4
Urban Land

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ATTEMPTING to discover the amount and composition of urbanised land in Britain is rather like grappling with the plot of a complex whodunit: witnesses have observed events at different times, in different places, for different reasons, and with varying degrees of attention, and one problem is to establish why their accounts contradict each other.

Sophisticated land use monitoring systems, such as Tyne and Wear's Joint Information System, exist only at the local authority level, and even where they do exist it has generally not been thought to be cost-effective to map the results and analyse the maps. This is despite the clearly recognised need to assess the effects of the national land use planning system which has been in operation for over 40 years (Fordham 1975: 71, 83; Rhind and Hudson 1980: 16; Dickinson and Shaw 1982: 343).

To calculate the areas of the urban land uses of Britain in the mid-1980s we therefore have to consult an assortment of mainly out-of-date surveys, conducted for special purposes, using various methods with varying degrees of accuracy, and producing results which are not directly comparable.

Sources of Evidence

A national spatial referencing system has been created in Sweden, and has been called for by the Chorley Report for the UK (Chorley 1987). The National Land Use Classification was produced by government departments in 1975, but has found little application. The Department of the Environment's Joint Circular 71/74 to all local authorities in 1974 requested annual returns on land use

change classified into the fifteen major orders of the NLUC. Peter Walls, the DoE's Principal Research Officer, however, noted that 'response rates were never sufficient for any one year to provide a comprehensive national or regional picture and the requirement to provide them was dropped in 1979' (Walls 1984: 27).

The DoE turned to the data collected by the Ordnance Survey during the course of its normal map revision process, and in January 1985 began a three (now extended to four) year trial implementation of a system developed by Roger Tyme and Partners (DoE 1986 and 1987). This monitors change in 24 mainly urban categories, and it was intended that two other DoE initiatives would produce results compatible with its new classification. One is a feasibility study, by the same firm, of possible sources and methodologies for a regular national land use stock survey. This remains as yet unpublished, awaiting clarification of the Government's view of the planning system. The other, in conjunction with the Countryside Commission, is a project to develop a method for monitoring landscape change (Hunting SC Ltd 1986), which has produced land use stock information, but mainly for rural areas.

The DoE's only project to date to measure the stock of specifically urban land uses has been the Developed Areas survey of England and Wales, which used air photographs taken in 1969 (DoE 1978). Peter Walls wrote that 'the technique used was not thought worth repeating when air cover was made available by the RAF for 1980/81.' The DoE therefore relies mainly on Dr Robin Best's, and his successor Dr Margaret Anderson's, analysis of transfer of farmland to a very broad 'urban' category recorded in the annual June Agricultural Census (eg. Best and Anderson 1984).

Best's only research on the components of urban land use, and its total stock as opposed to incremental change, applies to 1951 and 1961. He used the local authority Development Plans of the early 1950s and the improved Town Maps of the early 1960s, in conjunction with demographic data, as his source materials. He multiplied the mean urban land provision per person for a 'representative' sample of settlements within each of several settlement categories by the aggregate census population of that category to obtain the total urban area (Best 1981: 59). For its decomposition into the various urban land use categories, he was limited to the rough

classification employed by the local authorities. As for up-dating, he was thwarted by the Town and Country Planning Act of 1968, which made town maps 'an extinct species'.

Two other privately initiated surveys of the nation's land use were consulted for this study. The Second Land Utilisation Survey of England and Wales, inspired by Sir Dudley Stamp's pre-war survey, was directed by Dr Alice Coleman in the 1960s. During the decade some 3,000 volunteers, many of them school children, recorded their field observations on 6,500 six inch Ordnance Survey maps. A further five man years work was involved in sampling 151,000 points on the maps to produce area measurements. Five per cent of the area was then re-surveyed in the 1970s. By 1977, however, only 15% of the coverage had been printed, and in 1979 the Government announced that it would not be completing the job as the classification was 'unsuitable' and the information out-of-date (Rhind and Hudson 1980: 65). Dr Coleman has since become involved in other areas of research, and much data remains locked in computer files.

