

Towards 3D Property Formation

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Abstract-This paper presents a solution to reformulate, further improve and enhance usefulness of the existing cadastral system and title registration of multi-layer properties in order to facilitate a modern Malaysian Cadastral and Land Administration Systems. In this paper, field 3D property and its rights as well as the categorisation of 3D property issues relating to rights are looked into. Later, 3D property types in Malaysia are presented with an explanation on land legislation framework, cadastral survey and registration. Furthermore, discussions on ways towards 3D property formation and the criteria associated with the establishment of Malaysian 3D cadastre for 3D property rights are included with some approaches to achieve its implementation.

Index Terms- Land, Administration, Registration, Cadastre, Property, three-dimensional, Cadastral

1 INTRODUCTION

The main purpose of this research is to insinuate a generalised concept of 3D property rights and to suggest the possibilities of its implementation into current cadastral and land law practice in Malaysia as well as to identify the possible emerging related problems and to suggest ways to solve them. In this respect, many legal, technical and organisational matters were investigated. This study focuses more on the legal issues, nevertheless, the overview of technical and organisational issues are also provided for comprehensive understanding of the problem in question.

In achieving the objective, some previous international experiences in the development of new legislation regarding 3D property formation or alteration of the existing legislation were referred to. Secondly, an analysis was carried out regarding main problems associated with 3D property formation and methods to solve them. The analysis was based, largely, on the Swedish experiences.

Subsequently, representation of 3D property in the register was also investigated. The most important task is to represent the vertical dimension in a clear and unambiguous way. This can be done by specifying the upper and lower boundaries of the property rights in which the layers of the property rights are situated. The limitation of this approach is that these layers can often be determined only for the objects whose horizontal projection is within the boundaries of the ordinary parcel.

2 3D PROPERTY

Before discussing on what 3D property is, it is important to generally know what real property or property is about. However, it is difficult to determine what real property or property really is [1] because it is not a homogenous and standardised term, and different authors present different definitions.

As mentioned by [2] in her doctorate thesis, 3D property also has no simple meaning. However, in the most general sense, a 3D property can be defined as a property delimited both horizontally and vertically in length, width, height and

depth, and sometimes can be defined as three-dimensionally determined property. Another definition that is more or less neutral and can be used in most countries is that, a 3D property is a volume that is delimited in length, width, height and depth. The latter definition is even more suitable as it reflects the physical nature of 3D property.

It is worth to mention that issues of three-dimensional determination of property rights are becoming more and more important. 3D properties are not something new and they are like other conventional properties. They can be transferred, mortgaged, expropriated, inherited and can be created by cadastral procedures as a subdivision, partition and amalgamation. In fact, 3D properties are an extension of the concept of conventional properties, which possess all of the features pertaining to conventional properties, and can be integrated in the same legal framework as conventional properties. However, 3D properties have more advanced features like volumes, parts of spaces, while conventional properties have areas and parts of the earth surface. 3D properties can occupy different parts of space. They can be subdivided into strata that create separate parcels above or under the original surface parcels.

2.1 3D PROPERTY RIGHTS

The concept of 3D property rights also varies depending on the national legal system [3]. According to [2], in order to give an exact definition of a 3D property rights, it is therefore necessary to look at the legislations of different countries that have the possibility of 3D property rights formation.

There are two main types of 3D property rights that can be identified. First, an independent 3D property type, also known as public 3D property type, which is a model of sharing nature, intervening in the parties' ability to share their property units as they wish, and imposing a certain framework on them, having an inevitable measure of co-ownership.

Secondly, a condominium type, also known as common type, which is a form of 3D property rights, defined by [5] as a part of common law jurisdictions that constitutes a special

form of ownership giving the proprietor an absolute title to the property. This type of ownership is just one common way for people to own properties containing a number of flats or unit.

2.2 CLASSIFICATION OF 3D PROPERTY RIGHTS

There are different classifications on owning a building or a piece of land in three-dimensional delimited. Three-dimensional delimited properties can be classified into four types including public rights, common rights, management rights and private rights.

There are three types of 3D property under public rights, namely air space 3D property, 3D property on the ground surface and subsurface 3D property. The splitting of land into independent public rights used in some deed recordation system enables countries to divide ownership three-dimensionally [5]. Sometimes, it is called air rights or air space rights. In brief, the air space 3D property is not bound to a specific building or construction. In some legislation, it may contain only a space volume [2]. On the other hand, 3D property on the ground surface may only be created within a building or construction, the property will cease if the property is damaged.

