

The Role of the National Topographic Survey of Great Britain

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Introduction

In the English language, the word 'surveyor' covers a multitude of skills. Proof of this, if proof were needed, is to be found on all sides within this room, although, not even this great Institution encompasses all the variants of this versatile breed. However, among those that it does enfold we may find, after some patient searching, representatives of the species known as land surveyor. Their function is defined in our By-Laws as the measurement and delineation of the physical features of the Earth, and it may surprise you to know, if you do not know it already, that for this Herculean task, the membership of the Institution numbers a mere 660 which includes those whose speciality is hydrographic surveying. Among these relatively rare beings there are, at any one time, 25 or so who hold professional appointments in the Ordnance Survey and whose duty it is to direct and manage the national topographic survey of Great Britain. It is with that national survey, and the part which it plays in the day-to-day life of our country, that this paper is concerned.

A topographic survey may be defined as a detailed description of the natural and artificial features of the Earth, and in this context I mean visible features on the land surface. The detailed description is usually presented in graphic form, as a map, which most people find convenient and reasonably easy to understand; but modern technology has given us alternatives, as we shall see in due course. The survey defines not only the position but also the nature of the various features, and whereas the determination of position is a matter of applying an appropriate technique, and is relatively straightforward, the choice of what to survey, and what degree of refinement to use when describing the nature of the chosen feature, is a subjective matter related to the probable uses to which the survey is to be put, and it frequently gives rise to passionate argument among cartographic aficionados.

A fully developed national survey

is a vast store of information. It should be thought of as a national asset, which is what it is. Other things being equal, the larger the scale of the survey the greater and more valuable is the quantity of the information stored; and, of course, the greater is the cost of acquiring it. If this asset is to be a worthwhile investment, the constituent data must be suitable for a wide range of uses; must be presented to a uniform and recognised standard; must be kept up-to-date; and must be readily available whenever and wherever it is needed.

A country which requires a service of this kind has no option but to provide it out of public funds, because the very conditions just imposed make it impossible to recover the whole of the cost from revenue, let alone to show a profit. I am not saying that no survey can ever be commercially viable. It is of course quite possible for a survey to pay its way in the commercial sense, even if made at a very large scale and completed to the highest standards, provided it is commissioned specifically as a tool to aid the planning and execution of a particular venture, say a construction project; indeed in such a case, not only should the survey save money, but the work could well be impossible without it. But in a national survey one cannot pick and choose the profitable areas nor can one tailor the specification to suit some special requirement, and so the end products cannot all be expected to show an immediate return.

A map of a very remote place, for example, which has cost several thousands of pounds to make, may never recover in sales more than a few tens of pounds. Yet it has a latent value which could be very great indeed if interest suddenly developed in that particular place and decisions or action had to be taken which depended upon the topography. Despite formidable technical advances in recent years, it still takes time to make a map where none has existed before, and time can be expensive. The instant map can only be realised by making it before it is actually needed, and the immediate possession of the information required can then have a value far greater than the original cost of the survey.

Origins of our National Survey

During the 18th century, the concept of a national survey began to take root in the minds of farsighted and scientifically minded men in several countries.

Britain, although not actually the first in the field, was among the first. The foundations were laid towards the end of the 18th century, and a little over 100 years later she was the possessor of a large scale survey which had no equal, and still has no equal, anywhere in the world. Many men played their part in achieving this but, in this year of 1976, we ought most particularly to remember a Scotsman, William Roy, who was born exactly 250 years ago near Carlisle in Lanarkshire and who, as a Major-General in the Royal Engineers was in later life to be the persuasive and successful advocate of a national survey for Britain. Sadly, he died in 1790, one year before the Ordnance Survey began, but he is always spoken of as its founding father and there is no doubt that we owe our early start to his vision and determination, and to his highly developed professional skill as a surveyor.

Largely because defence was uppermost in people's minds at that time, the first Ordnance Survey map, published on 1 January 1801, was of the south-eastern part of the country at a scale of one inch to the mile. Napoleon, as you will recall, posed the threat. But in 1824, long before the whole of Britain was covered at this one-inch scale, attention was diverted to Ireland, where a survey at six inches to one mile was put in hand, principally for land valuation. The evident benefit of the resultant mapping for social and administrative purposes led, in 1840, to a decision to adopt six inches to one mile as the basic scale of survey for the whole of the Kingdom.

It is, I think, worth remembering that reasons other than defence began to influence our national mapping policy at such an early stage in its development; a direct consequence of this was the choice of scales far larger than those which are useful for purely military purposes. No sooner, indeed, had the six-inch survey begun than arguments, centering around the incipient registration of property, were put forward propounding the need for maps at a scale of 25 inches to one mile (ie 1:2500), complemented by still larger scales in towns.

Argument, indeed, was the operative word, and it was not all one-sided, for the cost of such a venture was clearly going to be great. However, after a agonising period of indecision, Treasury agreement was given in the mid-1850s to a survey at this scale, while the six-

inch scale continued to be the largest in mountainous and Moorland areas. The surveys of towns were to be at various scales, notably 1:500; but after 1892, these were all stopped except in London, and local authorities in other towns who wanted a scale larger than the 25 inch had to pay the difference in cost. By 1893, when the 25 inch survey was completed, Britain had a substantial topographic asset, unique in its scope and in its high standard. But, alas, its original quality was not long maintained. During the 50 years which followed, and particularly between the two wars, a number of factors including financial stringency prevented the Ordnance Survey from keeping pace with urban and rural development, so that the value of this national asset was considerably eroded as the maps fell out-of-date. In the towns, the disinclination of many local authorities to pay for the upkeep or extension of the larger scale town maps had a similar effect.

