

# Nøyaktighet til eiendomsgrenser

Lars Ramhøj

*Lars Ramhøj: Accuracy of (real property) boundaries*

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In Denmark it is required to register new or changed boundaries by means of measurements, but there are no regulations governing the accuracy of these measurements. Based on an analysis of the factors that are important when legal and actual dispositions of real property are made, and an analysis of the problems that may arise when the actual boundaries do not correspond with those registered, what follows is an attempt to clarify the situations in which reliable property data are demanded that are linked to the determination of (real property) boundaries.

*Key words:* Property boundaries, accuracy, cadastral

*Lars Ramhøj.* Associate Professor, Lic.Geom. Aalborg University, Fibigerstræde 11, DK 9229 Aalborg Ø.  
E-mail: lr@land.aau.dk

Property identification<sup>1</sup> is established and maintained in the cadastral system, but has no objective in itself. When identification of a plot/real property is made, the reason is that such identification is demanded in another context. This identification comprises in part a number of other property-related registers which are involved and which are at the disposal of the owner, primarily the Land Register and the Property Taxation Register, and in part registers which are the basis for public authority administration.<sup>2</sup>

The cadastre is the only register that has a national map attached. Via the cadastral map the cadastral designation provides an unambiguous location which implies that the cadastral registration is the foundation of geographic information systems. Knowledge of the data concerning the property is, of course, also important for the owner's rights of legal and economic disposition, and by the same token precise information on the boundaries of the property is essential when physical dispositions of the property are made.

The following presentation applies an application-oriented perspective, as I try to explain the conditions that have a significant influence on the accuracy requirements for the determination of property boundaries, or in other words: *I examine the connection between the use of registered data on property boundaries and the accuracy of the determination of property boundaries.*

The objective of the following is not only to clarify the types of property data which are required by these registers, but also to determine *what level of accuracy is required in the determination of the boundaries of real property when these registers are used.* Focus is placed on (1) transfer, (2) mortgaging and (3) registration of rights of real property, but also on (4) property valuation and (5) the situation in which the owner of a property initiates physical right of disposal of the property. Finally, the situation of the property boundaries will be important, when property data are used in (6) geographic information systems.

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1. This refers to real property (plots). Owner-occupied flats are identified through division which is registered in the registration system, which in Denmark is separated from the cadastral system.
  2. The different registers that contain property data can be divided into two groups: registers containing property data (the Cadastre and the Land Register) and registers containing administrative property data (the Building and Dwelling Register, the Real Property Taxation Register and the Planning Register), including registers i.a. containing property data (e.g. the Company Register), cf. Ejendomsdata, Daugbjerg and Villemoes Hansen, the National Survey & Cadastre 2000. The Building and Dwelling Register is completely disregarded, because this register uses only the property identification and, moreover, does not use property data, where the accuracy of the situation of the property boundaries is essential.

### Inaccurate register information

Plots are unambiguously identified by title number and cadastral district designation (indication of place), and it is very seldom that there is not correspondence between the actual and cadastral situation of the property.

In the cadastral codes of practice, determination and surveying of boundaries are required when new or changed property boundaries are registered. This implies that the boundaries are fixed with great accuracy. It is, however, not unusual that no other information exists about the boundary than cadastral maps, which are of varying accuracy (see point 6 below). Nonetheless, the boundaries must be characterized as «fixed boundaries».<sup>3</sup> The map inaccuracies mean that there may be, on the one hand, considerable or minor discrepancies between the boundaries on the cadastral map and the unchanged boundaries of the property in the field, and on the other, that the area size, which in many cases is calculated on the basis of the map, may deviate from the physical area in the field.<sup>4</sup>

Danish law, moreover, accepts prescription – based on what may be the oldest valid piece of Danish legislation, i.e. the Danish Code from 1683, 5-5-1. A prescriptive right can be gained through improper disposal of the land of another individual for 20 years. If prescription has been gained, it is the boundary

in the field which is the property boundary and not the registered boundary.

Whether the reason is inaccurately registered data or a change in the property boundary in the field due to prescription, it means that the boundaries of the cadastre are not «fixed» in the sense that they can be determined only on the basis of the registered information about the boundaries. If a final determination of the boundaries is requested, the boundaries must be fixed specifically in the field on the basis of the registered information, the actual conditions and historical information.

### (1) Transfer

Transfer of real property in a modern society takes place on the basis of registered information and after inspection of the property.