In 1974 Richard Fordham published estimates of the urban area of the UK and its regions. He systematically point sampled a sample survey of Ordnance Survey maps. It was found to be necessary to sample 124,000 points to produce an estimate of the UK total for which there was a two-thirds chance that it was accurate to within 5% (Fordham 1974: 48). His classification of land uses within urban areas was limited by the information contained in topographical maps, and as fewer observations were obviously recorded for each of the three main sub-divisions than for the urban area as a whole their accuracy was lower — there was a two-thirds chance of the true figure for each lying within 20% of the estimate (Fordham 1975: 76). Fordham saw his emphasis on the need to determine the degree of accuracy of estimates as one of the main contributions of his study, 'on the principle of the devil you know.' With Best's and Coleman's methods the degree of accuracy cannot really be known, but the accuracy of their raw data is bound to be much less than that of the OS topographical maps.

Other estimates of the urban area of England and Wales exist. Tony Champion (1974) used a technique similar to Best's to produce almost identical results. Margaret Anderson (1977) and

Guy Swinnerton (1974) independently point sampled Ministry of Agriculture land classification maps and again produced similar results. These are set out, as given by Best, in Table 4: I, but with one adjustment: Best noted that Champion assumed a two-thirds larger area of land for isolated dwellings, and this extra 90,000 hectares has been subtracted from Champion's total.

Table 4 : I
The urban area of England and Wales in the early 1960s, according to four surveys

	Effective date	*Urban area ('000 ha)*	*% of total area*
Anderson	1962	1,460	9.7
Best	1961	1,490	9.9
Champion	1960	1,466*	9.7
Swinnerton	1962 (?)	1,480	9.8

* See text
Source: Best 1981:44, 63.

The Urban Aggregate — England and Wales, 1961

Best concluded (1981: 77) that 'there is now fairly general agreement that the urban area of England and Wales extended to approximately 10% of the whole land surface in 1961.' In making this statement he had in mind also the surveys by Coleman, Fordham and the DoE (Developed Areas), but to assess its truth we shall have to look into the matter of urban definition, and the problems of comparing different classifications of urban land use. The results of this investigation are set out in Table 4: II.

Each of the surveys in Table 4: I used virtually the same definition of urban land, one determined by the Ministry of Housing and Local Government in its *Report for 1958*. According to Best,

> urban land may be defined as the built-up area with its associated open

> spaces and transport land. In more detail it comprises the so-called four main urban uses ... of housing ['net residential area' — the aggregate plot area of dwellings (including gardens) plus any small associated open spaces and service roads and paths], industry, open space and education, together with the 'residual urban uses' which are listed as 'railway land, waterways, principal business and shopping use and public buildings, together (where applicable) with mineral workings, derelict land, airfields, government establishments, land used by statutory undertakings and miscellaneous uses'. In practice, most opencast mineral workings and military land, in the country as a whole, fall outside the bounds of measured urban land ... It should also be noted that farmsteads, along with other isolated dwellings and development [transport] in the countryside, are recorded as urban land (Best 1981: 29, 59).

The classification of reservoirs was not clear (see Best 1981: 121). It was decided that these probably were not included as developments in the countryside, and that their extent in developed areas was not worth considering.

Fordham suggested that his own definition 'differs only in that he [Best] included some special non-urban uses and this survey excludes public parks' [and cemeteries and allotments] ... 'because no means of identification from the maps existed' (Fordham 1974: 30-31). He also pointed out (p. 5) the impreciseness of Best's categories: 'the four major land uses were defined in Development Plans as being "primarily" in the given use.'