Eventually, in 1935, a Departmental Committee under the chairmanship of Lord Davidson was appointed to consider what steps should be taken to recover the situation and to meet current needs. As well as proposing ways in which the basic surveys should be re-established, this Committee made the unprecedented and far-reaching recommendation that provision should be made for their systematic and continuous revision. They saw with stark clarity the need to avoid the mistakes of the past which had led to valuable surveys being allowed to deteriorate through lack of revision, and they sought by this radical proposal to enable the Ordnance Survey to keep permanently abreast of development as it occurred.

The modern basic scales

The recommendations of the Davidson Committee were put into effect after the second world war, and have been the foundation of departmental policy ever since. As a result, we now have three basic scales of survey in Britain, which are:

1. In cities and large towns, a post-War survey at 1:2500 scale which is complete and up-to-date.
2. In smaller towns, villages and developed rural areas, a survey at 1:2500 based on the surveys of the last century but revised and published in a modern format. This process began soon after the end of the War, and will be completed by 1980.
3. In mountainous and moorland areas, a post-War survey at a scale of 1:10,000 (or, pre-1969, six inches to the mile) which will be completed by 1980.

The use of three basic scales produces a patchwork effect over the whole country, which might be thought inconvenient but in practice causes few problems. In any case, where the two larger

scales are basic, 1:10,000 scale maps can be made by an office operation without further survey, and so the whole country can be and in due course will be covered completely by maps at this scale, all of which will bear contours.

At all three scales, as and when each new map is published, any subsequent development within its confines is kept under surveillance and the survey is revised at the earliest opportunity consistent with economical practice. The large scales operation is thus a continuing task, and taking all aspects of surveying, cartography and publication into account, it occupies about 75 per cent of the total resources of the Ordnance Survey. If in this paper the national survey is to a great extent identified with the completion and maintenance of these large scales, it is on account of that one simple fact. I do not imagine that this will cause any astonishment to professional people, but it does seem to surprise many others who think of the Ordnance Survey only as producers of the 1:50,000 map because that is the one which sells most widely and which causes most public interest.

The smaller scales do indeed have a part to play in the management of the nation's resources, but in a different way from the large scales, being more generalised and less detailed, and therefore better suited to broad studies over wide areas. However, with one or two exceptions, such as the classification of roads, they contain no information which has not stemmed in the first place from the large scales.

It is these large scale surveys which may truly be described as part of the essential infrastructure of national life, being used as they are for a wide variety of purposes, in the private sector mostly by professional persons, and in the public sector by many departments of central government as well as by local authorities and statutory undertakers.

Specialised information

A map is the usual end product of a survey, but it is not the only one. Before a detail survey can even begin, we need a framework of selected points, precisely co-ordinated, to control the whole operation, so that the scale, direction and absolute position on the Earth's surface of all the multitudinous details recorded on the finished map shall be as accurate at the end point of the survey as they are at the beginning. These co-ordinated points are of various types, but a common example is the trig point which in Britain is marked by the familiar concrete pillar. We also need a framework of precise heights all over the country, related to sea-level, and these are provided by bench-marks. These fixed or heightened

points are all marked in a suitably permanent fashion, so that they are available for others to use in the future. Thus an element of the survey is presented in numerical rather than graphical form, the principal users being land surveyors or engineers who wish to relate a new product to the existing survey datum.

Area measurement is another numerical by-product. Because of certain statutory requirements, and in order to meet the various needs of several government departments, we have to calculate the total areas of counties, London Boroughs, districts and parishes in England; of counties, districts and communities in Wales; and of regions, islands areas and districts in Scotland. In each case, the total is broken down into three categories, namely land, inland water, and tidal water and foreshore. The procedure is to divide the land up arbitrarily into parcels, and to measure the area of each one. These areas can then be aggregated to give the required totals, but they are also recorded separately, parcel by parcel, on our 1:2500 maps. A parcel typically, may be a field, a wood, a pond, a stretch of road, or some other identifiable entity; but parcel boundaries need not necessarily coincide with property boundaries, and if they do it will be purely fortuitous.

The depiction of the boundaries of administrative and electoral subdivisions of Great Britain are a particular and most important part of the national survey. It is interesting, indeed, to note that the Ordnance Survey Act of 1841, which is the primary statutory authority for the operations of the department, directed that public boundaries should be defined as an essential part of the survey.

While on the subject of special features, we must not forget archaeology. It may perhaps be stretching things rather far to describe archaeological sites as a national resource, but they are certainly a national heritage in which the general public is taking an ever-increasing interest. In recent years there has been a vast number of new discoveries and our policy now is to show on our maps only those features which are visible on the ground, at the same time maintaining a record of all sites. This record is kept in a card index, and also in graphical form as manuscript annotations on large scale maps. Copies of these cards and maps can be, and are, made available to planning officers in local authorities, one consequence of which will be, one hopes, to avoid the unintentional destruction of some antiquity during the course of development work.

First of two parts. For the next issue, we hope to obtain map samples.