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Preface

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Statistisk sentralbyrå, 18 December 2015

Anna Rømo

Abstract

This document discusses the definition and scope of land as an asset, and how to register land, esp. rented land in the balance sheets. The accounting links and associated entries related to land from opening to closing balance sheets in the SNA are also described in a comprehensive way.

Based on limited data and simple assumptions, estimation is made for the value of Norwegian land in 2011 by applying different measuring approaches for different types of land. The results are presented in both total value and the distribution of land cross-classified by land types and institutional sectors.

The results show that land underlying dwellings (AN.21111) is most valuable, of which Households sector (S14) owns the largest part. The second most valuable land refers to land underlying buildings other than dwellings (AN.211121), and Non-financial corporations (S11) is the biggest owner of this type of land. The third and fourth most valuable lands are those for forestry land (AN.21122) and agricultural land (AN.21121), respectively.

Contents

1. Introduction

As one of the essentially vital assets, land can be used for carrying out a range of tasks pertaining to urban planning, environmental protection, real estate management, and economic development more generally. Therefore, a good measure of land in terms of both physical quantities and monetary values is of significant importance.

Not only the measurement of total land, but also the information on the composition of land across different categories and/or different institutional units/sectors is indispensable for the purpose of policy making, decision taking, and economic analysis. To this end, information from both the assets and balance sheet accounts as designed in the SNA (System of National Accounts) and ESA (European System of Accounts) is of crucial value.

However, not many countries have ever compiled the asset accounts for land, and land has not often been registered in the balance sheet accounts, although it has already been regarded as one type of non-produced non-financial assets as classified in the SNA and ESA. This observation reflects in part the difficulties that are related to land measurement.

These difficulties arise in that land is a highly heterogeneous asset; there is scarce information about market transaction of land; even if information on market transaction of real properties including land sometimes exists, it is often hard to separate the value of land from the value of buildings/structures on it. But such a separation is needed because buildings/structures depreciate but land does not.

In the balance sheets of Norwegian National Accounts, land is missing; however, the estimates of land are required to be included in the balance sheets for non-financial assets and reported to Eurostat, with estimates for land owned by Households sector (S14) and Non-profit institutions serving households (NPISHs) (S15) starting from 2017, and those by other sectors on a voluntary basis (see Table 26 in EU (2012)).

The purpose of this paper is to discuss issues related to the incorporation of land as an asset into the balance sheets of the national accounts, and to make first-round preliminary estimates for Norwegian land classified by different categories and, if appropriate, by different institutional sectors.

The rest of the paper is structured as follows. Section 2 discusses the definition of land given by the SNA and ESA, with an updated definition being proposed in the end. Given that land is often rented out for use by others, Section 3 presents the ways how three most common cases should be dealt with. In Section 4, discussions are around how land is classified into different categories; also in this section, a modified classification is suggested to be applied in Norway.

Section 5 describes all the accounting links related to land from opening to closing balance sheets, with detailed accounting identity and associated entries being expounded. In Section 6, valuation of land is discussed, covering the general principles and several practical measuring approaches that have emerged from country practices. Section 7 presents the estimation results for Norwegian land as an asset in 2011, based on data within Statistics Norway. Finally, some concluding remarks with suggestions for future work are made in Section 8.

2. Definition and scope of land as an asset

Among the entries in the balance sheets of the SNA and ESA, the asset land (AN.211) is classified as one type of natural resources (AN.21). The latter itself is one part of non-produced non-financial assets (AN.2) which is distinct from the conventional produced non-financial assets (AN.1).

Land is defined in the ESA 2010 (Eurostat, 2013) as '*The ground, including the soil covering and any associated surface waters, over which ownership rights are enforced. Excluded are any buildings or other structures situated on it or running through it, cultivated crops, trees and animals; subsoil assets, non-cultivated biological resources and water resources below the ground*'(ESA Annex 7.1).

In the SNA 2008 (United Nations, 2009), the definition of land is: '*Land consists of the ground, including the soil covering and any associated surface waters, over which ownership rights are enforced and from which economic benefits can be derived by their owners by holding or using them* ' (SNA 10.175).

The ESA definition highlights the difference between land and other types of assets that are physically connected with the natural land, but ought to be shown separately in the balance sheet. For instance, buildings or other structures (AN.111+AN.112) situating on or running through the land, as well as cultivated crops, trees and animals (AN.115) are classified under fixed assets (AN.11); while subsoil assets (AN.212), non-cultivated biological resources (AN.213) and water resources (AN.214) below the ground are three different natural resources (AN.21).

Distinction should also be made between land and another closely related asset type, i.e. land improvements (AN.1123), which is defined as the result of actions that lead to major improvements in the quantity, quality or productivity of land, or prevent its deterioration (SNA 10.79, ESA Annex 7.1). The costs of ownership transfer related to land transaction is also part of land improvements. As one type of fixed assets, land improvements (AN.1123) is subject to consumption of fixed capital; on the contrary, there is no depreciation for land.

While having emphasized the ownership rights, the ESA definition, however, does not explicitly mention another necessary condition for an item being qualified as an asset, i.e. an asset should generate economic benefits to its owner. In contrast, this point is clearly made in the SNA definition.

Within the border of a country's territory, except for those parts of land with unambiguously recognized ownership, any other land over which ownership cannot be acknowledged is usually considered as owned by the government by default. But this pragmatic treatment does not imply that all land included in the geographic surface area of a country is necessarily within the asset boundary as stipulated by the SNA and ESA.

Some kinds of remote and inaccessible land such as deserts and tundras are apparently out of the asset boundary, and therefore should not be recorded in the balance sheet of the country at all. The reason is that even though the ownership could be identified to these lands, they are not capable of bringing any economic benefits to their owners, given the scientific knowledge and technology existing at the time.

Apart from holding and using land by the owner to make economic benefits, as one type of natural resources, land is frequently rented out for use by others, creating a resource lease. A resource lease is one where the owner of a natural resource (such as land) makes it available to a lessee in return for a payment recorded as rent.

In sum, land as an asset (AN.211) might be better defined as: Land consists of the ground, including the soil covering and any associated surface waters, over which ownership rights are enforced and **from which economic benefits can be derived by their owners by either holding, or using, or allowing others to use them**. Excluded are any buildings or other structures situated on it or running through it, cultivated crops, trees and animals; subsoil assets, non-cultivated biological resources and water resources below the ground.

3. Licenses and permits to use land

As mentioned above, land is frequently rented out by its owners for use by others, thus creating licenses and permits to use land. In many countries licenses and permits are often issued by government since government claims ownership of the land on behalf of the community at large. But renting land among private owners is also common. There are basically three different cases that may apply to the use of land that is owned by one intuitional unit, but used by others.

The first case is that the owner may permit the land to be eternally used by other institutional units, which is equivalent to the outright sale of land to the user. As a consequence, this case should be recorded as the ownership transfer from the owner to the user.

As the second and most frequent case, the owner may extend or withhold permission to continued use of the land by the user from one year to the next. Then the use of the land should be treated as a resource lease. The user as the lessee will regularly pay resource rent to the owner as the lessor. As a result, the land should be recorded in the balance sheets of the owner.

In Norway there exists a typical arrangement between user and owner of land, which is essentially a kind of land lease between the former (lessee) and the latter (lessor).[1] For instance, a user of land rents the land for a period of time (e.g. 50 or 100 years) with the primary purpose of building own house (with the majority being holiday house[2]) on top of it, and will pay annually, according to the law[3], a certain amount of money as the rental fee to the owner of the land.