Property deals are typically procured by estate agents who work out the sales material. In this material the property is described in a text and typically also with a number of photos and, of course, property data (cadastral or registration identification: title no. or flat no./title no., area size and property type) as well as on a (situation/property) map. Typically, there is no special focus on the property boundaries in connection with sales – and generally no attempts are made to determine the boundaries of the property specifically. The starting point is that the property is offered as it appears and is registered

3. The boundaries on the cadastral map are all measured, although with varying accuracy and not always with registered measuring data. The only «general boundaries» in the Danish system are the boundaries which change naturally (boundaries in internal bodies of water or in territorial waters).
4. Such discrepancies will only justify a claim against the seller if he has guaranteed for the area contents/boundaries of the property. This is usually not the case, and if so probably only when the seller has secured himself against inaccuracies through a new survey and/or boundary determination. If after the acquisition the buyer notices that the size or extent of the property is smaller than what is registered, there may be a wish for compensation for the deficits stated. Claims with regard to deficits cannot be advanced if these appear obvious. This does, however, not affect the deficits mentioned here, which typically cannot be stated directly. The tender documents regarding disposal of real property also comprise, as mentioned in the following, information on the registered area of the property. Even if this actually is indicated in square metres and immediately appears to be very accurate, a deficit claim can hardly be advanced if this area subsequently proves to be too large. This applies in any case to agricultural property, and to a lesser extent to year-round sites and owner-occupied flats. The difference is due to the accuracy of the calculation that forms the basis of the registered area. In connection with agricultural property it is not uncommon that the seller provides information about the size of the arable area included within the property on the basis of a map showing fields and crops (see below). There may be basis for a deficit claim if this area size proves to be incorrect, cf. Tidsskrift for Landbrugsret 2003.222 VLD, where a seller was sentenced to pay damages to the buyer in a case in which the cultivated area was not as stated 85 ha, but 82.24 ha. If the transfer has occurred after an inspection has taken place and is based on a total price – for instance, one price for the land and one for the buildings – there will not be a basis for advancing a deficit claim. If the deal is based on an area price and the registered area there will, however, be a basis for a deficit claim for not inessential area deficits, whether they are due to inaccurate area indications or a change in the boundary with the neighbouring property – and, of course, if the seller has guaranteed for the area size and nature of the property.

in the cadastre. In the vast majority of cases this is an adequate basis for the sale, because this information represents the property to a satisfactory extent and because there is accordance between the way the property appears and the way it is registered.

In connection with a sale, a seller therefore formally sells the registered property, which is also what the buyer acquires. If the registered boundaries do not correspond with the actual ones – which often will be the case in villages<sup>5</sup> – it is, however, not always the registered property that is transferred (see below).

Those who acquire title usually wish to secure their right through registration of the deed of transfer. From the point of view of registration there is a need to have the area identified/individualized sufficiently unambiguously. If the deed of transfer comprises a whole property, the document can be registered as final title, and it is then sufficient to identify the property with the cadastral designation (title no.), because this number indicates that the area has been parcelled out as an independent property. However, usually the size is also stated. The Protection Act as regards registration thus demands no special accuracy, either for property boundaries or area size. The cadastral identification is enough.

In connection with a partial sale the case is quite different, because then we cannot refer to any official cadastral identification of the area in question.<sup>6</sup> Therefore a sketched map of the area in question is required in connection with registration (cf. Weekly Law Report 1967.924). There are no specific requirements as to the identification of the plot

on this map. Usually a cadastral case has been initiated in connection with the transfer, and if it is sufficiently advanced, reference to the area can be made in the document of title as it is identified by the surveyor with a «partial number» and an area size in the cadastral case, which is indeed the case in practice.<sup>7</sup> The sketch is demanded by the buyer, not least in order to be able to identify the area in connection with the procuring of a mortgage promise.

It may occur that agreed changes in property boundaries (partial sale) are not registered. If the change is due to a civil law agreement, it may be due to ignorance of the registration requirement,<sup>8</sup> but it is more likely that registration has deliberately been omitted in order to save the resulting costs. An absence of registration may in certain cases also be due to general confidence in the validity of the agreement, «A man is a man and a word is a word».

