Article Title Page

ASSESSING THE MOST SUITABLE VALUATION APPROACHES AND METHODOLOGIES FOR STRATUM TITLE IN MALAYSIA

Author Details *(please list these in the order they should appear in the published article)*

Author 1 : **FAZIAH ABD RASID**
Department National Institute of Valuation (INSPEN), Valuation and Property Services Department,Ministry of Finance,
University/Institution: National Institute of Valuation (INSPEN)
Town/City: Kajang
State (US only): Selangor
Country: Malaysia

Author 2 : **ASSOC. PROF DR. HISHAMUDDIN MOHD ALI**
Department: Faculty of Geoinformation & Real Estate
University/Institution: University Technology Malaysia (UTM)
Town/City: Skudai
State (US only): Johor
Country: Malaysia

Author 3**: DR. KHATIJAH HUSIN**
Department: Faculty of Geoinformation & Real Estate
University/Institution: University Technology Malaysia (UTM)
Town/City: Skudai
State (US only): Johor
Country: Malaysia

NOTE: affiliations should appear as the following: Department (if applicable); Institution; City; State (US only); Country.
No further information or detail should be included

Corresponding author: FAZIAH ABD RASID
Corresponding Author's Email: faziah@inspen.gov.my

☐ *Please check this box if you do not wish your email address to be published*

Purpose – The purpose of this paper is to examine the current policy and legislation related to Stratum Title and assessing the valuation issues and most suitable valuation approaches and methodologies for Stratum Title in Malaysia.

Design/methodology/approach – And by using Nvivo software, researcher will carry out the contents analysis from the primary data of face to face interview and expert interview. It's will help the researcher develop and establish the valuation approached dan methodologies for Stratum Title in Malaysia.

Findings - From the analysis there are several suggestions for valuation approaches and methodologies for Stratum Title in Malaysia context. Which are Shadow Method, Residual Method, Cost Method can Comparison Method. But the most suitable method are Residual Method by extension the DCF method and Comparison Method a mixture of other principles are more appropriate.

Research limitations/implications:–

i) **Limitation of literature review**- There is no others country have a title for underground land. Only Malaysia have a title underground, that we call it 'Stratum Title'. Related to this, it's very difficult to find a literature review on Stratum Title. Mostly the literature reviews are related to underground land or underground space, subterranean space, or some countries are using 'subsurface' living. In Malaysia, there are only few researches which are related to the Stratum Title due to lack of information and knowledge about this.

ii) **Limitation of data collection** - Due to lack of information and knowledge about the stratum valuation, only five of them willing to answer willing the semi-structure questioner. A few of them did not answer the entire questioner especially valuer

because they don't have an experience in stratum valuation. The valuation of Stratum Title in Malaysia is not established yet.

Originality/value- This is the first paper to assess and analyses the valuation issues on Stratum Title and also to determine the most possible valuation approaches and methodologies to value the Stratum Title in Malaysia context. Only Malaysia has a title for underground land (that we call it Stratum Title)**.**

Key words:

National Land Code, Underground Development, Subterranean Space, Stratum Title, Valuation Methodologies and Approaches

1.0 Introduction

The National Land Code (NLC), the main land law in Peninsular Malaysia has been amended in 1990 to enable State Authority to issue Stratum Title for underground land. This Stratum Title can be issued seperately from the land title issued for the surface land. In Malaysia, land is divided into surface land, underground land and stratum land. This underground land is supposed to be owned by the surface landowner but the legal question is how deep that they own. Landowner does not know the actual depth that they own. With the amended Section 92A-L, we can conclude that the next layer of land is state land and the State Authority can now alienate the land for the issuance of the Stratum Title.

For valuation purpose, basically valuation is based on the title of the property which is by valuing the land and building or the land physically or various types of property such as residential, commercial and industrial property. In other words we call it landed property. While stratum is a solid aspect underground land with the depth determined below the earth. The used of underground land, either for buildings, infrastructure, e.g. utility networks, subterranean dwellings, mineral extraction and alike.

1.2 Problem Statement

Based on the above disputes, there are queries that arise that need to be figured out and studied according to our valuation practice in Malaysia. The valuation of Stratum Land in Malaysia is yet to be established in the Malaysia valuation sector. Based on assessment practice in valuing surface land is by using "two dimensional" calculation in measuring land area involved, by taking into account length and width. However, in the stratum, it is measured using "three dimensional" that taking into account length, width and depth that is calculated in volume. So in this case, how to value surface land which have a Stratum Title or how to value the Stratum Titles itself?
In this research, it is the intentions to look on the legislation issues related with Stratum Title, to examine the differences exist between Stratum Title and underground development in other countries. Also to determine the factors that affect the stratum interest and to assess and analyses the valuation issues that and assessing the most possible valuation approaches and methodologies that could be applied in the Malaysian context.

1.3 Research Objective

The main of this paper is to examine the current policy and legislation related to Stratum Title and assessing the valuation issues and most suitable valuation approaches and methodologies for Stratum Title in Malaysia.

2.0 Literature Review

2.1 Underground Land in Malaysia

Underground development began in Malaysia about twenty six years ago from the establishment of below Merdeka Square, Petronas Twin Tower and other constructions below ground level such as parking lots and other underground developments. The establishment of shop lots below the Merdeka Square in year 1990, the completed of Petronas Twin Towers (KLCC) in 1997, and Light Rail Transit (LRT), recently Mass Rapid Transit (2014) which under construction now is the most comprehensive developments of underground land in Malaysia.

Noted by Ghazali et. al (2000), stratum survey in property development in Malaysia is still new had to struggle with various problems due to underground development. Being a new form of land development several problems have been encountered, which includes the legal implications to the landowners above the developments and technical problems pertaining to building structures and the safety of the occupants. To overcome some of the problems the National Land Code (NLC), the principal land legislation in this country was amended in 1990 to enable the State Authority to issue Stratum Title to spaces underground. These Stratum Titles can be issued separately from the land titles issued for the surface land. In conjunction with this, National Land Code (Amendment) 1990 (Act A752/1990) and has been gazetted on 22nd February 1990. A new section "Part Five (A)" entitled "Disposal Of Underground Land" has been established regarding the disposal of underground land and other areas which are related. Prior to the above amendment, the use of underground land by the owner did not have any restrictions in terms of usage or depth. The owner can use it at any

preferred depth or height. The National Land Code (NLC) was amended in 1990 to enable the State Authorities to issue Stratum Title for underground land. Stratum Title can be separated from land titles issued for surface land. This is stipulated in Part 5(A) under Section 92A to 92G. According to Section 92G (1), underground land can be used for any purpose provided approval is obtained from the local authority.

i) What is of Stratum

Referring to Section 92A, Part 5(A), National Land Code 1965, stratum is defined as a cubic layer of underground land. "Stratum" is a solid aspect of underground land with the depth that is determined below the earth surface as in Diagram 1.