We can only guess at the amount of open space not included by Fordham, and the amount of mineral workings and derelict land included by Best. Coleman gives the most detailed breakdown of urban land, and it is assumed that her figure for 'open space — sport' (82,000 ha) covers Fordham's 'formal recreation land', and that the rest of her open space (95,000 ha), plus allotments (32,000 ha), represents the extent of his omissions. It is also assumed that 10,000 ha each of mineral and derelict land were measured by Best. These areas are added to Fordham's estimates, as is Best's figure for civil airports.

Fordham's major sub-divisions of urban land are unique in that he included the gardens of houses as open space rather than residential land. However, this anomaly may be ironed out by subtracting the assumed figure for 'formal recreation land' above from his 'open land' estimate. This leaves 383,000 ha for gardens,

which has been added to 'buildings' to give, with mineral/derelict land, the figure in Table 4 : II.

All the findings quoted from the Second Land Utilisation Survey, taken from a list supplied by the Survey, have been adjusted to exclude the 43,000 ha recorded by Best (1981 : 88) for urban growth from 1961/62 to 1963/64 (the median date of the Survey). This growth has been distributed proportionately between all the land use categories. The Survey's *Field Mapping Manual* (Coleman and Shaw 1980) shows that the 'settlement supercategory' includes all mineral workings, derelict land, and airfields (ie. military, too), and excludes allotments. All but 34,000 ha of the former have therefore been subtracted, and the latter have been added in Table 4 : II.

Upon the Developed Areas survey Best registered the following verdict:

> The definition of the urban area as a whole, though not of its component land uses, coincided fairly closely with the one used here, except that mineral workings were wholly included .... [Due to the small scale of the aerial photography] it was only possible to map and measure continuous areas of developed land of 5 ha and above. As a result, small developed sites and part of the transport system were not included in the calculations, whereas conversely, some agricultural and rural land was improperly absorbed because of the generalising of boundaries (Best 1981: 64).

The 1:50,000 scale of the maps, and the reliance of photo interpretation on ground cover features, meant that the functional classification was limited to five vague categories, three of which — residential, industrial/commercial, educational/community, etc. — begin with the adjective 'predominantly' (shades of Best's 'primarily'). The other two were transport and open space. On the plus side, however, is the fact that the coverage was exhaustive and the boundaries were digitised for computer processing, avoiding the inaccuracies of sampling (DoE 1978: 1).

In Table 4 : II the following assumptions have been made: the mineral land of the Hunting survey (below) was the measured extent of such land outside 'urban' areas in 1969 — so 30,000 ha has to be taken out (from the industrial category); 10,000 ha was all the derelict land measured (that not surrounded by developed land was ignored, as were reservoirs not adjoining developed areas — DoE

Table 4 : II
Five estimates of the urban area of England and Wales in 1961, harmonised to Best's definition of 'urban' and divided into common land use classes (in '000 ha).[1]