Without registration only a provisional registration of the agreement can take place<sup>9</sup> which, however, generally does not take place if the intention is to avoid costs. If the change is due to compulsory purchase or another intervention pertaining to public law, a temporary registration will, however, generally not be made.<sup>10</sup>

Without registration the agreement is not protected against turnover acquirers who are not acquainted with the agreement and who are, moreover, in good faith, which implies a risk that the agreement can be superseded by a later acquirer of rights to the property.<sup>11</sup> To this must be added that it is only buyers with no knowledge of the agreement who can supersede the unregistered

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5. The discrepancies may even be so great that buildings are erected across the registered boundary, a situation which is normally due to map inaccuracies (the boundary in the field is unchanged).
  6. Because the transfer comprises part of a title no., the document of title can only be registered temporarily as a burden (in the easement column).
  7. All things considered, the question is whether the precise area size, together with the partial number, does not in a satisfactory way identify the area, as it seems inconceivable that another document of title should be submitted at the same time for another area designated with the same partial number and with the same area size.
  8. Subdivision, implying that an area is separated as an independent property, is necessary when part of a property is sold, mortgaged or let for more than 30 years, cf. §§ 14 and 16 of the Subdivision Act (Act No. 494 of 12 June 2003).
  9. A constraint is built into the registration element postulating that the subdivision requirement must be met. If the necessary subdivision is missing, registration takes place with a deadline by which the subdivision must be carried out.
  10. In connection with reallocation the decision is registered temporarily, but it is not possible to identify the reallocated areas in the decision.
  11. Cf. § 1 and § 5 of the Registration Act (consolidated Act No. of 9 March 2006).

right (agreement). Generally, a buyer will inspect the property before the purchase, and if the change is readily apparent this may imply that the buyer has – or should have – knowledge of the improper agreement. If the changed boundary has been fenced, the court has in many cases taken the view that the buyer cannot have any expectation of buying an area lying outside the physical boundary of the property, and that therefore he does not acquire the outlying area which is covered by the agreement. If the buyer does not acquire this area, there is of course no conflict in relation to the uncorrected agreement concerning the plot, and therefore the buyer only acquires the registered property excluding the area which was sold previously.<sup>12</sup>

*When registering the deed of transfer in connection with a total sale it is sufficient to identify the area by its cadastral designation, while in connection with a partial sale the area in question must be indicated on a map which is attached to the deed. A precise area size is not required, and there are no special accuracy requirements for determination of the boundaries of the area.*<sup>13</sup>

### Changed property boundaries

If there is not agreement between the registered property data and the property as it appears in the field, problems may arise. Discrepancies between the registered boundary and the boundary in the field may be due to proper boundary changes: the intentional (agreed or forced area abandonment) or the unintentional (changes in consequence of prescriptive rights or the forces of nature).

### A. Intentional changes

Real property deals – here understood as purchases of an area of land with buildings erected thereon – usually take place on the basis of an offer price. The price is, in other words, fixed as a total price, where the land value, the building value, the value of position, etc. are not specified.

It is quite common that the selling price is an area price per ha, especially in connection with deals comprising agricultural property.<sup>14</sup> In such cases it is more important that the registered area corresponds to the actual area. For farms, in particular, the registered area may be inaccurate – a deviation in the order of 10 percent in relation to the actual area has been known to occur. As the price of farm land today typically amounts to DKK 200,000–350,000 (approx. € 27,000–47,000) per ha, it is evident that substantial inaccuracies in the registered areas are unacceptable to the parties. Therefore it is not uncommon that in connection with the deal a determination of the boundaries is carried out, along with a survey to ensure that the price corresponds with the transferred area (such a survey is, of course, quite necessary when parts of a title no. are separated). Such a determination will also be able to reveal whether the boundary is changed as a result of natural changes or prescription.

However, it is often the arable areas of the property, in particular, which are relevant. These areas are relevant in relation to payment of EU subsidies, and it is usual for the seller to provide information about the size of the arable area. These areas have been identified through the plans showing fields and crops which the owner himself or agricultural advisers, etc. have provided through surveying or on the basis of web-based calculations from aerial photos. This is the area which is of value to the farm, and which

12. If the owner has erected his «own fence» (the fence is placed fully on the owner's own site at some distance from the boundary), it should be expected that the buyer only acquires the area up to the fence, and that the seller keeps the strip between the fence and the boundary. This is, however, not the case. The situation has, after all, not arisen in consequence of an agreement with somebody else, and the intention of the owner is, of course, to sell what he owns, and he does so. It is then possible that the buyer only expects to buy the property which is bounded by the fence, but nevertheless he acquires the entire cadastral property.