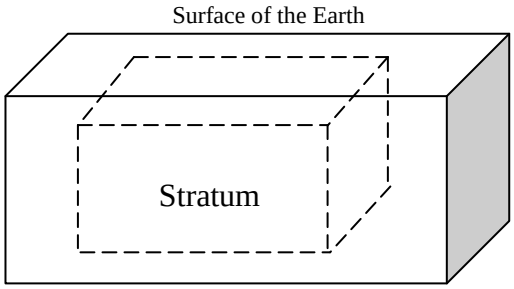


Diagram 1: Stratum
Source: Circulation JKPTG No. 1/2008

Stratum is defined as a cubic layer of underground land. Underground land is defined as land which lies below the surface of the earth. There are three types of land; namely State Land, Alienated Land and Reserved Land. There are four types of disposal of underground land as follows:

i. Alienation of underground State Land;
ii. Granting a right to use underground land below alienated land;
iii. Lease of underground reserved land; and
iv. Granting a right to use underground land below leased reserved land

ii) Stratum Depth

The depth of stratum is determined by the Local Authority. The local authority can set a certain depth of the stratum which can be enjoyed and used by the landlord on the surface of the land alienated. The depth then will be endorsed in the alienated land title as an expressed condition. However, the depth of a stratum limit shall not be less than the minimum depth that has been set. Minimum depth is determined by regulation of National Land Code (Minimum Depth Underground Land) 2006 which was enacted on 5 December 2006 through Warta Kerajaan Persekutuan P.U (A) 414 dated 4 December 2006 as attached in Table 1 and Diagram 2 below.

Table 1: Minimum Depth Of Disposal Of Underground Land.

Type of Stratum Application	Land Category/Classification		
	Agriculture	Building	Industry
Section 92B KTN	6 meters	10 meters	15 meters
Section 92E KTN	6 meters	10 meters	15 meters

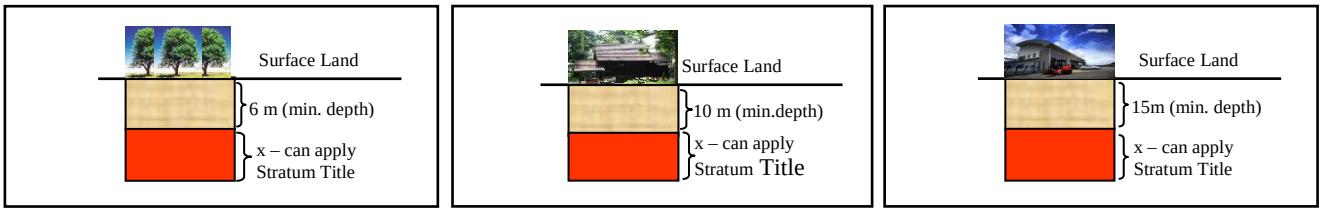


Diagram 2: Minimum depth with part of underground can be applied for Stratum Title by Land Category

Source: Circulation JKPTG No. 1/2008

iii) Application of Stratum Title

Stratum Title is a title issued by the State Authority on any state land (Sec 92 NLC) or any alienated land (Sec 92D NLC) or leased under reserve land (Sec 92F NLC). This land is an underground layer with specified depth below the earth's surface. Example: Alienate a stratum of underground State Land which is below any State Land.

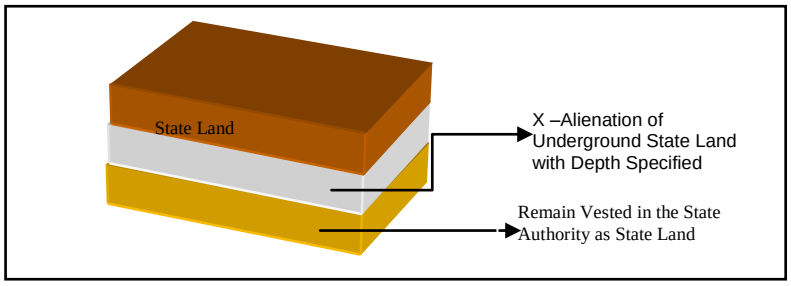


Diagram 3: Disposal of underground land for Sections 92C, NLC 1965

Source: Circulation JKPTG No. 1/2008

2.2 The Development of Underground Space Use

Since ancient time, underground development was existed in the world. Over the years, numbers of development growth expending parallel with the economic and political condition for every country. Sterling (1993) states that the rapid growth of world civilization will have a significant impact on the way humans live in the future. As the global population increases and more countries demand a higher standard of living, the world must provide more food and greater energy and mineral resources to sustain this growth.

View by Woodard (1998), underground space provided a new third dimension for land use and density. From his review of the underground development in the Kansas City area, Kansas City now the most significant pioneer in the development and use of commercial underground space in the world, and people go there to study the precedents established. A few relevant factors about this development are:

- 90% of the world's development and leased commercial underground space is in Kansas City;
- 6 million square feet is added each year in new mining; and
- There have about 50 businesses with 10,000 employees that operate underground in Kansas City.

Sterling (1993) notes that the development of underground space is categorized to a few examples of usage such as residential, religious, recreation, commercial and institutional, industrial facilities, military and civil defense facilities, storage, transportation, tunneling, water supply and sewage treatment, waste disposal, energy production and storage, mining, agricultural uses and miscellaneous.

Raufer (1998) points out; many utilities compete for underground space, from water or gas pipes to optic fiber cables. The same pattern could be traced regarding some transportation systems, both public and private. It is very common to see underground parking spaces in city centre. And something similar has happened with buildings too. In places with severe weather conditions, some built-up spaces tend to be located underground.

In other countries, there are different terms used for their underground space. Some countries are using 'subsurface' living, until most of the countries using the underground term only. Sterling (1993) denotes that on an urban or local level, the use of underground facilities is rising to accommodate the complex demands of today society while improving the environment. Sterling also thinks that the underground level is used by most of the countries to stabilize their living and the use of land.

In other cities, it is the very high value of land that presses development underground, mainly in city centres. In Japan, for instance, prime land has more and more been developed underground for a wide variety of uses: retailing, offices, cultural, etc. As more uses compete for prime underground locations, the more relevant the subject of subsurface rights and values becomes. All instances face a common feature, though. The use of underground land causes many externalities (Pasqual and Reira, 2004).

Utilizing underground space remains one of the great challenges for the future. The potential is to bury unsightly car parks, highways and shopping malls, and direct the surface that this unlocks to other uses that improve the urban environment. The benefits of utilizing underground space can be summarized as follows.

