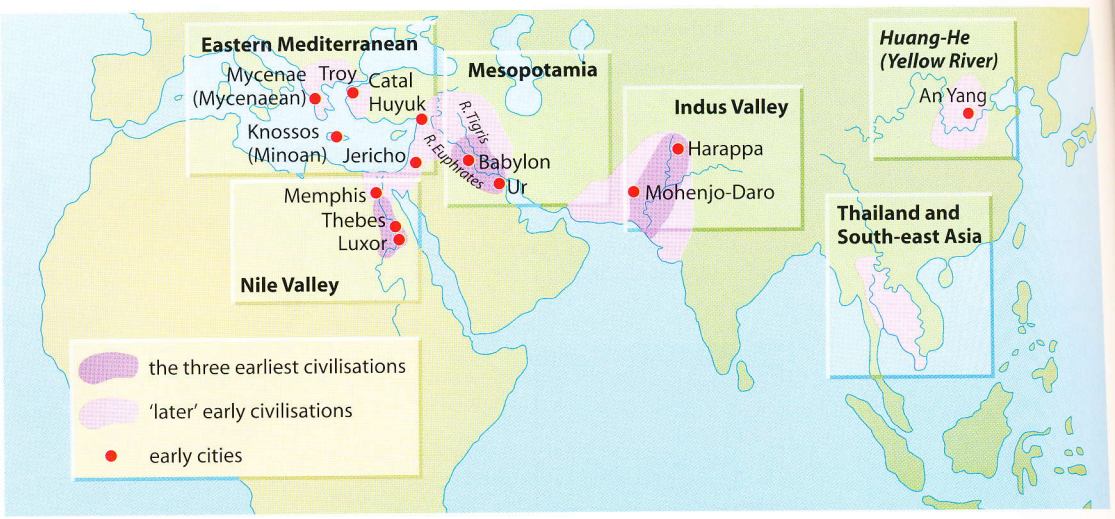


Figure 14.1
Civilisations and cities before 1500 BC

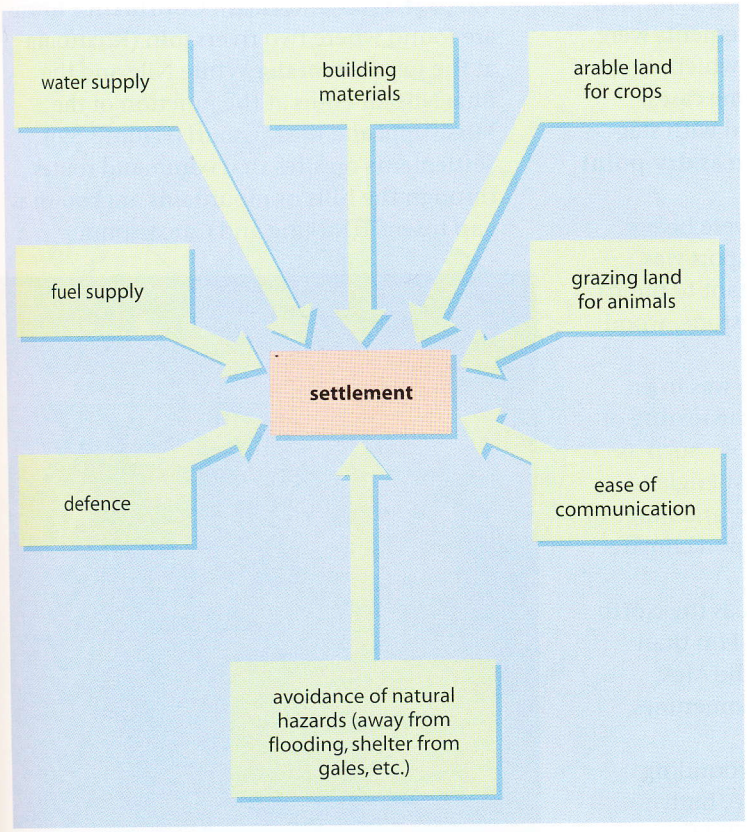
and bronze were being worked by 3000 BC. As towns continued to grow, it became necessary to have a legal system and an army for defence.

Although there is divergence of opinion over the exact dates, Figure 14.2 gives a chronological sequence of early settlements.

Figure 14.2
A chronology of early settlement

Approximate date BC		Near East (Tigris–Euphrates, Nile, Indus)	Rest of world
9000		Hunters and collectors	
8000	8500	First domesticated animals and cereals	Northern Europe recovering from the last ice age
	8300	Jericho: first walled city	
7000			
6000	6250	Catal Huyuk: first pottery and woven textiles; became largest city in world	
5000	5500	Growth of villages in Mesopotamia Growth of many villages in Nile and Indus valleys	
	5000	Early methods of irrigation	Rice cultivation in South-east Asia
4000		Bronze casting	
3000	3500	Invention of the wheel and plough in Mesopotamia, and the sail in Egypt	First Chinese city
	3000	Cities in Mesopotamia	First crops grown in central Africa; bronze worked in Thailand
2000	2600	Pyramids	
	2000	Minoan civilisation in Crete	Metal-working in the Andes
1000	1600	Mycenaean civilisation in Greece	

Figure 14.3
Settlement location factors



Site and situation of early settlements

Site describes the characteristics of the actual point at which a settlement is located, and was of major importance in the initial establishment and growth of a village or town. **Situation** describes the location of a place relative to its surroundings (neighbouring settlements, rivers and uplands). Situation, along with human and political factors, determined whether or not a particular settlement remained small or grew into a larger town or city (Figure 14.9).

Early settlements developed in a rural economy which aimed at self-sufficiency, largely because transport systems were limited. While the most significant factors in determining the site of a village include those shown in Figure 14.3 and described below, remember that several factors would usually operate together when a choice in the location of a settlement was being made.

Among the most important factors are:

- **Water supply** A nearby, guaranteed supply was essential as water is needed daily throughout the year and is heavy to carry any distance. In earlier times, rivers were sufficiently clean to give a safe, permanent supply. In lowland Britain, many early villages were located along the spring line at the foot of a

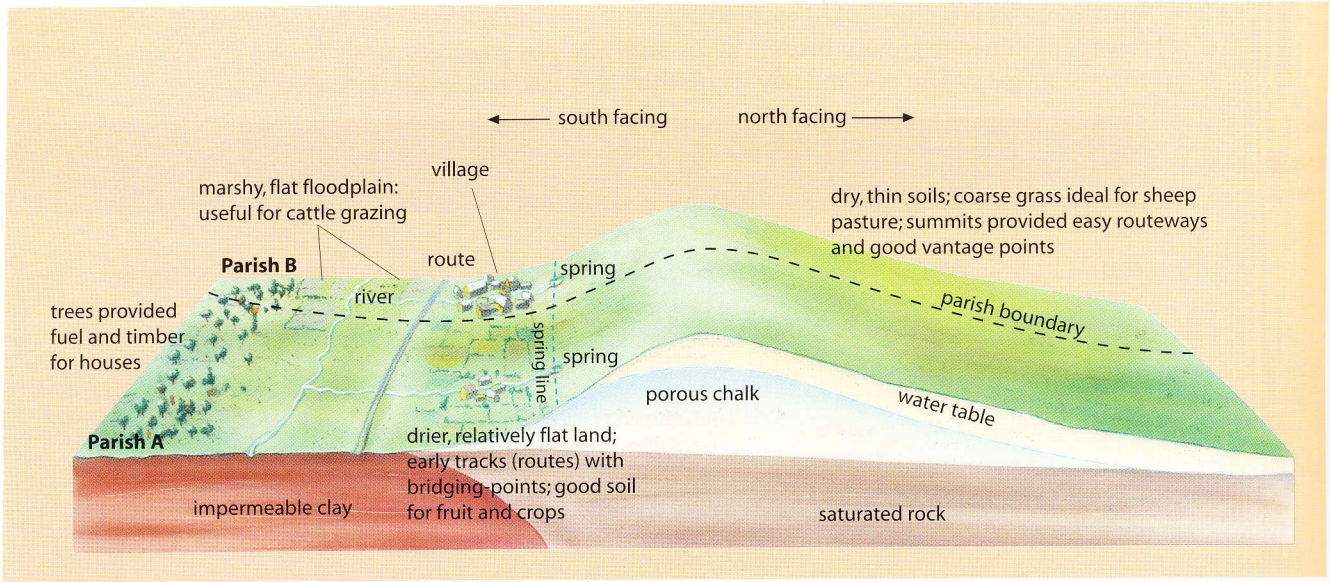


Figure 14.4

A spring-line village at the foot of the North Downs, south-east England

chalk or limestone escarpment (Figures 8.10 and 14.4). In regions where rainfall is limited or unreliable, people settled where the water table was near to the surface (a desert oasis, Figure 14.5) enabling shallow wells to be dug. Such settlement sites are known as **wet-point** or **water-seeking sites**.

- **Flood avoidance** Elsewhere, the problem may have been too much water. In the English Fenlands, and on coastal marshes, villages were built on mounds which formed natural islands (Ely). Other settlements were built on river terraces (page 82) which were above the flood level and, in some cases, avoided those diseases associated with stagnant water. Such sites are known as **dry-point** or **water-avoiding sites**.
- **Building materials** Materials were heavy and bulky to move and, as transport was poorly developed, it was important to build settlements close to a supply of stone, wood and/or clay.
- **Food supply** The ideal location was in an area that was suitable for both the rearing of animals and the growing of crops – such as the scarps and vales of south-east England (page 199). The quality, quantity and range of farm produce often depended upon climate and soil fertility and type.
- **Relief** Flat, low-lying land such as the North German Plain was easier to build on than steeper, higher ground such as the Alps. However, the need for defence sometimes overruled this consideration.
- **Defence** Protection against surrounding tribes was often essential. Jericho, built over 10 000 years ago (about 8350 BC), is the oldest city known to have had walls. In Britain, the two best types of defensive site were those surrounded on three sides by water (Durham, Figure 14.6) or built upon high ground with commanding views over the surrounding countryside (Edinburgh). Hilltop sites may, however, have had problems with water supply (Figure 14.7).
- **Nodal points** Sites where several valleys meet were often occupied by settlements which became **route centres** (Carlisle – Places 49, page 396 – and Paris). **Confluence towns** are found where two rivers join (Khartoum at the junction of the White Nile and the Blue Nile, St Louis at the junction of the Mississippi and the Missouri (Figure 3.59)). Settlements on sites that command routes through the hills or mountains are known as **gap towns** (Dorking and Carcassonne).

Figure 14.5

An oasis: Morocco

Figure 14.6
A settlement within a meander loop: Durham

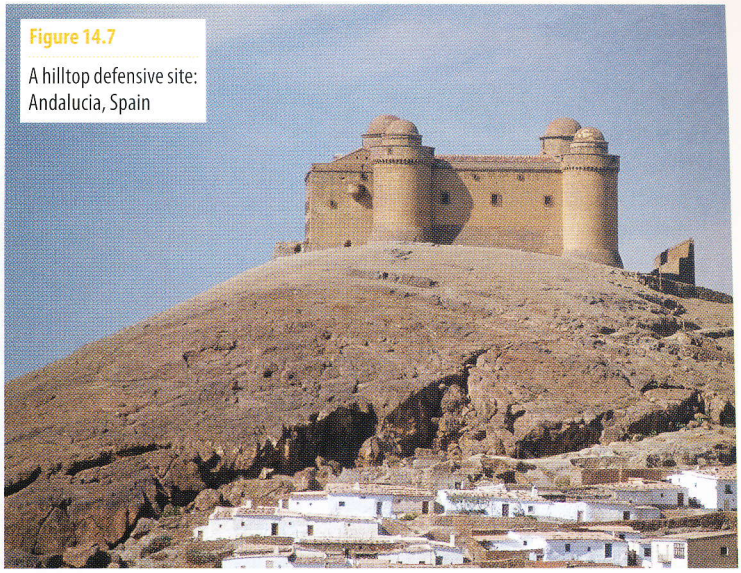


Figure 14.7
A hilltop defensive site: Andalucia, Spain

- **Fuel supply** Even tropical areas need fuel for cooking purposes as well as for warmth during colder nights. In most early settlements, firewood was the main source – and still is in many of the least economically developed areas, such as the Sahel.
- **Bridging-points** Settlements have tended to grow where routes had to cross rivers, initially where the river was shallow enough to be forded (Oxford) and later where the site was suitable for a bridge to be built. Of great significance for trade and transport was the lowest bridging-point before a river entered the sea (Newcastle upon Tyne).
- **Harbours** Sheltered sea inlets and river estuaries provided suitable sites for the establishment of coastal fishing ports, such as Newquay in Cornwall; later, deep-water harbours were required as ships became larger (Southampton and Singapore, Places 104, page 636). Port sites were also important on many major navigable rivers (Montreal on the St Lawrence) and large lakes (the Great Lakes in North America).
- **Shelter and aspect** In Britain, south-facing slopes offer favoured settlement sites because they are protected from cold, northerly winds and receive maximum insolation (Torquay).
- **Resources** Settlements also grew in places with access to specific local resources such as salt (Nantwich, Cheshire), iron ore, coal, etc.

Whereas most of the factors listed above were natural, today the choice of a site for a new settlement is more likely to be **political** (Israeli settlements on the West Bank; Brasilia), **social** (some of Britain's new towns) or **economic** (Blaenau Ffestiniog for its slate – Places 78, page 523 – or, in Brazil, Carajas for its iron ore, and Iguaçu for its hydro-electricity).

Roberts has produced a model (Figure 14.8) which draws together not only site and situation factors, but also the perceptions of different settler groups as to the relative importance of the specific factors – e.g. in a desert, water may be perceived to be the most important; in parts of Mediterranean Europe, it may have been defence. The inner circle in Figure 14.8 is concerned with desirable **site** characteristics (intrinsic qualities) and the outer circle with the general **situation** factors (extrinsic qualities). Roberts stresses that each settlement location represents a complex balancing act of all these factors (London, Figure 14.9), with few sites and situations being ideal. You should be aware that 'extrinsic' factors change over time, and that settlements are dynamic in nature.