13. In practice, areas are usually indicated in whole m<sup>2</sup>, and there must be agreement between the area size indicated in the deed and in the property register. For this reason it is especially important in connection with partial transfers that the deed area is either indicated as an approximate area or constitutes the area that the surveyor has calculated in the cadastral case.

14. 10,000 m<sup>2</sup>.

therefore may form the basis for the calculation of the purchase price.

In connection with the transfer of building sites the price is fixed «as a building site», where the specific size is less important, provided that the size of the site is sufficient for constructing the desired building. Surveying of the boundaries is required in connection with subdivision of building sites, for which reason the areas of building sites are usually determined quite accurately. Therefore it is possible to use an area price as the basis for the price determination.

*At transfer, when the price is based on an area unit price, it is important that the actual size of the property corresponds with the registered area. In towns this will usually be the case. The registered areas of farms may, however, have a degree of inaccuracy which is not satisfactory when the transfer is carried through on the basis of an area unit price.*

### **B. Unintentional changes**

Property boundaries may also be changed unintentionally. Property boundaries may be altered by natural changes (erosion or accession), or because someone else – typically a neighbour – has gained a prescriptive right.

#### *a. Natural changes*

The sizes of properties may change as a result of the forces of nature through accession or erosion, by which the size of the property is increased or reduced. This is a matter of property boundaries against water areas: territorial waters or internal bodies of water. The applicable principle here is that the property boundary follows the changed boundary in the field, regardless of whether the circumstance has been registered. Buyers must make the best of these inevitable changes.

#### *b. Prescription*

If the boundary has been changed as a result of the improper disposal of the neighbour, such uninterrupted access to a fixed boundary for 20 years may imply that the person with access gains a prescriptive right, i.e. formally becomes the owner of the area that the

execution of access has comprised. The improper disposal of an adjoining property will typically be in effect up to a physical boundary (a hedge or a firm fence) so that, in connection with an inspection in the field, it is not necessarily possible to see that the boundary has changed.

The legal relation between the owner, the person who has gained a prescriptive right and a possible buyer of the property commanded against depends on the point of time at which the property is sold.

If the property which is subject to questions of access is sold, the buyer acquires what the seller owns, which is the registered property. To the extent to which the buyer is not aware that there is a current question of access – or is aware, but does not oppose the granting of access legally or physically – continued improper disposal may imply that prescription is gained, when the person with access has been using this access for 20 years.

If the property is sold, and its owner has access to part of the adjoining property, the seller also sells what he owns, which is the registered property. If the new owner continues to use the right of access, prescription can be gained when he has maintained access for a period of prescription, i.e. for 20 years. The new owner succeeds in the legal status of the earlier owner.

In both cases the property is transferred as it is registered.

If the neighbour has gained prescription, he is the owner of the area comprised by the execution of prescription. This means that now the seller no longer owns the entire registered property, but only the part to which prescription has not been gained. Consequently, this is also the only part that the seller can sell. However, as the seller typically has no knowledge that prescription has been gained, it is usually all of the registered property which is offered for sale.

If the property for which prescription has been gained is sold, the ownership of the person who has gained prescription is to be considered an unregistered right of the property, and the prescription is, therefore, basically not protected against later acquirers of rights to the property. This applies, however,

only if the later acquirer of rights is in good faith. The good faith requirement can probably be fulfilled often, but in Danish law there is a special rule that the buyer must submit a claim for his right within two years after the acquisition.<sup>15</sup> If he fails to do so, the prescription will also become valid with regard to the buyer. If in connection with the acquisition the buyer has inspected the property up to the physically demonstrable boundaries in the field, the law courts have, however, been reluctant to recognize the opportunity of the buyer to supersede the unregistered prescription.<sup>16</sup> The explanation for this is that the buyer cannot have any expectation of acquiring an area located on the other side of the physical boundary and therefore does not acquire the area owned by the person who has gained prescription. As the possibility of displacement only applies to acquirers, the buyer cannot supersede the unregistered prescription. This means, therefore, that the buyer acquires what the seller owns, which is the registered property excluding the prescriptive area. Thus less than the registered property is transferred.<sup>17</sup>

If the property which has gained prescription of the adjoining property is sold, the seller sells what he owns, which besides the registered property comprises the part which formally constitutes part of the adjoining property.<sup>18</sup> Consequently, more than the registered property is transferred.