• Efficient land use and improvement of the environment: realizing the potential of underground space in congested urban areas and realizing surface for other uses such as parks and recreational areas. Construction of road tunnels relieves surface routes for cyclists, pedestrians, emergency vehicles and public transport.
• Aesthetic: removing unattractive structures such as car parks, roads and shopping malls from the horizon.
• Sustainable development: removing the need for external cladding and finishes leading to efficient use of materials and cost savings.
• Conservation of energy: using the ground's natural insulating properties to absorb noise and energy, allowing more efficient heating or cooling systems or harnessing the ground for energy storage.
• Protection of people to extreme weather conditions.
• Security: e.g. bank vaults and bomb shelters.

Support with Brundtland (1987), underground space use is tied to the sustainability of an urban area because the use of underground facilities can positively impact the extent to which human occupancy of a land area affects the surface environment. At the core of concern for sustainable uses of the urban underground is the maintenance of opportunity for urban development by future generations.

Back to Malaysia, underground developments in Malaysia are not new, Noted by Ghazali et. al (2000),underground development began in Malaysia about twenty six years ago from the establishment of below Merdeka Square, Petronas Twin Tower and other constructions below ground level such as parking lots and other underground developments. The establishments of shop lots below the Merdeka Square (1990), the completed of Petronas Twin Towers (KLCC) (1995) and Light Rail Transit (LRT), recently Mass Rapid Transit (MRT- under construction now) are the comprehensive developments of underground land in Malaysia.

It showed that Malaysia has already gone to underground development. But until today, there is no Stratum Title issued yet. All this underground development was develop under state land. Under the Land Acquisition Act 1960, Section 3 (1)(a) & (b) Government / The State Authority may acquire any land which is needed for any public purpose; by any person or corporation for any purpose which in the opinion of the State Authority is beneficial to the economic development of Malaysia or any part thereof or to the public generally or any class of the public.

Finding and suggestion from Ghazali et al (2000), forr successful implementation of the underground land development co-operation among all parties involved is necessary. The State Authority, the land administrators, property-related professionals, local authorities, proprietors and the private sectors must be able to come up with positive ideas to develop land underground. Underground land has a lot of potential for various forms of developments that can complement development on the surface of the land. An integrated approach to development using both surface and underground lands need to be worked out. With proper planning and foresight, it can open new opportunities for maximising land use to cater for current and future needs. The National Land Code has been amended and modified to accommodate for futuristic developments.

Refer to C. Yao (2011), in order to use the underground space of the subway station more effective, the problems of the right and the cost estimating of the underground space in the market transactions must be discussed. It is mean have to analysis the theory and the legal right about underground space which involved the land use right. The comprehensive legal system of the underground space will ensured the rights and obligations during the development processes.

2.3 Review of Underground Planning, Usage Strategy and Practice in other Countries

In order to implement an underground planning strategy, there needs to be specific consideration of the local requirements and demands of each country, region or city. The underground development practices are strongly linked. Where the framework to build, operate and maintain underground space has not been development there is potential for the above-ground based legislative and regulative framework to hinder the development of underground space.

Legislative and administrative issues concerning cavern development often include the limits of surface property ownership, the right to develop underground space, application of surface land use regulations to underground space, environmental controls, major permits required and potential development restrictions due to surface and underground planning and usage strategy is summarized below.

No.	Country	Underground Development
1.	Finland (Ilkka,2009)	• The Helsinki Underground Master Pelan (2009) is a legally binding plan for land owners and authorities. • Over 400 premises are located in underground locations (9,500,000 m3). • Used for private utilities in various underground areas of bedrock over the long term. • To managing and controlling the city's underground construction work
2.	Singapore (ESC, 2010)	The Economic Strategies Committee (ESC)- developing underground as long-term economic strategy. As a catalyze of underground development: • developing an underground master plan, • creating basement spaces in conjunction with new underground infrastructural developments,

		• establishing a national geology office • developing a subterranean land rights and valuation framework to facilitate underground development, and, • investing in underground development R&D • to add to the 'land bank'
3.	Hong Kong (Chan. R.K.S.,2011)	• The use of underground space is quite common in Hong Kong in relation to the Mass Transit Railway (MTR) and associated underground retail complexes • Land Use Category for Commercial, Industrial, Industrial and Public Utilities • In considering which types of land uses should have priority for cavern and underground development, criteria should be set up to facilitate an objective assessment.
4.	Norway (ARUP,2009)	• Norway has effectively and strategically placed the majority of their NIMBY type facilities below ground and has valued the land that has been released for other uses. • The concept has great public acceptance and there has been commitment from all government and district levels in implementing this strategy. • Despite the lack of a central or specific legal and administrative framework for planning and regulation of underground space, Norway has a long history of developing a large number and variety of underground facilities.
5.	Canada,	• The Underground City of Montreal is known as one of the largest and oldest underground pedestrian networks in the world. • This case demonstrates that rather than the development of a master plan to guide the growth of underground development, the use of appropriate incentive tools can also encourage successful underground development within the private sector.
6.	China	• More than 20 cities including Beijing, Shanghai, Shenzhen and Hangzhou have or are compiling plans for their urban underground space. • These plans show the size, layout, function, development depth and timing of the underground space, and have defined the guiding theory for urban underground space development of key development areas.
7.	United Kingdom	• Has a long and varied use of underground space, the development of which appears to have occurred according to local needs and on an ad-hoc basis.
8.	Japan	• Has a long history of developing underground pedestrian and retail space that has been mostly promoted by government incentives. • Oil storage, hydropower and other land uses have also been placed underground
9.	South Korea	• Has developed an extensive network of oil and fuel storage facilities for strategic and security reasons.
10.	Netherlands	• The two cities (Arnhem and Zwolle) that have prepared non-binding zoning plans that divide the subsurface into three layers that target the types of uses that those layers would be subject to. • The surface layer accommodates buildings and near surface development. • The next lower layer targets underground transportation systems and the bottom layer targets groundwater resources.
11.	Malaysia	Underground development began in Malaysia about twenty six years ago from the establishment of shop lots below Merdeka Square (1990), Petronas Twin Tower (1995) and other constructions below ground level such as parking lots, construction of Light Rail Transit (LRT) and Storm Water Management and Road Tunnel (SMART TUNNEL), are the comprehensive developments of underground land in Malaysia.

2.3 Valuation Methodology for Underground Land

2.3.1 Traditional Approaches to Value

Basically, there are three approaches to property valuation used by appraisers. Each gives a separate indication of value, yet the approaches are all interrelated and all use market comparison techniques. All three approaches are considered in each complete assignment. However, all three are not always employed, depending upon the property type and the process and report type agreed to by the client and the appraiser.

