Article

Improving estimates of land underlying other buildings and structures in the national balance sheet, UK: 2022

The redeveloped methodology for estimates of land underlying other buildings and structures in the UK national balance sheet. Detailing the current and improved methods, as well as the data sources and methodological limitations.

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1 . Main points

- Land underlying buildings and structures was estimated to be worth £869 billion in 2021 and accounted for 12% of the value of land in the UK.

- We are looking to improve our estimates of land by more accurately reflecting changes in the relationship between rental and sales prices over time.

- We will carry out a review of the data sources and methods to improve the accuracy and consistency of our estimates.

2 . Overview

This article follows on from the recently published article on [Improving estimates of land underlying dwellings in the national balance sheet](#). It is the second in a series of three methodology articles outlining proposed methods improvements to measuring non-produced assets.

Land is the most valuable asset in the [UK's national balance sheet](#) and was estimated at £7.0 trillion in 2021. The national balance sheet measures land as an economic asset, following international guidance ([System of National Accounts (SNA) 2008](#)) at current market prices. This does not account for externalities, that is costs or benefits which fall outside the transaction of buying or selling land; for example, environmental benefits such as carbon sequestration. Land underlying other buildings and structures accounts for 12% of the value of non-produced assets.

Figure 1: Land underlying other buildings and structures is the second most valuable type of land

Non-produced asset value in the UK, current prices, 1995 to 2021

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Non-produced asset value in the UK, current prices, 1995 to 2021
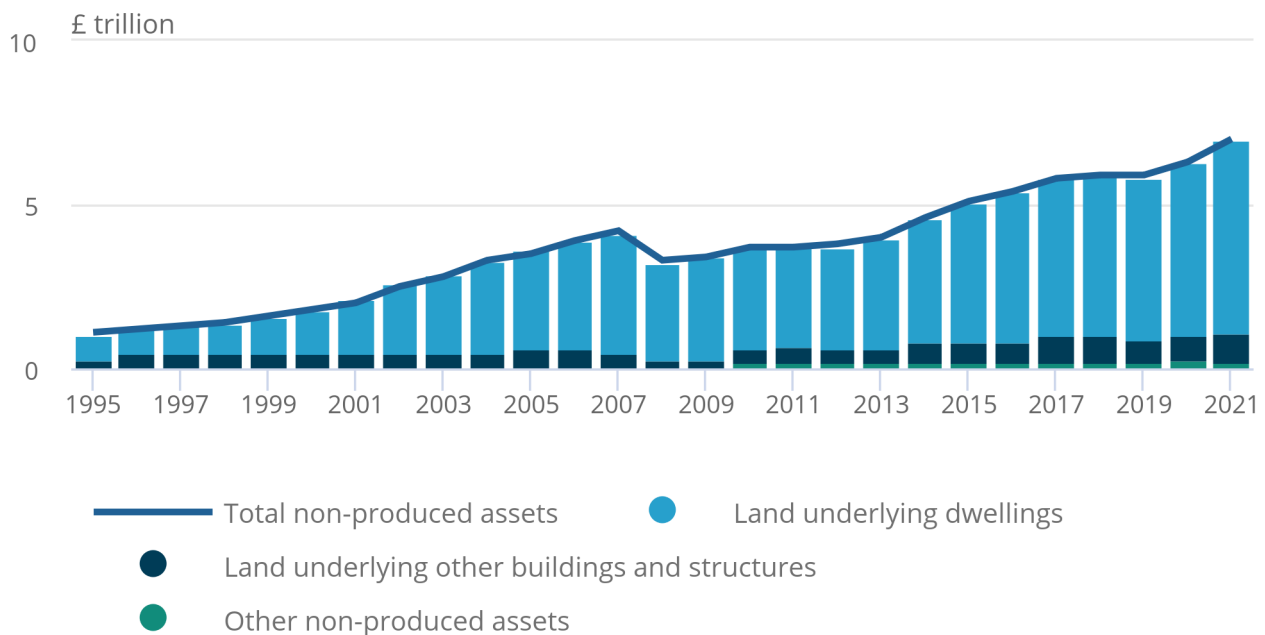
Source: Office for National Statistics – National balance sheet

Notes:

1. The components of land may not always add to the total because of rounding.

Other buildings consist of all buildings that are not dwellings and include commercial buildings, industrial buildings, and buildings used to provide public services (for example, schools and hospitals). Other structures include those that are not buildings; for example, transport (roads, railways, runways, ports), energy and communications infrastructure.