*At transfer of real property special focus will usually not be placed on the position of the property boundary. If a boundary has been changed as a result of natural changes or prescription, it is the boundary in the field which is the property boundary – not the registered one, for which reason it is not important how well the registered boundary is determined.*

## 2. Mortgaging

Mortgaging mainly takes place in the form of institutionalized mortgage loans which are granted on application and usually also after the credit institution's valuation of the property – often after an inspection. In addition to this, the position and utilization possibilities (according to plans, legislation and easements) are essential as well as, of course, the registered information about the size of the property and registered rights. Other conditions will also be important: for farms, for instance, the adjustment of boundaries of the property and whether there is a balance between production (spreading of organic fertilizers) and the land. Thus a large number of elements play an important role. The specific delimitation and precise size of the property are, on the other hand, usually less important.<sup>19</sup>

For sites it is crucial to determine whether the size of the site is sufficient for the construction of a normal single-family house or whether there are subdivision possibilities. The position of the site is, of course, also important.

*In connection with mortgaging there is – perhaps apart from farms – no need for precise information about the property, for which reason it is not decisive if the property boundary is not fixed accurately or if there are inaccuracies in the area information.*

## 3. Registration of other rights (easement creation)

Other rights of real property than title and mortgage are registered. For registration purposes, this group of rights is designated «burdens», and comprises a variety of rights:

15. The Registration Act § 26, ss. 1.

16. See, for example, U 1991.27 HD.

17. It is, however, quite conceivable that circumstances in connection with the transfer actually enable the buyer to supersede the prescriptive right, for example if the property is so large that its boundaries cannot be surveyed at the time of purchase.

18. It formally conflicts with the subdivision requirement (note 7), which is disregarded when the parties do not know that prescription has been gained. The subdivision requirement implies that the parties have a duty to try to have the condition registered when they become aware of it.

19. Increasing prices of production land (agriculture) mean that the share of land value of the property value increases, which confirms that – especially in connection with mortgaging in farms – it may be expedient to know the actual area of the property, which also implies that boundaries have been identified.

pre-emption, obligations regarding the property, rights of use and easements, etc.

Easements either give the entitled person the right to command or to require a certain state maintained at the property. They are also called limited rights.<sup>20</sup> Registration formally takes place at the property, and there is no need to describe any specific location if the easement right concerns the entire registered unit (an entire title no.). It is a different case if the easement only concerns part of a title no. As of today, the location of rights of way has been required only in reference to the road as it appears from the cadastral map or as indicated on a separate map attached to the document (Act No. 143 of 13 April 1938 on private road rights § 4<sup>21</sup>). This defective location has caused considerable problems when the need has arisen to clarify the geographic location of the right.

An amendment to the Registration Act has, however, now been adopted (§ 10, ss. 6) which implies that when creating new easements for part of a property, the location of the boundaries of the easement must be defined in the cadastral map<sup>22</sup> in order to fix the geographic field of validity of the easement forever.<sup>23</sup> The location may be direct (insertion by system co-ordinates), but if inaccuracies in the map are found in connection with the insertion in the cadastral map, which imply that the easement is not visualized correctly in relation to the boundary picture, either a map improvement<sup>24</sup> has to be made or a relative insertion of the easement boundary must be undertaken in relation to the boundary picture in such a way that the easement boundary is changed together with

the boundary picture when map improvements are made in other contexts.

*The actual registration takes place at the cadastrally identified property, but for new easements concerning parts of a title no. it is a further requirement that the delimitation of the easement is either determined absolutely by system co-ordinates and is inserted in the cadastral map, or that it is registered in relation to the boundary picture of the cadastral map.*

#### 4. Property valuation

The property valuation is used primarily as a basis for assessment of property taxes. The valuation is expressed in the property value, and constitutes the sum of the building value and the land value. The land value is determined on the basis of two factors: (1) the building right (depending on planning status) and (2) the size of the site as fixed from an area price (depending of the position and nature of the site). The price of each area unit is fixed for properties which can be utilized intensively per m<sup>2</sup>. For extensive utilization (typically farming) the valuation is fixed on the basis of an area price per ha.

The square metre price of ordinary sites (uncultivated land) is DKK 200 (approx. € 25) and upwards. The contribution to the land value calculated on the basis of the size of the property constitutes the site size multiplied by the area price which is rounded down to the nearest number of thousand kroner. Even very few square metres will therefore influence the land value, and this illustrates

20. «Limited» do not refer to the geographic extent of the right, but to the fact that the right usually only comprises a specifically indicated condition. Therefore it can easily occur that a partial right comprises the entire property (for example hunting rights).