There are three approaches to consider in making a market value estimate. These approaches are:

i. **Sales Comparison Approach**. Recent sales and listings of similar type properties in the area are analyzed to form an opinion of value.
ii. **Cost Approach**. This approach considers the value of the land, assumed vacant, added to the depreciated cost new of the improvements. This is considered a substitute or alternative to producing a similar improved property.
iii. **Residual Approach**. The estimated potential income of real property is capitalized into value by this approach.

Not only does each parcel of real estate differ in some respects from all other properties, but there are many different purposes for which an appraisal may be made. Each variation of purpose could result in a considerable, yet logical, variation of estimated value. For example the nature of the property, whether noninvestment, investment or service; the purpose of the purchase, whether for use, investment or speculation; and the purpose of the appraisal, such as for sale, loan, taxation, insurance and the like, all constitute matters which will influence the proper methods of appraisal approach and the final result reached by the appraisal (Jean Folger, 2015)

Consequently, the first step in any appraisal procedure is to have a clear understanding of the purposes for making the appraisal and the value to be sought. The adequacy and reliability of available data also are determining factors in the selection of the approaches to be employed. A lack of certain pertinent or up-to-date information may well eliminate an otherwise possible approach.

Each approach is used independently to reach an estimated value. Then, as a final step, conclusions are reached as to one appropriate value opinion. This procedure is known as reconciliation.

2.3.2 Underground Land Value

The estimation of urban land prices has a long tradition in economics. However, urban underground land values have often been ignored as specific research topic in land economics and in town planning. The used of underground land, either for buildings, infrastructure, e.g. utility networks, subterranean dwellings, mineral extraction and alike, causes negative and reciprocal externalities among users. If users are rational and perfectly informed, they will select the best possible location for their facilities, considering the underground space already occupied and regardless of the space required by the rest of potential users.

The importance of underground space for land use policy has grown with the development of urban areas and technological innovation. As, for instance, Raufer (1998) points out, during the industrial revolution cities could not easily grow beyond a given dimension unless they solved the sanitary sewerage and water drainage system, which typically involved the location of the network underground. Since then, many utilities compete for underground space, from water or gas pipes to optic fiber cables. The same pattern could be traced regarding some transportation systems, both public and private. It is very common to see underground parking spaces in city centres. And something similar has happened with buildings too. In places with severe weather conditions, some built-up spaces tend to be located underground.

In other cities, it is the very high value of land that presses development underground, mainly in city centres. In Japan, for instance, prime land has more and more been developed underground, for a wide variety of uses: retailing, offices, cultural, etc. As more uses compete for prime underground locations, the more relevant the subject of subsurface rights and values becomes.

2.3.3 Factors Affecting of Underground Land Value

Refer to previous research by Pasqual and Riera (2004), there are several reason have to consider to the underground land development which related to the characterization of the good.

The first reason is historical. Before towns were congested and with limited technology, underground space could almost be considered a free good because the existing volume of development space below ground clearly exceeded the expectation of needs. That situation was consistent with assigning a zero price to it. Such a price has been maintained in many places, at least by the public sector, despite the radical change in the level of occupation of urban underground land at present.

Second, since subsurface land has not traditionally been perceived as very valuable by many urban decision makers, there have been no strong incentives to clearly define the property rights; in fact, they still tend to be poorly defined from an economic perspective, which restricts the emergence of specific underground land markets.

A third reason could be that, usually, there is not a cash flow regarded as exclusive to subsurface land. Subsurface land is perceived to be in the same lot as surface land, in the same way that both above surface and underground development are undertaken by the same developer. Therefore, in practice, developers try to maximize their profit without explicitly caring about which part of the cost or the benefit comes from above or under the surface.

Fourth, underground development usually has a high cost of reversibility. For instance, to add an additional underground floor to a finished building may be even more expensive than to develop an additional above surface floor.

Finally, a separate market for underground land does not generally exist. This may be for various reasons, such as a high cost of reversibility, transaction costs and a general lack of developers' information on future
Listing by Sterling and Godard (1993) to do the assessments of underground structures have to consider a few factors which are:
i) Life-cycle cost it's - cover lands cost, construction cost, savings in special design features, energy saving, maintenance cost and replacement cost.
ii) Indirect benefits of underground structures such as the various advantages offered by the underground alternative, particularly the environmental benefits (with the cooperation of all the professions concerned engineers, economists, planners, architects, ecologists, etc.).

2.3.4 Valuation options
Most of the related economic literature has focused on the appraisal of underground land is for development of because of pollution. As far back as 1951, Dunlap (1951) realized the need to value those effects. There are several ways to find the value of underground land. The most common one has probably been by comparison. Brownell (1958) favored the observation of actual markets to estimate the burden of an underground development (a pipeline) on the overall land value.

In addition to the above work, Johnson (1967), Rhodes (1974) and Partaker (1982) attempt to calculate the burden for the land owner of different imposed underground land uses, from which to estimate the compensation to be paid for the underground development.

On a different methodological line, the hedonic price (Rosen, 1974) or regression analysis approach has also been applied, looking at land prices of plots with different underground uses, potential uses or qualities. Gunterman (1995) and Jackson (2001) are two examples of hedonic price applications to underground related to pollution (proximity to landfills, and contaminated sites, respectively).

Bucaria and Kuhs (2002), mentioned to know the value for rights of way for telecommunication infrastructure to be developed underground. It adopts the definition of market value provided by the Californian State Public Utilities Commission, which basically coincides with a competitive market price without taking externalities into account. After examining the legal issues involved, it suggests different possible ways to value corridor rights and provide some examples.

Another option by Pasqual and Riera (2004), mention the theoretical approached and empirical way to estimate underground land values which are the shadow price approach and a practical approach. Since urban underground land, as such, is not a separate good with an explicit existing market, its market value is not generally observed and, therefore, it has to be estimated. Both a theoretical basis and a practical way to calculate subsurface estates are important for the estimation. From the theoretical side, the formula for calculating its shadow price has been derived. A formal but simple way to estimate the underground land value has also been proposed. The applied method suggested by them was in this paper (isolating the implicit underground land value from the overall land value) makes the estimation feasible. Also, the implementation of the procedure is considerably quick and inexpensive, which represents an advantage for its application in economic and planning studies. Furthermore, these approaches allow underground land prices to be treated similarly to surface property prices. For instance, a detailed map of underground land prices can be drawn, so that other than average prices may be used. Such a map can be three-dimensional, reflecting how prices also vary according to the depth of the subsurface space considered.

On the other views from Derbes (1992), the appraisal of real estate at times involves some unusual circumstances, particularly relating to underground land uses. Ordinary appraisal problems involve the total bundle of rights which we refer to as fee simple interests. We all tend to think of the use and enjoyment of real property rights as pertaining to the surface of the land. But there are a number of below-surface uses of land that the real estate appraiser may be called upon to value. In this regard, there are instances where the proposed use of the underground may have an impact upon the value of the surface lands involved or adjacent lands.

