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METHOD OF SURVEY SUITABLE FOR REGISTRATION PURPOSES

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by

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Introduction

1. Most countries have found it necessary to adopt routine procedures for dealing with rights to land. There are three main systems:

(i) Private Conveyancing,
(ii) Registration of Deeds, and
(iii) Registration of Title.

All three systems are used by different countries and in various forms and combinations.

2. It is universally recognised that Registration of Title is superior to the other systems mainly because the method of recording used in Registration of Title does not depend so much on documents and human beings which are subject to movement and mistaken identity, as on the parcels of land affected, which are immovable, indestructible and precisely definable.

3. Before a system of Registration of Title is introduced there are two requirements which must be fulfilled:

a. The establisment beyond all reasonable doubt of the ownership of the properties to be brought on to the Register, by systematic adjudication;

b. The unambiguous definition of the extent of the properties, by cadastral survey.

4. The cadastral surveyor may be called upon to carry out both of these functions but more usually he will undertake the cadastral survey only, leaving the adjudication to be carried out by someone who is appointed solely for this purpose.

Cadastral Survey Methods

5. Cadastral surveys are undertaken in order that plans can be prepared to support the Register. The work involved in producing plans to support the register should be seen in its proper perspective. It is a service which is provided by surveyors to landowners (or the registrar) in order to satisfy the registrar's requirement that parcels which are entered in the register can be unambiguously defined.

6. There are various ways of providing this service, the two extremes being as follows :

(i) Definition by mathematically co-ordinated monuments

The surveyor places monuments which precisely delineate the parcel and carries out a survey of the monuments basing his survey on the control (triangulation or traverse) provided by the State for this purpose. The monuments are mathematically co-ordinated and a deed plan is prepared which must be authenticated by the State Survey Authority. On receipt of the deed plan the Registrar makes the appropriate entry on his register.

When properites are brought on to the register for the first time the adjudication of the ownership must be complete before the surveyor can start his work by placing monuments. In some countries when properties are brought on to the register for the first time the landowners are called upon to pay a subsidised fee. When Registration of Title has been completed then subsequent mutations are carried out by the surveyor and in general the landowner is required by law to obtain the services of a licensed surveyor. In the latter case, all the costs of the survey (and authentication) are met by the landowner.

(ii) Definition by topographical detail

The State Survey Authority prepares large scale plans showing all topographical detail. The Registrar uses these plans to prepare index plans of properties and explanatory notes are entered on the plans in cases where property boundaries do not coincide with the physical detail shown on the plans. The Registrar uses these property index plans to define properties. The cost of the survey is paid by the State except in very rare instances where the landowner requires his boundary to be 'fixed' in relation to permanent physical detail.

The adjudication is usually carried out after the topographical survey since the adjudication officer compares the situation on the ground with what has been shown on the plan.

7. Protagonists of the various methods tend to find it difficult to accept anything good in any method but their own and the object of this paper is to examine the advantages and disadvantages of the two extremes to see if any suitable system can be recommended for those countries not already committed to an existing system of cadastral survey. It is arguable that when dealing with a country's most important natural resource, the land, the system to be adopted should be such as to be susceptible to no error. However, it is also arguable that to devise such a system would entail more expenditure than a country could afford and that it is better to use a cheap method of survey and to initiate an indemnity fund to compensate the exceptional case where a landowner suffers because of sub-standard survey. The latter system has been introduced into many countries with success.

The two alternative systems

8. The following are the main arguments for and against the two methods.

(i) Monument method

(a) For The property is defined precisely and unambiguously. It can be reinstated at any time by reference to survey records and consequently boundary disputes can be determined by qualified surveyors without difficulty.

Against The survey is not as precise as appears at first sight. The control is often not of a high standard, and is sometimes out of sympathy with the monuments defing the property, particularly when it was carried out after the property survey had been carried out. If it had not been, the control would probably have been useless due to subsequent development which would have made control points no longer intervisible, and which in some instances would have necessitated the removal of the control points. Diffrent co-ordinates can be obtained by use of different control points.

The legal adoption of the 'ephemeral' boundary between monuments which are often missing can cause disputes when a surveyor points out that the boundary does not coincide with the physical boundary (hedge, fence, wall) which has until that time been happily accepted by both sides. When missing monuments have to be replaced (by a licensed surveyor) it can be quite costly. Most, if not all, countries using monuments accept that physical positions of monuments (if undisturbed) take precedence over positions re-established from co-ordinates if the two are not in agreement.

