The Choice between 3D Property Rights Alternatives.

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Abstract. The article analyses the economic and legal choice between 3D property formation and other property rights alternatives to accommodate needs for multiple uses of and access to three-dimensionally defined spaces. An overview of 3D property rights alternatives in Sweden is presented, and a closer comparison made between easements and 3D property formation with regard to transaction costs. Two case studies show that the choice between different 3D property rights alternatives may in practice depend on features in completely different parts of the real property law system.

Keywords: 3D property rights, 3D property formation, institutional choice, transaction costs.

1 Introduction
Several countries have in recent decades passed law reforms introducing various forms of independent three-dimensional (3D) property division into their systems of property law (cf. Paulsson, 2007). Usually there also exist alternative forms of 3D property rights, e.g. condominium rights, indirect ownership or various types of granted rights (easements, usufructs etc), which could also be created previously under the traditional system of property units defined only in two dimensions (2D).

The existence of legal possibilities for 3D property formation generates a number of alternative legal solutions for accommodating particular needs for multiple uses of space and access to three-dimensionally defined spaces. The economic aspects relating to system level, i.e. the economic consequences of
statutory reforms making possible the formation of 3D property units, have been addressed in a previous work (Ekbbieck, 2011). The present article has a different level of analysis, namely the choice in the individual instance between 3D property formation and the legal alternatives which can meet a certain need within the framework of the traditional property rights system.

The purpose of this article, then, is to describe and analyse more closely the economic and legal choice between 3D property formation, in relation to legal possibilities in the conventional property rights system, for the individual case. The study is mainly confined to the Swedish legal system, although the theoretical implications have general relevance.

The method used is standard law and economics, and involves a combination of jurisprudential and economic perspectives. An introductory review of the economic aspects of 3D property rights is followed by a presentation of existing 3D property rights alternatives in the Swedish real property law system. The choice between alternative solutions is analysed with reference to economic principles and statutory provisions. Two case studies illustrate some new factors relevant for the choice in practice.

2 General aspects of 3D property rights
Private property rights in land and real property resources are fundamental to modern societies. The division of land into property units and the establishment of exclusive, individual ownership rights, will devolve both the cost of resource utilisation and the proceeds of management measures on the individual property owner (Ekbbieck, 2009).

But the benefits of private property rights do not come for free – there is also a cost side to property rights. The territorial subdivision has to be documented by means of reference points, registers, maps or suchlike. Boundaries have to be marked and monitored. It must be possible for infringements to be proceeded against and prevented through public sanctions.

In order for a property rights institution to be economically justifiable, its costs must be offset by positive land use effects – higher land values. The positive effects come about through changed incentive structures and lower transaction costs for agreements on grants of rights, transfers etc. (cf. Demsetz, 1967).

By tradition, the division of land into property units has been defined in two dimensions only, even if the space above and below the surface of the ground has to a certain extent also been included in the property units (Lantmäteriet, 2003). The transition from 2D property formation to property units defined in three dimensions means that more resources have been invested in reference points, registers, maps etc. – the transition implies higher institutional costs.

One initial prerequisite for the efficacy of these additional costs may be the existence of demand for vertical separation of real property utilisation. This in turn presupposes high land values, since, normally speaking, building and civil engineering costs are higher for complex buildings in the vertical dimension and
for structures below ground. Another important prerequisite is for the proposed activities to be characterised by diseconomies of scale or scope (Ekbläck, 2011).

2.1 The comparative benefits of 3D property formation

When a three-dimensionally defined space needs to be legally secured for a particular activity, there are often alternative legal ways of meeting this requirement. 3D property formation is one possible method. The other solutions available for legally partitioning multiple uses of separate real property spaces depend on the general design of the real property law system. Perhaps certain needs can be provided for through different forms of indirect ownership, easements or usufruct rights.

The different solutions entail different costs of ensuring long-term secure and flexible access to and control over the space. The objective should be to minimise total transaction costs. By transaction costs – in general terms – we mean costs connected with the acquisition, transfer or other alteration of rights in a particular resource (cf. Williamson & Masten, 1995).

In this connection it is primarily the cost of securing possession and, during the term of possession, facilitating the grant of rights and transfers which can be reduced through 3D property formation by comparison with the option of 3D property rights solutions within the traditional system.