For appraisal purpose, when referring to the surface use of land, some invasion of the subsurface is allowed to accommodate the use and enjoyment of the surface itself. The foundations of buildings go below the surface. Some of our utilities such as water, sewer, drainage pipes or structures and other appurtenances dip into the subsurface a few feet. And, there are more exotic uses of the underground such as subways, water diversion channels, and even the superconducting super collider.

He divided the underground land into three categories with three valuation approached which are:
i. Near-surface Uses of land – Valuation For Near Surface Uses
ii. Deep underground uses - Valuation For Deep Underground Uses
iii. Semi- deep underground uses - Valuation of semi-deep underground uses

Refer to S.S. Low (1996) in Singapore, The Land Title (strata) Act provides for the subdivision of land into strata, apartment, shop, office, car park units. The airspace or subterranean space is defined in a Surveyed plan showing the

full dimensions including the height. A convenient term for such airspace or subterranean is “as-built”. For such “as-built” airspace or subterranean space the valuation is normally done by the comparison method. For subterranean space not governed by the Land Title (Strata) Act the approach to be used is the Residual Method. In arriving at the value the factors for consideration include the permissible type of development, the extent of development, the depth and height of the subterranean space. To value subterranean space also it is necessary to consider the development cost.

Under the Land Transport Authority (LTA) Singapore, they have different approached to value the underground land:
• For alienation of State land to Land Transport Authority (LTA) for development of MRT:
o Necessary as LTA requires land title to be issue for MRT stations, unlike railways tunnels, where no title are necessary;
o Used comparison method with industrial lands sale as a benchmarked for the value.
• For alienation of link-ways to private owner with commercial floor areas, they used Residual Method (GDV less total development costs).
• Without any commercial floor areas:
o Enhancement to value of adjoining lands
o Less total development cost
o For public link –ways can be used nominal value.

A.R. Tamlin (1996), there can be no conclusion on a suitable concept for value of land under roads until a number of options for applying a value have been explored. According to him the following options for method to derive values for land under roads and reserved could be considered in South Australia which are: Valuation at a nominal value; adjoining site value; existing use valuation and representative value. For the opinion of researcher, this is similar situation to value the underground land.

C.Yao (2011) introduced a valuation method of the underground land which suit for China’s specific national conditions. The method which introduced was proposed under the support of the legal right of the underground space, the analysis of evaluation methods which were usually used at home and abroad, and based on the principle of opportunity cost. The method of the underground land cost estimating was in accordance with the following steps, the first step of the underground land cost estimating method was to analysis the main factors of the underground land price, the second step was to determine the utilization of underground space in subway station, and the third step was to determine the price of the underground land in the subway station.

2.3.5 Theoretical Framework for Possible Valuation Approaches and Methodologies of Stratum Title in Malaysia

From the literature reviews indicates that, under the legal aspect, in order to use the underground land we must do the analysis of the theory and the legal right about underground land which involved the land use right. The comprehensive legal system:

i) Legislation and policy- it is very important that local authorities should control the use of the underground land of their cities through appropriate laws and regulations. The major aim of these laws and regulations should be to achieve the best possible use of the urban underground land in connection to the surface town planning. There should also prepared to provide guidelines, criteria and classifications for assessing appropriate uses of underground land and the issuing of Stratum Title.
ii) Land use planning - the awareness of underground option among planners, developers and financiers should be increased so that underground planning issues are properly addressed. The planning should be an integral part of the normal land use planning process.
iii) Property right- has to analysis the theory and the legal right about underground land which involved the land use right. The comprehensive legal system of the underground land will ensured the rights and obligations during the development processes.
iv) Economic factor – economy aspects remain a major barrier to the development of underground land because of the initial construction cost is generally higher than for building in the open air. The economic benefits of an underground facility need to be calculated in detail.

Under the valuation aspect, to arrive the valuation methodologies for Stratum Title have to consider a few factors that can affect the land value. However there are six (6) main factors affecting the underground land value, which are:

i) High cost of reversibility - underground development usually has a high cost of reversibility. For instance, to add an additional underground floor to a finished building may be even more expensive than to develop an additional above surface floor.
ii) Cah Flow - to do the assessment of underground land have to consider a few factor which are under the life-cycle cost it’s cover lands cost, construction cost, energy saving, maintenance cost and replacement cost.
iii) Strong Incentive – indirect benefits of underground structures such as the various advantages offered by the underground alternative, underground land has not traditionally been perceived as very valuable by many urban decision makers, there have been no strong incentives to clearly define the property rights; in fact, they still tend to be poorly defined from an economic perspective, which restricts the emergence of specific underground land markets.

iv) Historical - before towns were congested and with limited technology, underground space could almost be considered a free good because the existing volume of development space below ground clearly exceeded the expectation of needs.
v) Lack of info - lack of information on future development for underground land especially in Malaysia.

From the findings of the literature review , the developing of a theoretical framework to analyses and assess the valuation issues that impact on Stratum Title and renew possible valuation approaches and methodologies that could be applied in the Malaysian context are shown in the following Diagram 4.

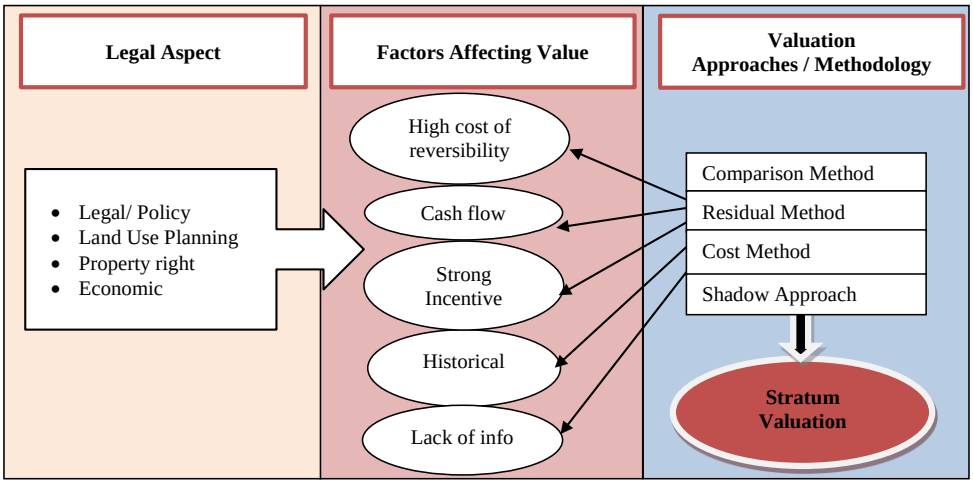


Diagram 4: Theoretical Framework for Possible Valuation Approaches and Methodologies of Stratum Title in Malaysia