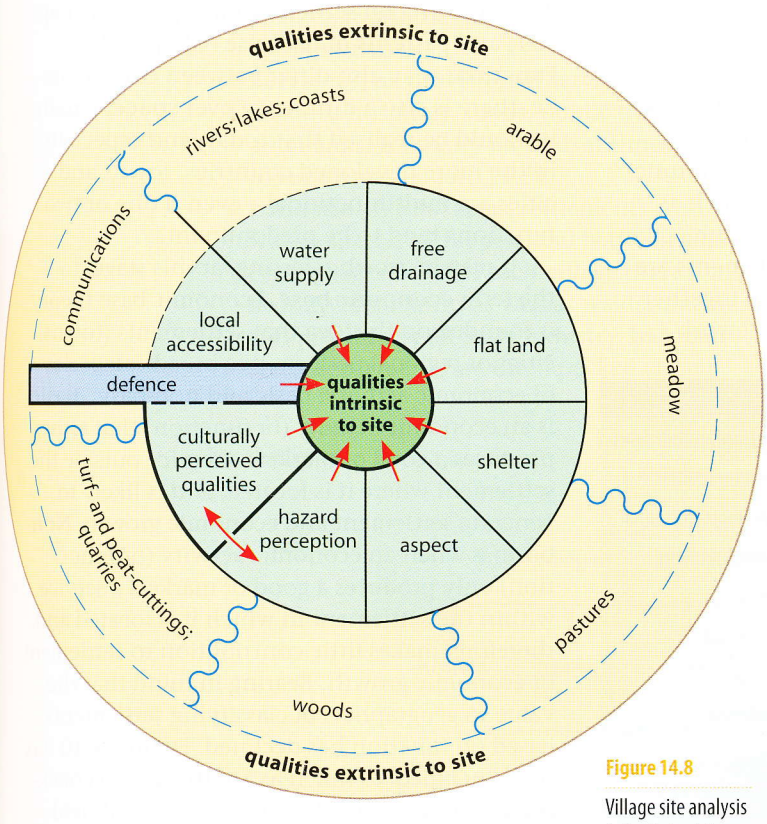


Figure 14.8
Village site analysis (*after* Roberts)

Figure 14.9

The site and situation of early London

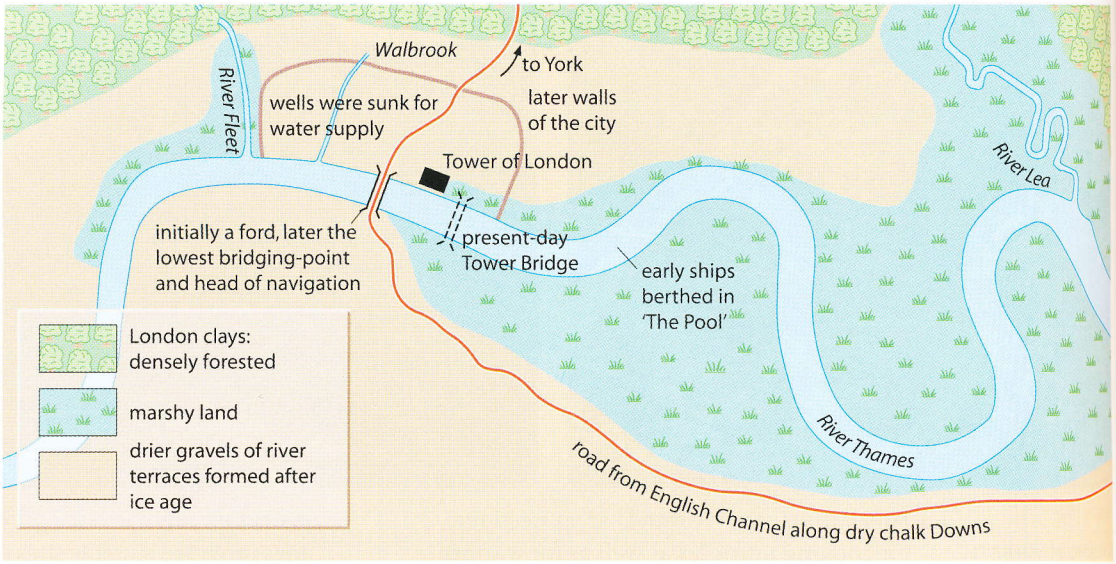


Figure 14.9 shows some of the early site and situation factors that helped determine the original location and early growth of London. As with other settlements, some of these early factors are no longer important, e.g. London now has piped water, has numerous shops to provide food, has bridges and tunnels to cross the river, and no longer needs a castle or city walls for defence.

Functions of settlements

As early settlements grew in size, each one tended to develop a specific function or functions. The **function** of a town relates to its economic and social development and refers to its main activities. There are problems in defining and determining a town's main function and often, due to a lack of data such as employment and/or income figures, subjective decisions have to be made. As settlements are very diverse, it helps to try to group together those with a similar function (Framework 7, page 167). Over the years, numerous attempts have been made to classify settlements based on function, but these tended to refer to places in industrialised countries and are often no longer applicable to post-industrial societies. Further problems arose when the growth of some settlements was based on an activity that no longer exists (the former coalmining villages of north-east England and South Wales), or where the original function has changed over **time** (a Cornish fishing village may now be a holiday resort). As functions change in time, this has a direct bearing on settlement morphology (page 394) and patterns of land use (Chapter 15). Functions may also differ between continents - i.e. there is also a difference over **space**. Finally it should be realised that today, and especially in the more developed countries, towns and cities are multifunctional – even if one or two functions tend to be predominant.

It may be worth referring, at this stage, to the term **economic base.** Economic base theory is founded on the idea that settlements (towns, cities or regions) perform two broad categories of economic activity: basic and non-basic. **Basic** is an economic activity (or function) that either produces a good or markets a service outside the settlement where it is located, and is likely to generate settlement and economic growth. **Non-basic** is when an economic activity (or function) only produces a good or markets a service within the settlement in which it is located and, therefore, makes little contribution to settlement or economic growth. Bearing in mind that the value to geographers of classifying settlements based on function has declined, Figure 14.10 has been included, as much as anything, as a checklist should you wish to conduct personal fieldwork or make an individual study of this topic.

Figure 14.10

Classification of settlement based on function

Rural	Urban	
	Developed countries	**Developing countries**
Market and agricultural	Mining	Administration
Route centre/transport	Manufacturing/industrial	Marketing/agricultural
Small service town	Route centre/transport	Route centre/port
Defensive	Retail/wholesale	Mining
Dormitory/overspill/satellite	Religious/cultural	Commercial
	Trade/commerce/financial	Religious
	Administration	Residential
	Resort/recreation	
	Residential	
	New towns	

Differences between urban and rural settlement

Figure 14.11 shows the commonly accepted types of settlement, but hides the divergence of opinion as to how and where to draw the borders between each type. Several methods have been suggested in trying to define the difference between a village, or rural settlement, and a town, or urban settlement.

- **Population size** There is a wide discrepancy of views over the minimum size of population required to enable a settlement to be termed a town, e.g. in Denmark it is considered to be 250 people, in Ireland 500, in France 2000, in the USA 2500, in Spain 10 000 and in Japan 30 000. In India, where many villages are larger than British towns, a figure of less than 25 per cent engaged in agriculture is taken to be the dividing point.
- **Economic** Rural settlements have traditionally been defined as places where most of the workforce are farmers or are engaged in other primary activities (mining and forestry). In contrast, most of the workforce in urban areas are employed in secondary and service industries. However, many rural areas have now become commuter/dormitory settlements for people working in adjacent urban areas or, even more recently, a location for smaller, footloose industries, such as high-tech industries.
- **Services** The provision of services, such as schools, hospitals, shops, public transport and banks, is usually limited, at times absent, in rural areas (Figure 14.21).
- **Land use** In rural areas, settlements are widely spaced with open land between adjacent villages. Within each village there may be individual farms as well as residential areas and possibly small-scale industry. In urban areas, settlements are often packed closely together and within towns there is a greater mixture of land use with residential, industrial, services and open-space provision.
- **Social** Rural settlements, especially those in more remote areas, tend to have more inhabitants in the over-65 age group, whereas the highest proportion in urban areas lies within the economically active age group (page 354) or those under secondary school age.

It has becoming increasingly more difficult to differentiate between villages and towns, especially where urban areas have spread outwards into the **rural fringe**. The term **rural–urban continuum** (page 516) is used to express the fact that in many highly urbanised countries such as Japan and the UK, there is no longer either physically or socially a simple, clear-cut division between town and country. Instead there is a gradation between the two, with no obvious point where it can be said that the urban way of life ends and the rural way of life begins (Figure 17.1). It is, therefore, more realistic to talk about a transition zone from 'strongly rural' to 'strongly urban'. Cloke (1977) devised an **index of rurality** based upon 16 variables taken largely from census data for England and Wales (Figure 17.2). These variables included people aged over 65; proportion employed in primary, secondary and tertiary sectors; population density; population mobility (those moving home in the previous 5 years); proportion commuting; and distance from a large town (Figure 14.20). Cloke then identified four categories (Figure 17.3):

- extreme rural (parts of south-west England, central Wales, East Anglia and the northern Pennines)
- intermediate rural
- intermediate non-rural, and
- extreme non-rural (mainly suburbanised villages (page 398) around London in Surrey, Cambridgeshire, Hertfordshire and Essex).

Figure 14.11
Type of settlement

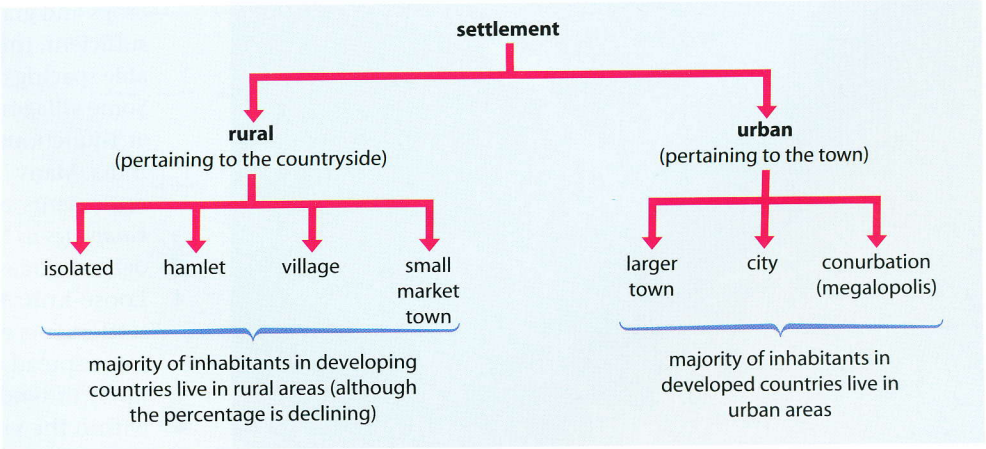


Figure 14.12

Isolated settlement: in the Amazon rainforest

Figure 14.13

Dispersed settlement: in North Yorkshire

Rural settlement

Pattern and morphology

Geographers have become increasingly interested in the **morphology**, i.e. the pattern (numbers **1** and **2** below) and shape (numbers **3–7** below) of settlements. Although village shapes vary spatially in Britain and across the world, it has been – again traditionally – possible to identify seven types (remember that, as in other classifications, some geographers may identify more or fewer categories).

1 **Isolated** This refers to an individual building, usually found in an area of extreme physical difficulty where the natural resources are insufficient to maintain more than a few inhabitants, e.g. the Amazon rainforests where tribes live in a communal home called a *maloca* (Figure 14.12). Isolated houses may also be found in planned pioneer areas such as on the Canadian Prairies where the land was divided into small squares, each with its own farm buildings.

Figure 14.14

Nucleated settlement: in Sumatra, Indonesia

2 **Dispersed** Settlement is described as dispersed when there is a scatter of individual farms and houses across an area; there are either no nucleations present, or they are so small that they consist only of two or three buildings forming a hamlet (Figure 14.13). Each farm or hamlet may be separated from the next by 2 or 3 km of open space or farmland. In the Scottish Highlands and Islands, some communities consist of crofts spaced out alongside a road or raised beach. Hamlets are common in rural areas of northern Britain, on the North German Plain (where their name *urweiler* means 'primeval hamlet') and in sub-Saharan Africa.

3 **Nucleated** Nucleated settlement is common in many rural parts of the world where buildings have been grouped closely together for economic, social or defensive purposes (Figure 14.14). In Britain, where recent evidence suggests that nucleation only took place after the year 1000, villages were surrounded by their farmland, where the inhabitants grew crops and grazed animals in order to be self-sufficient; this led to an unplanned and variable spacing of villages, usually 3–5 km apart. Some villages grew up around crossroads and at T-junctions, as is the case of many villages in India. Many border villages in Britain, hilltop settlements around the Mediterranean Sea, and *kampongs* in Malaysia became nucleated for defensive reasons.

4 **Loose-knit** These are similar to nucleated settlements except that the buildings are more spread out, possibly due to space taken up by individual farms which are still found within the village itself.

5 **Linear**, or **ribbon** Where the buildings are strung out along a main line of communication or along a confined river valley (Figure 14.15), the settlement is described as linear. **Street villages** – planned linear villages – were common in medieval England. Unplanned linear settlements also developed on long, narrow, flood-avoidance sites, e.g. along the raised beaches of western Scotland and on river terraces, as in London. Later, unplanned linear settlement grew up along the floors of the narrow coalmining valleys of South Wales and on main roads leading out of Britain's urban areas following the increase in private car ownership and the development of public transport. In the Netherlands, Malaysia and Thailand, houses have been built along canals and waterways.

6 **Ring and 'green' villages** Ring villages are found in many parts of sub-Saharan Africa and the Amazon rainforest (Figure 14.16). Houses were built around a central area which was left open for tribal meetings and communal life. In Kenya, the Maasai built their houses around an area into which their cattle were driven for protection during most nights. In England, many villages have been built around a central green.

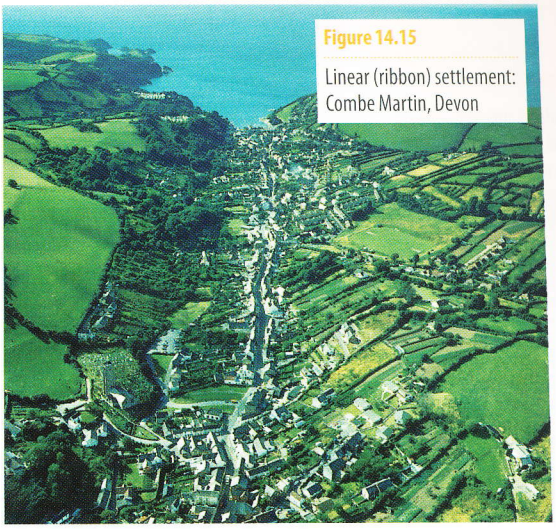


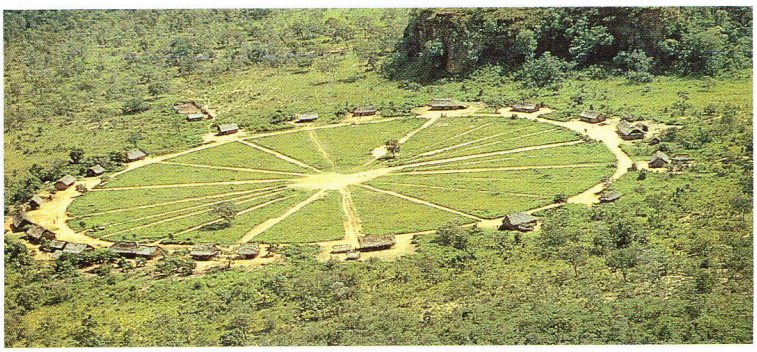
Figure 14.15
Linear (ribbon) settlement: Combe Martin, Devon

7 **Planned** Although many early settlements were planned (Pompeii, York), the apparently random shape of many British villages appears to suggest that they were not. More recently, villages surrounding large urban areas in, for example, Britain and the Netherlands, have expanded and become suburbanised, having small and often crescent-shaped estates (Places 49).

If you study maps of village plans, it is very likely that you will find many settlements with a mixture of the above shapes, e.g. a village may have a nucleated centre, a planned estate on its edges and a linear pattern extending along the road leading to the nearest large town (Figure 14.17).

Roberts (1987) suggested a different basis for classification (Figure 14.18). Even so, he concedes there are difficulties in trying to fit a particular village into a specific category, as when determining if a strip of grass is large enough to be called a green, and concludes that many villages are **composite** (or **polyfocal**), incorporating several plans and phases of development.