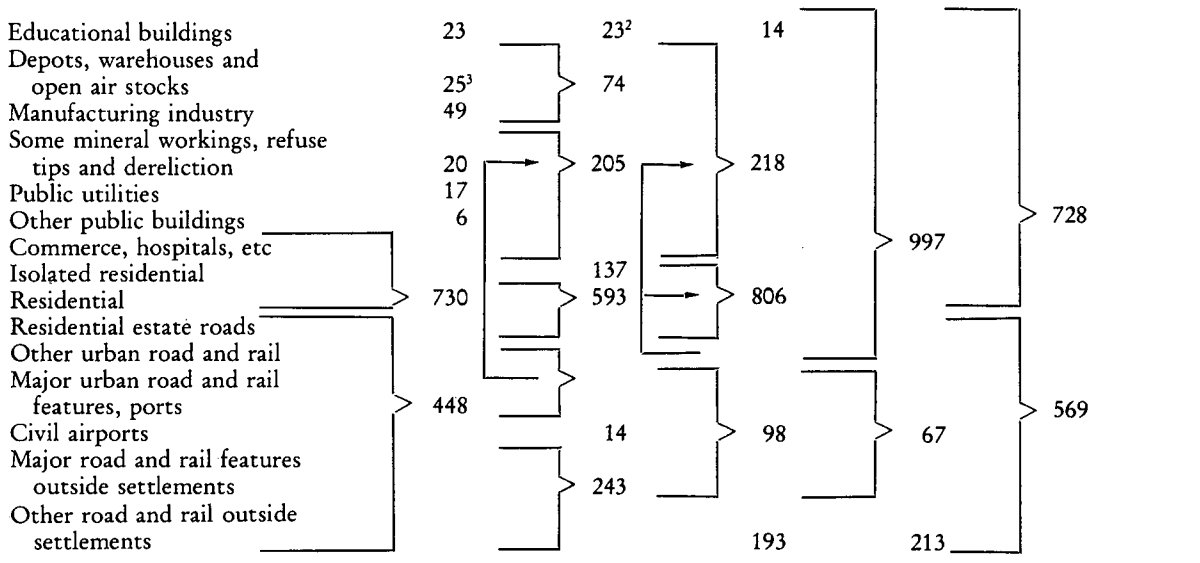

Table 4 : II – *continued*

Allotments	32				32
Open space	177	201[2]	193	197	177
Urban total	1,527	1,490	1,522	1,474	1,506
Urban percentage	10.1	9.9	10.1	9.8	10.0

1. See text for the numerous adjustments to the results published by these surveys.
2. Educational buildings are assumed to have been as in Coleman. Best's extra 22,000 ha is assumed to be playing fields and has been transferred to open space.
3. Best's industrial category is assumed to include depots, warehouses and open air material stocks. Accepting Best's figure, 25,000 ha is therefore transferred from Coleman's commerce and residential.

Table 4 : III
Summary of Table II ('000 ha)

Major class	*Coleman*	*Best*	*DoE*	*Hunting*	*Fordham*
Built up properties	870	842	881	829	728
Transport land[1]	448	448	448	448	569
Urban open space[1]	209	201	193	197	209
Urban total	1,527	1,490	1,522	1,474	1,506

1. Estimates are identical only due to the assumptions explained in the text.

1978: 3-4), which has to be transferred from open space; boundary generalisation and omission of isolated settlements partially cancelled each other out, leaving half of Best's isolated settlements (i.e. 70,000 ha) to be added to residential; 20,000 ha were transferred to open space, because grass areas of less than 5 ha were included in residential; of Best's 257,000 ha of transport land outside settlements (1981: 61), only 50,000 ha, plus 14,000 ha airports, was actually recorded, leaving 193,000 ha to be added; Best's figure of 126,000 ha for urban growth between 1961/62 and 1968/69 must be subtracted from the five classes in proportion to their areas. Many of the quantities chosen are guesses.

The latest land use survey of England and Wales was conducted in 1984. The DoE and the Countryside Commission contracted Hunting Surveys and Consultants Ltd to obtain statistically reliable information on post-war change in the distribution of landscape features (Deane 1986: 346). Twelve thousand air photographs taken around 1947, 1969 and 1980 were obtained for a stratified random sample of sites covering 2.4% of the area. The quality of interpretation was checked on the ground at 340 sites, and also by satellite data for 1984. Five major classes of ground cover were delineated, the fifth of which, 'other land', comprised bare rock, sand, and 'developed land', the latter being divided into five categories: built-up, open space, transport routes, quarries, and derelict. Larger scale photographs than in the Developed Areas survey were used, giving a resolution level of 0.25 ha. Mapping was at 1:25,000, and the maps were digitised for area measurement. However, the measurement of only 74,000 ha for transport routes in 1969, less than in the DA survey, strongly suggests that, once again, most isolated dwellings and rural transport land escaped the net.