On the other hand, for the purpose of productivity analysis, the compilation of balance sheets by industry may require capital to be allocated by its users rather than by its owners (i.e. different institutional units/sectors).

The third case is that the owner may allow the land to be used for an extended period of time in such a way that in effect the user controls the use of the land during this time period with little if any intervention from the owner as the legal owner. This case leads to the creation of an asset for the user, distinct from the land itself but where the value of the land and the created asset allowing use of the land (i.e. license and permit) are linked.

For example, a buyer of private building situated on a piece of land may sometimes pay for the right to use the land for an extended period in an upfront payment, which is normally recorded as the acquisition of an asset, rather than a payment of resource rent. When the building changes ownership, the purchase price includes an element representing the present value of future rent payments.

In such a case, the land is recorded as if the ownership is transferred along with the building above the land. If, at the end of the land lease, a further payment is liable for extension of the lease for another long-term period, this should be recorded as capital formation and an acquisition of an asset in a manner similar to costs of ownership transfer on purchase and sale of an asset.

In practice, the borderline between the second and third cases is not always clear-cut. For instance, a resource lease on land may be considered as a sale of an asset connected to land if the lease satisfies most or all of the same criteria as those listed for payments for a mobile phone license to be considered a sale of an asset (SNA 17.317, 17.318).

[1] In Norwegian, this arrangement is called *Tomtefesteordningen*.

[2] This is called *Fritidshus* in Norwegian.

[3] The relevant law (*Tomtefesteloven* in Norwegian) can be found at https://www.regjeringen.no/no/dokumenter/tomtefesteloven/id455474/.

4. Classification of land

In the previous version of both the SNA 1993 (United Nations, 1993) and the ESA 1995 (Eurostat, 1996), a disaggregation of land was provided. As an asset, land (AN.211) was subdivided as the following four categories: Land underlying buildings and structures (AN.2111); Land under cultivation (AN.2112); Recreational land and associated surface water (AN.2113); Other land and associated surface water (AN.2119).

The latest ESA 2010 (Eurostat, 2013) retains this classification. However, the latest SNA 2008 (United Nations, 2009) does not specify a disaggregation of land any more; instead, it recommends that if a disaggregation is required, it should be in accordance with that used in the SEEA (System of Environmental-Economic Accounting).

The latest SEEA (United Nations, 2012) proposes a classification of land in which land is divided into seven sub-classifications. It includes, for example, forestry, land used for aquaculture, and land used for maintenance and restoration of environmental functions. Furthermore, inland water is separated from land and divided into four sub-classifications (see 5.252, and Table 2 in the SEEA).

By comparing the two (suggested by the ESA and SEEA, respectively) and also many other different classifications of land, a recently established Eurostat/OECD task force on land and other non-financial assets provides a suggested classification that is based on land use statistics and is broadly in line with that proposed by the SNA 1993 and the ESA 1995 and the ESA 2010.

The purpose of this suggestion is to identify the lowest common denominator out of the many already existing classifications, with the intention to enhance international comparability as well as to provide guidance for compiling measurement of land as an economic asset. Table 1 presents the suggested classification.

Table 1 A suggested classification of land (AN.211)

1.Land underlying buildings and structures (AN.2111)
1.1 Land underlying dwellings (AN.21111)
1.2 Land underlying other buildings and structures (AN.21112)
2.Land under cultivation (AN.2112)
2.1 Agricultural land (AN.21121)
2.2 Forestry land (AN.21122)
2.3 Surface water used for aquaculture (AN.21123)
3.Recreational land and associated surface water (AN.2113)
4.Other land and associated surface water (AN.2119)

Source: Eurostat/OECD task force on land and other non-financial assets

Following this classification, it is identified that within the category of land underlying other buildings and structures (AN.21112), land underlying buildings other than dwellings (such as non-residential buildings), and land underlying other structures (such as motor ways) differ from each other in a significant way. Therefore, distinction should also be made between them, once data are available.

Given the availability of detailed land use statistics in Norway, the classification of land as shown in Table 1 is modified and presented in Table 2, where the category of land underlying other buildings and structures (AN.21112) is further subdivided into two new categories (land underlying buildings other than dwellings (AN.211121), and land underlying other structures (AN.211122)). By doing this, the correspondence between the associated fixed assets (buildings other than dwellings (AN.1121) and other structures (AN.1122)) with the corresponding underlying land is retained.

Table 2 The classification of land (AN.211) to be applied in Norway

1.Land underlying buildings and structures (AN.2111)
1.1 Land underlying dwellings (AN.21111)
1.2 Land underlying other buildings and structures (AN.21112)
1.2.1 Land underlying buildings other than dwellings (AN.211121)
1.2.2 Land underlying other structures (AN.211122)
2.Land under cultivation (AN.2112)
2.1 Agricultural land (AN.21121)
2.2 Forestry land (AN.21122)
2.3 Surface water used for aquaculture (AN.21123)
3.Recreational land and associated surface water (AN.2113)
4.Other land and associated surface water (AN.2119)

5. Accounting links related to land

The accounting links for the asset land between the opening balance sheet and the closing balance sheet through transactions, other changes in the volume of assets, and holding gains and losses are reflected in the entries as listed in Table 3 (ESA Annex 7.2).

Table 3 Land-related entries from opening balance sheet to closing balance sheet

				III.3.2 Holding gains and losses		
Asset	IV.1 Opening balance sheet	III.1 and III.2 Trans-actions	III.3.1 Other changes in volume	III.3.2.1 Neutral holding gains and losses	III.3.2.2 Real holding gains and losses	IV.3 Closing balance sheet
Land	AN.211	NP.1	K.1, K.22, K.3, K.4, K.5, K.61, K.62	K.71	K.72	AN.211

The exact relationship among the entries in Table 3 is as follows:
The value of land (AN.211) in the opening balance sheet (IV.1)

\+ *Transactions (NP.1 in capital account (III.1) and financial account (III.2))*
\+ *Other changes in volume (K.1, K.22, K.3, K.4, K.5, K.61, and K.62 in other changes in volume of assets account (III.3.1))*
\+ *Neutral holding gains and losses (K.71 in neutral holding gains and losses account (III.3.2.1))*
\+ *Real holding gains and losses (K.72 in real holding gains and losses account (III.3.2.2))*
= *The value of land (AN.211) in the closing balance sheet (IV.3)*

5.1. Transactions

Transactions of land take place when an institutional unit buys or sells land to anther institutional unit, and should be registered under acquisitions less disposals of natural resources (NP.1). Acquisitions less disposals of non-produced assets are recorded in the capital account of the sectors, the total economy and the rest of the world.
Normally all buys and sells occur between resident units. In case an owner or buyer is a non-resident unit (such as a foreign institutional unit), a notional resident unit is created and deemed to purchase the land, while the non-resident unit is deemed to purchase the equity of the notional unit and thus acquires a financial asset.

One exception is when the boundaries of the economic territory itself are changed, for example, when a foreign government, or international organization, purchases or sells land that is added to, or taken away from, the enclave in which its embassy or offices are located.

As a result, the general principle is that land is always an asset of the economy in which it is located. Moreover, as purchases and sales of land are recorded excluding the costs of ownership transfer (recorded as part of fixed capital formation and included within the asset Land improvements (AN.1123)) for both buyers and sellers, the sum of the total value of the purchases and sales of land must be equal to zero for the total economy as a whole, although not for individually separate units or sectors.

Formally, as mentioned before, distinct from fixed capital, land is not subject to consumption of fixed capital that is a common transaction item (P. 51c) pertaining to capital. In addition, land is not subject to depletion either since it is one special

type of natural resource that can not be depleted, which is contrary to some other natural resources, such as oil and natural gases.