3.0 Research Methodology

Refer to Diagram 5

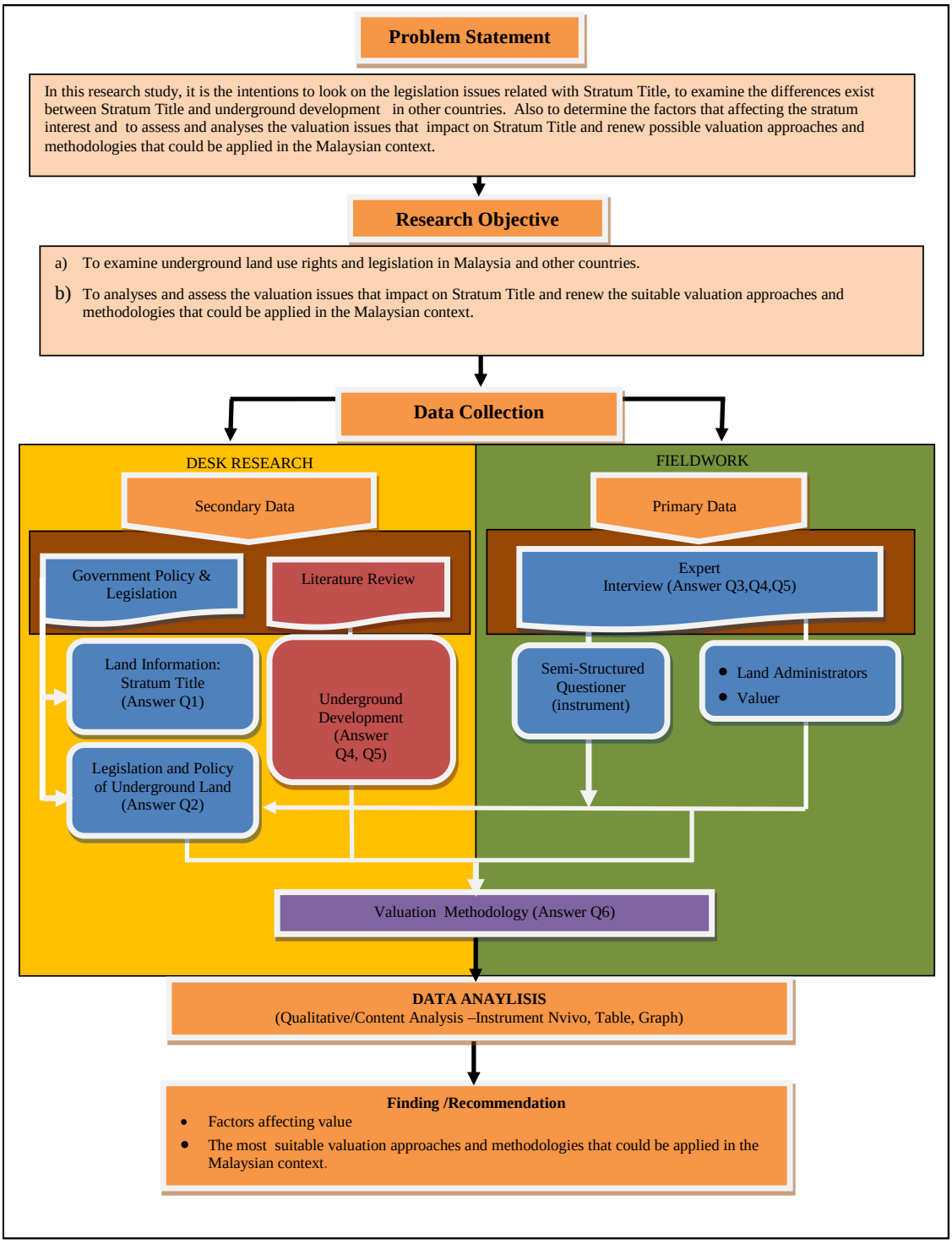


Diagram 5 : Research Methodology

4.0 DATA ANALYSIS AND FINDINGS

As discussed under this chapter, the Cognitive Maps (Diagram 6), was developed from the model application in Nvivo software. it's indicates that, to arrive a the 'Stratum Valuation Methods' have to consider a two parent factor which are 'Legal Aspects' and Factor Affect Value'. In other word to drive the most suitable methods have to consider these important factors.

Each factor has their owned sub-factors to be considered. Finally under legal aspect have six (6) factors to be considering which are Land use planning, Property right, Legal or policy, Economic factors and Expertise. Under the Expertise, the cooperation of all the professions concerned engineers, economists, planners, architects, ecologists, valuer etc. are very important.

For the factors affecting value , eight (8) factors to be considering which are Cash flow, History, Lack of information on future development, High cost of reversibility, Location, Tenure and Other. And for sub-factors are depth and high, type of development, energy saving, strong incentive, replacement cost and maintenance cost.

Finally from this analysis, there are four methods to value Stratum Title which are Shadow Method, Residual Method, Cost Method can Comparison Method. And the most suitable methods are Residual Method by extension of DCF method and Comparison Method a mixture of other principles are more appropriate.