21. As amended by Act No. 1101 of 21 Dec. 1994 and Act No. 466 of 7 June 2001.

22. Easement boundaries do not necessarily follow property boundaries, for which reason the statement concerning the handling of easement boundaries is somewhat outside the scope of this account as it is defined by the heading. The registration of easement boundaries does not differ from the registration of other theme boundaries (for example, the restrictions regarding construction on the coast, boundaries of polluted sites on the cadastral map), but is treated here precisely because these boundaries are inserted in the cadastral map.

23. With a view also to having all easements located, it is also required in the new codes of practice that the surveyor locates existing easements, cf. the Registration Act, § 23, ss. 1. Location, however, comprises easements only on the affected title no. and only has to be undertaken to the extent enabled by the information contained in the easement document. This implies that location can take place without considerable extra work. If this information does not permit an absolute location, the easement boundary can be located in relation to the cadastral unit (a title no.) or to the entire property.

24. This implies that in connection with the location of easement boundaries a suitable number of boundary points is also determined in order to ensure that the easement boundaries are placed correctly on the map in relation to neighbouring boundaries.

the great importance of accurate area measurements. When this is not the case it is due to the fact that the area price is estimated and rounded off (thus also comprising development costs of an average level) and that the other contributions to the land value, the building rights value and the estimation of the value of the building are based on factors that are more unmanageable and therefore insecure. The site size is, therefore, only a partial element of the estimated value of the property, which depends on other factors that are to a great extent based on an estimate.

*This means that extreme accuracy is actually not required in the determination of the property boundaries or in the area specification in connection with the property valuation (cf. thus that the land value of farms is estimated on the basis of ha prices).*

## 5. Utilization

When properties are utilized, their size and delimitation may have considerable importance, especially in connection with construction work, where the site size is often decisive for the size<sup>25</sup> of the buildings that can be erected on the property, just as the boundaries of the property are decisive for the placement of the buildings.<sup>26</sup> The area of property in urban areas will as a principal rule be calculated on the basis of a survey of the boundaries of the property, but to the extent that this is not the case, or if doubt about the size/delimitation of the property arises, it may be necessary to undertake a specific boundary determination/survey to be certain about the possibilities of utilization.<sup>27</sup>

Even if precise measurements for the property boundaries exist, it will usually be necessary to check the situation of the boundaries when construction work is to be undertaken, if the situation of the boundaries is decisive for the legality of the building.

This is due to the possible disappearance of boundary marks, or a possible change of the boundary as a result of prescription.

*The specific physical use of the property by the owner may, therefore, imply that the property boundaries are determined precisely, i.e. that registered information on the boundaries exists, enabling a precise determination to be carried out or – if this is not the case – that the boundaries are defined unambiguously and accurately on the basis of an actual boundary determination from the conditions in the field.*

## 6. Geographic information

Information on property and areas is to a considerable extent now accessible through web-based solutions which, as a rule, combine property data, aerial photos and maps.

When the cadastral map is used as a basis for other representations, it is important that this information represents the actual property conditions as they appear on aerial photos or on technical maps that are printed on the basis of aerial photos.

The cadastral map is now digital and therefore appears as a nationwide, continuous map. Outside the towns the cadastral map has its origin in the enclosure maps which were prepared in connection with the agricultural reforms in the late 1700s and early 1800s. These maps comprised a cadastral district and were produced through simple and table surveying (maps showing only a selected, isolated region), and the maps were thus very inaccurate and marked by distortions (deformations as a result of the storage conditions and rolled format of the maps). When digitization was carried out the absolute accuracy was improved, because some points were corrected with a high degree of accuracy, but the map may still feature many inaccuracies. In urban and development areas new measurements have been made in many places (often photogrammetri-

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25. The percentage of site coverage which is the proportion between the floorage and the land size, is thus fixed in the legislation or in binding plans.