Figure 14.16
Ring village: Kraito, in the Amazon rainforest



Basic shape	Plan and morphology	Village green
Linear (in a row)	regular	with
		without
	irregular	with
		without
Agglomerated (more nucleated)	regular grid	with
		without
	regular radial	with
		without
	irregular grid	with
		without
	irregular agglomerated	with
		without

Figure 14.18
A method of classifying village types in Britain (*after* Roberts)

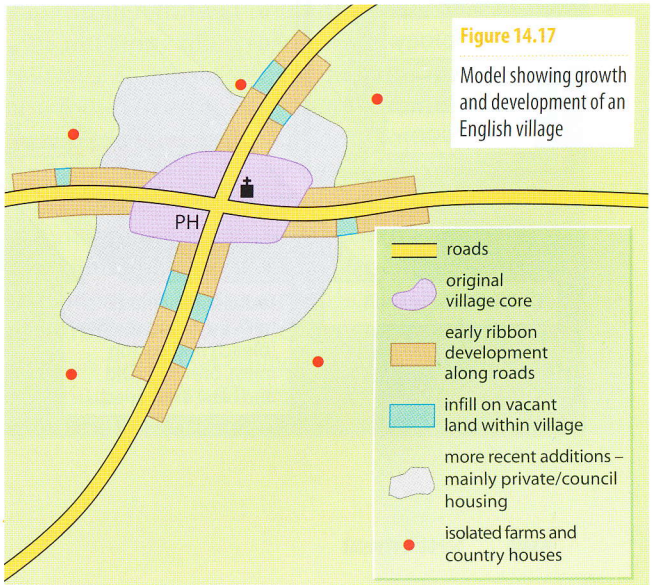
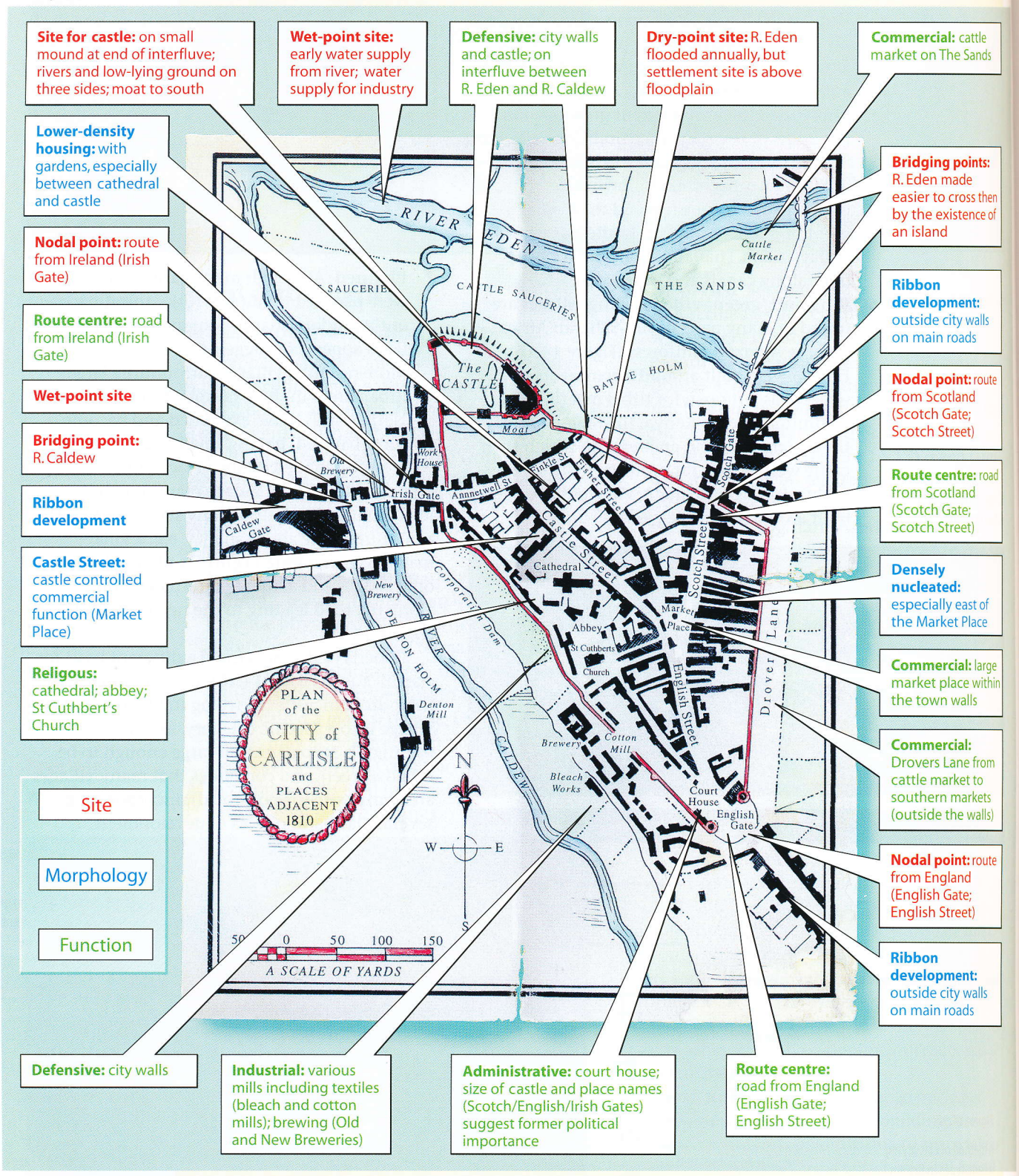


Figure 14.17
Model showing growth and development of an English village

Places 49 Carlisle: site, morphology and functions

Figure 14.19
Carlisle: site, morphology and functions, as shown on a map of 1810

Figure 14.19 is a map of Carlisle in 1810. It shows some of the original **site** factors (some of which still applied), the developing **morphology** (pattern) of the city, and some of its initial and subsequent **functions**.



Dispersed and nucleated rural settlement

Whether settlement is dispersed or nucleated depends upon local physical conditions; economic factors such as the time and distance between places; and social factors which include who owns the land and how the people of the area live and work on it.

Causes of dispersion

The more extreme the physical conditions and possible hardship of an area, the more probable it is that the settlement will be dispersed. Similarly, dispersed settlement develops in areas where natural resources are limited and insufficient to support many people (Figure 13.4). This lack of resources could include a limited water supply (the Carboniferous limestone outcrops of the Pennines); forested areas (the Canadian Shield and the Amazon Basin); and marginal farmland (the Scottish Highlands and the Sahel countries), where pastoral farming is limited by the quality and quantity of available grass. Areas with physical difficulties are also less likely to have good transport networks.

Forms of land tenure can also result in dispersed dwellings, especially in those parts of the world where inheritance laws have meant that the farm is successively divided between several sons. Similar patterns, though with larger farm units, can be found in pioneer areas such as the Canadian Prairies and the Dutch polders.

The 'agrarian revolution' in Britain in the 18th century ended the open-field system, in which strips were owned individually but the crops and animals were controlled by the community. It was replaced by enclosing several fields which were owned by a farmer who became responsible for all the decisions affecting that farm; new farmhouses were sometimes built outside the village.

Two other changes at about the same time increased the incidence of dispersed settlement. The first was the growth of large estates belonging to wealthy landowners. The second was the extension of farming in hilly areas, in the 18th and again in the 19th century, to produce the extra food needed to feed the rapidly growing urban areas. Much moorland in the Pennines was walled; while fenland areas, previously of limited value, were drained and farmed. Areas of downland were also put under the plough. Increased mechanisation reduced labour needs, resulting in overpopulation and, eventually, out-migration.

Finally, settlement was more likely to develop a dispersed pattern where there was less risk of war or civil unrest as there was then less need for people to group together for protection.

Causes of nucleation

The majority of humans have always preferred to live together in groups, as witnessed by the cities of ancient Mesopotamia and Egypt (Figure 14.1), and the present-day conurbations and cities with more than 5 million inhabitants (Figure 15.3). Two major reasons for people to group together have been either a limited or an excess water supply. Settlements have grown up around springs, as at the foot of chalk escarpments in southern England (Figures 14.4 and 8.10), and at waterholes and oases in the desert (Figure 14.5). Settlements have also been built on mounds in marshy fenland regions and on river terraces above the level of flooding (Figures 14.9).

A further cause was the need to group together for defence and protection. Examples of defensive settlements include living in walled cities on relatively flat plains (Jericho and York); behind stockades (African kraals); in hilltop villages in southern Italy and Greece (Figure 14.7); or in meander loops, taking advantage of a natural water barrier (Durham, Figure 14.6).

In Anglo-Saxon England, when many villages had their origin, the feudal open-field system of farming encouraged nucleation: the local lord could better supervise his serfs if they were clustered around him; while the serf, living in the village, was probably equidistant from his fragmented strips of farmland (Places 51, page 400). Today, the more intensive the nature of farming, the more nucleated the settlement tends to be. People like to be as near as possible to services so that the larger and more nucleated the village, the more likely it is to have a wide range of services such as a primary school, shops and a public house (Figure 14.21).

Transport and routeways have always had a major influence on the clustering of dwellings. Buildings tend to be grouped together at crossroads and T-junctions; controlling a gap through hills; at bridging-points (Places 49); and along main roads, waterways and railways. Compact settlement patterns are also found in areas with an important local resource (a Durham coalmining town or a North Wales slate quarry village – Places 78, page 523), or where there was an abundance of building materials. More recently, many governments have encouraged new, nucleated settlements in an attempt to achieve large-scale self-sufficiency. Examples may be found as far afield as the Soviet collective farm, the Chinese commune (Places 63, page 468), the Tanzanian *ujamaa* and the Israeli *kibbutz*.

Changes in rural settlement in Britain

Within the British Isles, there are areas, especially those nearer to urban centres, where the rural population is increasing and others, usually in more remote locations, where the rural population is decreasing (rural depopulation). These population changes affect the size, morphology and functions of villages. Figure 14.20 shows that there is some relationship between the type and rate of change in a rural settlement and its distance from, and accessibility to, a large urban area.

Accessibility to urban centres

As public and private transport improved during the inter-war period (1919–39), British cities expanded into the surrounding countryside at a rapid and uncontrolled rate. In an attempt to prevent this urban sprawl, a **green belt** was created around London following the 1947 Town and Country Planning Act. The concept of a green belt, later applied to most of Britain's conurbations, was to restrict the erection of houses and other buildings and to preserve and conserve areas of countryside for farming and recreational purposes.

Beyond the green belt, **new towns** and **overspill towns** were built, initially to accommodate new arrivals seeking work in the nearby city and, later, those forced to leave it due to various redevelopment schemes. These new settlements, designed to become self-supporting both economically and socially, developed urban characteristics and functions. New towns, overspill and green belts were part of a wider land-use planning process which aimed to manage urban growth (compare Figure 14.22).

Meanwhile, despite the 1968 Town and Country Planning Act, uncontrolled growth also continued in many small villages beyond the green belt. Referred to during the inter-war period as **dormitory** or **commuter villages** (page 375), these settlements have increasingly adopted some of the characteristics of nearby urban areas and have been termed **suburbanised villages**. Figure 14.21 lists some of the changes which occur as a village becomes increasingly suburbanised.

Less accessible settlements

These villages are further in distance from, or have poorer transport links to, the nearest city, i.e. they are beyond commuting range. This makes the journey longer in time, more expensive and less convenient. Though these villages may be relatively stable in size, their social and economic make-up is changing. Many in the younger age groups move out, pushed by a shortage of jobs and social life. They are replaced by retired people seeking quietness and a pleasant environment but who often do not realise that rural areas lack many of the services required by the elderly such as shops, buses, doctors and libraries.

Villages in National Parks and other areas of attractive scenery in upland or coastal areas are being changed by the increased popularity of **second** or **holiday homes** (Figure 14.20 and Places 50). Wealthy urban dwellers, seeking relaxation away from the stress of their own working and living environment, have bought vacant properties at prices that local people cannot afford. While this may improve trade at the village shop and pub during holiday periods, and improve the quality of some buildings, it often means local people cannot afford the inflated house prices, properties standing empty for much of the year, many jobs being seasonal, and an end of public transport.

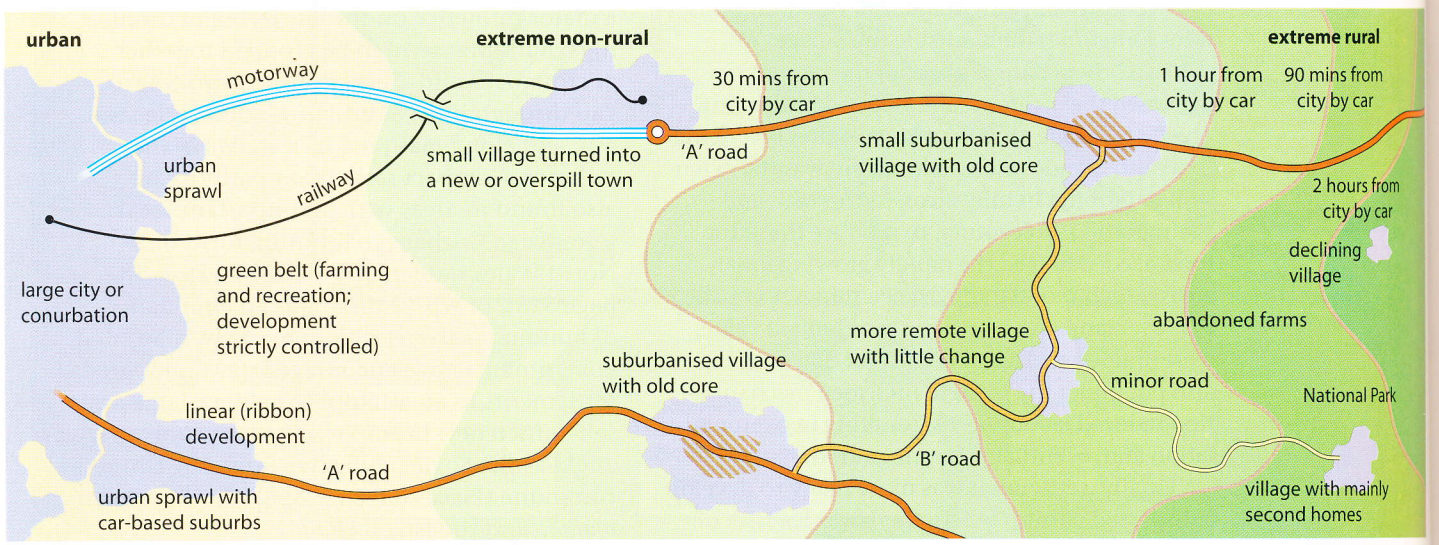


Figure 14.20
Rural settlements and distance from large urban areas (*after* Cloke, 1977; see page 393)

Figure 14.21

Social, economic and environmental change in British villages

Characteristic	Extreme non-rural (increasingly suburbanised)	Original village	Extreme rural (increasingly depopulated)
Housing	Many new detached houses, semi-detached houses and bungalows; renovated barns and cottages; expensive estates	Detached, stone-built houses/ cottages with slate/thatch roofs; some farms, many over 200 years old; barns	Poor housing lacking basic amenities; old stone houses, some derelict, some converted into holiday/second homes
Population structure	Young/middle-aged married couples with children; very few born in village; professional/executive groups; some wealthy retired people	An ageing population; most born in village; labouring/manual groups	Mainly elderly/retired; born and lived all life locally; labouring/manual groups; younger people have moved away
Employment	New light industry (high-tech and food processing); good salaries; many commuters (well-paid); tourist shops	Farming and other primary activities (forestry, mining); low-paid local jobs	Low-paid; unemployment; farming jobs (declining if in marginal areas) and other primary activities; some tourist-related jobs
Transport	Good bus service (unless reduced by private car); most families have one or two cars; improved roads	Bus service (limited); some cars; narrow/winding roads	No public transport; poor roads
Services	More shops; enlarged school; modern public houses/restaurants; garage	Village shop; small junior school; public house; village hall	Shop and school closed; perhaps a public house
Community/social	Local community swamped; division between local people and newcomers; may be deserted during day (commuters absent)	Close-knit community (many are related)	A small community; more isolated
Environment	Increase in noise and pollution, especially from traffic; loss of farmland/open space	Quiet, relatively pollution-free	Quiet; increase in conserved areas (National Parks/forestry)

Remote areas

These areas suffer from a population loss which, by leaving houses empty and villages decreasing in size, adds to the problems of rural deprivation (Figure 14.21 and Places 50). Resultant problems include a lack of job opportunities, fewer services and poor transport facilities. Employment is often limited to the shrinking primary industries which are low-paid and lack future prospects. The cost of providing services to remote areas is high, and there is often insufficient demand to keep the local shop or village school open. With fewer inhabitants to use public transport, bus services may decline or stop altogether, forcing people to move to more accessible areas.