(b) For Initial surveys can take place in a spasmodic manner as and when it is required that a property should be registered.

Against Cadastral Surveyors are always in short supply and delays are always caused by having to wait for the licensed surveyor to carry out the survey and for the Government to authenticate the survey. Spasmodic surveys are expensive, time-wasting and create difficulties of adjudication.

(c) For The survey in carried out for a specific purpose and this achieves the objective more quickly.

Against It is a waste of time and money to carry out an expensive survey for one purpose only. The resultant plan is of use only to the registrar since it does not show any topographical detail.

(d) For The survey is carried out by professional surveyors who can be relied upon.

Against The survey Act usually requires the surveys to be carried out by professional surveyors and this is a misuse of professional surveyors since technicians working under professional supervision could carry out most of the surveys. The exclusive use of professional surveyors can put up the cost.

(e) For Once the properties have been brought on to the register the landowner pays the full cost of survey. This cost in general is much less than the legal fees the landowner is called upon to pay.

Against The cost is still much too high and tends to inhibit transactions and the use of the register.

(f) For The system is conducive to checking so that errors can be discovered by the checkers.

Against A survey can never be checked wholly in the office. Some ground checks must be made if the checkers wish to be absolutely certain of the accuracy of the survey.

(ii) Topographical Survey Method

(a) For The use of physical detail in hedges, fences, walls, is more practical than beacons since landowners know exactly where their boundaries are and it will subsequently be very difficult for one or other of the landowners to move the boundary. In the vast majority of case it is not necessary to know the position of the boundaries with any greater accuracy.

Against The boundaries could only be replace to plottable accuracy of the plan. A natural holocaust could remove all the boundaries with dire consequences. In many areas there is no physical detail of the types listed. In addition, the parcel definition achieved is only as good as the relationship between the pattern of land ownership and the physical features the surveyor can record. If the boundaries do not coincide with physical features it is outside the surveyor's control since any failure to point out the discrepancy will be at the adjudication stage. It is likely, nevertheless, that the surveyor will be blamed.

(b) For The large scale plans serve many purposes being invaluable for planners, engineers, etc. They are necessary even if they were not required by the Registrar.

Against Why should the State pay for the production of maps for private landowners and developers?

(c) For: The system allows registration to take place in a methodical manner in that when the map is complete for an area the Registrar can register any property in that area, so that all property owners eventually benefit. In any case, as previously stated, the maps are required for many other public purposes.

Against It does not allow for spasmodic registration and many years might pass before all the maps are complete.

(d) For The method is cheap and is at no cost to the landowner. It does not, therefore, inhibit land transactions.

Against It is not as cheap as it appears at first sight. It involves the survey of the whole country at a large scale and much of this mapping might never be required for land registration purposes. It is all done at the taxpayer's expense for the benefit of individual landowners.

(e) For The boundaries are shown to plottable accuracies at appropriate scales which is adequate for the purpose for which the plan is produced.

Against There can be no absolute guarantee of accuracy even at plottable scale without an extensive system of checking. There is no easy foolproof checking system which can be used for a graphical survey.

(f) For The constinuous revision necessary to keep the large scale plans up to date can be carried out by technicians.

Against Continuous revision is expensive even if carried out by technicians. It can also be considered wasteful since all of the detail is constantly kept up to date to cater for the occasional changes which are required by the Land Registry.

Factors which must be considered

9. A country about to introduce Registration of Title must consider many factors before deciding on the method of cadastral survey to be used to support the Register. Some factors are as follows:

(i) Initial Registration To speed up initial registration it may be necessary to adopt a simplified form of survey to get all properties on to the Register and subsequently introduce better standards for mutations and transactions.

(ii) Cost of Surveys It is probable that the State will not be able to pay for an expensive initial survey. It is also possible that if the cost is passed on to the landowners, they will not be able to afford to pay for a high standard. A realistic standard must be set.

(iii) Value of Land This factor is related to (ii) above. Value of land is liable to great variation and standards of survey can be adjusted accordingly. For instance, it may be necessary to adopt different standards in urban areas from those in rural areas. If land values are very low and land is unproductive, the introduction of Registration of Title must be of very doubtful benefit and serious consideration should be given as to whether Registration of Title should be introduced.