The other type that is broadly used for 3D property is the use of common rights. The common term for this type of 3D property rights for condominium ownership is strata title, comprising individual ownership of dwellings in one building. It is derived from the common law [6] but is used in both civil law and common law countries, and is called strata title in countries with title registration systems, which are mostly common law countries [7]. Furthermore, strata titles in most countries are used for residential purposes, but in some countries, such as Malaysia, they can also be used for commercial and industrial purposes.

Another way to gain private ownership of an apartment without owning it as property is through management rights. The characteristic of this management rights is that the formal owner holds the private rights of occupancy to condominium and stands between the resident and the property by proprietary leases, who gives the rights to use it with shared expenses [8] and [9]. Finally, three-dimensional use of land is also probable through private rights, such as freehold, leasehold and easement. It is often used for underground transportation or piping purposes.

3 3D PROPERTY TYPE IN MALAYSIA

3.1 MALAYSIAN CADASTRAL SYSTEM

Peninsular Malaysia is a federation of states, each of which is responsible for its own land matters. All States operate a Torrens system of registration, administered by the State Land Offices and coordinated by the Department of Land and Mines. On the other hand, cadastral surveys are controlled by the Department of Survey and Mapping Malaysia that is a federal department. Department of Survey and Mapping

Malaysia is responsible for cadastral survey work within Peninsular Malaysia but is supported by a growing number of licensed land surveyors, who are primarily responsible for engineering and subdivision surveys. Notwithstanding the above, the cadastre in the states of Sabah and Sarawak are administered by the Department of Land and Surveys. They have the ideal set up of having land administration and cadastral surveys under the control of a single organisation, which is a state entity.

The objectives of the Malaysian Cadastral System are to provide security and simplicity to all dealings with land. It establishes and certifies, under the authority of the government, the ownership of an indefeasible title to land and simplifies, hastens and reduces the costs of all land dealings. The title is a conclusive proof that the person mentioned therein is the owner of the land described therein. Valid titles require an accurate description of boundaries and as such, cadastral survey plays an important role in the system.

3.2 MALAYSIAN LAND ADMINISTRATION

Malaysian Land Administration is traditionally based on Malaysian land law while cadastral system in Malaysia consists of land registration system and cadastral survey and mapping registration system that have different structures and authorisations. The land registration is a state government juridical while cadastral survey and mapping is under federal jurisdiction. It provides a variety of rights depending on the traditions of the country, but the legalistic cadastral system and land law are still using plane geometric expression for land and property tenure. There is still no registration in three-dimensional situations.

Land use right is one of the rights that are often based on occupation of land over a long period and can be defined in written law or by traditions [10]. Hence, a systematic record of lands in all matters is very important in land administration, planning and development of land. This means that, due to the ever increasing demand for ground space, the traditional paradigm in law should be changed [11]. In brief, land administration in Malaysia is generally responsible for the collection of revenue, title registration, managing application for land dealings, changing of condition of land use, subdivision, partition or amalgamation of land or building and so on.

3.3 LAND IN MALAYSIAN LEGISLATION

In Malaysian land registration, the process of recording rights in land is via registration of land title. "Land is a state matters", according to [12], land matters is under the jurisdiction of state government, handled by the respective state Registry or District Land Office, depending on where the document of title was formerly registered.

Land Ownership as governed by the National Land Code 1965 (Act 56) is based on the Torrens System (see previous sections). It is protected by [13] in Section 340 (Registration to

confer indefeasible title or interest, except in certain circumstances) and is guaranteed by the Federal Constitution 1957 as stated under Article 13 (rights to property). Once an ownership is being registered, the owner's title and interest is indefeasible except when it involves fraud or misrepresentation. Furthermore, nobody shall be deprived of property unless he or she had been paid an adequate compensation.

Meanwhile, there are three ways to acquire land. Firstly, the land can be acquired through alienation from the state authority under Section 42 and Sections 76 to 78, National Land Code 1965 (Act 56), secondly by dealings and finally through inheritance. State agencies and the Federal Government are required to go through State Authority to acquire land in accordance with the Land Acquisition Act 1960 (Act 486) [14].