5.2. Other changes in volume

Since land is not produced, the volume change of land usually takes place when the purpose of land uses changes (e.g. from agricultural land to land underlying buildings). This type of volume change should be recorded in the SNA and ESA as *Changes in classification of assets and liabilities (K.62)*.

The other type of *Changes in classification (K.6)*, i.e. *Changes in sector classification and institutional unit structure (K.61)* is also relevant for registering other changes in volume of land in the balance sheets of individual sector or institutional units when such changes take place.

Land in one specific category may also increase its volume when previously wild or waste land is transferred to this category in which ownership can be established and the land can be put to economic use (such as conversion from waste land to agricultural land). Although this type of volume change is similar with that due to asset reclassification, however, it should be registered as *Economic appearance of assets (K.1)*, because of the fact that the previously wild or waste land enters into the asset boundary.

Economic appearance of land is not restricted to the new entrance of previously wild or waste land into the asset boundary; it applies as well to land that is already within the asset boundary. For instance, activities such as land clearance, land contouring, creation of wells and watering holes that are integrated to the land in question will lead to major improvements in its quality or productivity, and thus an increase in volume.

This volume increase is also regarded as *Economic appearance of assets (K.1)*, although the activities themselves should be registered as formation of a separate type of fixed assets, i.e. Land improvements (AN.1123) which is subject to consumption of fixed capital (P.51c).

Activities that are not integrated to, but are in the vicinity of the land in question may also lead to economic appearance of land asset. One frequently observed example is that land becomes more desirable and thus more valuable because of the establishment of public infrastructure nearby, such as the creation of seawalls, dykes, dams and major irrigation systems. This type of volume change due to the change of the surrounding characteristics should also be registered as *Economic appearance of assets (K.1)*.

On the other hand, *Economic disappearance of non-produced assets (K.2)* may be recorded when land loses its volume, owing to the occurrence of events that are of opposite nature to those leading to economic appearance of land as outlined above. But since there is no depletion for land as being renewable resource, the corresponding volume changes are suggested to be recorded as *Other economic disappearance of non-produced assets (K.22)*, rather than *Depletion of natural resources (K.21)*, the latter being relevant for non-renewable resources such as oil and natural gases.

Formally, other categories for recording other changes in the volume of assets and liabilities (*Catastrophic losses (K.3)*, *Uncompensated seizures (K.4)*, and *Other changes in volume not elsewhere classified (K.5)*) may also apply to land whenever they are relevant and appropriate.

5.3. Holding gains and losses

Apart from the volume changes, the change of land prices will also lead to the change of land value. The corresponding value change due to price change should be recorded in the revaluation account as *Nominal holding gains and losses (K.7)*, or more specifically, as *Neutral holding gains and losses (K.71)* or *Real holding gains and losses (K.72)* when the distinction between K.71 and K.72 can be made.

According to the SNA and ESA, *Nominal holding gains and losses (K.7)* on land are the increase or decrease in value accruing to its owner as a result of a change in price over a period of time. As land prices are regularly subject to speculative bubbles and thus change frequently, this type of change could be an important explanation for the value difference between opening and closing balance sheet for land item. The holding gains or losses of land will be unrealized as long as the land is on the balance sheet, and will be realized as soon as the land is sold.

Neutral holding gains and losses (K.71) are the value change that accrues if the land price changes over a period of time in the same proportion as the general price level. *Neutral holding gains and losses (K.71)* are defined to facilitate the derivation of *Real holding gains and losses (K.72)*. The latter is the difference between nominal and neutral holding gains and losses, with the purpose of identifying the redistribution of real purchasing power among sectors. The general price index to be applied for the calculation of *Neutral holding gains and losses (K.71)* is a price index for final expenditure.

6. Valuation of land

6.1. General principles

The economic value of land depends on the purpose for which it is planned to be used, and on where it is located. If a tract of land is used as agricultural land, its value will be determined to a large extent by its own quality (such as soil nutrition), but its location is also important; for instance, a piece of agricultural land near an irrigation system is of a higher value than another piece that is though of the same quality but further away from the irrigation system.

If a tract of land is used for constructing residential buildings, its value will be largely determined by its location, to be more accurate, by its geographical location being associated with various both *in situ* and surrounding characteristics (such as proximity to amenities). An example is that a housing property in urban area is usually valued higher than its counterpart in rural area, even if the two compared properties are of exactly the same structure and quality of the buildings on top of the land with the same size.

Ideally, the asset land in a balance sheet should be valued by its market price, to be more precise, by its *current* market price, which is the value of the land as if it were being acquired on the date to which the balance sheet relates.

However, land is not a homogenous asset, and land prices can develop at very different rates both between and within different categories. Moreover, the extent to which the information on market transactions pertaining to land is available varies also across and even within different categories of land.

For some categories such as land underlying dwellings, the price of land underneath is usually included in the market price of the total housing property that is regularly, actively and freely traded on the market in many countries. Once it can be estimated separately, an average price of land can be derived to value the land in the balance sheet.

For some other categories, such as land underlying public roads, the information on market transactions is very scarce. Therefore, an attempt has to be made to estimate what the price would be, were the land to be acquired on the market, and equally important, on the date to which the balance sheet relates.

One possible way is to apply observed market prices for comparable land to the land in question. For instance, in order to evaluate a certain piece of land underlying public roads, information on privately owned toll ways or railways that is comparable to the public roads in concern can be employed for this purpose in countries where such information is available.

Alternatively, the acquisition costs of land could be used as a starting point that subsequently should be adjusted for revaluation and other changes in volume, to approximate the market value that might prevail on the date to which the balance sheet relates. If none of the methods mentioned above can be applied, the value of stocks may be recorded at the discounted present value of expected future returns.

Similarly, transactions in land, i.e. acquisitions and disposals of land should also be valued at *current* market prices prevailing at the time the acquisitions/disposals take place. Transactions in land are recorded at the same value in the accounts of the purchaser and in those of the seller.

As for the other changes in the volume of assets, it is usually necessary to value the land before and after the change in volume and take the difference that is not explained by any transaction as the value of the change owing to the change in volume (SNA 3.151).

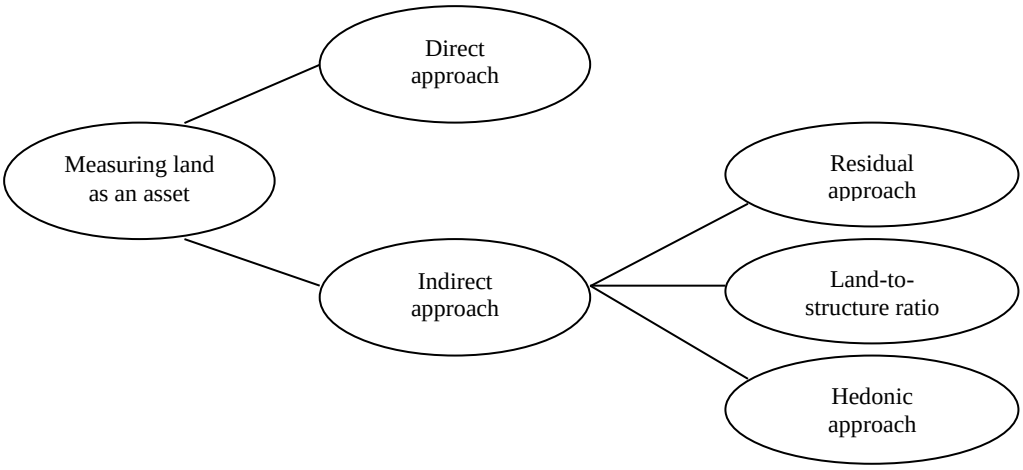
Holding gains and losses usually accrue continuously to land. In general, they are estimated by deducting from the total change in the value of land those that can be attributed to transactions and to other changes in volume (SNA 3.153).