Diagram 6 :The Model For Cognitive Maps

5.0 CONCLUSION AND RECOMMENDATION

5.1 Conclusion

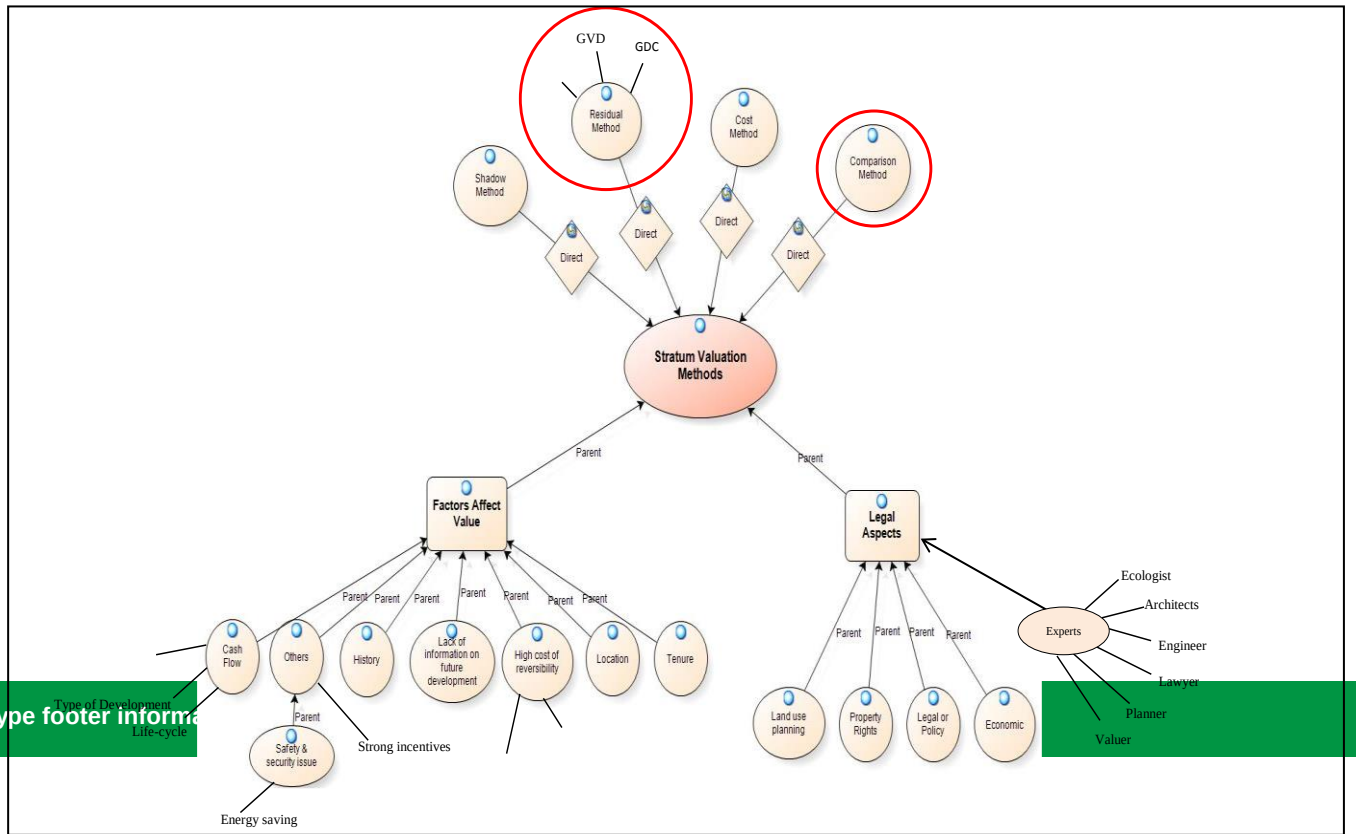
The conclusion will be drawn by referring to these sub-objectives.

a) Sub-objective (i): Examine underground land use rights and legislation in Malaysia and underground development in other countries

The legislation relating to stratum owner ship is the National Land Code under the provisions of Section 5 (A) under Section 92A to 92G. For the State Land Rules, only Kelantan state has a provision for the disposal of the stratum ownership. Other states have not a located these things and are still promulgating the relevant provisions. Refer to previous research and expert opinion they agree that the Stratum Title legislation is adequate; however, there still need to be further restudied and some improvement to be made to the act. For example the minimum depth of underground land for development must have a limitation depth due to issues of safety and construction/development constraints. Hence, the need to limit the depth allowed for development. Others factors for legal aspect have to consider are adequacy of Stratum Title; rights transfer from surface landowner to the underground land ownership; land use planning/ issues in land use; property right/ ownership rights and economic factors.

Factors affecting land value of this land are complex. However there are nine (9) main factors affecting the underground land value, which are:

High cost of reversibility - underground development usually has a high cost of reversibility. For instance, to add an additional underground floor to a finished building may be even more expensive than to develop an additional above



surface floor. It does will affect the price.

Cash flow - to do the assessment of underground land have to consider a few factor which are under the life-cycle costs and operation it's cover lands cost, construction cost, energy saving, maintenance cost and replacement cost. Each underground development may have its own peculiar features, return and cost. Limited experience of government departments to work in, and maintain underground space, it is also increase the cost of maintenance because have to hire from oversea or other expertise.

Strong incentive – indirect benefits of underground structures such as the various advantages offered by the underground alternative, underground land has not traditionally been perceived as very valuable by many urban decision makers, there have been no strong incentives to clearly define the property rights; in fact, they still tend to be poorly defined from an economic perspective, which restricts the emergence of specific underground land markets.

Historical - before towns were congested and with limited technology, underground space could almost be considered a free good because the existing volume of development space below ground clearly exceeded the expectation of needs. The historical developments have to be considered if there is relevance to the current and future use.

Property rights- Article 13 of the Federal Constitution protects all land owners/ stratum with title. This is important. The rights given should be the ultimate, meaning it cannot be questioned. As in the case assignment, what is transferred is the right to the land. The tenure is an issue as well, whether freehold or leasehold or should just follow the surface title.

Lack of info - lack of information on future development for underground land especially in Malaysia. Obviously, since the planning department does not look into this, as all master plans and local plans cover surface only.

Land use planning- the importance of underground space for land use policy has grown with the development of urban areas and technological innovation. The land use planning is important factor which can affect the land value.

Tenure - the tenure can be either be free hold or lease. It does will affect the value.

Location - as one of the important factors which can affect the land value

b) Sub-objective (ii): To analyses and assess the valuation issues that impact on Stratum Title and the most possible valuation approaches and methodologies that could be applied in the Malaysian context.

For the valuation purpose, basically valuation is based on the title of the property which is by valuing the land and building or the land physically or various types of property such as residential, commercial and industrial property. In other words we call as a landed property. In addition with this landed property, are also have strata property, which each of it having its own uniqueness and market especially for residential and commercial property. In this case, land is referring to the land surface. Apart from strata property that being issued the Strata Title, there has another title we call it Stratum Title. While stratum is a solid aspect underground land with the depth determined below the earth. The used of underground land, either for buildings, infrastructure, e.g. utility networks, subterranean dwellings, mineral extraction and alike. The valuation of Stratum land in Malaysia is yet to be established and this is a new area of valuation to establish.

From the findings of data analysis of this study there are several suggestions for valuation approaches and methodologies for Stratum Title in Malaysia context. The methods are Shadow Method, Residual Method, Cost Method and Comparison Method. At this point of time, it is not possible to zero in on a specific best method but the most suitable methods are Residual Method by extension of DCF method and Comparison Method a mixture of other principles are more appropriate.

5.2 Limitation of Study

Some limitations were encountered in this study are;

i) Limitation of literature review

There is no others country have a title for underground land. Only Malaysia have a title underground, that we call it 'Stratum Title'. Related to this, it's very difficult to find a literature review on Stratum Title. Mostly the literature reviews are related to underground land or underground space, subterranean space, or some countries are using 'subsurface' living. In Malaysia, there are only few researches which are related to the Stratum Title due to lack of information and knowledge about this.

Even though Stratum Title was established in Malaysia in 1990 under the NLC with a new section "DISPOSAL OF UNDERGROUND LAND" has been but until today there is no and other areas which are related.