3.4 CADASTRAL SURVEY AND REGISTRATION IN MALAYSIA

All cadastral survey and registration are performed at the request of the Land. The work of the Land Office is concerned with registration of title and with land alienation, either for individuals, government agencies, companies or groups. Meanwhile, the Federal Department of Director General of Lands and Mines has a purely advisory role in State land matters staffed by servant administrators.

The objectives of cadastral survey are primarily concerned with the determination of definition of property boundaries, locations and areas, through their marking and description on the ground and plans or maps respectively, for the purposes of alienation, subdivision, partition, amalgamation and conveyancing. The system as practised is classified as fixed and defined boundary whereby parcel definition is by the officially emplaced and mathematically coordinated boundary marks [11].

The existing Malaysian cadastral survey and mapping registration system and land registration system, deals with properties not only located on the surface level, but above the surface level and also below the surface level. Therefore, the rights of the proprietor of the surface parcel shall also apply to the proprietor of the above that is air space and underground land as well [15].

The current Malaysian cadastral registration system does not include three-dimensional objects registration rights. This type of cadastral system has been practiced in Malaysia for a period of one hundred years and it provides essential information about land and property like ownerships of the lots and land parcels for the country. In addition, Cadastral Database Management System (CDMS) and Computerised Land Registration System (CLRS), which work separately in each organisation with different legal aspect, are still in plane surface nature. Consequently, there are no three-dimensional property rights as well as 3D cadastral rights. However, these two systems later on can be incorporated in the registration form with the present advanced and modern technologies such as Geographical Information System, internet, web

based and e-commerce applications.

3.5 INTEGRATION OF CADASTRAL DATABASE MANAGEMENT SYSTEM AND COMPUTERISED LAND REGISTRATION SYSTEM

There could be extensive benefits if Computerised Land Registration System (CLRS) of State Land and Mines Office and District Land Office and Cadastral Database Management System (CDMS) of Department of Survey and Mapping Malaysia, are linked together [16]. Therefore, with the integration of attribute data from CLRS and spatial data from CDMS and through identified applications, efficiency of land administration can be greatly improved. According to [11], the envisaged applications include on-line registration for survey and preparation of title, extending Digital Cadastral Database enquiry module to the land administrators and on the other hand, linking the Qualified Title information to the Digital Cadastral Database. Although conceptually tenable, the eventual implementation would need substantial negotiation and compromise among State Land and Mines Office and District Land Office and Department of Survey and Mapping Malaysia (DSMM).

With the vast change in Information and Communication Technologies, such as Geographical Information System, internet and web-based application and together with the initiative of Malaysian Geospatial Data Infrastructure, National Spatial Data Infrastructure, e-Land of Ministry of Natural Resources and Environment and e-Cadastre of DSMM, CLRS and CDMS database could be integrated electronically. In order to achieve the goal of comprehensive Land Information System from district level up to state level and eventually at the national level, the integration of spatial CDMS database with the textual CLRS database serves as a preliminary requirement [17]. Moreover, [18] introduced a mechanism to integrate these two standalone databases. He suggested that coordination among these authorities can be provided by installation of centralised server or distributed server at each of their office that act as the transporters and bridges in exchanging data between CLRS and CDMS.

4 TOWARDS 3D PROPERTY FORMATION

The development of 3D cadastre registration is more on technical aspect where researchers study on the process of adding 3D cadastre objects in the current cadastre data model and information, accessible amongst the Department of Survey and Mapping Malaysia, State Land and Mines Office and District Land Office. Unfortunately, the two stated databases, which are CDMS and CLRS database work separately in different authorities and is still not in three-dimensional situation. As mentioned previously, Malaysian Land Administration is based on the Torrens System where cadastral map and document of title with spatial and textual information as a legal evidence is required under the rules and regulations in order to have full institutional coordination. Therefore, a good institution is very important

to achieve an excellent and wonderful cadastre registration system. However, due to historical constraints, it seems quite difficult to realise this unless with full cooperation from various legal bodies, technical organisations and other land related government and private sectors.

Recently, in terms of 3D cadastre, a registration model was proposed focusing on the combination of the two different databases mentioned above, namely the legal rights, land attributes and spatial objects geo-data. The three authorities mentioned earlier, are the main government agencies that are responsible for the cadastre registration system whom integrate and coordinate each other, in order to have an integrated and comprehensive cadastral system in Malaysia by using the 2D/3D hybrid cadastre approach [19].