Places 50 Bickington, Devon: a village

Bickington is a village of some 270 residents set on the edge of Dartmoor National Park. Now by-passed by the busy A38 road, it encapsulates most of the problems faced by many small rural settlements. Until recently it was a thriving farming community with its own post office, pub, garage, two churches, a children's nursery and a police house. Today, apart from an ailing village hall and the one remaining church, which has had to advertise for more worshippers, all have gone.

Bickington's location in such an attractive area has meant that property prices have been driven up far beyond the reach of local people and planning restrictions have meant no new affordable housing has been built. Without public transport, inhabitants have become increasingly reliant on the car and, by travelling to supermarkets and other public amenities in nearby Newton Abbot or further afield in Exeter, have caused the closure of the village shop, pub and post office. Meanwhile the nursery group, run in the church hall, was forced to close after government inspectors demanded improvements to the building that the church could not afford. The positive sign in 2008 is that the local community realises the need for radical action and is about to ask for exceptional permission to build affordable homes in the village, covenanted and price-capped so that they can only be sold to local workers, and to group together with five other nearby villages to share facilities.

Bickington's problems are shared by villages across the country. The Commission for Rural Communities claims that in villages each year 800 shops, 400 garages, over 100 churches and 7 primary schools close, while 27 village pubs close each week. Added to this, 95 per cent of village halls are struggling and most of the few remaining village hospitals are under threat. To many villages the death-knell may be the government's decision, in 2008, to close most village post offices, many of which had doubled up as the local shop.

Planned 'eco-towns'

The government has unveiled 15 potential sites for the first 10 of England's 'eco-towns', low-energy, carbon neutral settlements each with between 5000 and 15 000 homes. Of these five will be built by 2016 and the remaining five by 2020. The advantages will be the provision of many new homes to fill the housing shortage with 30 per cent being affordable housing. There will be good transport links with surrounding towns and cities for jobs and services, each settlement will have its own shops, secondary school, business space and leisure facilities and, by being carbon neutral, it will take no more energy from the National Grid than it replaces through renewable power. Opponents point out the likely increase in petrol costs and pressure on existing roads and schools, the location of most being in the south and east and many being on greenbelt sites.

Abridged from The Guardian, *3 April 2008*

Three million new homes by 2028

The government plans to force local councils to allow development on previously protected land in order to achieve their aim of providing 3 million new homes by 2028. Ministers want 33 000 new houses to be built each year, almost 100 every day, in the South East alone for the next 20 years. Of these a high proportion should be either affordable or social homes. Released documents reveal that the green belts around Oxford, Guildford and Woking are to be reviewed and that expansion into London's green belt may also be required. Similar strategies for other areas in the south and east will be released later. Despite growing opposition to their recently announced 10 'eco-towns', the government is set to push ahead with its large house-building programme regardless of the global credit crises and the fact that several of the country's leading house-builders are in difficulty.

Abridged from the Daily Telegraph, *17 July 2008*

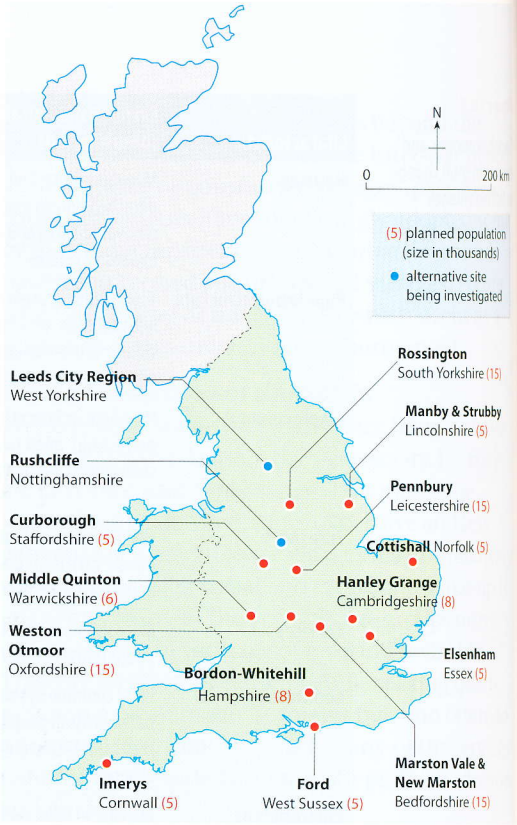


Figure 14.22
Pressure on green belts

Figure 14.23
Villages in the British landscape

Places 51 Britain: evolution of settlement

When Britain's first census was taken in 1801, almost 80 per cent of the population still lived in hamlets and villages. (The corresponding figure in the 1991 census was 7 per cent, rising to an estimated 10 per cent in 1998.) Most people have their own mental image of a 'traditional' hamlet, village, or market town. However, in reality, the development of rural settlement has been so dynamic and complex that, due to differences in site, form (morphology) and function (Places 49), there is no such thing as a 'typical' rural settlement (Figure 14.23) – nor is there a 'typical' urban settlement.

There is tendency to think of country life as stable, conservative and unchanging but this is far from the truth. Settlements, like the people who live in them, are mortal. There is, however, no recognisable expected life-span, and a village can survive for twenty or two thousand years depending on its ability to adapt to changing economic and social conditions. In addition to extant village communities there are in Britain thousands of former occupation sites which have been abandoned.

Rural settlement in the past reflected the ever-changing relationship between man and his environment. Human society is never completely static and the settlements which serve it can never remain absolutely still for very long; and before a well-balanced form of settlement becomes generally established, new forces will be at work altering that form. The forces which created our hamlets and villages have involved factors as varied as the pace of technological change, the nature of local authority, inheritance customs, the presence of arable or pasture, and the availability of building materials. Village history tells a story of fluctuating expansion, decline and movement, sometimes reflecting national factors such as pestilence, economic changes and social development, and sometimes purely local events, such as the silting up of a river estuary or the bankruptcy of a local entrepreneur. Such factors have combined to give each village a unique history and plan.

T. Rowley, 1978

Iron Age settlements

Palaeolithic man left behind flint tools, but few marks on the landscape. The first people to alter their natural surroundings were those of the Neolithic period, the Bronze Age and the Iron Age (Figure 11.18). They began, despite limited technology, to clear woodlands and to leave a legacy of stone circles, tumuli, barrows, hillforts (Figure 14.24) and settlement sites. The hillfort built on the volcanic sill at Drumadoon (Figure 1.37) had a fine panorama of an enemy approaching from the sea, while the steep cliffs prevented any frontal attack. Hillforts may, however, have only been settled during times of attack, as few had a guaranteed water supply. Not all Iron Age settlements were hillforts; some forts were located in lowland areas, while other settlements may have had a religious or market function as opposed to a military one.

Figure 14.24

Maiden Castle hillfort, Dorset, England

Romano-British settlements

While the Romans preferred to live in well-planned towns or in large rural villas, it is clear that at the same time many nucleated villages existed in lowland Britain, many of which showed evidence of Roman influence by having well-planned streets. One characteristic feature of Romano-British villages was the presence of small-scale industrial activity – usually pottery production and iron-working.

Anglo-Saxon settlements

Although many English village and town names have Anglo-Saxon origins, it does not prove that they existed during those times. Most Anglo-Saxon settlements were sited in clearings in the natural forest, on 'islands' in marshy areas or near to the coast. Archaeological evidence suggests that most settlements were likely to have consisted of several farms grouped together to form self-contained hamlets. The houses, or rather huts, were rectangular in shape and built from local materials – wood for the frame from the forest, mud and wattle (interlaced twigs and branches) for the walls from the river and forest, and thatch for the roof from local reeds or straw left over after the harvest. The huts, which were shared with the animals in winter, may have been protected by a stone or wooden wind-break. It was only by late Anglo-Saxon times that larger nucleated villages, with their open fields worked in strips by a heavy plough drawn by oxen, became more commonplace.

Medieval settlements

By medieval times, each village was dominated by a large farm, or manor, house in which the lord of the manor lived. The village would have contained several peasant cottages, built with materials similar to those of Anglo-Saxon homes, a church, a house for the priest, a blacksmith's forge and a mill. Surrounding the village were (usually) three large open fields – open because they had neither hedges nor fences as boundaries. Each field was divided into numerous, long, narrow strips, shared between the peasants. Two of the fields were likely to be growing cereals such as wheat, barley and rye (mainly for bread), while the third was left fallow (allowed to rest). The crops were rotated so that each field was left fallow every third year – the three-field system of crop rotation. When the fields were ploughed, a ridge was formed about 0.3 m above an adjacent furrow. Over many years of ploughing, the ridges built up so that they can still be recognised in our present-day landscape (Figure 4.25).

In the scarp-and-vale areas of south-east England (page 199), the villages were often close together along the spring lines. The parish boundaries were laid out between each village and parallel to each other, so that each individual parish had a long, narrow strip of land extending across the clay vale and over the chalk escarpment (Figure 14.4). This allowed each parish to be self-contained by having a permanent water supply together with land suitable for both rearing animals and growing crops. Although individual parishes no longer need to be self-supporting, the old boundaries still remain.

Figure 14.25

Ridge and furrow, south-east Leicestershire

Measuring settlement patterns

Several theories and statistical tests have been put forward to explain and to allow objective comparisons to be made between settlements in different parts of the world, e.g. within a country or between countries.

- **Nearest neighbour analysis** is a statistical test to describe the settlement pattern.
- **The rank–size rule** seeks to find a numerical relationship between the population size of settlements.
- **Central place theory** is concerned with the functional importance of places.
- **Gravity models** seek to determine the interaction (i.e. movement) between places.

Nearest neighbour analysis

Settlements often appear on maps as dots. Dot distributions are commonly used in geography, yet their patterns are often difficult to describe. Sometimes patterns are obvious, such as when settlements are extremely nucleated or dispersed (Figure 14.26). As, in reality, the pattern is likely to lie between these two extremes, then any description will be subjective. One way in which a pattern can be measured objectively is by using nearest neighbour analysis.

This technique was devised by a botanist who wished to describe patterns of plant distributions. It can be used to identify a tendency towards nucleation (clustering) or dispersion for settlements, shops, industry, etc., as well as plants. Nearest neighbour analysis gives a precision that enables one region to be compared with another and allows changes in distribution to be compared over a period of time. It is, however, only a technique and therefore does *not* offer any explanation of patterns.

The formula used in nearest neighbour analysis produces a figure (expressed as *Rn*) which measures the extent to which a particular pattern is clustered (nucleated), random, or regular (uniform) (Figure 14.26).

- **Clustering** occurs when all the dots are very close to the same point. An example of this in Britain is on coalfields where mining villages tended to coalesce. In an extreme case, *Rn* would be 0.
- **Random** distributions occur where there is no pattern at all. *Rn* then equals 1.0. The usual pattern for settlement is one that is predominantly random with a tendency either towards clustering or regularity.
- **Regular** patterns are perfectly uniform. If ever found in reality, they would have an *Rn* value of 2.15 which would mean that each dot (settlement) was equidistant from all its neighbours. The closest example of this in Britain is the distribution of market towns in East Anglia.

Using nearest neighbour analysis

Figure 14.27 shows settlements in part of north-east Warwickshire and south-west Leicestershire, an area of the English Midlands where it might be expected that there would be evidence of regularity in the distribution.

1 The settlements in the study area were located. (The minimum number recommended for a nearest neighbour analysis is 30.) Each settlement was given a number.

2 The nearest neighbour formula was applied. This formula is:

$$Rn = 2\bar{d}\sqrt{\frac{n}{A}}$$

where:

Rn = the description of the distribution
$\bar{d}$ = the mean distance between the nearest neighbours (km)
n = the number of points (settlements) in the study area
A = the area under study (km²).

Figure 14.26
Nearest neighbour values (*Rn*)

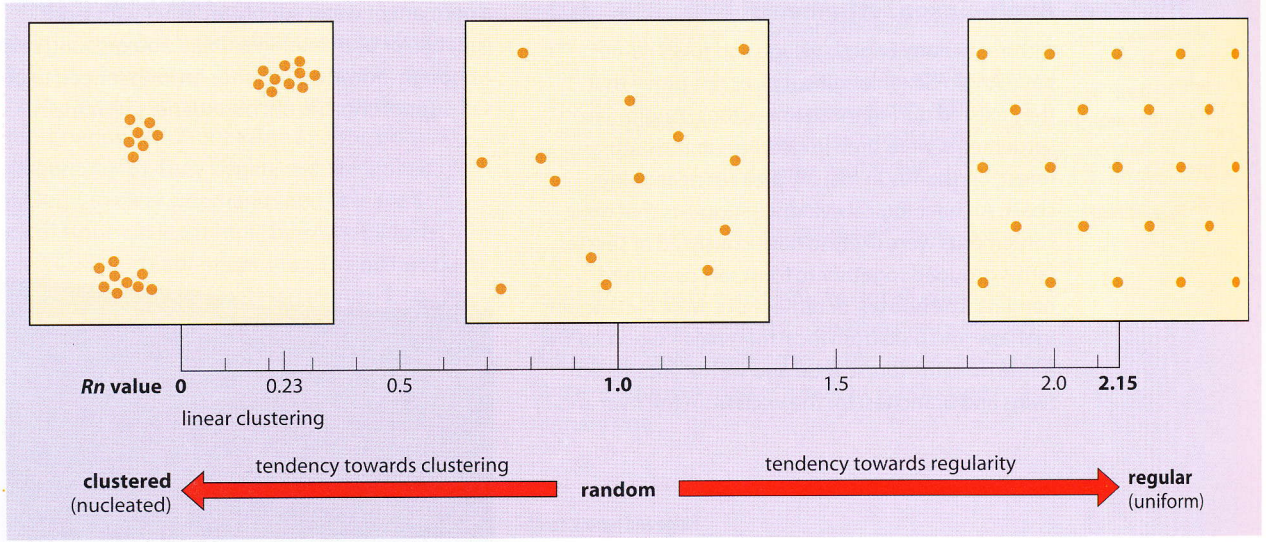
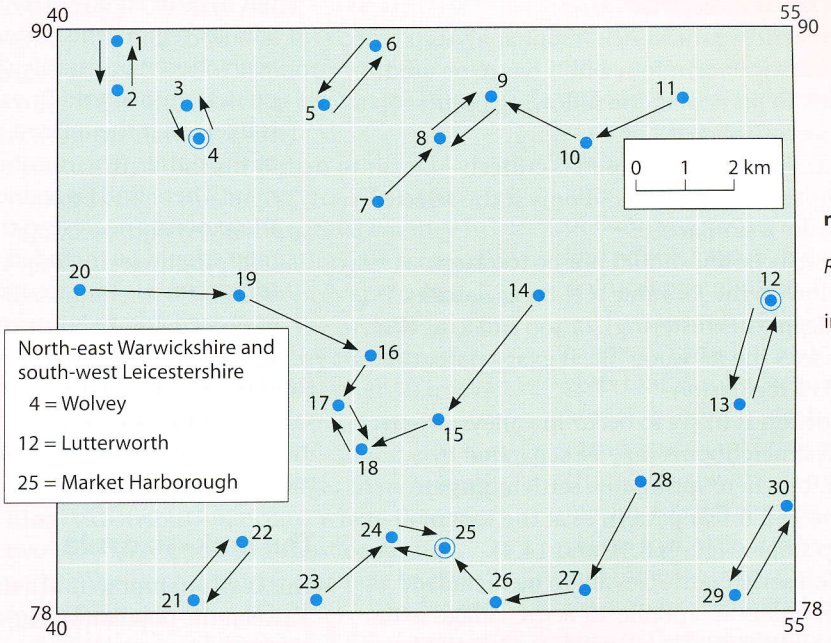


Figure 14.27

Nearest neighbour analysis: a worked example for part of north-east Warwickshire and south-west Leicestershire

Settlement number	Nearest neighbour	Distance (km)
1	2	1.0
2	1	1.0
3	4	0.6
4	3	0.6
5	6	1.6
6	5	1.6
7	8	1.8
8	9	1.3
9	8	1.3
10	9	2.1
12	10	2.2
13	13	2.2
14	15	3.3
15	18	1.7
16	17	1.3
17	18	1.0
18	17	1.0
19	16	3.0
20	19	3.2
21	22	1.6
22	21	1.6
23	24	2.1
24	25	1.1
25	24	1.1
26	25	1.5
27	26	1.8
28	27	2.5
29	30	2.2
30	29	2.2
		Σ51.7



3 To find $\bar{d}$, measure the straight-line distance between each settlement and its nearest neighbour, e.g. settlement 1 to 2, settlement 2 to 1, settlement 3 to 4, and so on. One point may have more than one nearest neighbour (settlement 8) and two points may be each other's nearest neighbour (settlements 1 and 2). In this example, the mean distance between all the pairs of nearest neighbours was 1.72 km – i.e. the total distance between each pair (51.7 km) divided by the number of points (30).

4 Find the total area of the map: i.e. 15 km x 12 km = 180 km^2.

5 Calculate the nearest neighbour statistic, *Rn*, by substituting the formula. This has already been done in Figure 14.27 and gives an *Rn* value of 1.41.

6 Using this *Rn* value, refer back to Figure 14.26 to determine how clustered or regular is the pattern. A value of 1.41 shows that there is a fairly strong tendency towards a regular pattern of settlement.

7 However, there is a possibility that this pattern has occurred by chance. Referring to Figure 14.28, it is apparent that the values of *Rn* must lie outside the shaded area before a distribution of clustering or regularity can be accepted as significant. Values lying in the shaded area at the 95 per cent probability level show a random distribution. (*Note:* with fewer than 30 settlements, it becomes increasingly difficult to say with any confidence that the distribution is clustered or regular.) The graph confirms that our *Rn* value of 1.41 has a significant element of regularity.

How can the nearest neighbour statistic be used to compare two or more distributions? Figure 14.28 shows the *Rn* value for three areas in England, including that for our worked example, the English Midlands. The *Rn* statistic of 1.57 for part of East Anglia shows that the area has a more pronounced pattern of regularity than the Midlands. An *Rn* value of 0.61 for part of the Durham coalfield indicates that it has a significant tendency towards a clustered distribution.

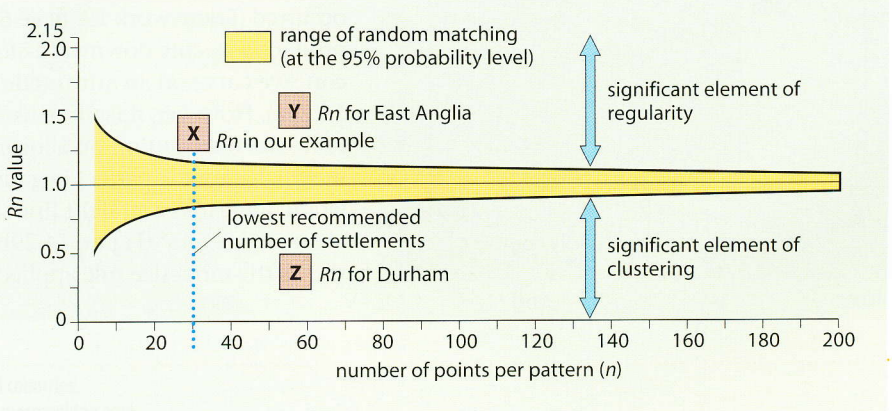


Figure 14.28

Interpretation of *Rn* statistic: significant values

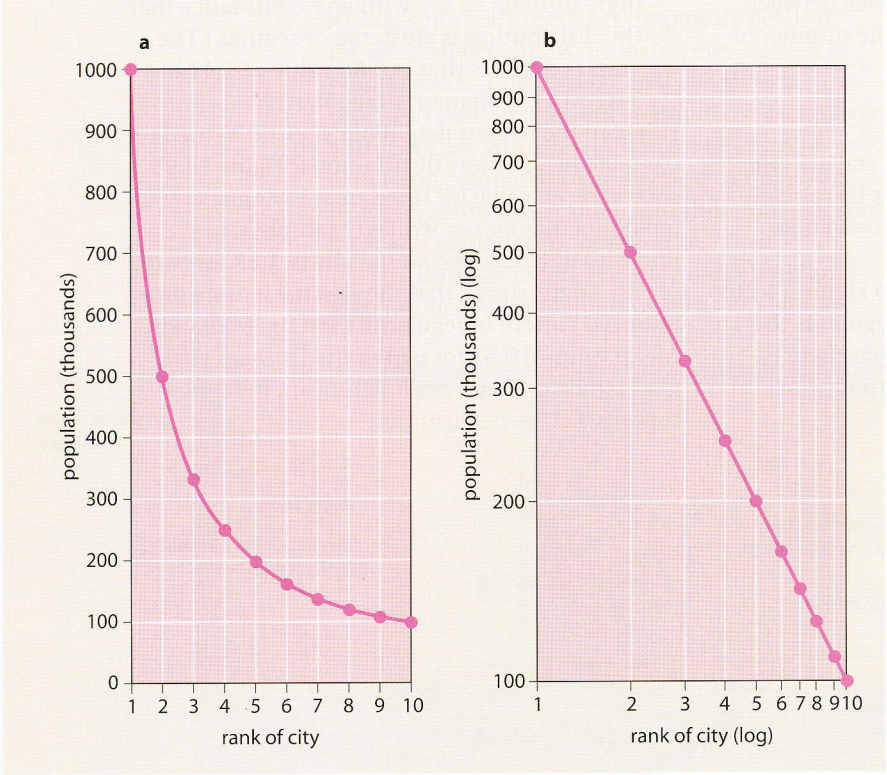
Limitations and problems

As noted earlier, nearest neighbour analysis is a useful statistical technique but it has to be used with care. In particular, the following points should be considered:

1. The size of the area chosen is critical. Comparisons will be valid only if the selected areas are a similar size.
2. The area chosen should not be too large, as this lowers the *Rn* value (i.e. it exaggerates the degree of clustering), or too small, as this increases the *Rn* value (i.e. it exaggerates the level of regularity).
3. Distortion is likely to occur in valleys, where nearest neighbours may be separated by a river, or where spring-line settlements are found in a linear pattern as at the foot of a scarp slope (Figures 8.10 and 14.4).
4. Which settlement sizes are to be included? Are hamlets acceptable, or is the village to be the smallest size? If so, when is a hamlet large enough to be called a village (page 393)?
5. There may be difficulty in determining the centre of a settlement for measurement purposes, especially if it has a linear or a loose-knit morphology.
6. The boundary of an area is significant. If the area is a small island or lies on an outcrop of a particular rock, there is little problem; but if, as in Figure 14.27, the area is part of a larger region, the boundaries must have been chosen arbitrarily (in this instance by predetermined grid lines). In such a case, it is likely that the nearest neighbour of some of the points (e.g. number 20) will be off the map. There is disagreement as to whether those points nearest to the boundary of the map should be included, but perhaps of more importance is the need to be consistent in approach and to be aware of the problems and limitations.

Despite these problems, nearest neighbour analysis forms a useful basis for further investigation into why any clustering or regularity of settlement has taken place.

Figure 14.29
The rank–size rule



The rank–size rule

This is an attempt to find a numerical relationship between the population size of settlements within an area such as a country or county. The rule states that **the size of settlements is inversely proportional to their rank**. Settlements are ranked in descending order of population size, with the largest city placed first. The assumption is that the second-ranked city will have a population one-half that of the first-ranked, the third-ranked city a population one-third of the first-ranked, the fourth-ranked one-quarter of the largest city, and so on.

The rank–size rule is expressed by the formula:

$Pn = Pl \div n$ (or R)

where:

Pn = the population of the city
Pl = the population of the largest (primate) city
n (or R) = the rank–size of the city.

For example, if the largest city has a population of 1 000 000, then:

the second-largest city will be 1 000 000 ÷ 2, i.e. 500 000
the third-largest city will be 1 000 000 ÷ 3, i.e. 333 333
the fourth-largest city will be 1 000 000 ÷ 4, i.e. 250 000.

If such a perfect negative relationship actually occurred (Framework 19, page 612), it would produce a steeply downward-sloping, smooth, concave curve on an arithmetic graph (Figure 14.29a). However, it is more usual to plot the rank–size distribution on a logarithmic scale, in which case the perfect negative relationship would appear as a straight line sloping downwards at an angle of 45° (Figure 14.29b). Figure 14.30 shows the rank–size rule applied to Brazil.

Variations from the rank–size rule

In reality, it is rare to find a close correlation between the city size of a country and the rank–size rule. There are, however, two major variations from the rank–size rule.

1 **Primate distribution** (urban primacy) is found where the largest city, often the capital, completely dominates a country or region (in terms of population size, economic development, wealth, services and cultural activities). In such a case, the primate city will have a population size many times greater than that of the second-largest city (Lima in Figure 14.31). Montevideo in Uruguay is 17 times larger than the second-largest city, and Lima in Peru is 11 times larger than Arequipa.

2 **Binary distribution** occurs where there are two very large cities of almost equal size within the same country: one may be the capital and the other the chief port or major industrial centre. Examples of binary distribution include Madrid and Barcelona in Spain, and Quito and Guayaquil in Ecuador.

It has been suggested (though there are many exceptions) that the rank–size rule is more likely to operate if the country is developed; has been urbanised for a long time; is large in size; and has a complex and stable economic and political organisation. In contrast, primate distribution is more likely to be found (also with exceptions, including France and Austria) in countries which are small in size; less developed; former colonies of European countries; only recently urbanised; and which have experienced recent changes in political organisation and/or boundaries.

Two schools of thought exist concerning the causes of variation in urban primacy. One suggests that as a city begins to dominate a country it attracts people, trade, industry and services at an increasingly rapid rate and at the expense of rival cities (arguably this is more applicable to economically less developed countries). The other claims that as a country becomes more urbanised and industrialised, the growth of several cities tends to be stimulated, thus reducing the importance of the primate city (arguably more applicable to economically more developed countries where some of the largest cities are now experiencing urban depopulation, page 365).

Rank 2007	City	Actual population	Estimated population according to rank–size rule (000s)
1	São Paulo	10 239	–
2	Rio de Janeiro	6094	5120
3	Salvador	2891	3413
4	Fortaleza	2431	2560
5	Belo Horizonte	2413	2048
6	Brasilia	2349	1707
7	Curitiba	1797	1463
8	Manaus	1602	1280
9	Recife	1534	1138
10	Belem	1400	1024

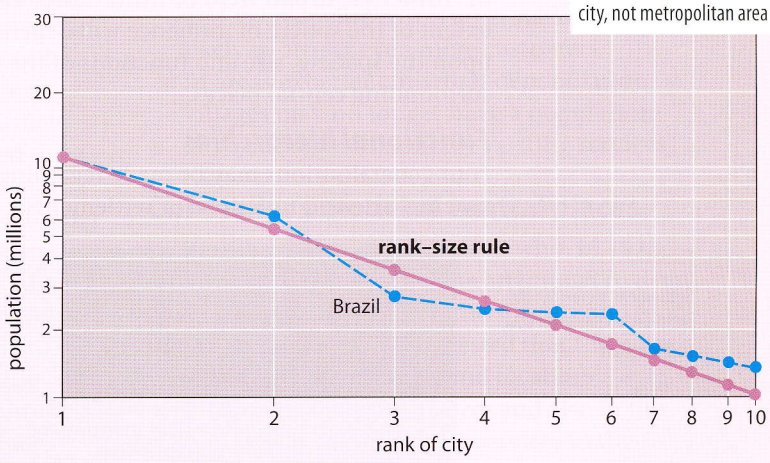


Figure 14.30

The rank–size rule applied to Brazil. Population refers to city, not metropolitan area

Rank	USA 2007 actual population (000s)		Italy 2007 actual population (000s)		Peru 2007 actual population (000s)		Japan 2007 actual population (000s)	
1	New York	8275	Roma	2706	Lima	8473	Tokyo	8536
2	Los Angeles	3834	Milano	1303	Arequipa	749	Yokohama	3603
3	Chicago	2837	Napoli	975	Trujillo	683	Osaka	2635
4	Houston	2208	Torino	901	Chiclayo	524	Nagoya	2223
5	Phoenix	1552	Palermo	667	Piura	377	Sapporo	1889
6	Philadelphia	1450	Genova	616	Iquitos	371	Kobe	1529
7	San Antonio	1329	Bologna	373	Cusco	349	Kyoto	1473
8	San Diego	1267	Firenze	366	Chimbote	335	Fukuoka	1414
9	Dallas	1241	Bari	325	Huancayo	323	Kawasaki	1183
10	Detroit	917	Catania	302	Tacna	242	Hiroshima	1158

Figure 14.31

Largest cities in four selected countries. Population refers to city, not metropolitan area

Figure 14.32

Size, spacing and functions of settlements

Central place	Population	Distance apart (km)	Sphere of influence (km^2)	Functions (services)
Hamlet	10–20	2	–	probably none
Village	1 000	7	45	church, post office, shop, junior school
Small town	20 000	21	415	shops, churches, senior school, bank, doctor
Large town	100 000	35	1 200	shopping centre, small hospital, banks, senior schools
City	500 000	100	12 000	shopping complex, cathedral, large hospital, football team, large bus and rail station, cinemas, theatre
Conurbation	1 million	200	35 000	shopping complexes, several CBDs
Capital or primate city	several million	–	whole country	government offices, all other functions

Notes: The distances and service areas have been taken from Christaller's work in southern Germany (1933) with, in some cases, a rounding-off of figures for simplicity. The population figures and functions are more applicable to the UK and the present time. Populations, distances and service areas vary between and within countries and should be taken as comparative and approximate rather than absolute. All places in the hierarchy have all the services of the settlements below them.

Central place theory

A **central place** is a settlement that provides goods and services. It may vary in size from a small village to a conurbation or primate city (Figures 14.32 and 14.33) and forms a link in a hierarchy. The area around each settlement which comes under its economic, social and political influence is referred to as its **sphere of influence**, **urban field** or **hinterland**. The extent of the sphere of influence will depend upon the spacing, size and functions of the surrounding central places.

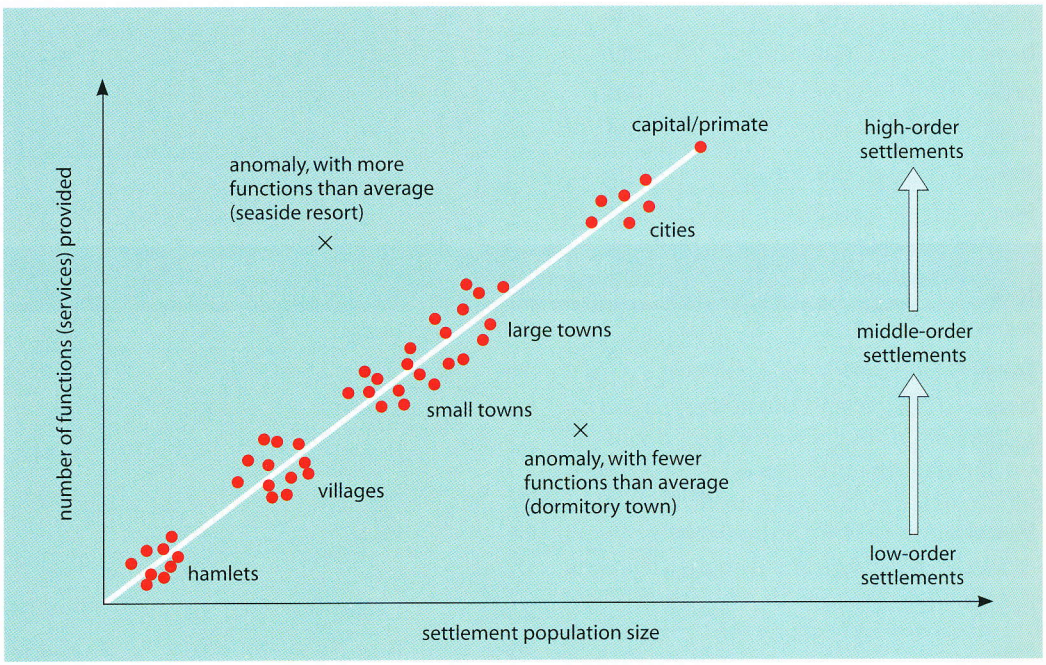
Functional hierarchies

Four generalisations may be made regarding the spacing, size and functions of settlements:

1 The larger the settlements are in size, the fewer in number they will be, i.e. there are many small villages, but relatively few large cities.
2 The larger the settlements grow in size, the greater the distance between them, i.e. villages are usually found close together, while cities are spaced much further apart.
3 As a settlement increases in size, the range and number of its functions will increase (Figure 14.33).
4 As a settlement increases in size, the number of higher-order services will also increase, i.e. a greater degree of specialisation occurs in the services (Figure 14.32).

Figure 14.33

Settlement hierarchy: the relationship between size and function



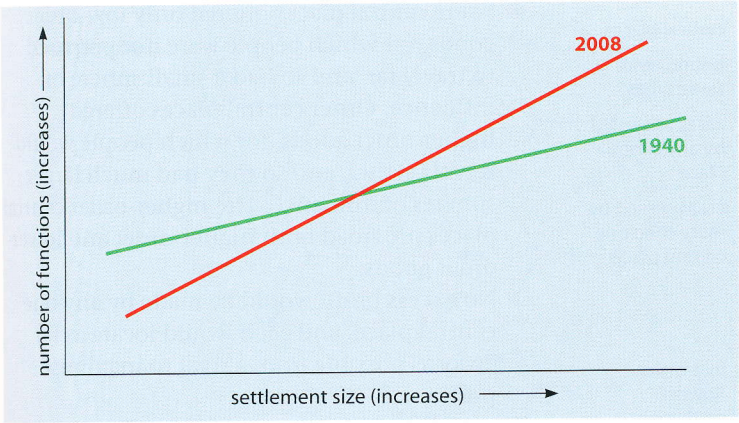


Figure 14.34

Relationship between the number of functions and settlement size in the UK, 1940 and 2008

The range and threshold of central place functions

Central place functions are activities, mainly within the tertiary sector, that market goods and services from central places for the benefit of local customers and clients drawn from a wider hinterland. The **range** of a good or service is the maximum distance that people are prepared to travel to obtain it. It is dependent upon the value of the good, the length of the journey, and the frequency that the service is needed. People are not prepared to travel as far to buy a newspaper (a low-order item), which they need daily, as they are to buy furniture (a high-order item), which they might purchase only once every several years. Low-order functions, such as corner shops and primary schools, need to be spaced closely together as people are less willing and less able to travel far to use them. High-order functions, such as regional shopping centres and hospitals, are likely to be widely spaced as people are more prepared to travel considerable distances to them (page 432).

The **threshold** of a good or service is the minimum number of people required to support it. It is assumed, incorrectly in practice, that people will always use the service located nearest to them (the nearest superstore). As a rule, the more specialised the service, the greater the number of people needed to make it profitable or viable. It has been suggested that, in the UK, about 300 people are necessary for a village shop, 500 for a primary school, 2500 for a doctor, 10 000 for a senior school or a small chemist's shop, 25 000 for a shoe shop, 50 000 for a small department store, 60 000 for a large supermarket, 100 000 for a large department store, and over 1 million for a university. Services locate where they can maximise the number of people in their catchment area and maximise the distance from their nearest rival. Threshold analysis was used by planners of British new towns who equated, for example, 20 000 people with a cinema, 10 000 people with a swimming pool and 100 000 people with a theatre.

Changes in population size and number of functions

Figure 14.34 shows that over the last 50 years in the UK there has been a decrease in the number of services available in small settlements and an increase in the number of functions provided by large settlements. This may be due to many factors, for example:

- Small villages are no longer able to support their former functions (village shop) as the greater wealth and mobility (car ownership) of some rural populations enable them to travel further to larger centres where they can obtain, in a single visit, both high- and low-order goods (Places 50, page 399).
- Domestic changes (deep freezers, convenience foods) mean that rural householders need no longer make use of daily, low-order services previously available in their village.
- As larger settlements attract an increasingly larger threshold population, they can increase the variety and number of functions and, by reducing costs (supermarkets), are likely to attract even more customers.
- In areas experiencing rural depopulation, villages may no longer have a population large enough to maintain existing services.

Christaller's model of central places

Walter Christaller was a German who, in 1933, published a book in which he attempted to demonstrate a sense of order in the spacing and function of settlements. He suggested that there was a pattern in the distribution and location of settlements of different sizes and also in the ways in which they provided services to the inhabitants living within their sphere of influence. Regardless of the level of service provided, he termed each settlement a **central place**. Although Christaller's **central place theory** was based upon investigations in southern Germany, and it was not translated into English until 1966, his work has contributed a great deal to the search for order in the study of settlements.

The two principles underlying Christaller's theory were the **range** and the **threshold** of goods and services. He made a set of assumptions which were similar to those of two earlier German economists, von Thünen (agricultural land use model, page 471) and Weber (industrial location theory, page 557).

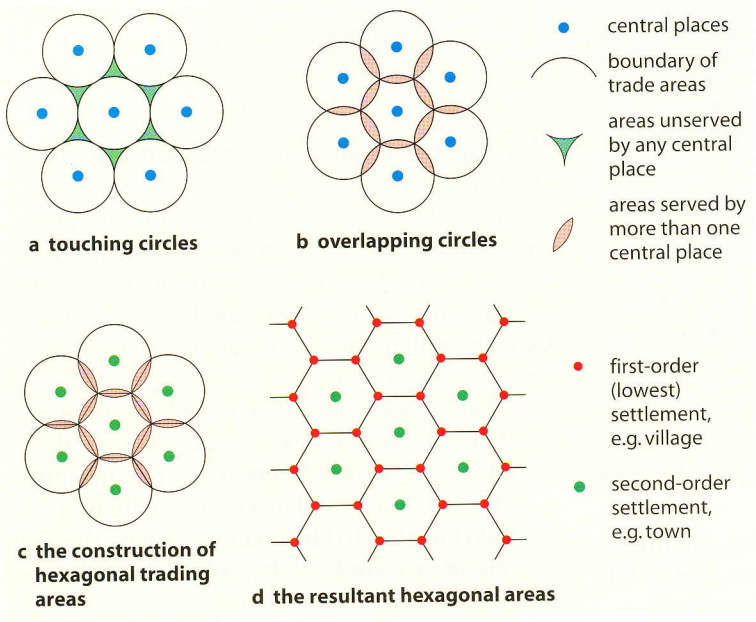


Figure 14.35
Constructing spheres of influence around settlements (*after* Christaller)

These assumptions were:

- There was unbounded flat land so that transport was equally easy and cheap in all directions. Transport costs were proportional to distance from the central place and there was only one form of transport.
- Population was evenly distributed across the plain.
- Resources were evenly distributed across the plain.
- Goods and services were always obtained from the nearest central place so as to minimise distance travelled, i.e. the assumed rational behaviour that all consumers will minimise their travel in the pursuit of goods and services.
- All customers had the same purchasing power (income) and made similar demands for goods.
- Some central places offered only low-order goods, for which people were not prepared to travel far, and so had a small sphere of influence. Other central places offered higher-order goods, for which people would travel further, and so they had much larger spheres of influence. The higher-order central places provided both higher-order and lower-order goods.
- No excess profit would be made by any one central place, and each would locate as far away as possible from a rival to maximise profits.

The ideal shape for the sphere of influence of a central place is circular, as then the distances from it to all points on the boundary are equal. If the circles touch at their circumferences, they leave gaps which are unserved by any central place (Figure 14.35a); if the circles are drawn so that there are no gaps, they necessarily overlap (Figure 14.35b) – which also violates the basic assumptions of the model. To overcome this problem, the overlapping circles are modified to become touching hexagons (Figure 14.35c). A hexagon is almost as efficient as a circle in terms of accessibility from all points of the plain and is considerably more efficient than a square or triangle (Figure 14.35d). A hexagonal pattern also produces the ideal shape for superimposing the trading areas of central places with different levels of function – the village, town and city of Christaller's hierarchy. Figure 14.36 shows a large trade area for a third-order central place, a smaller trade area for the six second-order central places, and even smaller trade areas for the 24 first-order central places.

By arranging the hexagons in different ways, Christaller was able to produce three different patterns of service or trading areas. He called these $k = 3$, $k = 4$ and $k = 7$, where k is the number of places dependent upon the next-highest-order central place.

The following should be noted at this point.

- Where $k = 3$, the trade area of the third-order (i.e. highest) central place is three times the area of the second-order central place, which in turn is three times larger than the trade area of the first-order (lowest) central place.
- Where $k = 4$, the trade area of the third-order central place is four times the area of the second-order central place, which is four times larger than the trade area of the first-order central place.
- Where $k = 7$, the trade area of each order is seven times greater than the order beneath it.

Figure 14.36
Christaller's central places and spheres of influence

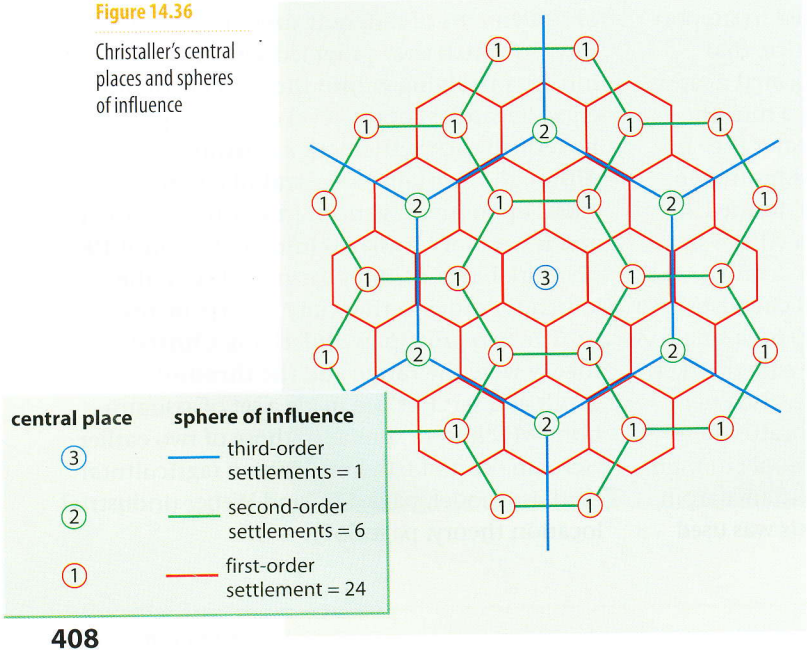
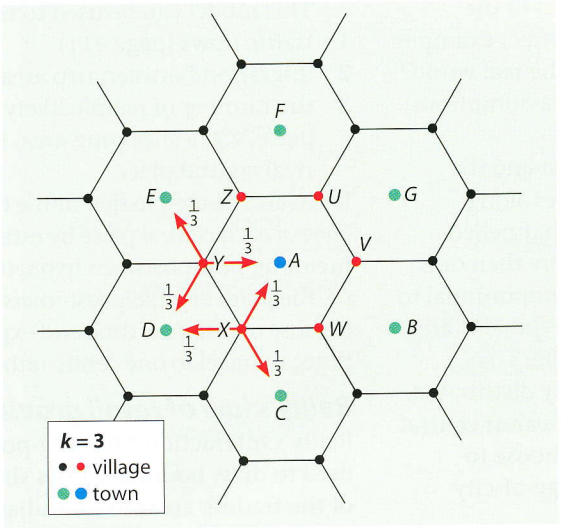


Figure 14.37
Christaller's $k = 3$



$k = 3$

The arrangement of the hexagons in this case is the same as given in Figure 14.36 and the explanation of how $k = 3$ is reached is shown in Figure 14.37, where:

A is the central place or third-order settlement
B, C, D, E, F and *G* are 6 second-order settlements surrounding *A*
U, V, W, X, Y and *Z* are some of the 24 first-order settlements which lie between *A* and the second-order settlements.

It is assumed that one-third of the inhabitants of *Y* will go to *A* to shop, one-third to *D* and one-third to *E*. Similarly, one-third of people living at *X* will shop at *A*, one-third at *D* and one-third at *C*. This means that *A* will take one-third of the customers from each of *U, V, W, X, Y* and *Z* ($6 \times \frac{1}{3} = 2$) plus all of its own customers (1). In total, *A* therefore serves the equivalent of three central places (2 + 1).

Christaller based the $k = 3$ pattern on a **marketing principle** which maximises the number of central places and thus brings the supply of higher-order goods and services as close as possible to all the dependent settlements and therefore to the inhabitants of the trade area.