The [Eurostat-Organisation for Economic Co-operation and Development (OECD) compilation guide on land estimation](#) outlines three methods used in national accounts to estimate the value of land. Estimates can be measured directly, or indirectly using either the residual approach or the land-to-structure ratio approach.

The direct method relies on having suitable data sources to calculate the value of land, excluding the value of buildings or structures on the land. Some countries such as South Korea have administrative data on the value of land to directly estimate these.

Current UK estimates of land underlying other buildings and structures are generally calculated using a "residual approach" method. This involves calculating a combined estimate of land and other buildings and structures, then subtracting the value of other buildings and structures. Many other countries use this approach, with estimates for the value of buildings and structures coming from capital stocks estimates. Capital stocks measure buildings and structures by accumulating investment and accounting for depreciation and revaluation.

The other indirect method of calculating the value of land is the land-to-structure ratio approach, where the relationship between the value of buildings and structures and land is used to estimate the value of land. This methodology relies on accurate measurement of capital stocks and being able to capture the relationship between land and buildings and structures.

In 2021, over half of the combined value of land and other buildings and structures was estimated to come from property subject to business rates (51%). Just under a quarter of the combined value was estimated as general government structures (24%), and just over a fifth from private sector structures (21%).

Figure 2: Property subject to business rates accounted for over half of the combined value of land, other buildings and structures in 2021

Breakdown of combined value of land, other buildings and structures in the UK, current prices, 1995 to 2021

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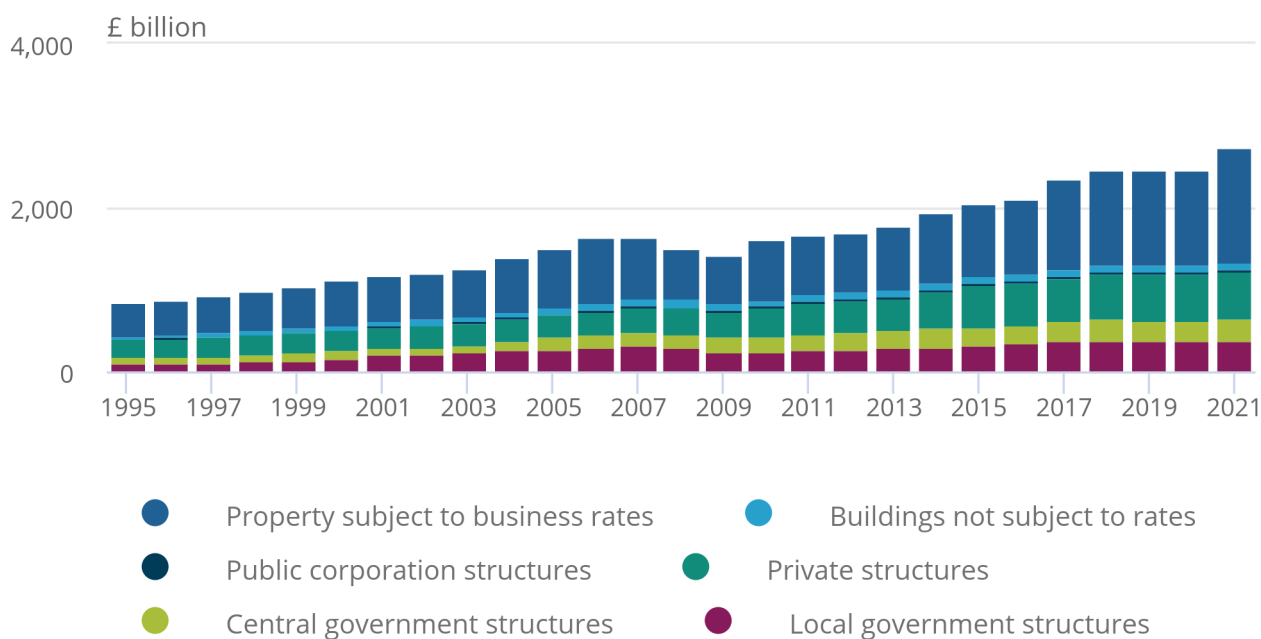
Source: Office for National Statistics – National balance sheet

Notes:

1. Components may not always add to the total because of rounding.

The current methodology for property subject to business rates is likely to underestimate the value of land, as we do not effectively capture changes in the relationship between rent and sales prices.