26. This is adjusted by means of provisions on boundary distances and inclined height limit plans.

27. The size of the property and the precise situation of the property boundaries are, of course, of less importance if the property is developed to less than its potential, or if the building is placed at a greater distance from the boundary than the minimum requirement.

cally based), and the maps here, which are prepared as framework maps, have a high degree of absolute accuracy. New boundary points need to be inserted on the basis of coordinates in the reference network, which

may result in local rectification of the boundary picture. The National Survey & Cadastre lists the following point accuracies for the various cadastral maps:

Boundary point inserted after	Scale	Expected accuracy
Measurement in the reference network		1-10 cm
Boundary survey <sup>a</sup>		<20 cm
Digitized survey sheet <sup>b</sup>		<50 cm
Framework map	up to 1:2000	<1 m
Framework map	1:4000	<2 m
Map showing only a selected, isolated region	1:4000	4-5 m

a. Measurement linked to reference points co-ordinated in the reference network.

b. Digitizing of boundary survey from a construction typically 1:1000 or 1:500 in scale, on the basis of known points in the reference network.

In recent years different themes have been linked to the cadastral map (for example the coast protection zone, polluted sites, planning boundaries and most recently easement boundaries, and more will certainly be added in future). A high level of geometric accuracy in the map is then desirable, because otherwise the combination may give rise to misunderstandings, doubts and insecurities with regard to the geo-information presented, especially if the theme boundary on the map affects other areas/properties than those actually defined by the boundary.<sup>28</sup>

When cadastral data are used for GIS analyses – for example in visualisation of the site values in a given area – high geometrical accuracy is not required in the cadastral map. Here the geometric connection (that the registered areas are registered as surfaces), completeness and topicality are the most important parameters.

*It is therefore essential that the property maps used are accurate / represent the current property conditions so that visible deviations between the actual and the registered conditions do not occur. This means that representation of the property boundaries on the map should ideally have a high level of accuracy depending on the lo-*

*cality and the zoom level enabled by the information system. In built-up (intensively utilized) areas the accuracy demand will probably involve only a few cm. This represents a relatively rigorous demand which the digital cadastral map cannot meet. Improving the digital cadastral map rapidly is therefore decisive if the map is to fulfil its role as the basis for the GIS system.*

## Conclusion

The analysis shows that high accuracy demands with regard to property boundaries are not required for the use of the property registers which are based on cadastral data.

In connection with property sales, where the size of the property has a major influence on the purchase price, it is desirable that the registered area corresponds to the actual one, i.e. that the boundaries of the property are determined with the necessary accuracy. The accordance will, however, as a result of the possibility of prescription, in practice imply that the correct position of the boundaries – irrespective of the registration accuracy – is checked in the field.

It may be necessary to obtain precise information regarding the position of the boundaries when the owner commands the property

28. If the boundaries of the themes are not inserted through absolute co-ordinates, it is important that the boundaries are inserted relatively in relation to the boundary picture in order to ensure that the theme boundaries are updated when the cadastral map is improved. This has not consistently been the case.

physically, typically in the form of construction work, the legality of which depends on the position of the boundary. It is then of the utmost importance that the boundary is registered with such accuracy that it can be determined (or its position can be checked) precisely – i.e. as accurately as possible – just as accurate position data are also necessary for projecting objectives.

A high level of accuracy is also demanded with regard to the map material used for geoinformation purposes. The demand for accuracy is then as detailed as within a few cm, and in other words future easement boundaries must be determined by system co-ordinates in order to be visualized correctly on the cadastral map.

Accurate data for property boundaries are consequently primarily demanded by the

owner of the property in connection with his actual and legal dispositions of the property, for which reason it seems reasonable that it is also the owner who pays for the accurate registration. Demands for precise determination of the boundary can, therefore, be most suitably linked to the registration made when the dispositions of the owner require registration, as occurs when new or changed boundaries are determined in cadastral cases (or when easement boundaries are registered).

In addition to this the analysis indicates that the map authority should intensify efforts with a view to improving the absolute accuracy of the cadastral map.<sup>29</sup>

The results of the analysis are more clearly apparent in the diagram below:

	Geometric accuracy of boundaries	Accurate area size
Transfer	Less important	May be important
Mortgaging	Less important	Less important
Right registration	May be important	Not important
Property valuation	Less important	Less important
Utilization	May be important	May be important
Geographic Information	Important	Not important

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29. This occurs in Denmark primarily as «map improvements», when in connection with cadastral cases the surveyor inserts new or changed system-related boundary points into the cadastral map. New updating rules have recently been adopted which allow improvement of the map picture on the basis of valid support material (orthophotos, etc.), if the boundaries are unchanged in the field, i.e. without measuring the boundaries. In addition, the National Survey & Cadastre only occasionally update the cadastral map – typically when major local distortions of the map are found.