$k = 4$

In this case, the size of the hexagon is slightly larger and it has been re-oriented (Figure 14.38). The first-order settlements, again labelled *U, V, W, X, Y* and *Z*, are now located at the midpoints of the sides of the hexagon instead of at the apexes as in k = 3. Customers from *Y* now have a choice of only two markets, *A* and *N*, and it is assumed that half of those customers will go to *A* and half to *N*. Similarly, half of the customers from *X* will go to *A* and the other half to *M*. *A* will therefore take half of the customers from each of the six settlements at *U, V, W, X, Y* and *Z* ($6 \times \frac{1}{2} = 3$) plus all of its own customers (1) to serve the equivalent of four central places (3 + 1). This pattern is based on a **traffic principle**, whereby travel between two centres is made as easy and as cheap as possible. The central places are located so that the maximum number may lie on routes between the larger settlements.

$k = 7$

Here the pattern shows the same high-order central place, *A*, but all the lower-order settlements, *U, V, W, X, Y* and *Z*, lie within the hexagon or trade area (Figure 14.39). In this case, all of the customers from the six smaller settlements will go to *A* ($6 \times 1 = 6$), together with all of the inhabitants of *A* (1). This means that *A* serves seven central places (6 + 1). As this system makes it efficient to organise or control several places, and as the loyalties of the inhabitants of the lower-order settlements to a higher one are not divided, it is referred to as the **administrative principle**.

Figure 14.38
Christaller's $k = 4$

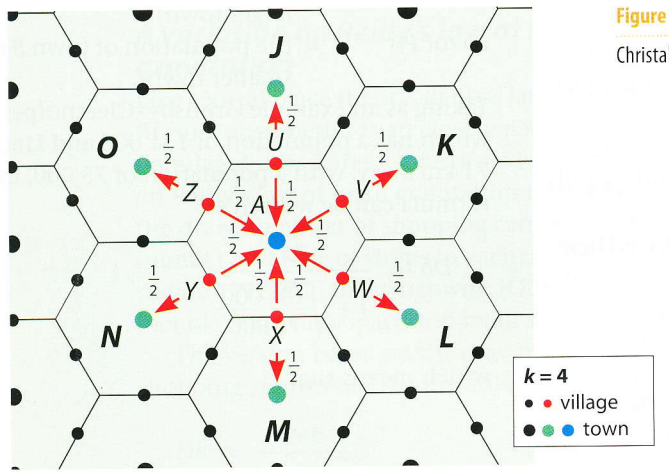
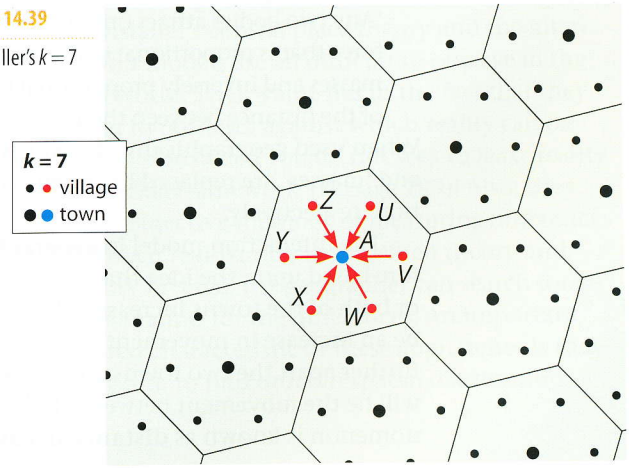


Figure 14.39
Christaller's $k = 7$



Why, with the possible exception of the reclaimed Dutch polders, can no perfect example of Christaller's model be found in the real world? The answer lies mainly in the basic assumptions of the model.

- Large areas of flat land rarely exist and the presence of relief barriers or routes along valleys means that transport is channelled in certain directions. There is more than one form of transport; costs are not proportional to distance; and both systems and types of transport have changed since Christaller's day.
- People and wealth are not evenly distributed.
- People do not always go to the nearest central place – for example, they may choose to travel much further to a new edge-of-city hypermarket.
- People do not all have the same purchasing power, or needs.
- Governments often have control over the location of industry and of new towns.
- Perfect competition is unreal and some firms make greater profits than others.
- Christaller saw each central place as having a particular function whereas, in reality, places may have several functions which can change over time.
- The model does not seem to fit industrial areas, although there is some correlation with flat farming areas in East Anglia, the Netherlands and the Canadian Prairies.

Christaller has, however, provided us with an objective model with which we can test the real world. His theories have helped geographers and planners to locate new services such as retail outlets and roads.

Interaction or gravity models

These models, derived from Newton's law of gravity, seek to predict the degree of interaction between two places. Newton's law states that:

> 'Any two bodies attract one another with a force that is proportional to the product of their masses and inversely proportional to the square of the distance between them.'

When used geographically, the words 'bodies' and 'masses' are replaced by 'towns' and 'population' respectively.

The interaction model in geography is therefore based upon the idea that as the size of one or both of the towns increases, there will also be an increase in movement between them. The further apart the two towns are, however, the less will be the movement between them. This phenomenon is known as **distance decay**.

This model can be used to estimate:

1. traffic flows (page 411)
2. migration between two areas
3. the number of people likely to use one central place, e.g. a shopping area, in preference to a rival central place.

It can also be used to determine the sphere of influence of each central place by estimating where the **breaking point** between two settlements will be, i.e. the point at which customers find it preferable, because of distance, time and expense considerations, to travel to one centre rather than the other.

Reilly's law of retail gravitation (1931)

Reilly's interaction breaking-point is a method used to draw boundary lines showing the limits of the trading areas of two adjacent towns or shopping centres. His law states that:

> 'Two centres attract trade from intermediate places in direct proportion to the size of the centres and in inverse proportion to the square of the distances from the two centres to the intermediate place.'

Unlike Christaller, Reilly suggested that there were no fixed trade areas, that these areas could vary in size and shape, and that they could overlap.

This can be expressed by the formula:

$$Db = \frac{Dab}{1 + \sqrt{\frac{Pa}{Pb}}}$$

or similarly

$$djk = \frac{dij}{1 + \sqrt{\frac{Pi}{Pj}}}$$

where:

Db (or *djk*)	=	the breaking-point between towns *A* and *B*
Dab (or *dij*)	=	the distance (or time) between towns *A* and *B*
Pa (or *Pi*)	=	the population of town *A* (the larger town)
Pb (or *Pj*)	=	the population of town *B* (the smaller town).

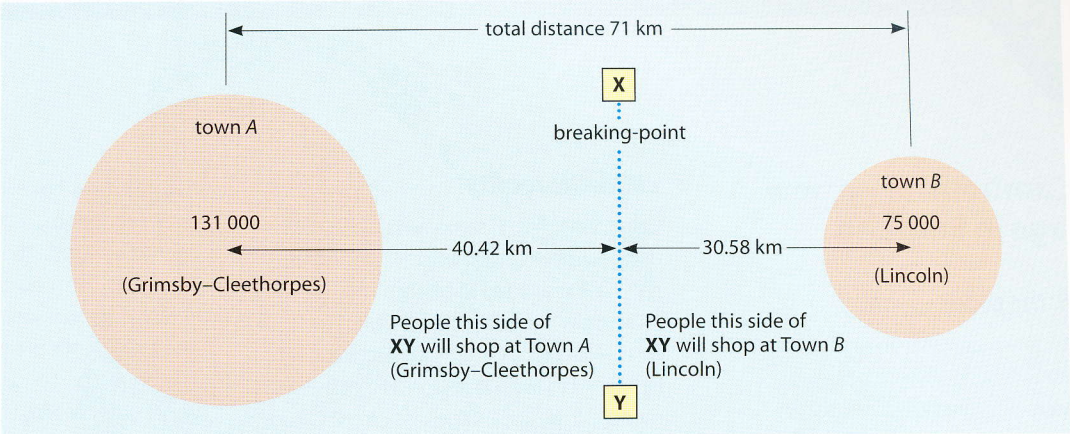
Taking as an example Grimsby–Cleethorpes which has a population of 131 000 and Lincoln, 71 km away, with a population of 75 000, the formula can be written as:

$$Db = \frac{71}{1 + \sqrt{\frac{131\,000}{75\,000}}}$$

which means that

Figure 14.40

Reilly's breaking-point between settlements of different sizes, applied to north Lincolnshire



$$Db = \frac{71}{1 + 1.32}$$

$$\therefore Db = 30.58$$

Thus the breaking-point is 30.58 km from Lincoln (town *B*) and 40.42 km from Grimsby–Cleethorpes (town *A*). This is shown in Figure 14.40.

Limitations of Reilly's model

As with other models, Reilly's model is based on assumptions which are not always applicable to the real world. In this case, the assumptions are that:

- the larger the town, the stronger its attraction
- people shop in a logical way, seeking the centre which is nearest to them in terms of time and distance.

These assumptions may not always be true. For example:

- there may be traffic congestion on the way to the larger town and, once there, car parking may be more difficult and expensive
- the smaller town may have fewer but better-quality shops
- the smaller centre may be cleaner, more modern, safer and less congested, and
- the smaller town may advertise its services more effectively.

A variation on Reilly's law of retail gravitation

Like central place theory, Reilly's law seems to fit rural areas better than closely packed, densely populated urban areas. One of several variations on Reilly's law of retail gravitation is based on the drawing power of shopping centres (i.e. the number and type of shops in each) rather than distance between the two towns. (Other variations include retail floorspace and retail sales.)

The version based on the drawing power of shopping centres has the formula:

$$Db = \frac{Dab}{1 + \sqrt{\frac{Sa}{Sb}}}$$

where:

Sa = the number of shops in town *A*

Sb = the number of shops in town *B*.

Referring to our original example, suppose Grimsby–Cleethorpes has 800 shops and Lincoln has 300 shops. The formula could then be written:

$$Db = \frac{71}{1 + \sqrt{\frac{800}{300}}}$$

$$\therefore \text{Db} = 27$$

This means that out of every 71 shoppers, 44 would go to Grimsby–Cleethorpes and 27 to Lincoln.

In reality, the competitive commercial relationships between urban centres can change over a period of time. On Humberside, for example, there have been the effects of the opening of the Humber Bridge on places either side of the estuary, the construction of the M62 and M180 motorways, and the development of new out-of-town shopping centres (pages 433 and 458).

Measuring settlement patterns: conclusion

Nearest neighbour analysis, the rank–size rule, Christaller's central place theory and the interaction models are all difficult to observe in the real world. Their value lies in the fact that they form hypotheses against which reality can be tested – provided you do not seek to *make* reality fit them (Framework 10, page 299)! Also, they offer objective methods of measuring differences between real-world places. When theory and reality diverge, the geographer can search for an explanation for the differences. An important shared characteristic of these approaches is that they aim to find order in spatial distributions.

A Cambourne – a new village in England

1998: the plan

Work began in late 1998 on a new village in South Cambridgeshire to be called Cambourne (Figure 14.41). Eventually 8000 people will live here, in 3300 houses (up to 900 of which will be 'affordable homes'), which are to be built over 12 years. Cambourne, which covers 400 hectares, will be laid out as three distinct villages (Figure 14.43), each with its own central green (Figure 14.42) and separated by two small valleys that will provide open space and leisure amenities. There will also be a church, two primary schools, a library, 18 hectares of playing fields, a multi-purpose sports centre, a health centre, police and fire stations. The developers have agreed to provide funds for a park and ride scheme, cycle tracks and a bus service. The development aims to enhance the environment by including 69 hectares of planted woodland, 56 hectares for a new Country Park, and the construction of a series of lakes. It is hoped that a new 20 hectare business park will eventually create up to 3000 new jobs, many of which, as the village is so close to Cambridge, are likely to be high-tech (Places 86, page 566). In time, the A428 arterial route linking Cambourne to Cambridge will become a dual-carriageway.

2008: the reality

Cambourne has, in some ways, become a unique type of settlement in that the planners have managed to create a village environment with the facilities of a small town. An evaluation by Cambridge Architectural Research Ltd (2007) concluded that the settlement had the advantages of being less congested, polluted and noisy than Cambridge; had cheaper, newer and a wider choice of houses; had easy access to the countryside, a dual-carriageway and mainline stations; and had, despite a bad press, less crime and antisocial behaviour. Residents appreciate the green space and lakes that have been incorporated into the scheme and perceive it to be a safe place to raise a family. In contrast, there is less choice in shops and fewer public transport options than in Cambridge; some residents, especially those without children or a reason to mix, feel isolated; there is less civic pride and an obvious lack of history or a sense of belonging; is not large enough for a secondary school (needs a population of 6000) and – a key issue – there is a lack of local job opportunities.

By early 2008, 2600 houses had been built, of which almost 30 per cent were 'affordable'. By that date, house-building in Great Cambourne should have been completed and the first house in Upper Cambourne should be occupied. Cambourne (Figure 14.43) has primary schools in Lower and Great Cambourne and a day nursery. Morrisons supermarket and several other retail outlets, including a pharmacy, occupy sites in the High Street (which is in Great Cambourne), along with an estate agent's, a petrol station and the Monkfield Arms pub. The medical practice and public library share Sackville House, and the village also has a dental practice and a new church. The landscaped business park, in the north-west corner near to the interchange with the A428 dual-carriageway, employs over 1000 people and includes the new offices for South Cambridgeshire District Council. Cambourne has a 4-star hotel with 120 bedrooms and a leisure complex, as well as a fully equipped sports centre and community centre, both recently opened. An eco-park has segregated areas for the under 4s and 4–10-year-olds as well as a 'teenage hangout'. There is also a large sports field, skateboard park and golf course. The country park has lakes, which provide opportunities for fishing, a wetland habitat for wildlife, and large wooded areas.

The future

It was planned, before the recent slump in house-building, to complete the last house by 2010. However, an outline planning application for 950 additional homes in Upper Cambourne has been lodged, 40 per cent of which would be affordable. If successful, it would increase the final number of homes in Cambourne to 4250. The application followed a government directive allowing housing densities to increase from 25 to 30 per hectare in an attempt to provide more homes in south-east England (page 400). It is also hoped that a wider range of high street shops will be available by 2010.

Figure 14.41
Lower Cambourne: houses off the village green 2008

Figure 14.42
Upper Cambourne: village green 2008

1. Monkfield Park primary school
2. Vines inter-church primary school
3. Day nursery
4. Morrisons and High Street
5. Sackville House (medical practice and public library)
6. Dental practice
7. Church
8. Business park
9. South Cambridgeshire DC offices
10. Hotel
11. Sports centre and playing fields
12. Community centre
13. Eco-park
14. Sports field
15. Skateboard park
16. Golf course
17. Country park
18. Woodland
19. Cricket ground
20. & 21 Allotments

Figure 14.43

The new village of Cambourne

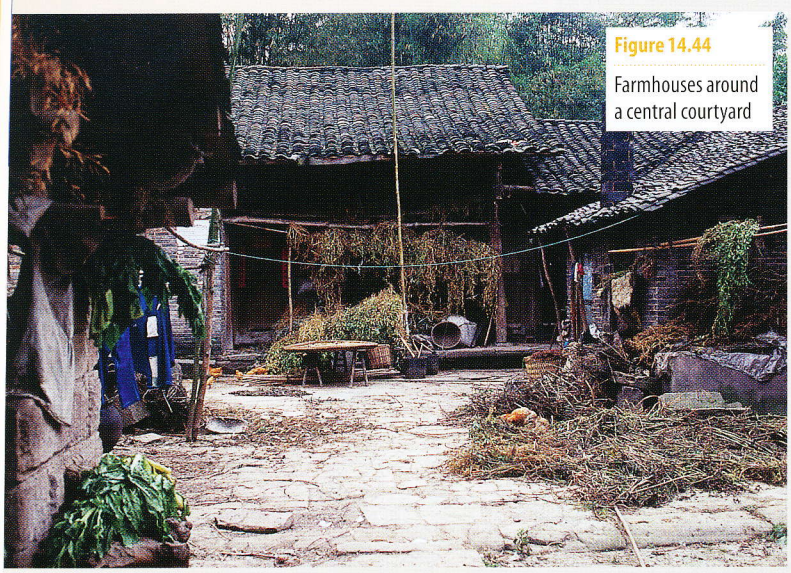


Figure 14.44
Farmhouses around a central courtyard

Figure 14.46
Farmer within the courtyard

B Hua Long – a village in China

Hua Long is situated in the province of Sichuan, 280 km from Chengdu and 180 km from the Yangtze port of Chongqing. Like many other villages in the area it dates from the later Ming period (1550–1644). Between that time and the 1990s, little changed. Today, some 2000 people live in the village, which is fairly small by Chinese standards. Hua Long is linear in shape with most of its buildings strung out along the wide, but poorly maintained, 'main' road which passes through it (Figure 14.47).