Some methodological improvements are likely to lead to downward revisions in land estimates. This includes some elements of double counting combined values and where the residual approach method captures differences in the measurement of capital as land value.

At this stage, it is not possible to provide an indication of what the net effect of methodological improvements will be. In December 2022 we will publish experimental estimates for the value of land underlying dwellings, other buildings, and other structures, providing an indication of revisions from these improved methodologies.

3 . Measuring the combined value of buildings, structures, and land subject to business rates

Current methodology

Valuation Office Agency (VOA) appraisals provide estimates of annual market rent. To estimate the market value of the combined value of buildings and land we use a capitalisation rate, which captures the relationship between rental and sales prices.

$$\Sigma \, Combined \, Value \, _{(u,r,t)} = \Sigma \, \frac{Annual \, market \, rent \, _{(u,r,t)}}{Capitalisation \, rate \, _{(u,r)}}$$

(1)

Where:
$u = use$
$r = region$
$t = year$

For example, if a commercial property rents for £50,000 a year and has a capitalisation rate of 5%, the value of the property would be £1 million.

Equation 1 relies on the assumption that capitalisation rates do not vary over time, and this is unlikely to be a valid assumption, as a range of economic factors will impact upon this rate. Our estimates use capitalisation rates from 1992. These are considerably higher than recent real estate industry capitalisation rate estimates and are likely to lead to an underestimation of the combined value in more recent years.

Property use is broken down into:

- office

- retail

- industry

- other

Regions are broken down into:

- North

- Midlands

- Wales

- East

- South-West

- South-East

- London

The current methodology uses capitalisation rates broken down by region from 1992, while the new methodology will use more granular regional estimates.

These are quite broad groups, so important features that can affect capitalisation rates within these categories, such as location, will not be captured. For example, capitalisation rates in more affluent parts of London such as Mayfair are lower than other areas. If the capitalisation rate for an office is 3.5% in one part of London and it rents for £50,000, the value would be £1.4 million. Whereas in another part of London a property rented for the same value, where the capitalisation rate is 5% would only be worth £1 million. Therefore, capturing differences in capitalisation rates within regions can improve the quality of estimates.

Given that appraisal estimates are currently calculated every five years, it is necessary to capture changes in the capital value of property between revaluations. [MSCI series on capital growth](#) are used to estimate changes in value between revaluations.

$$\Sigma Combined\,value_{(u,t+n)} = \Sigma(Combined\,value_{(u,t)} * Capital\,growth\,from\,t\,to\,(t+n)\,in\,standing\,investments_u)$$
(2)

Where:

$u = use$

$t = VOA\,appraisal\,year$

$n = number\,of\,years\,after\,appraisal$

The [Wood committee](#) (1993) estimated that 2% of rateable value consisted of plant and machinery, but this may or may not remain the case. The current methodology adjusts appraisal estimates down by 2% to remove plant and machinery, as the combined value should only include estimates of buildings, structures and land.

Estimates for the combined value of land, other buildings, and other structures for each of Scotland and Northern Ireland respectively are estimated from historical proportions of 9% and 3% of the aggregate of England and Wales.

Proposed methodology

We are looking to move away from the assumption that the capitalisation rates do not vary between appraisal periods. Using VOA appraisals of rateable value and Land Registry price paid data will enable us to derive a "sale price appraisal ratio", to estimate the relationship between appraisal and sales values. This will mean that changes in capitalisation rates will be reflected in estimates of the combined value of other buildings, other structures, and land. The sale price appraisal ratios can then be applied to appraisal estimates to derive the combined value estimates of land, buildings, and structures subject to business rates.

A key challenge will be accurately matching data on property sales to the corresponding rateable values.

Using microdata will provide the opportunity to incorporate a more granular level of detail on "property use" and location characteristics, and enable us to derive the relationship between appraisal values and sales.

We are also investigating suitable data sources that will enable us to produce estimates of land underlying other buildings and structures for Scotland and Northern Ireland directly. This will be instead of producing estimates from a historical proportion of England and Wales.

4 . Private sector structures

Current methodology

Private sector structures and underlying land accounted for 21% of the combined value of other buildings and structures and underlying land in 2021. Nearly all of this was estimated to be in the "water supply and sewerage" and "mining and quarrying" industries.

The current estimates of the combined value for structures and land in the "water supply and sewerage industry" are likely to be too high. This is because they are calculated using the water industry regulator's (Ofwat) estimates, where a proportion of the capital is not depreciated. This means that estimates of the value of land will be overestimated as the residual method will pick up differences in the value of capital, and this will be incorrectly captured as land value.

There may also be double counting as some assets in Ofwat estimates may already be captured in Valuation Office Agency (VOA) estimates.

Current estimates for the "mining and quarrying" industry use historical capital stocks estimates projected forward.

Proposed methodology

The process of improving estimates of land underlying structures will involve understanding where estimates are also captured by the VOA. This is important to avoid any double counting and selecting the most appropriate source. In addition, we will review the available data sources for various structures and consider on a case-by-case basis whether the residual method is the most suitable to produce the best estimates.

An example of this approach would be for the "extraction of crude petroleum and natural gas" industry. In this circumstance offshore platforms held within this industry will not be captured by VOA data, although onshore structures may be included. Continuing to use the residual method will rely on a data source providing accurate estimates of the combined value of structures and land, which are broadly consistent with capital stocks estimates for structures. However, as The Crown Estate manage the seabed and foreshore around England, Wales and Northern Ireland, the value of offshore land could potentially be more reliably calculated by directly measuring the value of land.

5 . Local government structures

Roads account for most of the value of local government structures and underlying land, which represent 14% of the combined value in 2021. The value of the roads themselves is projected from previous estimates, although these should be estimated from capital stocks figures. The value of land underlying roads is calculated using the direct method, taking Department for Transport data on road length to calculate the area covered by roads and multiplying this using a historical price estimate projected forward.

Current estimates of the price of land underlying roads in built-up areas is estimated at £1.1 million per hectare in 2021, which is comparable with the value of land underlying dwellings in many areas. This may result in overestimating the value of land, given that the value of roads will also be captured in real estate prices. By contrast, the value of land underlying roads in non-built-up areas is estimated at £8,550 per hectare, which is lower than the value of agricultural land.

National balance sheet estimates for the value of land underlying roads differs considerably between local government and central government, where estimates are taken from the whole of government accounts. We will consider how best to estimate the value of land underlying roads on a more consistent basis, subject to suitable data sources.

In addition to roads, there are estimates of other local government civil engineering. We will look to review what local government assets are not captured in either VOA data, or our estimates for roads and reflect on how this is best estimated.

6 . Central government structures

Central government estimates of the value of structures and underlying land are sourced from infrastructure estimates in the [Whole of Government (WGA) accounts](#) (except for Network Rail). As WGA are not compiled on a national account's basis, suitable data sources or adjustments need to be considered.

Network Rail provides an example of where balance sheets or WGA accounts data differ from those required for the national balance sheet. For Network Rail, we currently use estimates from [Network Rail's annual report](#). This does not use depreciated replacement costs and consequently underestimates the value of capital owned by Network Rail on a national account's basis. The WGA uses modern equivalent asset valuations for capital, which provides estimates on a depreciated replacement cost basis. However, these do not use the Perpetual Inventory Method (PIM) as recommended by the [Organisation for Economic Co-operation and Development (OECD) Measuring Capital Manual](#).

In addition to differences between how capital should be measured in the national balance sheet and WGA, land is also not captured on a national accounts' basis. The valuation of land by Network Rail includes a land compensation adjustment, which should not be included in national balance sheet estimates.