Apart from the inclusion of all recorded mineral workings and derelict land, the developed land definition in the final report (Hunting 1986: volume 2, Appendix D, 120-130) is comparable with Best's. Urban growth of 126,000 ha is therefore subtracted from the 1969 data; Best's isolated dwellings and rural transport, minus 20,000 ha and 30,000 ha, respectively — arbitrarily assumed to be actually recorded — are added; 20,000 ha is added to open space for allotments, which, according to the definitions, 'should

usually be part of open country'; and another arbitrary 20,000 ha is added because playing fields and parks are only 'usually included in Urban Limit'.

It can be seen from the bottom line of Table 4: II that Best's conclusion is justified if the numerous foregoing assumptions are anywhere near the mark. It can also be seen that dividing this 10% of the surface area of England and Wales into its constituent parts poses yet more problems.

The Urban Sub-Divisions — England and Wales, 1961

The most obvious problem with sub-dividing the urban area is the contradiction over transport land. Fordham's estimate is 27% higher than Coleman's — a matter of 121,000 ha, or 8% of the urban area. Both sampled 6″ OS maps for the most part, so how could this have occurred?

The most likely explanation is that the contradiction is more apparent than real, because the difference lies well within the bounds of statistical error. Fordham noted that the larger part of his transport land lay outside 'built up areas'. This meant that it was dealt with by his survey of 6″ maps rather than by his survey of the 25″ maps which he used for obtaining the division of urban land uses within administratively urban areas. He wrote of the 6″ survey that 'the sampling density was not intended to permit accurate measurement of the fifteen uses, but to achieve good accuracy for the UR [urban in rural areas] estimate' (1974: 36). Accuracy being related to the size of the class measured, the urban total was obviously more accurate than its constituent parts.

Whatever the class size, accuracy also depends on the number of points sampled. Only 9,000 point observations were made for the Rural Districts of the UK, whereas Coleman must have made nearly 130,000 for those in England and Wales alone. Within Urban Districts about 15,000 and 23,000 observations were made, respectively (though the latter were still on 6″ maps, which, if anything, overstate urban transport land). 100,000 of Fordham's observations were made on one inch maps for the purpose of measuring the urban aggregate alone, not its constituent parts, for which the one inch maps are inadequate.

Fordham's other two umbrella categories — buildings and open land — occur mainly in Urban Districts, and errors in the 6" survey must have had less effect on them. It is clear that his transport category must have been the least accurate of the three. His generalisation for all three that 'it is likely that there is a two-thirds chance of the true figure being within 20% of the estimate' would, therefore, appear to have been optimistic as regards transport land. Coleman's estimate was 21% less, and that was also liable to error (though lower, according to the standard errors presented, by an order of magnitude).

It is worth noting at this point that Hunting and Anderson claimed sampling accuracies of the same order as Fordham's. Also the accuracy of the photo interpretation by both Hunting and the DoE was claimed to range between 90 and 99% (Deane 1986: 347; Rhind and Hudson 1980: 79).

Returning to Table 4 : II, the difficulty of assessing the various classifications is obvious. Table 4 : III is presented as an attempt to make that task easier.

In view of the foregoing discussion of statistical methods, we decided to adopt the transport measurement from the Second Land Utilisation Survey. The figures could be reworked using Fordham's data or a compromise estimate. However, given the lower estimate, certain deductions follow.

First, Fordham's built up properties must be increased by 121,000 ha — he measured very little non-garden open space and rural districts have smaller urban open space components anyway (Best 1981: 68) so open land would hardly have been affected. In round figures, the picture from the five surveys now looks like this:

Built up properties	850,000 ha
Transport land	450,000 ha
Urban open space	200,000 ha
Urban total	1,500,000 ha

(Of course, Fordham's extra transport land may have been partially at the expense of rural land. The urban area may easily have been exaggerated by, say, 60,000 ha. But then his adjusted results would have been further out of line.)

Second, the transport sub-divisions may be roughly quantified, in the order in which they appear in Table 4 : II, as follows: 100, 60, 31, 14, 43, 200 ('000 ha).