Underground development began in Malaysia about twenty six years ago from the establishment of below Merdeka Square, Petronas Twin Tower and other constructions below ground level such as parking lots and other underground developments. It showed that Malaysia had already gone to underground development. However, the disposal of the ownership is not available, including the case of stratum Pergau Dam Development in Jelly Kelantan, which is an underground development but until now the ownership of the stratum has yet to be determined. And also from the review by Land and Mineral Office of Selangor and related government agencies, there are no Stratum Title issued and no related property disposal in this country.

ii) Limitation of data collection

Due to lack of information and knowledge about the stratum valuation, out of twenty expertise only five of them willing to answer willing to answer the semi-structure questioner. A few of them did not answer the entire questioner especially

valuer because they don't have an experience in stratum valuation. The valuation of Stratum Title in Malaysia is not established yet.

5.3 Recommendation

The conclusion of this study had mentioned the most suitable method are Residual Method and Comparison Method. Related to that, for the future research should adopt the case study or actual case to prove the valuation of Stratum Title. This is highly beneficial to enhance this study and analysing in depth for establishes the valuation methodologies of Stratum Title in Malaysia.

Biblography

Andy Krause, Ron Throupe (2012), Contaminated Properties, Trespass, and Underground Rents; Journal of Property Investment & Finance, Vol.30 No.3.2012

Artikel Projek Mass Rapid Transit Lembah Kleng Jajaran Sungai Buloh-Kajang

ARUP (2009), Enhanced Use of Underground Space in Hog Kong- Feasibility Study; Geotechnical Engineering Office of the Hong Kong Government's Civil Engineering and Development Department

Chan, Raymond KS (2011), Planning Future Cavern Development In Hong Kong; Civil Engineering and Development Department Hong Kong SAR, China; Proceeding of the Joint HKIE –HKIP Conference on Planning and Development of Underground Space, Hongkong.

ChenYao (2011), Research on Right Concept and Evaluation Method of Underground Land in Subway Station; Huazhong University of Science and Technology

Creswell, J. (2005), Mixed Methods Research: Developments, Debates, and Dilemmas. Research in Organizations. Foundations and Methods of Inquiry, Swanson, R. and Holton III, E. (eds.), Berrett-Koehler Publishers, San Francisco, pp. 315-326.

Creswell, J. and Plano Clark, V. (2007) Designing and Conducting Mixed Method. SAGA Publications

David Richmond (1994), Introduction to Valuation (Third Edition), Publish by MacMillan Press LTD.

Douglas Scarrett (1991), Property Valuation: The 5 Methods, Publish by E&FN Spon, London SE1 8HN, UK.

Harvey W. Parker (2004), Underground Space: Good for Sustainable Development, And Vice Versa; World Tunnel Congress, Singapore

Joan Pasqual, Pere Riera (2004), Underground Land Values, Land Use Policy 22 (2005) 322-330, Elsevier Ltd. All rights reserved

John Carmody, Raymond Sterling (1993) Underground Space Design, A guide to Subsurface Utilization and Design for people in Underground Spaces.

Jean Paul Godard (2004), Urban Underground Space And Benefits of Going Underground, World Tunnel Congress 2004 and 30th ITA General Assembly- Singapore, 22-27 May 2004.

Kanun Tanah Negara 1960 (Pindaan 2006)

Land Acquisition (Just Terms Compensation) Act 1991, Australia (as at 31 January 2011)

Ling, KK (2011), Towards An Underground Development Strategy For Hong Kong, Planning Department, Hong Kong SAR, China; Proceeding of the Joint HKIE –HKIP Conference on Planning and Development of Underground Space, Hongkong.

Nur Dzarifah bt Zulifly (2012), An Implementation of Stratum Title in Malaysia, University Teknologi MARA.

Max J. Derbes, Jr., SR/WA (1992), The Appraisal of Underground Easement

Megat Mohd. Ghazali etc. (2000), The Development and Administrative Issues of Stratum Title for Underground Land Resources in Malaysia; PRRES

Moden Methods of Valuation of Land, House and Buildings (2000); Tony Johson, Keith Davies & Eric Shapiro @ Estate Gasette, 151 Wardour Street, London W1V 4BN.

Pat Bazeley (2007), Qualitative Data Analysis with Nvivo, Sage Publications Ltd.

P. Panneeselvam (2006), Research Methodology. New Dehli, Prentice Hall

Pekeliling Ketua Pengarah Ukur Dan Pemetaan Bil.2 Tahun 2006- Penyediaan Pelan Untuk Permohonan Hakmilik Stratum Tanah Bawah Tanah

Proceedings of The Joint HKIE-HKIP Conference on Planning and Development of Underground Space (2011), Hong Kong; The Hong Kong Institution of Engineers & The Hong Kong Institute of Planners.

Raymond L. Sterling and Jen-Paul Godard (2000), Geoengineering Considerations in the Optimum Use of Underground Space ; An International Conference of Geotechnical & Geological Engineering, Vol.1

Richard C. Floyd, SR/WA(1993), More Semi-Deep Easements : An Appraisal Case Study, Right Of Way August 1993.

Siti Uzairiah Mohd Tobi (2014), Qualitative Research & NVIVO 10 Exploration; Aras Publisher.

Stanley Richardson, Balachandher Krishnan Guru, Cheng Ming Yu, Khong Kok Wei & Leo Pointon, How To Research- A Guide for Undergraduate & Graduate Students, Copyright @ 2005 by Thomson Learning (a division of Thomson Asia Pte. Ltd).

Underground Issues Try National Land Code Amendments (The Edge Financial Daily, 11 October 2011)

Uma Sekaran (2003) Research Methods for Business – A Skill Building Approach; John Wiley & Sons, Inc.

Valuation of Land and Local Government (Amendment) Act No.66 1961

Vince Mangioni (2009), Just Terms Compensation and the Compulsory Acquisition of Land, University of Technology, Sydney, Australia

Vahaaho, Ilkka (2011), Helsinki Experience With Master Planning For Use Of Underground Space, Helsinki City Real Estate Department, Finland; Proceeding of the Joint HKIE –HKIP Conference on Planning and Development of Underground Space, Hongkong.
Zhou, Yingxin & CAI, Jungang (2011), Society for rock Mechanics and Engineering Geology, Singapore; Proceeding of the Joint HKIE –HKIP Conference on Planning and Development of Underground Space, Hongkong.
Internet sources:
http://en.wikipedia.org/wiki/Stratum
http://www.thefreedictionary.com/underground
http://www.consumersresearchcncl.org/Real_Estate/re_chapters_1.htm
http://www.arup.com/projects/hk_underground_study.aspx

For internal production use only

Running Heads: