The Study on the Utilisation of Spatial Unit Above and Beneath the Surface in Indonesia based on 3D Cadastre System

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Key words: 3D Cadastre, Indonesia and Spatial Unit

SUMMARY

The development of vertical constructions in cities in Indonesia has, to some extent, urged the adaptation of its cadastral system to cope with this type of development. As also happened in most mega cities in the world, the intensification of physical development in urban areas urges not only the utilisation of earth's surface but also the space above and/or beneath it. The development of apartment units on mid 80s was followed by the promulgation of Act no. 16 year 1985 regarding Apartment Unit. Unfortunately, the arising needs of commercial spaces, which have been captured by the development of spaces above and beneath the surface, have not been able to be managed by the recent cadastral system of Indonesia.

This paper highlights the measurement on the feasibility of the improvement of cadastral legal framework in Indonesia for providing the security of tenure regarding the employment of the space above and beneath the surface. The applicability of tenureship principles applied in Indonesia, as well as the legal and technical aspect of registration of 3D object in Indonesia, on the improvement of 3D cadastral system in Indonesia was measured by means of all 3D cadastral approaches namely 2D cadastre with 3D tags, hybrid cadastre and full 3D cadastre. Within the studies that are highlighted in this paper, Beringharjo Market in Yogyakarta was employed as the case study on the establishment of tenure for the space above the surface, while Blok M Shopping Centre, which is located beneath Blok M Terminal in Southern Jakarta, was studied for acquiring the insights on the establishment of tenure for the space beneath the surface. Furthermore, the implications on the further improvement of cadastral system of Indonesia are also provided in this paper.
Through this paper, the employment of Spatial Unit term for representing any 3D unit is also quickly introduced. The working definition of Spatial Unit is a 3D unit that is wholly enclosed by either physical or imaginary surface(s), which is located partly or completely on, above and beneath the surface of the earth and sea. In fact, this term has been at least partially applied within the existing cadastral concept. Land is a physical thing that encompasses the surface of the earth and all things attached to it both above and beneath. The definition reflects a direct relationship between land and space, even though the space itself is not restricted by its volume. The employment of Spatial Unit in marine and waters cadastre is even more obvious as, in some extent, the 3D representation of rights is enormously important for controlling and regulation marine activities, as well as facilitating ocean governance.

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1. INTRODUCTION

The intensification of physical development in urban areas urges not only the utilisation of earth's surface but also the space above and/or beneath it. The land scarcity particularly in mega cities has led to the development of vertical constructions for fulfilling the needs of space for performing activities in area in question. Consequently, the spaces above and/or beneath the surface in these cities have nowadays been mostly occupied for specific purposes.

Analogical to the employment of land, to ensure the continuous utilisation of the space in various extents, its security of tenure should therefore be guaranteed. Only with the secured tenureship the productivity of the space could be amplified. As suggested by Dale and McLaughlin (1999: 2), the secured tenureship would mostly prevent social instability, as well as provide the basic means for improving the physical state of the space. Moreover, the mobility of the subject of the tenure could also be improved by the provision of legal assurance to the object of the tenure (*ibid*.: 3).

The development of vertical constructions in cities in Indonesia has, to some extent, urged the adaptation of its cadastral system to cope with this type of development. The development of apartment units on mid 80s was followed by the promulgation of Act no. 16 year 1985 regarding Apartment Unit, which implementation has been regulated by Government Regulation no. 4 year 1988. Unfortunately, the arising needs of commercial spaces, which have been captured by the development of spaces above and beneath the surface, have not been able to be managed by the recent cadastral system of Indonesia. See Figure 1 for the examples of the developed structures above the surface in Indonesia.

Figure 1. The structures constructed above the surface in Indonesia (source: Wisudanar, 2010)

This paper highlights the measurement on the feasibility of the improvement of cadastral legal framework in Indonesia for providing the security of tenure regarding the employment of the space above and beneath the surface. The applicability of tenureship principles applied in Indonesia, as well as the legal and technical aspect of registration of 3D object in Indonesia, on the improvement of 3D cadastral system in Indonesia was measured by means of all 3D cadastral approaches namely 2D cadastre with 3D tags, hybrid cadastre and full 3D cadastre. Within the studies that are highlighted in this paper, Beringharjo Market in Yogyakarta was employed as the case study on the establishment of tenure for the space above the surface, while Blok M Shopping Centre, which is located beneath Blok M Terminal in Southern Jakarta, was studied for acquiring the insights on the establishment of tenure for the space beneath the surface. Furthermore, the implications on the further improvement of cadastral system of Indonesia are also provided in this paper.

Through this paper, the employment of Spatial Unit term for representing any 3D unit is also quickly introduced. The working definition of Spatial Unit is a 3D unit that is wholly enclosed by either physical or imaginary surface(s), which is located partly or completely on, above and beneath the surface of the earth and sea. In fact, this term has been at least partially applied within the existing cadastral concept. As defined by Dale and McLaughlin (1999: 1), land is a physical thing that encompasses the surface of the earth and all things attached to it both above and beneath. The definition reflects a direct relationship between land and space, even though the space itself is not restricted by its volume. The employment of Spatial Unit in marine and waters cadastre is even more obvious as, in some extent, the 3D representation of rights is enormously important for controlling and regulation marine activities, as well as facilitating ocean governance (Ng'ang'a *et al*, 2004: 447).

2. 3D CADASTRE SYSTEM IN INDONESIA

2.1 Cadastral Principles

There are several important principles that should be taken into account for improving the cadastral system in Indonesia to be able to cope with the deployment of Spatial Unit. The cadastral system in Indonesia, which was basically established based on Article 33.3 of the Constitution of 1945 and Act no. 5 year 1960 on Agrarian Principles. Based on the mentioned laws, those principles are the classification of cadastral unit, the employment of land and Spatial Unit possession rather than ownership doctrine and the horizontal separation principle.

Within the cadastral system of Indonesia, the cadastral unit could be defined on, above or beneath the land, waters and space. Article 33.3 of Constitution of 1945 defines the cadastral unit as any applied unit that is linked to the land, waters and natural resources contained therein. Additionally, Agrarian Principles Act states that space, which is understood as the space above the earth and waters, as well as the Spatial Unit beneath the land and water surface.

The cadastral system in Indonesia applies the principle of possession rather than ownership of the land and Spatial Unit. Spatial Unit Article 1.2 Agrarian Principles Act states that every portion of land, waters and space, as well as natural resources contained therein, are a gift from God to Indonesia as a nation. This article defines that none of land, waters and Spatial Unit in the territory of Indonesia could be owned but only be possessed. Land, waters and Spatial Unit could only be owned by Indonesia as the nation, while, in order to provide the people with the greatest benefit from the management of land, waters and Spatial Unit, the State regulates the alteration, use, possession and the maintenance of land, waters and Spatial Unit; defines and regulates the right, restriction and responsibility over the relationship between the people of Indonesia and land, waters and Spatial Unit; and defines and regulates the legal binding over the land, waters and Spatial Unit.

Last but not least, the horizontal separation principle, or *horizontale scheiding* in Dutch, is also applied within the performance of the cadastral system of Indonesia. Article 33.3 of Constitution of 1945 states that the land, waters and natural resources contained therein shall be possessed by the State and exploited to the greatest benefit of the people. Agrarian Principles Act also regulates the attachment of every Spatial Unit and its sub-division to the right of State to possess it. Furthermore, Agrarian Principles Act also regulates the legitimate tenures that could be attached to any land, waters and Spatial Unit in Indonesia. Consequently, there existed no land and Spatial Units that are not possessed in Indonesia. Every segment of land and Spatial Unit, as well as all natural resources on, above and beneath the land and water surface within the territory of Indonesia, is therefore attached to the right of State to possess the land, Spatial Unit and natural resources without any exception.

Above the right of State to possess the land, Spatial Unit and natural resources, several primary and secondary tenures could be overlaid on top of the right of State to possess the land, Spatial Unit and natural resources. The primary tenures are the tenures that could be directly overlaid above the right of State to possess the land, Spatial Unit and natural resources. On the other hand, the secondary tenure could only be overlaid on top of the primary tenure. The primary land tenures comprises of the right to possess, right to exploit, right to use and right of the State to manage the land, as well as the right to use and exploit the building, while secondary land tenures are leasehold, right to clear the land, right to collect forest product and any temporary tenures over the primary tenures. While the sea is still considered as the common property, Agrarian Principles Act only provides the guidance on the delivery of primary tenure on, above and beneath the water surface, which are the right to use water unit and the right to breed and catch the fish. Furthermore, the right to use space is also regulated by Agrarian Principles Act. Figure 2 illustrates the horizontal separation principle applied in Indonesia. Figure 2 also explains the eternality of the right of State to possess the land, while primary and secondary tenure could only be established on the right of State to possess the land in the case of no public interest existed on, above or below the surface in question. However, it is only primary land tenures and leasehold that have been commonly delivered.

2.2 Strata Title

In order to address the development of both residential and non-residential apartment unit, the Government of Indonesia promulgated Act no. 18 year 1985 on Apartment Unit, which was followed by the promulgation of Government Regulation no. 4 year 1988, also regarding Apartment Unit, for executing the Apartment Unit Act. By the promulgation of these laws, the Government of Indonesia added new secondary land tenure, which is Strata Title.

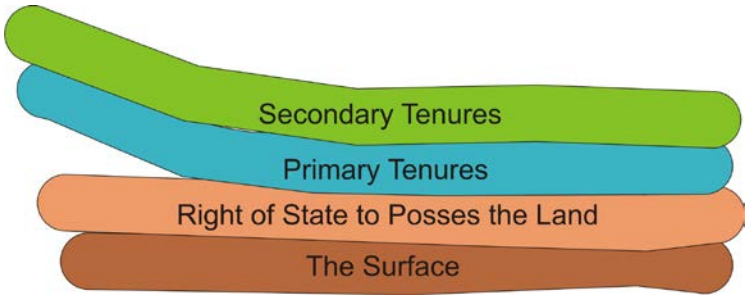

Figure 2. Illustration of vertical separation principle in Indonesia

Strata Title that is promulgated by the previously mentioned laws is basically comparable to 2D cadastral system with 3D tags for linking the 2D parcel to apartment unit attached to the title. The Strata Title in Indonesia could be attached to any Spatial Unit that is partly of completely located on, above and/or beneath the surface, as stated in Article 17 of Government Regulation on Apartment Unit. Moreover, Article 38.1 of Government Regulation on Apartment Unit mentions that the Strata Title should be attached to any of primary land tenure. Accordingly, these two articles imply that any Spatial Unit attached to Strata Title should be affixed to the land surface with primary land tenure on it.

Each Strata Title is a bundle of rights comprises of the right to possess the individual Spatial Unit as well as rights to common properties such as parts of the constructions, goods and land as stated in Article 41.1 of Government Regulation on Apartment Unit. Article 41.3 defines the boundary of each Spatial Unit attached to Strata Title as comprises of the inner surface of the wall, the lower surface of ceiling and the upper surface or the floor. As it is possible that the Spatial Unit is partly or not bounded by wall(s) as stated in Article 41.2, the Spatial Unit is bounded by the outer part(s) of the wall that is directly linked the universe of Spatial Unit as stated by Article 41.4 or the vertical projection of the 2D boundary as stated by Article 41.5.

Moreover, the Strata Title registration document comprises of the primary tenure certificate; Strata Title certificate for the possessor; the Land Book for each Spatial Unit deposited in the registry that includes the Spatial Unit's separation deeds, occupancy worthiness permit, sketches and field notes; floor plan or blueprint of the unit and, when necessary, the proportional value of the Spatial Unit in question as stated by Article 38, 39, 40 and 41. For transfer of Strata Title, the following documents are needed, which are the transfer deeds, Strata Title certificate, tenant union's association article and other legal documents as stated by Article 42. Specifically for the Strata Title transfer based on the inheritance, death

certificate and other legal documents in relation to the inheritance of the Spatial Unit should also be added.

3. THE CASE STUDIES ON 3D CADASTRE IN INDONESIA

3.1 Beringharjo Market

Beringharjo Market in Pabringan Street of Yogyakarta was established even before 1765 (Sartono, 2006; as cited in Wisudanar, 2010: 24). There was no available document on the land allocation during the establishment of this market, which is established on the land of Sultanate of Ngayogyakarta Hadiningrat (*ibid.*). Not until 1992 was the construction permit for the renovation of market issued by the Mayor of Yogyakarta, while the permit for the employment of the land of Sultanate of Ngayogyakarta Hadiningrat was issued by the Mayor on 2009.

Having gone through several phases of renovation, the structure of this market includes a feeder bridge that is located above Pabringan Street. Consequently, this bridge is located above the land of the State, due to its function for upholding the public infrastructure. Pabringan Street is therefore automatically attached to the right of State to possess the land.

Such structure raises several issues on the registration of Beringhajo Market and its feeder bridge. The rights to commercial units of Beringharjo Market itself could be registered as Strata Title by the registry only after the tenure of Sultanate's land is acknowledged under one of the available land tenures stated in Agrarian Principles Act. The conversion of the tenure attached to Sultanate's land has not been done as the Sultanate is not considered as the eligible subject of land tenure in Indonesia. The eligible subjects of land tenure in Indonesia are individual(s) and legal entity. The Sultanate itself is acknowledged only as a social entity by the Government of Indonesia. Therefore, *de jure* cadastral situation of Beringharjo Market is that the land upheld the market is attached to See Figure 3 for the 3D view of Beringharjo Market and its surroundings on land registry map.

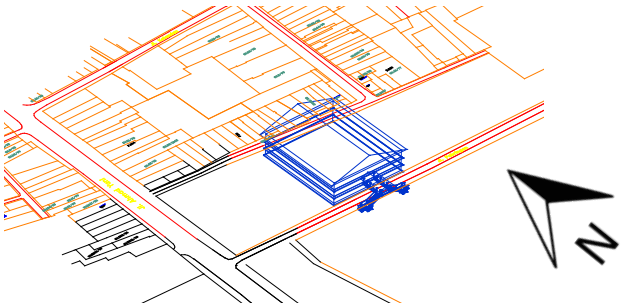

Figure 3. 3D view of Beringharjo Market and its surroundings on land registry map (source: Wisudanar, 2010)

Moreover, the registration of Strata Title over the commercial units within the feeder bridge is not yet possible. This is due to the existence of Pabringan Street below the feeder bridge, which is not registered yet. In general, the right of State to possess the land is registered only

after the land is occupied and utilised by any of State's body. The land that is occupied and employed by State's body is normally registered as the right of the State to manage the land. Unfortunately, the public infrastructure particularly street is not commonly registered in the registry. See Figure 4 for the view of the feeder bridge of Beringharjo Market from its main building. See also Figure 5 for the blueprint and the Spatial Unit of the feeder bridge.

Figure 4. The feeder bridge of Beringharjo Market (source: Wisudanar, 2010)

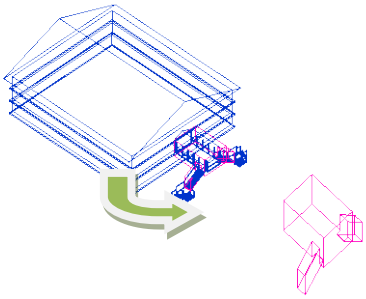

Figure 5. Blueprint (in blue) and Spatial Unit representation (in pink) of the feeder bridge of Beringharjo Market (source: Wisudanar, 2010)

The structure of Beringharjo Market comprises of two sections. These sections are the main building and the feeder bridge that includes two stairways for connecting the ground and the entrance of the bridge. From the cadastral system point of view, this structure could be divided into five parts, which are the parcel that uphold the main building, the commercial units within the main building, the Spatial Unit of the feeder bridge and two supporting parcels for upholding the stairways on the ground. See Figure 6 for the cadastral situation of the feeder bridge of Beringharjo Market.

3.2 Blok M Shopping Centre

Blok M Shopping Centre was established along the renovation of Blok M Terminal in Southern Jakarta on 1993 (Ristiawan, 2010: 3). This shopping centre is located below Blok M Terminal and is allocated for commercial use (*ibid.*). See Figure 7 for the view of Blok M Terminal. See also Figure 8 for the view of Blok M Shopping Centre below Blok M Terminal. Blok M Shopping Centre comprises of two levels, Level B1 and B2. See Figure 9 for the 3D view of Blok M Shopping Centre.

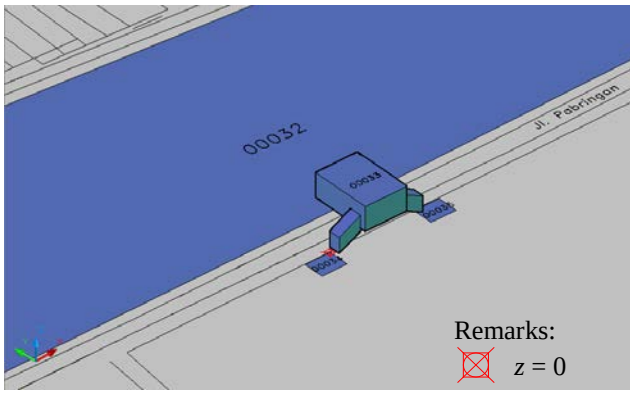

Figure 6. Cadastral situation of the feeder bridge of Beringharjo Market (source: Wisudanar, 2010)

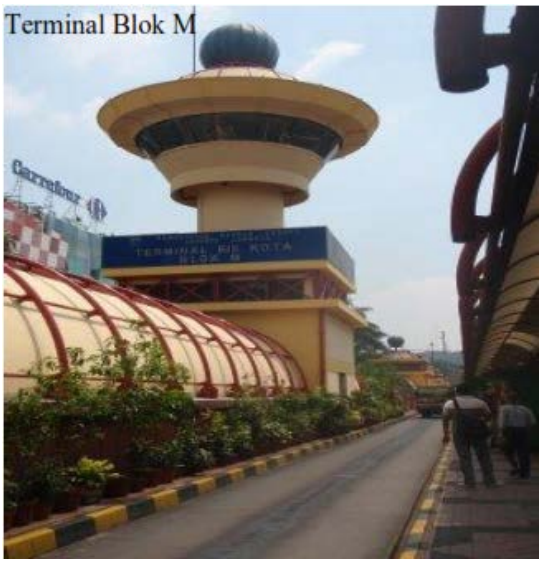

Figure 7. The view of Blok M Terminal in Southern Jakarta from within (source: Ristiawan, 2010)

On 2010, all commercial units of Blok M Shopping Centre were not yet registered (*ibid.*: 47). The tenant is legally bonded to the management of Blok M Shopping Centre only by the leasehold deeds of the unit (*ibid.*: 48). See Figure 10 for the 3D description of Blok M Shopping Centre on land registry map.

4. 3D CADASTRE LEGAL IMPROVEMENT IN INDONESIA

The researches on the implementation of 3D cadastre principles in Indonesia have been previously done. Most of the researches suggest the issuance of new tenures such as right to Spatial Unit above the surface and right to Spatial Unit beneath the surface for registering the previously described examples. The main argument for the need on the issuance of tenures mentioned from above is the fact that these Spatial Units are not attached to the surface and therefore the Strata Title for these Spatial Units could not be overlaid over the primary tenure attached to the surface. Moreover, it is also argued that the issuance of Strata Title for the examples from the previous section is not yet possible due to the different allocation of use between the above described Spatial Units and the corresponding parcels.

Figure 8. The view of Blok M Shopping Centre located below Blok M Terminal (source: Ristiawan, 2010)

By considering the existing regulations regarding 3D cadastre in Indonesia, in general the Spatial Units represented in the previous section could bylaw be registered. As previously mentioned, Article 17 of Government Regulation on Apartment Unit states that the Spatial Unit could be located partly or wholly on, above and/or beneath the surface. Therefore, the issue that the Spatial Unit could not be registered under Strata Title, due to its location that is not attached to the surface, is bylaw not relevant. In fact, apartment unit located above ground floor is not attached to the surface at all.

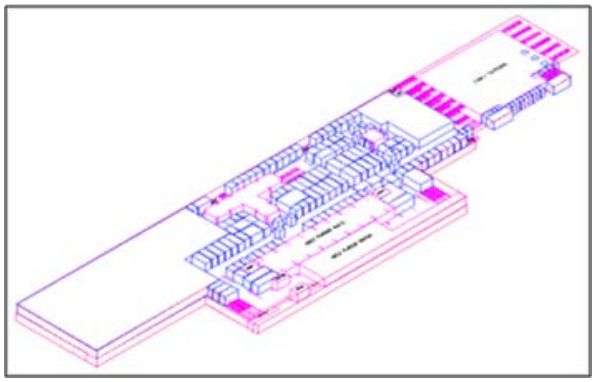

Figure 9. 3D structure of Blok M Shopping Centre (source: Ristiawan, 2010)

Furthermore, the issue on the different allocation of use between the Spatial Units from above and the corresponding parcels could not be blamed as the reason for not registering them under Strata Title. The land upheld apartment unit in fact has no other allocation of use except for the establishment of apartment unit. On the other hand, the foundation of the above mentioned Spatial Units were done for the purpose of the intensification of the use of the land. In spite of the different allocation of use between the Spatial Unit and the corresponding parcel, there is no restriction for registering the corresponding parcel under any of the primary tenure. The Strata Title could therefore be applied as long as the corresponding parcel is attached to one of the primary tenures.

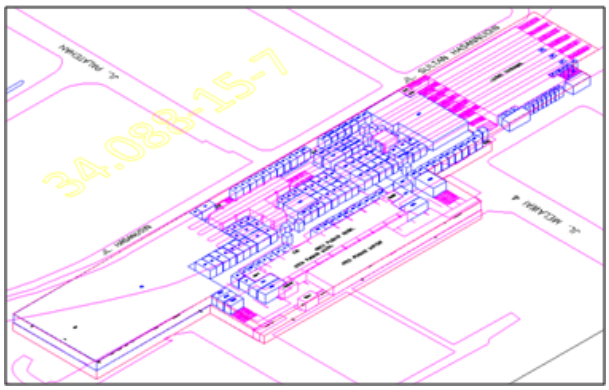

Figure 10. 3D view of Blok M Shopping Centre on land registry map (source: Ristiawan, 2010)

However, the above examples raise the issue on linking the secondary tenure, in this case Strata Title, to basic tenure, which is the right of the State to possess the land. As previously mention in Section 2.1, the secondary tenure is existed due to the existence of the arrangement on, above or beneath the surface that is attached to primary tenure, either by the possessor of the primary tenure or others. It is not completely correct that the Spatial Units from above are not attached to any tenure. This is due to the existence of the right of State to possess the land, which covers the land and marine territory of Indonesia. The right of State to possess the land could be raised in the case that there is no primary tenure attached on it. Consequently, there would be no secondary tenure in the area in question as well.

For improving the 3D cadastral system in Indonesia, different approaches could off course be suggested. The employment of the each approach would provide different consequences compared to it of other approaches. The consequences of the implementation of legal framework of 2D cadastre with 3D tags, hybrid cadastre and full 3D cadastre approach are further highlighted in the next sub-sections.

4.1 2D Cadastre with 3D Tags

2D cadastre with 3D tags approach is at the moment still operational in Indonesia. Therefore, the application of this approach on the improvement of 3D cadastral system in Indonesia could be done without any legal improvement.

However, the issue on linking the Strata Title to the eligible tenure in the case of the function of the corresponding parcel for upholding public infrastructure is still arisen. The issuance of new tenures such as right to Spatial Unit above and beneath the surface is hardly necessary and would technically be difficult in the application of this approach as the only link between 2D and 3D representation is only the 3D tag(s). By issuing the mentioned tenures in this approach, it is suggested to migrate to at least hybrid approach. The most feasible alternative is indeed to issue the right of State to manage the land to any public infrastructure in Indonesia. The Strata Title could therefore be overlaid on top of the right of State to manage the land.

Unfortunately, the application of this approach would also provide technical difficulties for providing the legal assurance to the employment of Spatial Unit with Strata Title attached to it. With such system that records everything on paper, the possibility of having more than one tenures for the same Spatial Unit, even for the same parcel, with the same type of tenure is widely open. Moreover, even though the improvement could be made by digitalising the Spatial Unit and other cadastral spatial unit, it is still difficult to acquire the spatial relationship between the Spatial Unit in question and other Spatial Unit as the 3D drawing is only attached to the corresponding parcel and not linked to the administrative database as suggested by Stoter (2004: 216).

4.2 Hybrid Cadastre

By implementing the hybrid approach, the recently employed principles of 3D cadastre in Indonesia could still be maintained. No legal improvement should be made, except for assigning the right of State to possess the land for upholding the Strata Title on top of land that upheld public infrastructure.

The consequence of the application of this approach is that the development of 3D cadastral database becomes a necessity. This database should also be connected to the 2D cadastral database, which is only partly developed in Indonesia, for allowing the Strata Title to be linked to its primary tenure. Furthermore, as shown by Aditya *et al* (2009), 3D cadastral survey should be done during the data acquisition process. This is particularly due to the inconsistencies found after comparing several construction plans and their implementations.

The issuance of new primary tenures such as the right to Spatial Unit above and beneath the surface could be an alternative. However, the issuance of such tenures would lead to the necessity to change the principle that any Strata Title should be overlaid over the existed primary tenure. While these rights to Spatial Unit are acted as primary tenures as well, the tenures could solely be established.

Furthermore, in spite of issuing new primary tenures, the available tenure besides Strata Title, which is the right to use space, could also be employed. The only obstacle of the application of this tenure for addressing the employment of Spatial Unit on, above or beneath the land is the perception that the space is more related to the outer space, such as implied by Supriadi (2007; as cited in Wisudanar, 2010: 45). The clear definition of the space, followed by the issuance of technical regulation concerning the employment of the space term for addressing the delivery of tenure attached to Spatial Unit above or beneath the surface, could theoretically solve the problem. This is particularly due to the nature of this tenure as of the primary tenures in Indonesia.

4.3 Full 3D Cadastre

For implementing full 3D cadastre approach, the legal improvement is necessarily to be done. First of all, the necessity to overlay the right to Spatial Unit over the primary tenure should be abolished. The right to Spatial Unit should solely be established without any restriction applied by 2D parcels. Therefore, the re-issuance of Strata Title as the primary tenure, the issuance of new tenures such as the right to Spatial Unit above and beneath the surface or the provision of well-defined space unit for fitting the right to use the space to the full 3D cadastre situation should also be done.

As the consequence of the cadastral system legal improvement by means of full 3D cadastre approach, a completely 3D cadastral technical improvement should also be done. A full 3D cadastral database would be necessary to be established. The link to 2D cadastral database should also be established, particularly on the implementation of combined 2D/3D alternative of full 3D cadastre, not for connecting the right to Spatial Unit to the tenure on 2D parcel but for representing the spatial relationship among 3D Spatial Units and 2D parcels. The 3D cadastral survey would also be required, particularly by considering the inconsistencies during the implementation of several construction plans.

5. CONCLUSION

The improvement of cadastral system is necessarily to be done to cope with the recent development of 3D situation in Indonesia. On the other hand, such improvement could be very costly and would require both juridical and technical changes in the cadastral main principles applied in Indonesia. As any type of improvement approach is possible to be implemented, the feasibility of the possible legal improvement approach should therefore be measured. Their possible implications should also be considered.

Having considered the recent 3D cadastral system state in Indonesia, it is argued that the most feasible approach to be applied within the improvement of 3D cadastral system in Indonesia is the hybrid approach. By applying this approach, less legal and technical improvement is required compared to it of other approaches, which would provide considerable improvement to cope with the recent 3D situation in Indonesia. However, the application of this approach would still raise the issue on the inability of the cadastral system to deliver right to Spatial Unit on, above or beneath the surface without the existence of primary tenure for upholding the right to Spatial Unit. Even though conceptually the right of State to possess the land is attached to any 2D and 3D cadastral unit it Indonesia, this type of tenure is not considered as of the primary tenures and, therefore, could not be employed for upholding the right to Spatial Unit. Consequently, in some cases, such as the cases that are raised by this paper, more legal improvement is expected.

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