The 3D cadastre objects such as stratified buildings, construction above and below the ground surface are under the responsibility of the Department of Survey and Mapping Malaysia, State Land and Mines Office and District Land Office on the ownership registration and object registration respectively. In short, 3D cadastre registration is a combination of land registration with plan land parcel and three-dimensional land parcel of cadastral registration. These are combinations of legal rights of land attributes, plane cadastral objects and three-dimensional information.

5 CRITERIA ASSOCIATED WITH THE ESTABLISHMENT OF MALAYSIAN 3D CADASTRE FOR 3D PROPERTY RIGHTS AND THE WAYS TO ACHIEVE ITS IMPLEMENTATION

The issues outlined in this section will provide the basis of introduction of 3D cadastre for 3D property rights in Malaysia.

5.1 THE COST OF TRANSITION

Any transition from one system to another more advanced system necessarily entails inevitable costs. One should acknowledge that it could be rather difficult to calculate such transition costs. Despite this fact, an attempt is made below to present at least the main directions of the expenditures for the introduction of 3D property formation as well as the factors that influence these expenditures. Where possible, the estimation is done in monetary terms, primarily according to the information available about the developments in the countries that are going to introduce 3D property formation.

First, it should be mentioned that the transition from existing formation to three-dimensional has only to take place when the benefits to be obtained from the new system outweigh the costs associated with its implementation. Otherwise, there is no reason to change the old system that, in this case can perform its functions to a satisfactory extent under given circumstances.

It is found that the following measures entail main expenses with regard to the transformation from existing method to three-dimensional environment:

- a) Changes in the property legislation

- b) Changes in the property registration system as well as its registration and maintenance costs
- c) Changes in the handling of cadastral procedures
- d) Preparation of the new instructions, regulations, handbooks and so on
- e) Education of the people who are to deal with different aspects of 3D property formation, such as surveyors, registrars and other

5.2 LEGAL ISSUE

5.2.1 THE NECESSITY OF CHANGES IN THE LAND RELATED LEGISLATION

Legal issues associated with the establishment of 3D property formation, as mentioned in the previous chapters and sections, is the most important aspect in the process of introducing 3D property formation because it forms the base for all subsequent activities. The process of changes in the current legislation is rather time consuming which is quite natural as the matter in question should be comprehensively investigated and the host of factors should be considered. On the other hand, if the alteration of the current property legislation is artificially speeded up in order to get the working system as soon as possible, the consequences can be that unforeseen problems will arise and the amendments to the already adopted legislation on 3D property formation will be needed. As a result, the process of removing the failures can take longer times than would be needed in the case of careful investigation.

In general, when deciding on the introduction of the 3D property formation into the current legislation, it is first necessary to clarify if there are some provisions in the legislation that allows consideration in handling 3D situations. Secondly, to clarify if these provisions are sufficient for the present moment, and for the immediate future, and thirdly, if not, what changes should be made? Property legislation in some countries is largely adapted to handle 3D situations where either only minor or no changes are needed in the legislation. If the need for the new system has been identified, it is then necessary to decide which changes and additions should be made to the legislation. If, on the other hand, a country's legislation lacks any provisions concerned with three-dimensional situations and the need for 3D property formation exists, the development of the purely three-dimensional legislation is a better alternative. The extent of the necessary changes and additions, which depends on the legislation, exerts great influence on the other legal, technical and organisational issues related to 3D property formation.

5.2.2 HANDLING OF CADASTRAL PROCEDURE

In principle, the introductions of 3D property formation must not significantly change the cadastral procedures, but some alterations in the old system are still inevitable. The application for a cadastral procedure concerned with 3D

property formation will still be maintained by the survey and mapping department. The same suitability conditions must apply as to existing properties. What is specific for the formation of 3D properties is that during the procedure, the survey and mapping department should hold more consultations with the planning and building department.

Together with conventional maps, construction drawings must have the possibility to be used as cadastral maps and serve for the determination of new boundaries. It means that the survey and mapping department has to set up the requirements for these drawings. The survey and mapping department should, together with the professionals responsible for the project, control the drawings that are compiled by an authorised entity. If the survey and mapping department handles the drawings during the procedure, participation of a consultant who is literate in the property formation is recommended. The new property boundaries can be charted on the available drawings.

In general, cadastral procedure associated with 3D property formation is more time consuming than the normal procedure because more factors should often be considered. It may also require closer cooperation between the survey and mapping department with the planning and building department.

5.2.3 DEFINITION OF BOUNDARY

Drawing of precise boundaries between 3D properties will be one of the greatest problems. Boundaries must be well defined that there can be no misunderstanding in the rights and responsibilities. These boundaries must be described in detail in the document of title and cadastral map. That is why it is necessary to pay due attention to the issue of boundary determination in 3D property formation.

First, the objects outside the boundaries of a 3D property should be resolved. It is necessary to identify what else, besides the building or facility, is included into a 3D property. Usually, the ground related in some ways to the building or facility is included in the volume of the 3D property. For example, the ground on which the building is built, the ground area containing the exits from an underground property and the ground area between platforms in a 3D property.

It is obvious that the property boundaries can no longer be described by x and y coordinates. They should instead be described in detail using x , y and z coordinates in the documents of title and cadastral map and this should be done with such precision that any doubt should never emerge concerning the exact position of the boundary.

Another question is where to put the boundary between 3D properties within a building, which can be solved through some different approaches. In Malaysia, there are clear rules about this in [20] that the boundaries are in the middle of the walls, floors and ceilings and what is beyond this is common property. In other countries, for instance, in Sweden, it is up to a surveyor to decide where to put the boundaries in each

particular case. The last approach is deemed as more flexible than the first one as it allows finding a solution best suited to the particular circumstances. In addition, 3D property formation is such a complicated matter that it is very difficult to find some standardised solutions for the drawing of the boundaries.

5.2.4 MANAGEMENT OF 3D PROPERTY

The introduction of 3D property formation has two contradictions. On one hand, each property should be as independent as possible from other properties. On the other hand, properties subdivided horizontally become more dependent on each other. Vertical relations between 3D properties become more complex than the horizontal properties. These units cannot be separated and the upper levels are dependent on the support from the levels below. The underground is dependent on the upper levels for upward outlet, ventilation, drainage and passage purposes. When several properties are in such close connection within the same building complex or construction, it is also important that there are clear rules about rights between neighbours to get access to maintenance, repairing and building work. In the Swedish Land Code, for example, there are provisions intended for the protection of a property owner from the damage caused by non-maintenance of the neighbouring property. If, for instance, bearing to a fixed point for constructions in a building are included in 3D properties, there is a great risk for such damage.

Management of common property can be conducted through a Management Corporation or Joint Management Body for strata scheme that has not been subdivided. In complicated cases, a professional manager can be appointed. When all the owners take part in the management corporation, it can be easier for them to be aware of the costs and needs to be fulfilled, but for large schemes, self-management can be too complicated and then it is more convenient to let a professional manager to take care of it. Clear rules must also be established for all management corporations, because of the problems and disagreements that can arise. Problems can occur, for example, with the management of a building containing residential, commercial, office, car parking and shopping complex properties, such as a service apartment concept in mixed developments. The cooperation matters thus become difficult to handle in this case. Different property owners may have different views on what condition is considered good for the building and how much money should be spent on the management. Those living in the residential properties will not necessary think investing in the renovation and repainting that puts the building in a good condition after every 20 years as appropriate. On the other hand, a professional manager who takes care of the retail properties on the ground floor would have completely different interest in the building being in a good condition. This shows that clear contradictions may exist concerning the condition in which the properties should

be held.

5.2.5 FIRE PROTECTION AND INSURANCE IN 3D PROPERTY

When usual property formation is concerned, a building constitutes one property and thus has one owner. The fire protection of the building in this case means that the building is constructed in such a way that it can withstand fire until all people have been evacuated from the building. In the case of 3D property formation, there may be many property owners in the same building, who will be affected in case a fire. Therefore, the need exists to develop measures against fire spreading within building.

The most common way for fire protection is a firewall, which is a metal or concrete wall with very high withstanding capacity that will prevent fire spreading between properties without help of a fire brigade. It is quite easy to limit fire spreading horizontally between normal properties but in the case of 3D property formation, there is a risk of fire spreading in the vertical direction between different properties. Most often, it happens through windows. However, this can be resisted in different ways including by having:

- a) Larger safety distance between windows vertical wise
- b) Fireproof windows that cannot be opened. However, these are inappropriate for dwelling purposes
- c) Introduction of a kind of firewall that limits fire spreading in the vertical direction
- d) The use of sprinklers that are automatically activated in case of fire

Another important issue related to the security of 3D properties is insurance. With 3D property formation, many owners and different activities can be gathered in the same building. Therefore, it is important to have clear rules about the insurance and to regulate the relations between the different kinds of insurance, such as what should be included in the insurance for building, for the private units and for the common property.