3 3D property rights alternatives in Sweden

In order to compare the transaction costs of alternative 3D property rights instruments, we need to take a closer look at the legal possibilities and limitations of the legal figures. Table 1 provides an overview of existing 3D property rights alternatives in the Swedish system. The categorisation of different rights follows Paulsson (2007).

Table 1. Overview of 3D property rights alternatives in Sweden

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<th>Independent 3D construction property</th>
<th>Condominium ownership</th>
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<td>3D property unit</td>
<td>Condominium ownership unit</td>
<td>Tenant-ownership Housing cooperative</td>
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### 3.1 Independent 3D construction property

The possibility of forming and registering 3D property units (*tredimensionella fastigheter*) was introduced in Sweden in 2004. These units can be formed independently of the underlying parcel(s). There is no need for a connection with the ground parcel(s). Units can thus be created in subsurface space in the same manner as in tracts of air.

This type of property unit is not tied to any particular manner of use. The 3D property units can be transferred and mortgaged and rights granted in them, just as with traditional property units.

A 3D property unit is subject to special conditions. For example, it must include an existing or future building or other structure. The legal securing of necessary co-operation with neighbouring properties, e.g. regarding staircases, lifts, water and sewerage etc., is another requirement.

### 3.2 Condominium ownership

A special form of condominium ownership units (*ägarlägenhetsfastigheter*) has existed since 2009 which forms the basis of individual ownership of a premise in a building. A condominium unit may only include a dwelling unit, as opposed to non-housing premises. The units can be transferred and mortgaged and rights granted in them, just as with traditional property units.

Just as with the formation of all-purpose 3D property units (see section above), the formation of condominium ownership units is subject to special conditions. Among other things, necessary co-operation with neighbouring properties has to be legally secured, e.g. with regard to load-bearing structural parts, staircases, lifts etc. This can be arranged through the grant of easements or by making the facilities joint facilities in which the participating units each have a share.

### 3.3 Indirect ownership

The category indirect ownership implies that a legal person (co-operative or association) is the formal owner, and as such stands in between the residents and the property. Membership of such an association gives the right to use a specific apartment in a building. There are two variants of indirect ownership in Sweden.

Tenant-ownership (*bostadsrätt*) involves a tenant-ownership association owning one or more built properties. Membership of an association is linked to the right of using a certain unit for housing or non-housing purposes. The tenant-ownership right – i.e. the right of user in the unit – can be transferred and mortgaged by the tenant.

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1 See the Real Property Formation Act (*fastighetsbildningslagen*). Formation of 3D joint property units (*tredimensionella samfälligheter*), i.e. 3D spaces in which two or more property units have certain shares, is also possible.

2 See the Tenant-Ownership Act (*bostadsrättsslagen*).
Housing co-operatives (kooperativ hyresrätt) exist in two different forms – the ownership model and the rental model. With the ownership model, a cooperative tenancy association owns one or more apartment buildings which are let to the association’s members on a rental basis. The right of user in the dwelling unit cannot be sold. Instead it reverts to the association when cancelled.

3.4 Granted rights
There are limited rights of many different kinds which can be formed to accommodate the need for three-dimensional property use. For reasons of space, we shall confine ourselves here to the commonest of them.

An easement (servitut) entitles a dominant property unit to use a servient property unit in a certain respect. The easement is tied to the property units and thus applies regardless of ownership. Easements can moreover be granted in perpetuity. In order for a right to constitute an easement, certain characteristics are needed. For example, the benefit to the dominant property must exceed the burden on the servient property. As a main principle, an easement may not entail active performance by the servient property. Easements can be formed either by agreement or by (peremptory) official decisions.

A usufruct (nyttjanderätt) is a personal right for the right holder to use real property for some specified purpose. Most types of usufruct are governed by the Land Code (jordabalken) and are formed by agreement, e.g. leasehold (arrende) and rental tenure (hyra). Usufructs cannot be granted in perpetuity. In detailed development plans their duration may not exceed 25 years.

Public utilities, such as high-voltage power lines, telecommunications lines, water or sewerage mains, district heat etc., can be granted a right to land by utility easement (ledningsrätt). A utility easement can be granted for an indefinite period, and is formed by (peremptory) official decision.

Space for a joint facility (gemensamhetsanläggning) can be granted for needs of co-operation between a number of property units. A joint facility can be formed for such purposes as roads, garaging, water and sewerage facilities, playgrounds etc. The right to space and participation in the facility is linked to each property concerned and is of unlimited duration. Joint facilities are formed by (peremptory) official decisions.