(iv) Description of Parcels In some countries it is customary to sell by parcels which are well defined by physical boundaries and are therefore completely identified. In others, it has become the custom to sell by precise units of area (to 3rd or 4th decimal) which necessitates a higher standard of survey. It is arguable that in the rural areas of many countries there are few permanent physical boundaries and that therefore there is no alternative to definition by area, especially on initial allocation of State land.

(v) Control and Reference Marks It is probable that not enough control will exist to undertake a systematic cadastral survey. Whatever system of survey is used it will be necessary to undertake a comprehensive control network by triangulation or traverse broken down to 2-3 kilometres in rural areas and much more dense in urban areas. The control points must be permanently monumented and should be in sympathy with the ruling triangulation. It is false economy to inadequately beacon control points. However, limiting factors of time and finance may prevent the establishment of a comprehensive control system in sympathy with the ruling triangulation and it may be necessary to adopt a local system. When circumstances allow, it is desirable that any such system be connected to the country's ruling triangulation and the necessary transformation of co-ordinates undertaken.

(vi) Availability of Surveyors Professional surveyors will possibily be in short supply especially those indigenous to the country. It may therefore be necessary to adopt a system which needs a minimum of professional supervision and which can make use of technicians who will be easier to recruit and train.

(vii) Existence of Deeds Much will depend on existence of deeds for properties since the method used in describing properties on existing deeds might pre-empt, to some extent, the method of survey to be used.

(viii) Existence of boundaries In some countries boundaries may be non-existent. For instance, in areas used by pastoral people where cattle have enjoyed unrestricted grazing. In such cases it is difficult to see an alternative to placing some monuments, although it is perhaps possible to utilize hilltops, streams, etc. for boundary definition. It might also be worth investigating the possibility of the State encouraging landowners to demarcate their plots.

(ix) Leases of State Land It is possible that the State will require a more precise definition of parcels which it leases and that a higher standard of survey will be required. In most cases no physical boundaries will exist and there will be no alternative to some form of physical demarcation.

General Conclusions

10. Cadastral survey is costly no matter what method is used, although some methods are much more expensive than others. Any country intending to introduce Registration of Title should carefully examine the economic effect that such a system would have on the various areas within the country. If the value of the land and the development potential is small, then Registration of Title is probably not worth introducing. Some countries have embarked on an expensive programme of Land Registration for land much of which is plainly not worth registering.

11. If the land in a certain area is considered to warrant the introduction of Registration of Title the various factors appertaining to the land should be determined and listed. It is probable that a careful examination of those factors which cannot be altered will point the way to what kind of cadastral survey shall be used.

12. If a system of monumenting is to be used then alternative methods of survey should be considered. The alternatives range from the use of theodolite and tape, including short distance EDM equipment, to compass and tape and perhaps even graphical. Photogrammetric methods can also be used to co-ordinate monuments which have been marked in such a manner as to render them visible on aerial photography. If approximate survey methods are used extra care should be taken over the monumenting of the boundary corners. Any system combining approximate survey with inadequate monuments, such as wooden pegs, is inevitably creating tremendous difficulties for future generations.

13. If, however, a system of topographical survey is considered possible and desirable, the alternatives range from photogrammetric methodes of producing a graphical plot to ground methods. The use of orthophotographs should be considered. The method of dealing with boundaries where no physical detail exists should be carefully considered, since the cost of surveying the 'missing' boundaries can exceed the total cost of survey up to that stage.

14. No matter what method of cadastral survey is used it will be necessary to provide a close network of control points which should be permanently beaconed. It is false economy to provide inadequate control or to try to save money by inadequate monumenting of the control points.

15. It will be desirable to provide a 'picture' of the parcels before a systematic adjudication and cadastral survey is undertaken. Such a picture will help to determine the density of control which is required and the methods of survey to be adopted. The use of enlargements of aerial photographs (or orthophoto enlargements in hilly areas) should be considered for the building up of this 'picture'. It is also probable that the existence of some form of deeds can help in compiling this picture.

16. It might prove possible to undertake a cadastral survey using an inexpensive survey, to back up demarcation by monuments, which would subsequently be replaced by a topographical survey when the area is sufficiently developed - such a topographical survey would have to be undertaken in any event for normal administrative and development requirements.