However, the estimation of the components of the flows (transactions, other changes in volume of assets, holding gains and losses) hinges heavily upon the availability of data sources. For instance, if information on the price developments of land is accessible, it might be possible to estimate the holding gains and losses autonomously and derive one of the other flow components as a residual.

6.2. Measuring approaches

There are several approaches for measuring the value of land appeared in country practices. As shown in Box 1, these approaches can be broadly divided as two distinct groups, i.e. direct and indirect approaches. The indirect approach can be further divided as residual, land-to-structure ratio, and hedonic approaches. All these approaches have their strengths and weaknesses. Most often than not, the main reason for applying a specific approach is driven by data availability.

Box 1. Taxonomy of measuring approaches



6.3. Direct approach

This approach measures the value of land by multiplying the quantity of each homogenous piece of land by its corresponding unit price. Usually, the quantity is denoted by land area, such as in km^2, and the corresponding unit price by monetary value (in national currency) per km^2. The direct approach can also be considered as a physical inventory method that is sometimes used for estimating the value of cultivated biological resources, such as animals and trees.

The advantage of this approach is its simplicity. Ideally, if the information of both quantity and unit price for every type of homogenous land is available, to obtain the value of land owned by institutional units/sectors is straightforward, simply by summing up the value of each type of land that are within the asset boundary and owned by the corresponding institutional units/sectors.

However, land is a notoriously heterogeneous asset, because the prices of land can develop at very different rates both across and within different categories as

classified in Table 2. Even if the quantity information of land is relatively easier to find by resorting to land use statistics, the unit price information of each detailed type of land is hard to obtain.

Therefore, the direct approach is often applied for valuing land that is relatively homogenous and for which the unit price information is available, such as agricultural land and forestry land. For those highly heterogonous land such as urban land underlying residential buildings, other methods for measuring the value of land should be called for.

By applying the direct approach, it is implicitly assumed that the unit of physical quantity of one type of land (e.g. km^2) is the same as that for volume of this specific type of land. This is problematic, esp. when decomposing the value changes between the balance sheets of two consecutive (accounting) years.

By decomposing the value changes, only the part due to reclassification is accounted for as other changes in volume, the rest of the value changes are implicitly attributed to the change of prices, i.e. revaluation. However, the rest of the value changes include actually a part which arises when quality of land has changed regardless whether reclassification occurs or not. This part should also be considered as other changes in volume.

6.4. Indirect approach

Distinct from agricultural land and forestry land, there is, if any, very scarce price information for separate land underlying buildings and other structures. What can be usually observed is the market transaction of real properties, including buildings/structures on top of the land in question. How to make separate estimates of the value of underlying land is challenging. It seems that the value of land can only be measured in an indirect way, hence the name of the indirect approach.

Residual approach

For land underlying residential buildings, one way of approaching its valuation is by using information on market transaction of housing properties (comprising both buildings and land underneath) with information on buildings only to derive land values residually. Hence the residual approach.

In many countries, information on the price and quantity of buildings without land is often more readily available when data on the stock of buildings uses the perpetual inventory method (PIM) with investment series for buildings from the national accounts. Investment surveys on construction permit relatively easy collection of information on the value of buildings excluding land.

As for the other necessary component for estimating the value of land through the residual approach, i.e. the combined value of buildings and land beneath, it seems that information on non-financial wealth in general and on the value of housing properties in particular, is also readily available for many countries.

With some modifications, the residual approach may also be applied for valuing land underlying non-residential buildings and other structures, and some agricultural land with real properties attached, once combined (land and buildings and other structures) value and separate value of buildings/structures are accessible.

Another advantage attributed to the application of the residual approach is that, if the combined value and the value of land estimated from other methods are reliable, the approach can be used to verify the plausibility of the key assumptions under the PIM used for making estimation of the value of buildings/structures.

However, since the residual approach measures the value of land residually, the estimated value is bound to be affected by measurement errors in the two components entering the accounting identities (i.e. the combined value and separate value of buildings/structures), resulting in potential biases in the final estimates of land value.

Under some extreme circumstances, inaccurate and inconsistent estimates of the two components, due to biases in the estimation method and/or in data sources, can lead to negative values of land, which are not an economically meaningful result. This occurred in USA for some estimates (BEA, 2011) and in Denmark for some years in the period 1995 – 2002 (Gysting and Nguyen, 2004).

Land-to-structure ratio approach

To separate the value of land from the combined value of both buildings/structures and land underneath, some countries (e.g. Canada) use a land-to-structure ratio approach, i.e. by applying the land-to-structure ratio of certain type of land to those that are comparable to generate the value of land for the latter. The ratios can be derived from sources such as real estate agents or official records of land values, or are based on sample survey analysis.

This approach is suitable for the estimation of land underlying dwellings and other buildings and structures. It is easy to apply if the samples surveyed are representative. For countries in which such ratios are not available, they may be able to borrow ratios estimated from neighboring countries which have similar population densities and housing structures.

The accuracy of the estimates of the land value obtained through this approach increases with the level of detail at which these calculations are carried out, as the matching between structures and land-to-structure ratios will more fully take into account property characteristics in terms of type, location, and geography.

However, if this methodology is to provide estimates of land that vary by type of structure, by urban and rural areas and by regions of the country, the actual degree of representativeness of the sample used to build the land-to-structure ratios should be substantially high, which may resulting in the estimation becoming significantly labor-intensive and accordingly time-consuming. Moreover, there may be some time lag for the estimates to be updated, as encountered by Canada (Statistics Canada, 2014).

Hedonic approach

The hedonic approach represents another option to derive indirectly the value of land from the combined value of real properties. It applies a hedonic regression model with market price of real properties (combined value) as dependent variable, and a number of other factors as independent explanatory variables, including the respective size of separate land and buildings/structures.

This approach is theoretically appealing and can generate consistent estimates for land and buildings/structures, both separately and combined. But this approach requires substantial technical skills to undertake the estimations, and is time and data demanding. In addition, there are also some technical problems to be overcome, such as the existence of multicollinearity associated with the regression.

So far this approach has only been applied for valuing land underlying residential buildings (Statistics Denmark, 2014). Generally speaking, it is still in the form of research investigation and has not yet been applied in practice at country level, although its wide application in the future looks promising.

6.5. Applicability of different measuring approaches

Having discussed the strengths and weaknesses of different approaches to measuring the value of land, Table 4 sums up and presents the applicability of the different measuring approaches by land categories, given the current knowledge drawn from country practices. The pattern as shown in Table 4 could be changed when data sources and/or measuring methodologies are improved in the future.

Table 4 Applicability of different approaches for measuring the value of land

Category of land (AN.211)	Direct	Residual	LSR	Hedonic
1.Land underlying buildings and structures (AN.2111)				
1.1 Land underlying dwellings (AN.21111)		×	×	×
1.2 Land underlying other buildings and structures (AN.21112)				
1.2.1 Land underlying buildings other than dwellings (AN.211121)		×	×	*
1.2.2 Land underlying other structures (AN.211122)	*	*	*	
2.Land under cultivation (AN.2112)				
2.1 Agricultural land (AN.21121)	×	*		
2.2 Forestry land (AN.21122)	×			
2.3 Surface water used for aquaculture (AN.21123)	×			
3.Recreational land and associated surface water (AN.2113)	*	*		
4.Other land and associated surface water (AN.2119)	?	?	?	?

[1] LSR stands for the land-to-structure approach;
[2] The symbol '×' stands for 'Applicable';
[3] The symbol '*' stands for 'Might be applicable' or 'Applicable with some modifications';
[4] The symbol '?' stands for 'Don't know'.

7. Estimated value of land as an asset in Norway

In this section, the different measuring approaches as discussed in Section 6 are applied for making estimates for Norwegian land as an asset. The estimated results for different types of land for 2011 are presented here, based on data available within Statistics Norway.

In general, two indirect approaches (the residual and land-to-structure ratio approaches) are applied for land underlying dwellings (AN.21111) and land underlying buildings other than dwellings (AN.211121), while for other categories of land including agricultural land (AN.21121) and forestry land (AN.21122), the direct approach is employed.

As a point of departure, physical information on land area is derived from Norwegian land use and land cover statistics, which serve as one of the key sources for land measurement in this paper. Land use statistics provide a breakdown of all land (and inland water bodies) in Norway into different types of land, such as those as classified in Table 2.

Statistics Norway published the official statistics for land use and land resources in Norway for the first time for Year 2011 in 2012 (Steinnes, 2013). Using this land use statistics as a benchmark ensures the consistency between the sum of the areas of all categories of land and the total area of land in Norway.

By applying the classification category as suggested in Table 2, the statistics about land area (in km^2) across different categories is derived and presented in Table 5. In the following, the value of land for each category/type is estimated in order.

Table 5 Land area by category in Norway, 2011

Category of land (AN.211)	Land area (km^2)	Share (%)
1.Land underlying buildings and structures (AN.2111)		
1.1 Land underlying dwellings (AN.21111)	1640.94	0.51
1.2 Land underlying other buildings and structures (AN.21112)		
1.2.1 Land underlying buildings other than dwellings (AN.211121)	1450.05	0.45
1.2.2 Land underlying other structures (AN.211122)	2167.96	0.67
2.Land under cultivation (AN.2112)		
2.1 Agricultural land (AN.21121)	10954.78	3.38
2.2 Forestry land (AN.21122)	120761.13	37.30
2.3 Surface water used for aquaculture (AN.21123)	7.37	0.00
3.Recreational land and associated surface water (AN.2113)	27.63	0.01
4.Other land and associated surface water (AN.2119)	186722.53	57.68
Total	323732.39	100

Source: Author's calculation based on land use and land cover statistics from StatBank at Statistics Norway.

7.1. Land underlying buildings and structures (AN.2111)

Land underlying dwellings (AN.21111)

The value of land underlying dwellings and owned by the Households sector (S14) is estimated by using the residual approach, i.e., the value of such land is measured as the difference between the market value of household housing properties and the value of the corresponding buildings situated on land.

The market value of Norwegian household housing properties is derived as follows. First, an econometric model developed by Statistics Norway is estimated each year, based on housing market transaction data since 2004 up to the year in estimation. The market transaction data is provided by a web-based service company [4] and accounts for roughly 60 per cent of total housing transactions on the Norwegian market (Holtung, 2012).

[4] For more information, see the website of the company: www.finn.no

Second, to generate the market value of each housing property for Norwegian household sector, the estimated results from the econometric model are then applied to a cadastral database which is a register-based database and provides information on housing stock statistics in Norway. For 2011, the calculated market value of household housing properties in Norway is NOK 4628.76 billions.

The value of the corresponding buildings included in the household housing properties is obtained from the Norwegian National Accounts. This value is estimated by means of the perpetual inventory method (PIM), i.e. long time series of investments in housing are accumulated from which capital depreciation is subtracted, so that a net capital stock of the corresponding buildings can be derived. For 2011, the estimated value of net capital stock of the buildings is NOK 2623.63 billions.

Following the residual approach, the value of land underlying dwellings and owned by households sector (S14) in 2011 is derived by taking the difference of the two estimated values just mentioned (i.e. NOK 4628.76 billions and 2623.63 billions), giving NOK 2005.14 billions.

Since the value of household housing properties does not include the market value of holiday houses,[5] while the stock value of buildings as derived from the Norwegian National Accounts does, there exists a downward bias for the estimated value of land underlying dwellings and owned by the Households sector (S14). However, without further information, it is hard to gauge the magnitude of the downward bias.

There may exist another estimation bias. The price indices used in the current PIM are constructed through the input approach, i.e. based on price changes of labour and other material inputs. Due to the change of taste, e.g. certain type of buildings (such as terraced apartments) becoming more popular, then the revaluation of buildings is wrongly attributed to the land underneath, leading to an upward bias of the land value. Certainly, a downward bias due to the opposite trends could have happened as well.

In general, this kind of bias last mentioned may not be significant for the economy as a whole, since that some types of buildings come to be popular implies that there must be other types of buildings turning out to be unpopular. However, the bias may not be negligible, if the balance sheets by separate institutional units or sectors are to be compiled.

For land underlying dwellings but owned by other institutional sectors (i.e. Non-financial corporations S11, Financial corporations S12, General government S13, and Non-profit institutions serving households S15), the combined value of land and buildings is not available. However, the separate value of buildings possessed by each institutional sector can be still obtained from the Norwegian National Accounts.

To value the land underlying dwellings and owned by other (than Households) sectors, a simple assumption is made that the land-to-structure ratio of households housing properties is the same for dwellings owned by other sectors. By applying the land-to-structure ratio of 76.43% (i.e. 2005.14/2623.63) to the value of buildings owned by different sectors, the corresponding values of land are calculated and displayed in Table 6.

[5] See footnote 2.

Table 6 Estimated value of land underlying dwellings by institutional sector (NOK billions), 2011

	S11	S12	S13	S14	S15	S1
Land	24.35	0.66	0.63	*2005.14*	1.74	2032.52
Structure	31.86	0.86	0.83	*2623.63*	2.28	2659.46

Source: Author's calculation based on data from Norwegian National Accounts

Land underlying other buildings and structures (AN.21112)

Land underlying buildings other than dwellings (AN.211121)

Land within this category refers primarily to land underlying commercial buildings, sometimes referred to as land underlying non-residential buildings. Although the value of buildings situated on land is available in the Norwegian National Accounts, also by different institutional sectors, information on market transactions of such commercial properties is relatively scarce, simple assumption has to be made in order to make estimates for the land underneath.

Generally speaking, land underlying residential buildings is usually more valuable than its counterpart underlying non-residential buildings, given the same size, quality and location of the land in concern. Therefore, a simple assumption is accordingly made that the land-to-structure ratio for non-residential properties is 50% of that for residential properties, i.e. 38.22% for 2011.

Applying the ratio of 38.22% to the values of buildings owned by all five institutional sectors yields the value of land underlying non-residential buildings (AN.211121) and owned by different institutional sectors, as shown in Table 7.

Table 7 Estimated value of land underlying buildings other than dwellings (NOK billions), 2011

	S11	S12	S13	S14	S15	S1
Land	385.43	39.14	220.10	0	19.72	664.38
Structure	1008.97	102.46	576.17	0	51.62	1739.22

Source: Author's calculation based on data from Norwegian National Accounts

Certainly, these estimates are of the nature of preliminary results, given the data situation for the time being. There might be two possible sources that can be exploited for improving the quality of the estimates in the future: one is the cadastre and the other is business accounts, from which information on market transactions (such as purchase/sell price, area, location) of non-residential properties may be drawn. More on this in Section 8.

Land underlying other structures (AN.211122)

Land within this category refers mainly to land underlying highways, streets, pipelines and power lines, etc. Currently, information that can be utilized to make estimation of the land within this category is extremely scarce. For the moment, a direct approach is applied by using the price for forestry land (AN.21122) as the unit price. The way the unit price of forestry land (AN.21122) is estimated will be discussed in the following subsection.

As for the distribution of this type of land across the different institutional sectors, because most of the infrastructures (e.g. highways, streets, etc.) are owned by the government, as an approximation, the assumption is made that only the general government sector (S13) owns the land underlying other structures (AN.211122), before further information can be obtained.

7.2. Land under cultivation (AN.2112)

Agricultural land (AN.21121) and forestry land (AN.21122)

The direct approach is applied for making estimates of the value of land under cultivation in Norway. Given the relevant land area (in km^2) (see Table 2), the task is to find the corresponding information of unit prices (in NOK/km^2) for each type of land within this category.

In Norway, information about unit prices, or more generally, market transaction of land under cultivation is not rich. Statistics Norway publishes the annual data about average purchase price per registered transfer of agricultural properties sold on the free market, cross-classified by owned agricultural area and productive forest area.

In order to apply this kind of data to generate the unit prices (in NOK/km^2), several issues have to be resolved. First, the average prices currently published are referred to market transaction of agricultural *properties*, rather than agricultural *land*. However, given the sheer size of agricultural or forest land in Norway (see Table 5), treating the two values as approximately equivalent may not likely lead to significant bias.

Second, the price information is the average price per *registered transfer*, rather than *per physical unit*, such as km^2. Although the price is cross-classified by agricultural and forest area, the area referred to is in category rather than in point. The categories for agricultural area are (in decares[6]): All, 0-4, 5-99, 100-199, 200 and more; while for forest area, they are (in decares): All, 0-24, 25-499, 500-999, 1000 and more.

Third, the price information actually needed is the separate price for agricultural land (AN.21121) and forest land (AN.21122) respectively, instead of being cross-classified by both agricultural and forest land combined, as shown in the current StatBank at Statistics Norway.

Given the data currently available, without further information, a simple and approximate method is applied: the standard unit price (NOK in physical unit) for agricultural land (AN.21121) is calculated as the average price (NOK per transfer) with agricultural area of 200 and more decares, and productive forest area of 0-24 decares, divided by 200 decares.

In a similar way, the standard unit price (NOK in physical unit) for forest land (AN.21122) is calculated as the average price (NOK per transfer) with productive forest area of 1000 and more decares, and agricultural area of 0-4 decares, divided by 1000 decares.

The rationale behind this kind of treatment is that the area of the category cross-classified with one component of the lowest category and another component of the largest category is assumed to be the same as the area of the component with the largest category.

At the current StatBank at Statistics Norway, the data for 2011 is missing. The estimated value for Year 2011 is then calculated as a simple arithmetic average of the estimated values of 2010 and 2012. As presented in Table 8, the estimated unit price for Norwegian agricultural land (AN.21121) in 2011 is NOK 12.55 million/km^2; while that for Norwegian forestry land (AN.21122) in 2011 is NOK 2.17 million/km^2.

[6] 1 decare = 1000 m^2.

Table 8 Estimated unit prices for agricultural and forest land in Norway, 2011

Agriculture area (decares)	Forest area (decares)	Average purchase price (NOK millions per register) 2010	2012	Estimated unit price (NOK million/km^2) 2011
200 and more	0 - 24	2.91	2.11	12.55
0 - 4	1000 and more	2.35	1.99	2.17

Source: Author's calculation based on data from StatBank at Statistics Norway

Multiplying these estimated unit prices by the physical area as shown in Table 5 yields the corresponding value of Norwegian agricultural land (AN.21121) in 2011 as NOK 137.48 billions and the value of Norwegian forestry land (AN.21122) in 2011 as NOK 262.23 billions, respectively.

As regards the sub-classification either by institutional sector or by industry for land under cultivation, a reasonable assumption could be made that the agriculture industry is the main user of both agricultural land (AN.21121) and forest land (AN.21122).

Thus, as an approximation, the value of agricultural land (AN.21121) is assumed to be owned exclusively by the households sector (S14), while the value of forestry land (AN.21122) is assumed to be owned by the sector of non-financial corporations (S11), based on the fact that most institutional units operating in the agriculture industry in Norway belong to the household sector (as being self-employed farmers), while a significant part of Norwegian forestry land users is corporations.

Surface water used for aquaculture (AN.21123)

Due to data limitation, the direct approach is applied by using the price for forestry land (AN.21122) as the unit price for this category (AN.21123). The multiplication of the unit price (2.17 NOK million/km^2, see Table 8) with the area (7.37 km^2, see Table 5) gives rise to the estimated value of land within this category (AN.21123) in 2011as NOK 0.09 billions.

For the distribution of this type of land by institutional sector, without further information, a similar assumption is made that only the sector of non-financial corporations (S11) owns surface water used for aquaculture (AN.21123).

7.3. Recreational land and associated surface water (AN.2113)

Likewise, the value of the recreational land and associated surface water (AN.2113) is tentatively calculated based on the direct approach by also using the unit price for forestry land (AN.21122). The multiplication of the unit price (2.17 NOK million/km^2, see Table 8) with the area (27.63 km^2, see Table 5) yields the estimated value of land within this category (AN.21123) in 2011as NOK 0.35 billions.

To allocate the value of this type of land across the different institutional sectors, the simple assumption is made that only the general government sector (S13) owns the recreational land and associated surface water (AN.2113), given that most of the infrastructures are owned by the government sector.

7.4. Other land and associated surface water (AN.2119)

Land within this category refers mainly to open firm ground, wetland, rocks and gravel, permanent snow and glaciers, as well as lakes and ponds, from which it is hard to generate economic benefits by owning the land, based on current technology. Therefore, the value of the land within this category (AN.2119) is

treated as zero. As a result, no further assumption is made for the distribution of its value by institutional sector.

To summarize, the value of Norwegian land by detailed land type and institutional sector is now estimated for 2011. The estimation results are listed in Table 9. By comparing Table 9 with Table 5, some conclusions can be highlighted:

- Land underlying dwellings (AN.21111) is most valuable compared to other types of land, accounting for 65.53% of the total Norwegian land value, although its area accounts just 0.51% of the total Norwegian land. For this most valuable land, the largest part (almost 99%) is owned by the Households sector (S14).
- The second most valuable land is land underlying buildings other than dwellings (AN.211121), accounting for 21.42% of the total land value; while its area is just 0.45% of the total land. Since most of land with this category is underlying commercial buildings, it is not surprising that the sector of the non-financial corporations (S11) is the biggest owner of this type of land, with its share being roughly 58%.