5.2.6 BUILDING RENOVATION ISSUES

3D properties that most often tend to encompass a building or facility are subject to obsolescence because of time. It means that with time the question of renovation of building or facility or part of the same can arise. Sometimes, it may be even necessary to demolish a building or facility. As 3D properties within a building are considerably dependent on each other, it is necessary to have clear guidelines in the legislation concerning undertaking such measures.

First, any works aimed at renovation or demolition of the existing building or facility or part of the same must require an official permit. The property owner applying for such a permit should gain consent from other property owners affected by the measure. Otherwise, the application will be rejected. Any works being undertaken in connection with building renovation should be carried out in such ways that no substantial damage or inconvenience are caused to the

adjacent properties. Otherwise, the question of compensation should arise.

5.2.7 REGISTRATION OF 3D PROPERTY RIGHTS

The matter of registration is one of the most discussed when 3D property formation is concerned. It is obvious because the main objective of any property register is to warrant legal security in property transactions. The registration is thus not an aim in itself. The primary target, from a legal point of view, is to make 3D property rights certain and transferable and, in this way, to make the multi use of space practically possible and attractive to the market. Therefore, all the legal situations, especially those related to complex three-dimensional cases, have to be represented in the register in a correct way and the registration should provide an insight into the actual legal situation in a simple, straightforward and sustainable manner.

Discussing about 3D property rights registration in the most general sense, one can point out first, that such registration will be, in one way or another incorporated into the existing property registration framework of a country wishing to introduce 3D property formation. It is obvious that the introduction of purely three-dimensional registration would entail huge changes in the law and it, in itself, is rather non-purposeful because 3D property formation is often needed only for intensively used properties in urban areas. In many situations, normal registration is still sufficient and this will be the case in the observable future. The two types of properties will therefore co-exist in the registration system.

As seen in the previous sections, the main distinctive feature of 3D property formation is the vertical dimension being taken into consideration, and should be explicitly represented in the register. Therefore, from this point of view, it is important to understand how this dimension can be shown in the register, along with other relevant information on a particular 3D property. Another important issue is the relationships between different 3D properties as well as between 3D properties and normal properties. In order to get a good insight, it is useful to look at Sweden that has developed good prototypes of three-dimensional registration system.

5.3 TECHNICAL ISSUES

The technical perspective of 3D property formation has been paid great attention in recent years in many countries, primarily because technological achievements have made it possible not only to create 3D models of 3D objects but also to visualise these objects in 3D space. In addition, the new methods of 3D data acquisition have become available. All these facts increase the interest to three-dimensional issues in real estate property domain because now it turns out to be possible to establish a closer link between the real world and legal objects that are represented in the register, which could add to the overall efficiency of the whole system of property rights. It is found that there are two general groups of such

aspects that can be identified:

- a) The creation of a 3D data model in order to implement 3D objects into the current ordinary land information system
- b) 3D cadastral mapping

The first item is extremely important because without a 3D data model, it will be impossible to organise efficient management of 3D information in a property register. This data model can be separated into two different components:

- a) Semantic data model
- b) Geometric data model

The second group of technical aspects of 3D property formation is 3D cadastral mapping, which involves obtaining digital mapping of 3D data in establishing a cadastral information system. This, in general, usually generates problems because the current digital or paper cadastral maps are based often on lack of altimetry information, for example, in the form of contour lines, not to mention that there is often no information, regarding the existing infrastructure below and above the ground. Even if the legal system of a particular country allows managing three-dimensional situations to a satisfactory extent without recourse to 3D property formation, the representation of these situations has always been plan dimension. In this respect, all countries face mainly the same problems.

As a conclusion, one can say that paying due attention to the technical issues aimed at the establishment of the information base of 3D property formation results in getting the system that is capable of performing its tasks with a high degree of efficiency. It is also important to realise that, once obtained, three-dimensional information can be used for many purposes such as in city planning, city management, environment impact assessment and so on.