17. Alternatively, if the value of the land is high it might prove possible to undertake a systematic cadastral survey using an inexpensive survey initially, to back up demarcation by monuments, and subsequently to raise the standard for subsequent 'monument' surveys by private surveyors so as to gradually build up a comprehensive cadastral survey of a reasonable standard. Again, it must be emphasised that the survey fees which will be charged are normally only a very small perventage of the value of the land and will always be small when compared with legal fees.

18. Everything should be done to encourage a systematic approach to the survey. Ad hoc surveys are naturally more expensive and time wasting since the adjudication procedures which precede the survey must be carried out on the property to be surveyed and on all contiguous properties, which can lead to much duplication of work.

19. It is recommended, therefore, that there should be no preconceived ideas about what particular mehtods are suitable for any particular country. Only after a thorough investigation of the pertinent factors prevailing in a country can conclusions be reached as to the method to be adopted, a method which will usually be a compromise.

20. Brief explanations of some the various methods used for cadastral surveys are included in the Appendix.

APPENDIX

SOME OF THE VARIOUS METHODS OF SURVEY USED IN DEFINING PROPERTIES AS PART OF THE LAND REGISTRATION PROCESS

1. Definition by placing monuments and deriving unique co-ordinates for the monuments

This method is used in most of the countries of continental Europe, in Australia, in New Zealand and in many African countries. The method varies in detail from country to country out essentially consists of the following:

a. The State establishes the control system and the surveyor (who must be licensed by the State) is obliged to connect his property surveys to the control system. In areas where control is sparse and where unjustified expense would be incurred in connecting to the control system the surveyor is required to undertake astronomical observations to establish approximate geographical position and azimuth.

b. The surveyor places monuments at all changes of direction of boundaries. He undertakes sufficient survey by triangulation or traverse to be able to derive unique co-ordinates for the monuments and also to be able to plot on his final plan any natural features which form property boundaries.

c. The surveyor computes the survey and produces a (deed) plan of the property by depicting boundaries between the plotted co-ordinates of the monuments. He also shows bearings and distances between monuments and the area deduced from co-ordinates.

d. The surveyor submits the survey to the State for authentication after which he forwards copies of the deed plan to the Registry so that the property may be registered.

e. The property owner pays a fee to the surveyor for services rendered. In most cases the fee will amount to much less than the legal fees of transfer. However this is the most expensive method of carrying out cadastral surveys.

Regulations are generally prescribed by the State for all of these processes.

2. Definition by monuments which are surveyed by more simple method

This method has been used in the Sudan, in parts of Uganda and in the coastal area of Kenya.

a. The State provides a fairly dense control network of permanently monumental points.

b. The surveyor (Government or licensed) places monuments at all changes of direction of the property boundaries and surveys the monuments by simple survey methods such as plane table or compass and chain.

c. A property boundary map is produced from this survey showing all the monuments and the boundaries between monuments. Where possible distances between adjacent monuments along property boundaries are measured and shown on the map.

d. The surveyor provides a deed plan to the Land Registry.

3. Definition by survey of all hedges, fences, walls, etc. forming property boundaries

This method has been used extensively in the rural areas of Kenya. The survey does not attempt to precisely define boundaries but only to show the general boundaries on the Registry index map.

a. The State provides a control network to cover the area to be registered.

b. The property owners are encouraged to provide hedges and fences round their boundaries, a policy which can be justified solely on the grounds that enclosure is desirable for reasons of improving agriculture.

c. When the boundaries are sufficiently well established air photographs are taken and all the boundaries which can be identified are plotted by photogrammetric means. The remaining boundaries are surveyed by simple methods using the photogrammetric plot as control.

d. From these plots, property boundary index maps are prepared for the use of the Land Registry.

4. Definition by a systematic survey of all topographic detail at a large scale

This method is used by the Ordnance Survey in the United Kingdom.

a. The State provides a very dense control network.

b. The Ordnance Survey produces 1/1,250 topographical maps of the intensely developed urban areas, 1/2,500 maps of the developed rural areas and 1/10,000 maps of the areas of little development. The maps are produced partially by photogrammetric methods and partially by simple field methods and are kept up to date by continuous revision field teams.

c. Copies of these maps are supplied to the Land Registry whose responsibility it is to identify property boundaries. It is possible to relate boundaries to fences, hedges, walls and etc. included in the topographical detail.

d. Property index maps are then prepared for use in the registration process.