Third, a means of reconciling the difference between Best and the DoE over the residential area presents itself. If most of the 60,000 ha approximately of 'other urban road and rail' belongs in the DoE's 'predominantly residential' category, then two-thirds of the difference melts away. The residential area shorn of roads becomes roughly 650,000 ha, and the rest of the built up properties, roughly 200,000 ha.

Urban Growth in England and Wales, 1961-1985

Having analysed the position in 1961 in some detail we must now attempt to bring it up to date. Margaret Anderson has carried the urban total up to 1985 by continuing Best's analysis of the annual returns of farmland transfers to urban use (The Inner City Commission 1987: 32). By this method the 1985 urban area is reckoned to be 1.78m ha or 11.8% of England and Wales.

This result may be checked against the Hunting survey, which was aimed at monitoring landscape change. The results cannot be compared directly due to the adjustments that have to be made to bring the urban coverage into line. But in the analysis above, 23% (300,000 ha) was added to the estimated 1961 equivalent of the 1969 measurement, and if 23% is added to the 1980 measurement, a figure of 1.796m ha is produced, as against Best's/Anderson's 1.756m ha (Best and Anderson 1984 : 22).

The categories covered by the adjustment to the 1961 area, however, would not have grown at the same rate (i.e. by 66,000 ha) as the rest of the urban area. They consisted of isolated dwellings and farmsteads and transport outside settlements. The planning system probably kept the former fairly static, and the contraction of the railways probably counterbalanced the extension of the motorways. A third of the 22% growth may have occurred, which would bring the Hunting and Best estimates into line.

Fordham gave it as his judgement on Best's use of the annual returns from all farmers that 'The procedure has consistency and continuity. For this reason it may be regarded as having fair accuracy' (Fordham 1974: 51).

The Urban Composition in 1985

Regarding the composition of the urban area in 1985, one has to look for clues as to how the 1961 picture may have changed. The DoE's trial project on monitoring land use change has produced data for 1985 and 1986, and unlike the Hunting project is particularly strong on the urban sector. But the time span is narrow and not necessarily representative, the coverage is for England alone, and there is the usual problem of having to merge somewhat incompatible land use classifications.

In Table 4 : IV the land use classes of Tables 4 : II and 4 : III and of the DoE project are roughly consolidated. Residential estate roads have been included in residential, and utilities with transport. To achieve an approximation to the latter's 'community services' category, hospitals have been extracted from their place in column 2 of Table 4 : II and combined with educational buildings and other public buildings. For this purpose the area of the National Health Service given by Dowrick for 1972/3 was used (Dowrick 1974). Fortunately, government offices are combined with industry and commerce in both classifications.

Another problem was the treatment of 'waste land'. This class has no equivalent in Table 4 : II, derelict land being only a small proportion of it. It was decided that, as it was included in the other classes and only an indication of the growth of those classes was needed, waste land could be safely subtracted from the DoE figures.

The 280,000 ha addition to urban land between 1961 and 1985 was then allocated to each class in the same proportion as its share of the addition to urban land in 1985 and 1986, producing its calculated area for 1985.

The Area of Commercial Land

The land use classes of most interest to this study — the highest value ones — are also the smallest and hence the least accurately measured at the national scale. In fact, no attempt has yet been made, or will be in the foreseeable future, to measure the area of commercial land in the country. However, at a more local level the

Table 4 : IV
Estimated change in urban land uses, 1961-1985

Class	(1) *1961 stock ('000 ha)*	(2) *1961 share (%)*	(3) *Share of 1985-1986 urban growth (%)*	(4) *% in (3) applied to urban growth 1961-1985 ('000 ha)*	(5) *1985 stock, (1) + (4) ('000 ha)*	(6) *1985 share (%)*
Community services	53	3.5	4.0	11.2	64.2	3.6
Industry and commerce	131	8.7	8.9	24.9	155.9	8.8
Residential	750	50.0	66.5	186.2	936.2	52.6
Transport and utilities	366	24.4	11.2	31.4	397.4	22.3
Outdoor recreation	200	13.3	9.4	26.3	226.3	12.7
Total	1500	100.0	100.0	280	1780	100.0

Source: Tables 4:II and 4:III above; Dowrick 1974; DoE 1986: Table 1; DoE 1987: Table 1.