Our review will look to explore whether the direct method would produce better estimates for land underlying central government structures. This could involve taking land estimates directly from accounting estimates, which will avoid problems of differences in the measurement of capital affecting our estimates of land when using the residual method. Where there are conceptual differences in the measurement of land in WGA, we could consider applying adjustments.

7 . Public corporations' structures

Estimates for the combined value of structures and land for public corporations are generally calculated using annual reports. We will evaluate the data sources to see if these are the best available and whether any methodological improvements could be made.

8 . Combined value of buildings and land not subject to business rates

Most buildings and underlying land are included in estimates compiled using Valuation Office Agency (VOA) estimates, but some buildings are not subject to business rates. Where this is the case alternative sources are required to produce estimates.

Uncompleted buildings and structures accounted for just under half of the combined value of other buildings, other structures and land in 2021 that are not subject to business rates.

The current estimate for uncompleted buildings and structures is derived from gross fixed capital formation (GFCF) data on new construction, average construction contract lengths, and a new to completed construction ratio. However, this approach excludes estimates for the value of land and many of the historical sources used in this methodology are no longer available.

Directly valuing the land or using a land-to-structure ratio may be preferable when producing estimates of uncompleted buildings and structures. The value of aspects of new GFCF or work-in-progress for buildings and structures could provide the value of uncompleted buildings and structures. The land element could potentially be calculated either using data on planning permissions or a ratio between buildings and structures and land.

Buildings registered for public religious worship or church halls are exempt from business rates. Currently the national balance sheet only includes a historical estimate for the value of churches, which has been projected forward. We will explore which data sources are available to produce estimates.

Other properties that are exempt from business rates include other buildings and structures in agriculture, and buildings used for the training or welfare of disabled people. Currently these are not included in the combined value of other buildings, other structures and land in national balance sheet estimates.

Currently an estimate for the value of Crown Estate properties is separately calculated. Crown Estate properties are included in VOA estimates from April 2000, so this adjustment will be removed after this date.

9 . Land ownership by institutional sector

Estimates of land underlying buildings and structures are currently assumed to be in proportion to the capital stock held by that institutional sector. Given that land value is likely to differ between various other buildings and structures, we will look to identify the value of land by sector, to account for differences in land value across sectors. For example, the value of land for a retail outlet on Oxford Street is likely to be much higher than the land value of a warehouse.

10 . Future developments

This article has presented the current and improved methodologies in estimating the value of land underlying other buildings and structures. It is the second of three articles explaining improvements to the non-financial estimates in the National Balance Sheet. The next release will cover the estimation of valuables and non-produced assets, excluding land underlying buildings and structures, which will be published later this year.

The Office for National Statistics (ONS) will be publishing land value estimates incorporating some of these improvements in December 2022 as experimental statistics. These will complement the National balance sheet bulletin and will be introduced in the Blue Book 2023.

Keeping in touch with our users and understanding how their needs are changing is important to us. To send us your feedback and for any further information, please contact us on capstocks@ons.gov.uk.

11 . Acknowledgements

We would like to thank Marianthi Dunn, Richard Heys, Tusan Nguyen, Katharine Owen and Matt Steel for their contributions to this article. We would also like to thank everyone that has provided further information about existing and potential data sources, including civil service colleagues, such as those at the Valuation Office Agency.

12 . Related links

Improving estimates of land underlying dwellings in the national balance sheet, UK: 2022
Article | Released 10 March 2022
The methodological improvements for estimates of land underlying dwellings in the UK national balance sheet. Detailing the current and proposed methods, as well as the data sources and methodological limitations.

National balance sheet estimates for the UK: 2021 Bulletin | Released 2 December 2021
Annual estimates of the market value of financial and non-financial assets for the UK, providing a measure of the nation's wealth.

The national balance sheet and capital stocks, preliminary estimates, UK: 2022
Bulletin | Released 5 May 2022
Preliminary annual estimates of the nation's net worth, by type of financial and non-financial asset for the UK. Includes estimates of produced assets used in the production process and their loss of value over time.

Capital stocks and fixed capital consumption, UK: 2021
Bulletin | Released 25 November 2021
Annual estimates of the value and types of non-financial assets used in the production of goods or services within the UK economy and their loss in value over time.