5.4 ORGANISATIONAL ISSUES

The success of any system of property formation and property registration is dependent on how the legal, technical and organisational aspects are resolved with regard to this system. One of the most important matters is to decide on the authority responsible for three-dimensional registration, survey and mapping. To the great extent, it depends on the current organisational framework in a particular country. Solving the issue on registration of 3D properties requires comprehensive tools and solutions in legal and technical sides, practically in the cadastre and land registry. If the country in question has different authorities dealing with these two matters, a comprehensive decision-making is more difficult but the implementation of three-dimensional registration in separate organisations can be easier since the full data consistency is not always compulsory by law. This is the case with Malaysia where the registration of titles is by the State Lands and Mines Office and District Land Office while the survey and mapping falls under responsibility of Department of Survey and Mapping Malaysia, a federal agency.

In the case of a single authority responsible for both cadastral and land registry, there should only be one decision maker and the comprehensive solution can be achieved easier. However, as data consistency between the legal and mapping division is compulsory, the implementation of three-dimensional registration is more complicated. This means that the solution of three-dimensional registration should be simultaneous in the legal and mapping parts of the system.

6 RECOMMENDATIONS FOR AMENDMENT

As mentioned earlier in this writing, the need of 3D property formation exists in Malaysia, mainly in large cities. Therefore, the legal situations should be looked into in the cases where 3D property formation can be relevant and what changes should be made to the current cadastral and land law in connection. Analysis of the Malaysian legislation allows an opinion that it already provides for some elements of three-dimensional concerning property. According to the definition of real property given in [21], it refers to any land situated in Malaysia and any interest, option or other right in or over such land. Meaning that it is possible to own property where dimension is on surface, above surface and below surface. The matter of ownership of these three dimensions is very important concerning 3D property rights.

In order to make it possible to create 3D property in Malaysia, some changes will be needed to the legislation. It is necessary to make provisions in defining complicated building structures, especially those including the underground space and air space as separate 3D property. As far as utilities are concerned, it would also be useful to define them as a kind of 3D property, so as to deal with them as integral legal objects, not divided among different parcels. The owners of these utilities, some of which are quite influential companies, can well be interested in the clear definition of all the legal issues with their possessions, which gives better security, and thus could form a room to work and adopt the new legislation.

7 CONCLUSION

Malaysian land and cadastral registration is thought to be served by a transparent and accessible registration of rights to properties. Current cadastral systems that are traditionally parcel based experience complications in maintaining and providing information on the legal status of property in three-dimensional situations. The actual needs for a 3D cadastre and 3D property registration not only consist of general, fundamental needs for a 3D cadastre, but also of country specific needs. General needs address the issue on how to maintain and provide three-dimensional information on properties in cadastre systems, which are traditionally based on a flat surface cadastral map and registry title.

The development of modern society, being most active in urban areas, results in high pressure on the land use. Nowadays, many cities including those in Malaysia often meet with the problem of the lack of land for development that leads to the intensive use of space above and under the ground surface. Consequently, legal situations occur when different activities are located on different level of spaces. The experience shows that handling such situations within the existing traditional property formation framework does not allow provision of a clear insight into the related property rights, and this framework might no longer be applicable in the future in cases involving more complex situations.

Therefore, a new approach is needed which could overcome these deficiencies. Such approach is called 3D property formation, which implies the system of measures aimed at the establishment of properties with the rights on them being explicitly defined both horizontally and vertically. Historically, property rights have been considered three-dimensional for quite a long time, but the lack of explicit vertical delimitation of these rights did not allow true 3D property. The need for 3D property formation exists also in Malaysia and thus the ways to implement this possibility into the current cadastral and land law should be considered.

A number of organizational issues must also be solved to get a well functioning system. The issues include the responsibility for 3D registration, preparation of guidelines, regulations, seculars and instructions as well as training of experts in the field of 3D property formation. Subsequently, possible directions of the establishment of 3D property formation in Malaysia have been outlined. The target groups are property above and below the surface, which includes structures attached to a multi-layer building, the usage of air space, complex building structures encompassing underground spaces and utilities as well as building structure above public road. Since it is possible to own strata and stratum properties in Malaysia by Strata Titles Act 1985 (Act 318) and National Land Code 1965 (Act 56) respectively, only addition to the current legislation would be needed. First, neighbour relationships issues and management of common areas and second, the rights of ownership, fire protection, insurance and boundary definition. In order to be able to define above and underground spaces and utilities as 3D properties, the development and adoption of the new legislation would be needed.

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