Table 4 : V
The area of commercial and public buildings as a percentage of urban area in several local studies

	London Borough of Tower Hamlets (1977)	*Leeds (developed) area, 1976)*	*Mersey-side County (1976)*	*Thames Estuary (1972)*	*Cleve-land County (1978)*	*Surrey (1978)*	*Bucking-ham-shire (1977)*
1. Public buildings and institutions	7.3	8.8	3.8	45.3	3.9	3.5	3.5
2. Commerce	11.6	4.3	3.4		3.2	2.8	2.5
3. Residential	11	40	38		33	49	40
4. % of area urbanised	100	100	56	49	40	29	16
5. '000 people per km²	7.3	5.7	2.3	—	0.9	0.6	0.3
6. Row 4 divided by row 5	14	18	24	—	44	48	53

Sources: Dickinson and Shaw 1982:346; Rhind and Hudson 1980: 140-141; Second Land Utilisation Survey of Britain, King's College, London; Pears Cyclopaedia 1980.

obstacles are not so great and there have been a number of studies which have thrown light on this facet of urban areas.

The Second Land Utilisation Survey's re-surveys of the 1970s, for example, became more urban orientated and distinguished commercial areas and all public buildings from residential land. Dr Coleman and Mrs Janet Shaw have kindly made available from the Survey's computer files at King's College, London, hitherto unpublished data on these land uses in Surrey and Buckinghamshire. In Table 4 : V this is combined with results from their surveys of Merseyside and Tower Hamlets, and with information from the Cleveland County Planning Department and the School of Geography at the University of Leeds.

In order to assist interpretation of the table, the sets of figures have been ranked according to the degree to which they focus on central areas, as measured by population density and percentage of the study area urbanised. Obviously studies which are specifically of central business districts will include more commercial land than those which have a wider focus. An attempt must be made to decide which data set is the most representative of England and Wales as a whole.

The population density of England and Wales is 330 persons/km^2, and roughly 12% of its surface is urbanised. From an inspection of Table 4 : V it would seem that Buckinghamshire might be the choice, but its population density looks rather low in relation to its urban area, suggesting an under-representation of larger urban centres. If the percentage of area urbanised is divided by population density (in thousands per square kilometre), as in the table, then England and Wales' 36.3 is somewhere between Merseyside and Cleveland. It is proposed that this position is correct, and that public buildings occupy 3.8% of the urban area of England and Wales and commercial buildings 3.3%. Janet Shaw does point out that there is 'a slight difference in mapping technique' between the Merseyside and Surrey/Bucks surveys, but the percentages chosen leave an area for industrial land which allows for reasonable growth since 1961.

'Commerce' is taken as comprising roughly the same categories as appear under that heading in the rating statistics: shops, offices, public houses, hotels, restaurants, warehouses, commercial garages

Table 4 : VI
The Composition of Commercial Land in Three Local Studies

	Wholesale/storage (%)	*Retail* (%)	*Office* (%)	*Total* ('000 ha)
Cleveland	68.8	28.2	3.1	785
Merseyside	27.3	69.7	3.0	1,238
Leeds	43.3	48.4	8.4	548

Source: As in Table 4:V.