Table 9 Estimated value of Norwegian land by type and institutional sector (NOK billions), 2011

Category of land (AN.211)	S11	S12	S13	S14	S15	S1
1.Land underlying buildings and structures (AN.2111)						
1.1 Land underlying dwellings (AN.21111)	24.35 (0.79)	0.66 (0.02)	0.63 (0.02)	2005.14 (64.65)	1.74 (0.06)	2032.52 (65.53)
1.2 Land underlying other buildings and structures (AN.21112)						
1.2.1 Land underlying buildings other than dwellings (AN.211121)	385.43 (12.43)	39.14 (1.26)	220.10 (7.10)	0 (0)	19.72 (0.64)	664.39 (21.42)
1.2.2 Land underlying other structures (AN.211122)	-	-	4.70 (0.15)	-	-	4.70 (0.15)
2.Land under cultivation (AN.2112)						
2.1 Agricultural land (AN.21121)	-	-	-	137.48 (4.43)	-	137.48 (4.43)
2.2 Forestry land (AN.21122)	262.23 (8.45)	-	-	-	-	262.23 (8.45)
2.3 Surface water used for aquaculture (AN.21123)	0.09 (0.00)	-	-	-	-	0.09 (0.00)
3.Recreational land and associated surface water (AN.2113)	-	-	0.35 (0.01)	-	-	0.35 (0.01)
4.Other land and associated surface water (AN.2119)	-	-	-	-	-	-
Total	672.10 (21.67)	39.80 (1.28)	225.78 (7.28)	2142.62 (69.08)	21.46 (0.70)	3101.76 (100)

[1] Percentage (%) in parentheses;
[2] The symbol '-' stands for 'zero by assumption';
[2] Either row or column sum may not match the total due to rounding errors.
Source: Author's calculation.

- Forestry land (AN.21122) is the third most valuable land, with its share being 8.45% of the total land value in Norway, owing to its large size. As shown in Table 5, it is the second largest category (37.30% of total land area) after Other land and associated surface water (AN.2119) (57.68% of total land area).
- Agricultural land (AN.21121) is third largest in terms of area (3.38% of total land area), but is just the fourth in terms of value, with its share being 4.43% of total land value in Norway in 2011.

7.5. A simple decomposition of value changes between years

Suppose the value of land is already estimated for the consecutive years 2011 and 2012, a simple decomposition method can be applied to decompose the value changes in the whole economy into two items, i.e. other changes in volume and revaluation, since the sum of the total value of transactions must be equal to zero.

The decomposition method is illustrated as follows. Denote the value of land of category i in year t as V_{it}, which can be written as

(1) $V_{it} = P_{it} \times Q_{it},$

where P_{it} and Q_{it} are the unit price and quantity of land of category *i* in year *t*, respectively.

Table 10 Sequence of balance sheets of land (NOK billions), 2011 and 2012

Category of land (AN.211)	Opening balance sheet	Other changes in the volume	Revaluation	Closing balance sheet
1.Land underlying buildings and structures (AN.2111)				
1.1 Land underlying dwellings (AN.21111)	2032.52	61.60	405.88	2500
1.2 Land underlying other buildings and structures (AN.21112)				
1.2.1 Land underlying buildings other than dwellings (AN.211121)	664.38	-7.51	-106.87	550
1.2.2 Land underlying other structures (AN.211122)	4.7	0.26	5.04	10
2.Land under cultivation (AN.2112)				
2.1 Agricultural land (AN.21121)	137.48	1.17	11.35	150
2.2 Forestry land (AN.21122)	262.23	-0.51	-11.72	250
2.3 Surface water used for aquaculture (AN.21123)	0.09	0.01	0.90	1
3.Recreational land and associated surface water (AN.2113)	0.35	-0.46	1.11	1
4.Other land and associated surface water (AN.2119)	0	0	0	0
Total	3101.75	54.55	305.70	3462

Source: Author's calculation.

Then the change of value between year *t* and *t+1* can be written as:

(2) $V_{it+1} - V_{it} = P_{it+1} \times Q_{it+1} - P_{it} \times Q_{it},$

which can be further decomposed in two different ways:

(3) $V_{it+1} - V_{it} = (Q_{it+1} - Q_{it}) \times P_{it+1} + (P_{it+1} - P_{it}) \times Q_{it},$

or

(4) $V_{it+1} - V_{it} = (Q_{it+1} - Q_{it}) \times P_{it} + (P_{it+1} - P_{it}) \times Q_{it+1}.$

Since there is no theory that can be applied to discriminate between equations (3) and (4), and to smooth the abrupt changes of either volume or price between years, the following equation by taking average of equations (3) and (4) is applied for the decomposition analysis:

(5) $V_{it+1} - V_{it} = (Q_{it+1} - Q_{it}) \times \overline{P_{it}} + (P_{it+1} - P_{it}) \times \overline{Q_{it}},$

where $\overline{P_{it}} = (P_{it} + P_{it+1})/2$ and $\overline{Q_{it}} = \left(Q_{it} + Q_{it+1}\right)/2.$

The first part on the right hand side of equation (5) is defined as other changes in the volume of land, i.e. the part of value changes due to the change in volume, keeping price as constant; while the second part on the right hand side of equation (5) is defined as revaluation, i.e. the part of value changes due to the change of price, keeping volume as unchanged.

For fulfilling the decomposition analysis, the information for physical quantity of land area is needed. The land area for 2011 is shown in Table 5, while that for 2012 is drawn from Statbank at Statistics Norway, and is actually the land area for 2013 because data for 2012 is missing.

In Table 10, the figures in the column of 'opening balance sheet' are estimated for 2011, as presented in Table 9; while the figures in the column of 'closing balance sheet' are hypothetically assumed with the purpose of facilitating the illustration.

By applying equation (5), the results from the decomposing analysis are presented in columns of 'other changes in volume' and 'revaluation', respectively.

As explained in subsection 6.2.1 about the direct approach for measuring the value of land, treating physical units (km^2) as the same as that of volume, as implicitly assumed by equation (5), will attribute some of the value changes due to volume change in land to that due to holding gains/losses, which is not correct.

However, the result from the decomposition method based on equation (5) is still quite useful because it offers a rough picture on what are main driving forces behind the value changes between years, should due caution be taken when making interpretations.

7.6. Concluding remarks and future plan

As one of the important economic assets, land has to be incorporated into the balance sheet accounts for countries, including Norway, which is required by both the SNA 2008 and the ESA 2010. This paper sets out the first attempt to make some estimates for the value of Norwegian land as an asset.

It discusses the definition and scope of land as an asset, and how to register rented land in the balance sheets. The accounting links and associated entries related to land from opening to closing balance sheets in the system of national accounts are described in a comprehensive way.

As regards the classification of land into different types, a suggestion is made for Norway based on detailed land use and land cover statistics. In terms of the valuation of land, the general principles and different practically available measuring approaches are also reviewed in this paper.

Based on limited data, the estimation results are made for the value of Norwegian land in 2011 by applying different measuring approaches for different types of land as discussed in the paper. The estimated results for Norwegian land in 2011 are summarised in Table 9 in the form of the estimated absolute value and the corresponding share cross-classified by land type and institutional sector.

The results show that, compared to other types of land, the land underlying dwellings (AN.21111) is most valuable, and that is the Households sector (S14) that owns the largest part of this type of land. In general, the estimated value of land underlying dwellings and its distribution (in terms of the absolute values and the relative ratios among each other) across different institutional sectors are of relatively higher quality. Its production can be sustained by applying the regularly produced statistics, i.e. annual national accounts and the outcomes from annually estimated housing market model developed at Statistics Norway.

As shown in Table 9, the second largest part of the total land value refers to land underlying buildings other than dwellings (AN.211121), and the sector of non-financial corporations (S11) is the biggest owner of this type of land. However, the estimated absolute value is of worse quality compared to that for AN.21111, although the relative ratios among each other across different institutional sectors may be relatively better than their absolute values. The estimates are based on the assumption that the land-to-structure ratio for AN.211121 is 50% of that for AN.21111, and is the same across the institutional sectors.

Despite not a member of the European Union (EU), as a country within the European Economic Area (EEA), Norway is legally obliged to report to the Eurostat the estimates for land owned by the Households sector (S14) and Non-

profit institutions serving households (NPISHs) (S15) starting from 2017, and those by other sectors on a voluntary basis, as stipulated by the Eurostat data transmission program (see Table 26 in EU (2012)).