4 The economic choice between 3D alternatives
When the legislation offers alternative legal solutions for safeguarding the use of three-dimensionally defined spaces in real property, the possibility arises of choosing the solution which is most advantageous in relation to the needs in the

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3 See the Co-operative Tenancy Act (lagen om kooperativ hyresrätt).
4 The general definition of an easement is set forth in the Land Code (jordabalken), Chap. 14.
5 See the Utility Easements Act (ledningsrätslagen).
6 See the Joint Facilities Act (anläggningslagen).
individual case. In an economic perspective, the solution should be chosen which maximises the surplus, i.e. benefit minus costs.

Benefit or income is above all related to the activities to be carried on within the space. This can mean residence, business enterprise or something else.

Costs can vary in several respects from one legal solution to another. In solutions by agreement, negotiating the contract-drafting costs are involved. Official decisions entail costs connected with the public assessment process. Different alternatives can also entail different costs at the management stage. Rights of certain kinds can be mortgaged and transferred by standardised procedures at little expense, while other rights may perhaps be impossible to mortgage or transfer at all. Thus different legal solutions entail different kinds of transaction costs.

This argument is illustrated in figure 1, with the choice between 3D property formation and other legal options within the framework of the traditional system (2D), e.g. indirect ownership or granted rights.

![Figure 1](image)

**Figure 1. Relationship between benefits and costs of alternative 3D property rights solutions**

In this figure, both benefits and costs are assumed to rise when the intensity of and demand for use of the property do so. This is a plausible assumption when the value of strategically located land rises, new building techniques make possible more complex structures, and several different activities are carried on within a given area or space (cf. Ekbäck, 2011).

For the sake of simplicity, the benefits are represented by one and the same function, regardless of the property rights choice. This is unlikely to be the case in practice – certain uses may perhaps not even be feasible with traditional solutions – but the argument of principle remains unaffected.
The transaction costs vary, depending on which 3D property rights alternative is chosen. The most important assumption on this point is that the cost of 3D property formation is higher than that of solutions within the framework of the traditional 2D system when intensity of and demand for property utilisation are low. For example, a contracted easement can be formed at little expense when the parties are few in number and the land use extensive. In cases of this kind, 3D property formation, which entails examination and decision by a public authority, is likely to be more expensive.

When the number of activities and users increases, the transaction costs of legally safeguarding three-dimensional spaces for all alternatives also increase, but not at the same rate. The rising number of activities and parties, coupled with a growing need for co-ordination and co-operation, is presumed here to make traditional solutions more expensive than 3D property formation. The higher transaction costs are also bound up with the limited powers conferred by indirect ownership and granted rights in relation to ownership rights which are only possible with 3D property formation. We shall be returning to these aspects in the next section.

Due to the costs of alternative solutions developing at different rates, a point (a) occurs where the costs of alternative 3D property solutions break even. With lower demand for land, transaction costs are minimised by traditional solutions (2D), whereas 3D property formation is more efficient when demand is higher.

The choice of institutional mode governs the magnitude and nature of transaction costs, just as alternative production technologies decide what production costs are going to be involved.

Changes in the cost functions can have the effect of shifting the point where the costs break even. This can, for example, refer to statutory reforms changing the legal effects of certain property rights structures, or new technology cutting the cost of a certain solution. The development of digital mapping and reference systems, computer-aided design (CAD) etc. exemplifies new technology which is likely to reduce the cost of 3D property formation, which in turn will shift point (a) in figure 1 further to the left.

4.1 Comparison of certain transaction costs
In this section, certain specific transaction costs are identified which differ between 3D property formation and alternative property rights choices. The review has been structured by grouping the costs of securing possession, transfers, mortgages and granting of rights, as well as co-ordination and cooperation. Advantages and disadvantages of the different alternatives are analysed in qualitative terms.

Prior to the introduction of 3D property formation in Sweden, an empirical study was carried out to see which property rights alternatives were most frequently used for securing three-dimensional property use (Julstad, 1994). The
findings showed that they were normally easements, joint facilities and utility easements. This also applied in certain cases to housing properties, despite tenant-ownership then being an option.

The comparisons will therefore refer primarily to the formation of easements as an alternative to 3D property formation. Joint facilities and utility easements are of limited applicability for general purposes.