Most families in Hua Long are farmers (Sichuan is known as the 'rice bowl of China'), working long hours at little more than a subsistence level (page 477). Many live in farmhouses which are usually grouped together, in typical Chinese fashion, around a central courtyard. Around the courtyard shown in Figure 14.44 are 13 doors, signifying 13 families (Figure 14.45). The address of this group of families – a legacy of the commune days of the 1960 and 1970s (Places 63, page 468), is Group 4 Team 1. Most of the families (Figure 14.46) have lived in these one-roomed houses for several generations. Despite the lack of running water and sewerage, and the presence of several pigs, there is no smell. The wooden or mud-bricked houses have tiled roofs and shutters, or iron bars, across openings that served as windows. There are no chimneys. Central to the courtyard is an area for collecting household waste that can be fed to the pigs. The remainder of the area is used for drying and storing crops, or as a social meeting-place. The houses are soon to be pulled down (the families visited by the author in 1999 wanted copies of the photos shown here as mementoes), and although many of the occupants will be sad to lose their ancestral home, they are looking forward to living in modern, brick-built houses with water and electricity.

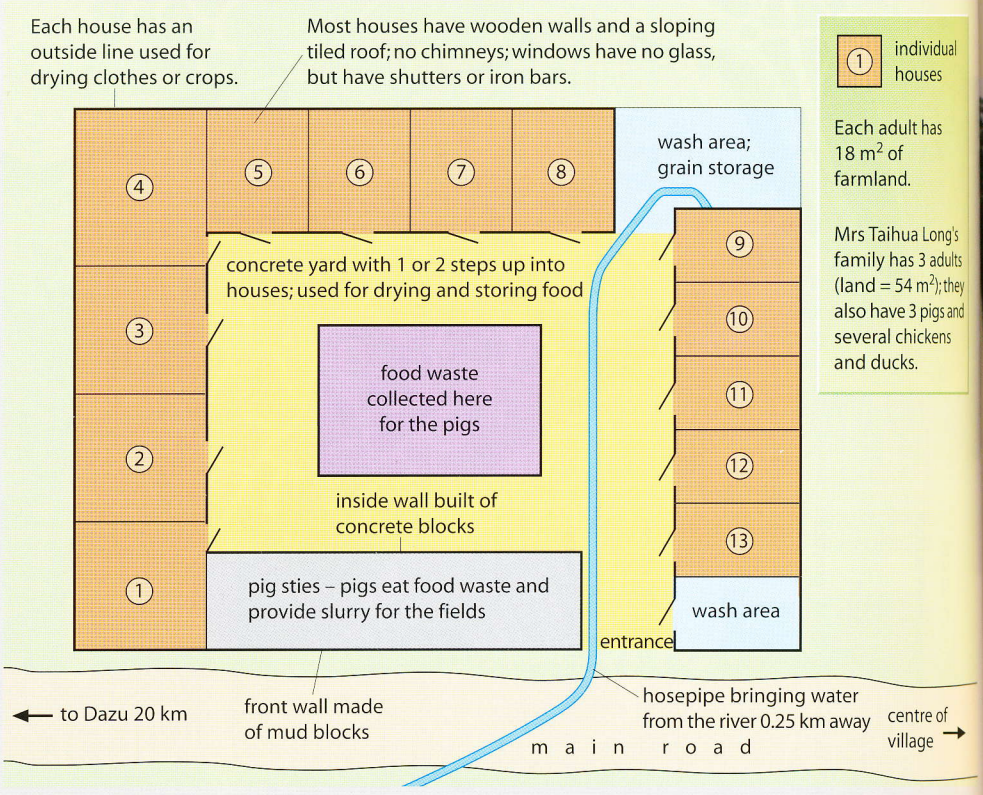


Figure 14.45
Courtyard plan

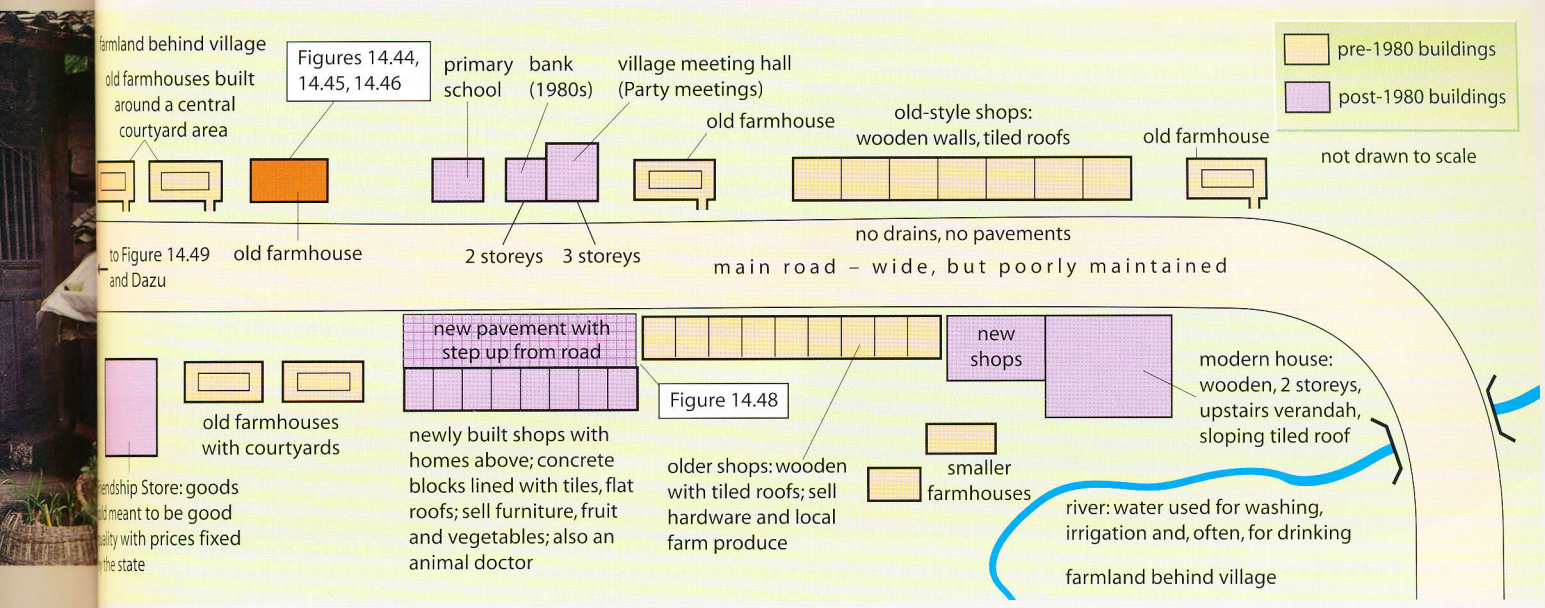


Figure 14.47
Plan of Hua Long

Several changes have taken place in Hua Long in the last 20 years (Figure 14.47). These include the building of a bank (not needed before 1980 as people were not allowed to earn money), an improved primary school for children aged 6 to 12 (funded by the voluntary Hope Project which aims to improve education in the poorest parts of China) and a Friendship Store. Along the main road are several tile-faced, double-storey buildings (Figure 14.48) where newly rehoused people live above shops and small workshops, and several new detached houses (signs of increasing wealth among a few of the inhabitants).

In contrast, the Yangs live, with their two children, in a large, two-year-old brick farmhouse built on the outskirts of the village (Figure 14.49). Mr Yang is a farmer, but he also operates a trishaw 'taxi' in the nearby town Dazu. The family saved enough money, and borrowed the rest from Mr Yang's cousin, to replace their old wooden farm with a seven-roomed, double-storeyed house (though some rooms are only used for storing crops, and furniture is sparse). The Yangs claim that most people in the village are better off and much happier than they were 20 years ago (Figure 16.8).

Even so, some are likely to have joined China's 150 million migrant workers who have left villages such as Hua Long to seek better-paid jobs in the coastal cities (Case Study 19).

Figure 14.48
New shops and houses

Figure 14.49
A new farmhouse

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Countryside Agency, UK National Parks and regional sites: www.naturalengland.co.uk

Early civilisation in Crete: www.dilos.com/region/crete/kn_01.html

Future of rural England: http://ruralnet.org.uk/

Gretton: a Northamptonshire village: www.grettonvillage.org.uk/

Milton Keynes: www.mkweb.co.uk/

Questions & Activities

Activities

1 **a** What is the meaning of:

- **i** the 'site' of a settlement *(1 mark)*
- **ii** the 'situation' of a settlement? *(1 mark)*

b In the past various factors had to be considered by people seeking a settlement site. Explain what each of the following terms means, and why each type of site was sometimes chosen for settlements:

- **i** a 'wet point site' *(2 marks)*
- **ii** a 'dry point site' *(2 marks)*
- **iii** a 'nodal point'. *(2 marks)*

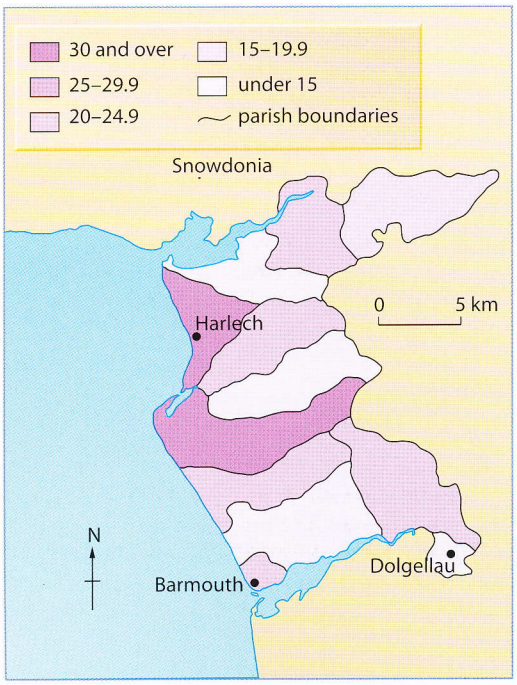

Figure 14.50 Second homes as a percentage of all houses in part of North Wales

c Many towns and cities in the UK have changed their functions many times since they were first built. This has often caused serious planning problems because the original sites are not suitable for the modern functions of the settlement. Name one town or city in the UK that has problems caused by its original site.

- **i** Describe the site, and explain why it was originally chosen. *(4 marks)*
- **ii** Explain why that site causes problems now. *(4 marks)*
- **iii** Describe how the planners are attempting to tackle the problems caused by the site. *(6 marks)*
- **iv** To what extent have the planners been successful in tackling the problems? *(3 marks)*

2 **a** What is meant by:

- **i** the morphology of a settlement *(1 mark)*
- **ii** a nucleated settlement *(1 mark)*
- **iii** dispersed settlement? *(1 mark)*

b Name an example of each of the settlement types listed below. Describe the main features of each of the settlements that you name. Explain why each of the named settlements developed at that location.

- **i** linear settlement *(4 marks)*
- **ii** ring or green village *(4 marks)*
- **iii** commuter village *(4 marks)*

c Study Figure 14.50. It shows the development of second homes in a remote area of rural North Wales.

- **i** Suggest why such a high proportion of houses have become second homes for people who have their main homes elsewhere. *(5 marks)*
- **ii** Explain why the growth of second home ownership can create problems in areas such as that shown on the map. *(5 marks)*

Exam practice: basic structured questions

Figure 14.51
MetroCentre, Gateshead

3 **a** Study Figure 14.51 showing the MetroCentre on Tyneside.

i What evidence supports the view that this site was chosen because it was:

(i) accessible to a large number of people *(5 marks)*

(ii) built on comparatively cheap land? *(5 marks)*

ii What evidence shows that the MetroCentre has been carefully designed to allow customers to have the easiest possible access to all parts of the complex? *(5 marks)*

b Some modern offices are built as close as possible to city centres, whilst others are located on the rural–urban fringe. Compare the advantages of these two types of location for offices. Refer to specific examples. *(10 marks)*

Exam practice: structured questions

4 **a** What do the following phrases mean?

i the 'range' of a good or service *(1 mark)*

ii the 'threshold population' for a good or service *(1 mark)*

b When geographers develop models they always make a set of assumptions before they start to describe the model. Explain three of the assumptions that Christaller made before he developed his central place model. *(6 marks)*

c Explain how first, second and third order settlements are distributed in the $k = 3$ version of the Christaller model. *(7 marks)*

d How useful is Christaller's central place model for modern geographers? *(10 marks)*

5 Study Figure 14.20 on page 398.

a Six settlements are shown outside the main conurbation. Explain why these settlements have developed in different ways. *(12 marks)*

b Choose a region in which rural settlement changes in nature with distance away from a large urban area. Discuss the extent to which this model helps explain variations in the form of settlements in your chosen region. *(13 marks)*

6 Choose a town in a more developed country that shows evidence of its evolution through different periods of history.

a Describe how the present settlement shows evidence of the form of the settlement in previous periods. *(12 marks)*

b Discuss the problems and benefits which the historical development presents for today's inhabitants of the town. *(13 marks)*

7 **a** Study the map of Cambourne on page 413. Referring to map evidence:

i Describe how the planners of Cambourne have tried to make Cambourne an ideal place for people of all ages to live. *(7 marks)*

ii Discuss whether they have been successful. *(8 marks)*

b With reference to examples of settlements in less developed countries, discuss why settlement structures have to be adapted as the functions of the settlements change. *(10 marks)*

8 **a i** Outline how you would carry out a nearest neighbour analysis for an area of 1000 km^2. You have been provided with an Ordnance Survey map (or the local equivalent) at a scale of 1:50 000 (or 2 cm = 1 km). *(7 marks)*

ii If, having completed the nearest neighbour calculation, you obtained a figure of $Rn = 1$, what conclusions could you draw? *(3 marks)*

b i What is the 'rank–size rule' of settlements in a country? *(5 marks)*

ii How can the rank–size rule be helpful to geographers who are studying urban patterns in different countries? *(10 marks)*

Exam practice: essays

9 Study the description of Bickington, Devon on page 399.

To what extent does Bickington illustrate issues that affect all rural villages in the UK at the present time? *(25 marks)*

10 Name **one** town or city that you have studied. Explain how the growth and development of the town have been influenced by the physical geography of its site. *(25 marks)*

11 'Settlement morphology is usually a result of an interaction between physical geography, economic geography and cultural development.'

Discuss this statement with reference to a range of settlements that you have studied. *(25 marks)*