To report the estimates for land owned by the Households sector (S14) and the NPISHs (S15), the current estimates of the values of land underlying dwellings (AN.21111) and land underlying buildings other than dwellings (AN.211121) that are owned by the Households sector and the NPISHs, as presented in Table 9, can serve as a first-order approximation. Although these two sectors (S14+S15) may own other types of land as well, such as agricultural or forestry land, the values of land underlying dwellings (AN.21111) and land underlying buildings other than dwellings (AN.211121) are by far the largest component of the total land value.

In order to make improvements on the estimated value of land underlying buildings other than dwellings (AN.211121), one possibility is to explore another data source, i.e. annual Norwegian general trading statements for business[7]. In the statements, there are items asking a firm to report the value of commercial properties it owns, as well as that of land underneath. However, despite the potentially possible benefit, more systematic and cooperative work within Statistics Norway needs to be done in the future, in order to adjust the corresponding values as reported in the general trading statements for business, so that they are consistent with the concept as applied in the SNA.[8]

In Table 9, the third and fourth largest parts of the total Norwegian land value are those for forestry land (AN.21122) and agricultural land (AN.21121), respectively. For the moment, only the aggregated values for these lands are estimated, by means of the direct approach by multiplying the estimated unit price with the corresponding land area. Without further information, the value of agricultural land (AN.21121) in Norway is just assumed to be owned by the households sector (S14), while the value of Norwegian forestry land (AN.21122) is assumed to be owned by the non-financial corporations (S11) only, as presented in Table 9.

The unit prices for both agricultural and forestry lands (AN.21121 and AN.21122) are currently estimated in a simple and rough way. However, the estimates are of the same magnitude with those based on a recent survey at Statistics Norway in 2014. This survey was conducted as part of an EU grant project, with the purpose of collecting information on agricultural land prices and rents (see Steinset, 2015).

Although the results from the survey look promising, they are still regarded as preliminary rather than official statistics at Statistics Norway. However, the survey will be carried out in 2015 as well, and hopefully, it will be undertaken as a regular annual survey in the following years. As such, information from these surveys will provide an important data source for improving the estimates on the unit prices for agricultural land (AN.21121) and forestry land (AN.21122).

To improve the results of the distribution of the value of agricultural and forestry lands by institutional sector, further information is needed. For example, the Norwegian cadastral database needs to be further exploited, from which useful information may be drawn about the ownership, transaction, location etc. In addition, such information from the cadastral database can be used for compiling balance sheets by not only institutional sectors but also industries, which is of great use for productivity analysis.

[7] *Næringsoppgave* in Norwegian.

[8] For instance, most of the values reported in the statements are not based on current market prices; rather, they are historical costs.

The current data source about physical land area for this paper is Norwegian land use and land cover statistics that are officially published for the first time for Year 2011 in 2012, and are planned to be compiled and published annually since then. Up to now, data for 2012 is still missing while those for 2013 and 2014 are available in the Statbank at Statistics Norway; however, the compilation method has been modified since the production of land use and land cover statistics for 2011.

For the time being, both the estimation methods and the corresponding results for other land types as listed in Table 9 are rather preliminary, although their estimated values account for only a small part of the total land value in Norway in 2011. If possible, the improvement of both data source and estimation method for these types of land should be considered as well.

Up to now the estimated results about land value as presented in the paper are still on the highly aggregated level, although some of them are allocated across the institutional sector, they are in general based on quite simple assumptions. In a broad sense, the methodology applied in this paper is a top-down approach.

To apply the estimated land value for other purposes, information about land on detailed disaggregated level is also needed. One alternative source for such information may be drawn from detailed surveys, so that the top-down approach can be supplemented by the information based on the bottom-up approach followed by the surveys. How to combine the top-down and the bottom-up approaches in a systematic way in order to improve the quality of land value estimation is an important research line worth to be pursued in the future.

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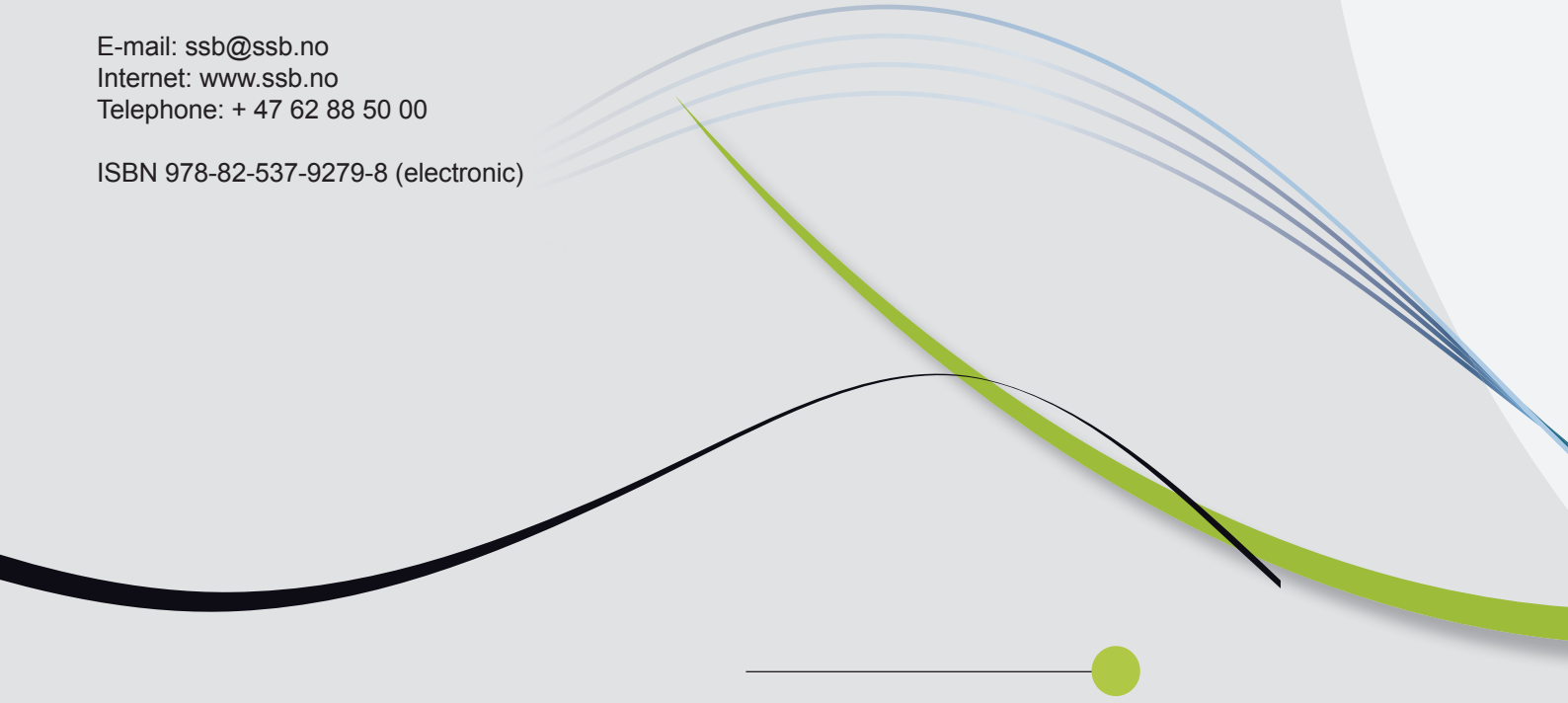

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