Table 4 : VII
Urban land uses in England and Wales in 1961 and 1985, extended to Great Britain in 1985

Class	*England and Wales, 1961*		*England and Wales, 1985*		*Great Britain, 1985*	
	('000 ha)	*(%)*	*('000 ha)*	*(%)*	*('000 ha)*	*(%)*
Commerce	34	2.25	40	2.25	46	2.25
Industry and warehouses	73	4.9	93	5.2	106	5.2
Public utilities	17	1.1	20	1.1	22	1.1
Public buildings and institutions	58	3.9	68	3.8	77	3.8
Some mineral workings/ dereliction	20	1.3	20	1.1	22	1.1
Residential	650	43.3	810	45.5	920	45.5
Residential estate roads	100	6.7	126	7.1	144	7.1
Other urban road and rail, ports	91	6.1	99	5.6	113	5.6
Road and rail outside settlements, civil airports	257	17.1	278	15.6	343	16.9
Open space	200	13.3	226	12.7	230	11.4
Total urban	1,500	100.0	1,780	100.0	2,023	100.0
Urban as % of total area		9.9		11.8		8.8

and other minor land uses. Boarding houses and lock-up garages form an indeterminate area as far as this study is concerned on the border between commerce and housing.

Warehouses are usually situated on industrial estates and valued accordingly. They should therefore be classified separately from shops and offices, as in Table 4:II. Table 4:VI sets out the information on these uses in the studies cited above. It is probable that Cleveland County (which includes Teeside) has an unusually large proportion of land devoted to storage of material stocks for heavy industry, and that the county of Merseyside is more representative of the whole country than is the city of Leeds. 32% has therefore been taken as the proportion of commercial land to be classed as industrial, which means that commercial land occupies 2.25% of the urban area and industry and storage 5.2%.

Table 4:VII applies these percentages to Table 4:IV assuming no change between 1961 and 1985, and sub-divides transport and utilities on the same assumption. It also extends the results to cover Scotland, which is yet another hazardous undertaking.

The Urban Area of Scotland

Only Fordham and Best have ventured into this uncharted territory, the former relying particularly on his 6″ maps, the latter on 'essentially proxy figures derived from English and Welsh material' (Best 1981: 63). Predictably, Fordham's Scottish urban total for 1961, 59% of which was transport, was 12% higher than Best's. An over-measurement of transport land might not have affected the UK total, but it would have affected its regions, especially Scotland, Wales and Northern Ireland. Fordham gave the likely two-thirds confidence limits around his Scottish figure of 225,000 ha as plus or minus 31-35,000 ha (1974: 45, 47). Best's 199,000 ha, therefore, would seem to command a modicum of credibility.

Given Best's estimate, it only remains to bring it up to date. If the same relation between Scotland and its neighbours held in 1985 as in 1981 and 1971 (Best and Anderson 1984: 22) then the urban total was 243,000 ha. Looking at Best's division of this land between different settlement categories (1981: 61) there would appear to be no reason for expecting a markedly different percen-

tage of valuable commercial land. A top heavy hierarchy was counter-balanced by the wide expanse of transport land; the index number in the bottom line of Table 4 : V would have been 46.7. An adjustment has, however, been made to reflect the contrasting amounts of transport land and urban open space in Scotland.

The Need for a Land Use Monitoring System

Table 4 : VII closes this investigation. But it will have become apparent by now that unlike in the average whodunnit all the loose ends have not been tied up. The very need for this inquiry has shown that the official process of monitoring the impact of an official function — land use planning — falls far short of what is required.

Rhind and Hudson (1980: 17) have summarised the difficulties of implementing an ideal monitoring system. Collecting data in a form detailed and flexible enough to be suitable for all potential uses is an expensive process. It would be necessary for the State to create a standard spatial referencing system and a standard land use classification, as called for by the Chorley Committee. The basic spatial unit measured would have to be small enough to be uniform both in form and function, and the monitoring process would have to be continuous. In this way whatever aggregations of the units might be required — towns, counties, regions, etc. — might be compared over time and space. Many of the elements of the system, however, are already in place at the local authority level.

The task is one that most national governments have not undertaken. It is clearly one that in the interests of better planning and better use of scarce resources the Government of Britain should be able, and willing, to undertake.