4.1.1 Costs of securing possession
The formation of 3D property units takes place through a cadastral procedure, in which various conditions are examined and determined by the Cadastral Authority (lantmäterimyndigheten). The public decision-making procedure entails certain expenses. Property formation, however, results in ownership rights, which are very strongly protected by property law and are recorded in the Real Property Register.

As mentioned earlier, easements can be formed by agreement or by cadastral procedure. A contracted easement can be formed at little expense, but requires agreement between the parties. An ordered easement does not require consensus, but the procedural costs can come close to the cost of property formation.

As regards the endurance of easements, contracted easements are less protected. They can lapse when the servient property changes hands or in the event of changes to the property division etc. Ordered easements, by contrast, have priority in relation to the servient property and can be said to be as enduring as ownership rights.

Regarding the possibility of adapting use to changing needs and circumstances, ownership rights afford much greater scope for changes and adjustments. The powers of an easement are defined in the contract or in the public decision. Future changes will require a new agreement or decision.

One particular problem with easement solutions is that the right has to be tied to a dominant property unit. Finding or acquiring such properties is not always possible. These difficulties are of course compounded in areas where there is high demand for land. A similar problem occurs in cases where the easement itself will constitute the main purpose instead of being an adjunct to the dominant property. Solutions of this kind lack statutory support.

In one case from the study already mentioned (Julstad, 1994, pp. 165-167), the intention was to secure the right to a rock cavern below ground. In order for grant of the rock cavern by easement to be possible, a new 2D property unit had to be formed, and this would be the dominant property in an easement relation. But there was no naturally independent purpose for this property. The problem was solved by the possessor of the rock cavern being deemed in need of a parking space for surveillance of the rock cavern. Thus a property (measuring 60 sq. m.) was formed for parking purposes and supplemented by a rock cavern easement. There was no connection between the dominant property’s purpose and the rock cavern’s mode
of use. Probably neither the property formation nor the easement grant satisfied the mandatory legal provisions.

The possibilities of using easement solutions are limited by the statutory conditions to which easement formation is subject. In cases where the easement has no statutory foundation, this naturally increases the future costs. Another characteristic which can increase the future cost of easements is when the powers are unclear or complicated in substance, which can lead to conflicts and disputes.

4.1.2 Transfers costs
Future circumstances may necessitate a transfer of title in the property-related three-dimensional space. Ownership rights can be transferred at low cost in standardised procedures.

An easement, on the other hand, is united with title in the dominant property, and cannot be transferred separately. The possibility of transfers also creates incentives for long-term value maximisation, in that the three-dimensional space can easily be conveyed to the party putting the highest value on it.

4.1.3 Costs of mortgages and limited rights
One of the most important purposes behind division of land into property units, is to individualise objects for mortgages and grants of rights. Thus the real property law system is constructed with a view to facilitating mortgages and the granting of limited rights in individual property units. Obviously, 3D property formation has clear advantages in these respects.

The Land Code includes standardised procedures for mortgaging real property. The possibility of using real property as security for credit reduces the financial cost of investments.

Limited rights, as a rule, are granted in property units, added to which, only property units an be dominant in easement relations.

An easement cannot per se be mortgaged, but in cases where the holder of an easement himself erects a building or structure on the strength of the easement, the finished building or structure will constitute an adjunct to the dominant property and ipso facto form part of that property’s credit base. In cases where the easement has been granted in an existing building or structure, these do not automatically become adjuncts of the dominant property unit. They still belong to the servient property unit. The difficulties of using 3D property rights alternatives in a simple, secure manner within the traditional system as a credit base are often referred to as a general problem (SOU 1996:87 p. 130).

7 See the Land Code (Chap. 14, Section 3).
8 In cases of ordered easements, it is possible in the cadastral procedure also to determine a transmission of property fixtures to the dominant property; see the Real Property Formation Act (Chap. 7, Section 14).
The possibility of granting other limited use rights (encumbering) in an easement depend on the powers following from the easement’s wording.

An easement applies in favour of a property. Where beneficial limited rights are concerned, further easements can of course be formed in favour of a property unit which is already the dominant property in another easement relationship.

4.1.4 Costs of co-ordination and co-operation

When three-dimensional spaces are divided into separate property units, this generates a need for co-ordination and co-operation between the different units – a consequence of the inevitable interdependence of different property units on the vertical plane (cf. Sandberg, 2003, pp. 134-135). The earth’s gravity being what it is, an underlying unit will always underpin activities and structures on top of it. Vertical dependence also makes itself felt, for example, with regard to drainage, ventilation and entry/exit (the latter normally on ground level). All changes in the use of one stratum can affect the others.

In 3D property formation, each space is separately owned. For the avoidance of, say, opportunism and hold-out strategies, special solutions are therefore needed where co-ordination and co-operation are concerned, solutions such as easements, joint facilities or other arrangements governed by statute. There is an essential difference here from alternative 3D property rights forms which are based, for example, on indirect ownership or granted rights. Co-ordination and co-operation then normally follow from the superior status and responsibility of the association, or else are governed by the actual grant of rights. Thus, 3D property formation entailing a division of ownership can make costs in these respects higher than with 3D property rights alternatives within the framework of the traditional system.

Specifically regarding the easement option, something should be said concerning the constraints entailed by the basic prohibition of including active performance by the servient property in the easement powers. The apportionment, between interdependent parts used by different rights holders, of responsibility for the maintenance and operation of buildings and facilities calls for other solutions.

The study mentioned above (Julstad, 1994) showed that matters of operation and maintenance were often settled in separate agreements, collateral to the easement grant. Agreements of this kind are personal and apply only between the parties to an agreement, which means that they cannot be asserted against a new property owner or a new rights holder.

4.2 Summary comments on transaction costs

The analysis affords certain indications of when a particular 3D property rights solution is relatively efficient in relation to the institutional alternatives.

Easements can in certain cases be an efficient solution attainable by agreement at little expense, but this presupposes the existence – or the possibility of
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forming – a suitable dominant property unit to which the easement can be attached. The easement has certain limitations as regards the possibility of using buildings and structures as a basis for credit, and regulating responsibility for operation and maintenance in connection with complex activities.

In other situations, 3D property formation is more efficient, especially in cases where an easement would not meet the existing statutory conditions. The possibility of transferring the property and of using it as a basis for credit argue in favour of this solution being most justifiable in urban areas with high land values. The formation of 3D property units, however, is likely to entail higher costs than easements, because property formation takes place as a public assessment process and because co-ordination and co-operation have to comply with certain formalities.

It should also be noted that the comparative analyses in this section have only referred to the easement option. There are several 3D property rights alternatives which have both advantages and drawbacks compared with 3D property formation.

5 Legal provisions for independent 3D property formation
As has been shown in previous sections, there are several legal aspects to the possibilities of creating 3D property rights arrangements within the framework of the traditional system. So far, though, we have addressed these solutions in terms of higher transaction costs. In actual practice, legally dubious solutions appear to occur from time to time.

In this section, however, we propose taking a closer look at certain legal restrictions on the possibilities of forming 3D property units. The topic of enquiry will be whether these conditions are framed in a manner conducive to efficient choices between 3D property formation and other 3D property rights alternatives.

5.1 Provisions for property formation in the Real Property Formation Act
In all property formation, there are certain mandatory conditions which have to be satisfied. These are laid down in the Real Property Formation Act (Chap. 3). Among other things, all property units must be suitable for their purpose, in terms of location, configuration, size, access to roads etc., and in an area with a detailed development plan, property formation may not take place at variance with the planning regulations. These and other conditions apply to properties of all kinds.

Over and above the general conditions, there are special conditions applying to 3D property units, e.g. that they must include an existing or prospective building or other structure. In addition, there is a special provision indicating the general prerequisites for choosing 3D property formation instead of traditional property formation.
Real Property Formation Act (Chap. 3, Section 1, Par. 3) “A three-dimensional property unit or a three-dimensional property space may be formed or re-formed only if it is clear that this measure is more appropriate than other measures for achieving the purpose intended...”

This provision means that the Cadastral Authority must consider what is the best legal solution for meeting the existing needs in each individual case. In the first instance, the solution must be looked for within the framework of traditional property formation – e.g. transmission of land, formation of an easement or a joint facility.

The purpose of this provision is for 3D property units to be formed only in clear and clearly justifiable cases, and for 3D property formation as a rule to be a purely subsidiary instrument in relation to traditional property formation (Government Bill Prop. 2002/03:116, pp. 137-138).

The condition is clearly met in cases where the purpose of the 3D property formation cannot possibly be achieved with the ordinary instruments, as for instance in the case, described earlier, of the rock cavern which was unconnected with any other property. Furthermore, the requirement is probably met if the purpose in itself could be accomplished in other ways but those solutions are still seen to be unsuitable, e.g. if they entail heavy expense, lead to administrative inconvenience or entail legal uncertainties.

5.2 Economic interpretation
We are all living in a world of complexity and imperfect information. The consequences of choices and decisions of different kinds are characterised by varying degrees of uncertainty. This still applies when the benefits and costs of alternative 3D property rights choices have to be sized up in the course of practical decision-making.

In an economic perspective, the aim should be to minimise the error costs accompanying type I errors and type II errors (Feinberg, 1971). For present purposes, a type I error can be described as choosing 3D property formation even though a traditional alternative would have been more efficient. A type II error corresponds instead to cases where a traditional property rights solution is chosen even though 3D property formation would have been the efficient choice.

Assuming the costs of type I and type II errors to be of equal magnitude, the optimal decision rule should state that the point where the costs for alternative property rights solutions break even should also decide the institutional choice. Thus the interval of uncertainty should be centred round this break-even point, which will maximise the expected utility (Schoemaker, 1982).

Is this economic standpoint compatible with the statutory condition dealt with in section 5.1? The wording that it must be “clear that this measure [3D property formation] is more appropriate than other measures” indicates that this point of clear evidence does not correspond to the point where the costs of alternative solutions break even. If so, the mere word “appropriate” would suffice.
Figure 2 is a graph illustrating the economic consequences of the statutory condition. With this formulation, the interval of uncertainty is not centred round the break-even point but is shifted in favour of traditional 2D solutions. When the statutory condition is correctly applied, all property rights choices within the grey-shaded area will be inefficient. The value of the institutionally conditioned rise in costs matches the area between the two cost curves.9

![Graph illustrating economic consequences](image)

**Figure 2. Economic interpretation of legal provision regarding the choice between different 3D property rights alternatives**

What is the reason for this construction? The Government Bill (Proposition 2002/03:116 pp. 52-53) on which the new legislation was based, argued:

"It [is] essential that the new provisions should not lead to a deterioration of order and clarity in property boundaries. Unnecessary fragmentation of the property stock is calculated to substantially augment social costs, e.g. in connection with property registration and planning."

The statutory amendment making possible 3D property formation came into force in 2004. Up to and including 2010, about 500 pieces of 3D property units had been formed, i.e. something like 70 per annum (Lantmäteriet, 2011). With 3D property formation having been employed in so few cases hitherto, the legislator’s apprehensions appear exaggerated to say the least.

9 With linear cost curves, a quite contradictory condition, i.e. in favour of 3D property formation, leads to an allocation loss of exactly the same magnitude. When the assumption of linearity is relaxed, more information about the cost functions will of course be needed in order to evaluate the economic consequences.
6 Two case studies
In this section a brief account will be given of two specific cases which were concerned with infrastructure development and in which 3D property formation was among the options on the table when questions concerning the acquisition and grant of rights were decided. The first case concerns the construction of a railway line in a tunnel, while the other concerns the development of a power supply line in a tunnel.

Information was obtained through personal communication with representatives of the Swedish Transport Administration (*Trafikverket*), the Cadastral Authority, and the Swedish National Grid (*Svenska Kraftnät*).

6.1 The Citybanan project
Citybanan is a 6 km suburban railway tunnel below the centre of Stockholm and is being built to augment track capacity through the city. The project is scheduled for completion in 2017 (*Banverket*, 2007).

In order to build and use the railway tunnel, the Swedish Transport Administration has to acquire property rights in the three-dimensional space surrounding the railway tunnel and a safety zone surrounding the actual structure. By tradition, property rights acquisition in cases of this kind has been accomplished through the grant of easements pertaining to a railway property outside the tunnel opening. The new 3D property formation law now made it possible to choose between these two solutions.

One important advantage of 3D property formation was seen to be that the space came to be held with ownership rights. If at some future date the safety zone needs to be used for supplementary purposes – e.g. wiring or other technical installations – this can be done within the scope of ownership, whereas with an easement the purpose is defined through the powers which the easement confers. A change of use then also requires alteration of the easement. With the Swedish Transport Administration owning the space, it is also possible for easements and similar rights to be granted to other line owners wishing to use the safety zone for such purposes.

There was a further consideration which argued in favour of 3D property formation. Large parts of the centre of Stockholm are held by site leasehold (*tomträtt*), which is deemed movable property. The railway tunnel passes at several points through building volumes included in these site leaseholds, which can impede the grant of ordered easements, the main principle being that easements can only be granted in real property. Compulsory expropriation or contracted easements would then be required instead. The first of these is time-consuming and expensive, while the second is dependent on the parties reaching an agreement.

The only apparent drawback to 3D property formation was the greater demands which cartography and technical reports would have to meet as a basis for
defining property boundaries instead of easement boundaries. But the difference in documentation costs was of marginal significance.

As should by now be clear, the majority of considerations, and the weightiest, argued in favour of 3D property formation, which was the solution finally adopted.

6.2 The Stockholms Ström project (CityLink)
An extensive project is in train for developing a new structure for Stockholm’s power supply network. The main responsibility for this new structure devolve on the Swedish National Grid, a state-owned public utility and owner of the national grid. The most important part of the project will be the new CityLink conduit, which among other things involves building a tunnel just over 10 km long beneath the centre of Stockholm for a 400 kV power cable (Svenska Kraftnät, 2005). Planning is now in progress, and the project is not expected to be completed before 2020.

In order for the tunnel to be built and the power cable installed, the Swedish National Grid needs to acquire property rights in the three-dimensional space surrounding the tunnel. By tradition, property rights in cases of this kind are acquired through the formation of a utility easement, but the rules of 3D property formation have now created a second option.

The Swedish National Grid sees a number of advantages in 3D property formation. The ownership rights solution is considered more long term and flexible. Future changes to lines and technical installations will involve fewer parties and the processes will for the most part be internal. With utility easement, the powers included are of course defined in the grant itself, and no changes can be made without the right being amended in new assessment procedures. Ownership of the space also makes possible the grant of limited rights to other line proprietors wishing to make use of the tunnel.

The drawbacks of 3D property formation are connected with differences in the processes of property rights acquisition. A utility easement can be formed (compulsorily) in a cadastral procedure, at relatively little cost in time and money. To bring about 3D property formation, the Swedish National Grid took the view that expropriation would have to be resorted to if voluntary agreements could not be reached with the property owners concerned. The expropriation process, which requires government permission and has to be completed through judicial proceedings, was considered expensive and time-consuming.

Given these procedural aspects, the Swedish National Grid decided in favour of a utility easement as the most advantageous 3D property rights option.

7 Concluding comments
The economic choice between different 3D property rights alternatives is easily expressed in theory. The efficient institution is simply the one which minimises present and future transaction costs of legally securing a three-dimensionally defined space for a particular activity. These transaction costs arise in connec-
tion with securing possession, transfers, mortgages and granting of rights, as well as co-ordination and co-operation.

Provisions in real property legislation can, however, indicate other decision-making criteria for choosing between different options. A closer study was made of the statutory conditions in the Swedish Real Property Formation Act, regarding the choice between 3D property formation and traditional (2D) solutions. The condition is framed with the intention of 3D property formation constituting an exceptional solution. It is not unlikely that 3D property formation will in practice prove an exceptional measure, even when a balance is struck on the basis of economic criteria, but it has not been possible to identify any tenable reasons for framing the statutory condition in that direction.

Two case studies of major infrastructure projects have been presented. Those descriptions confirm the thesis that the essential function of 3D property formation consists in economising on transaction costs. But the cases also show that in a practical situation the choice between 3D property rights alternatives may hinge on features in completely different parts of the real estate law system.

As a closing remark on this last issue, the aim should be for different institutional options to be of equal value with regard to procedural forms and limitations. It should be possible for the choice of optimum solution to be based on the material properties of the institutional alternatives, irrespective of process, but that is an issue requiring a whole article in itself.

References

Literature


The Choice between 3D Property Rights Alternatives


*Government publications*

Proposition 2002/03:116 Tredimensionell fastighetsindelning.

SOU 1996:87 Tredimensionell fastighetsindelning.

*Personal communication*

de Maré, Björn. Cadastral Authority, Stockholm.

Forsling, Sofia. Swedish National Grid, Stockholm.

Rönnberg, Karolina. Swedish Transport Administration, Stockholm.