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BALANCE SHEETS FOR LAND, ENERGY RESERVES AND MINERAL RESERVES IN THE NETHERLANDS

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BALANCE SHEETS FOR LAND, ENERGY RESERVES AND MINERAL RESERVES IN THE NETHERLANDS

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Summary: This report presents the non-financial balance sheets for land and mineral assets as annually compiled for the Netherlands. These balance sheets are constructed for the total Dutch economy but also include breakdowns by institutional sectors and industries. The paper shows the main results and covers conceptual and practical issues concerning asset valuation and other measurement aspects.

Keywords: Non-financial assets, balance sheet, land, mineral and energy reserves.

* This paper summarizes the findings of Van den Bergen et al. (2010) and Veldhuizen et al. (2009). The authors of these two papers represent those colleagues at Statistics Netherlands responsible for the development of the Dutch non-financial balance sheets.

INTRODUCTION

This short paper presents the non-financial balance sheets for the Netherlands as compiled for the following two natural resources 'land' and 'mineral and energy reserves'. These two asset categories are included in the non-financial balance sheets as annually published by Statistics Netherlands, covering the following asset categories: fixed assets, inventories, mineral and energy reserves, the most important types of land and consumer durables. The latter asset category is presented as a memorandum item.

The non-financial balance sheets are used to calculate the capital inputs in the KLEMS based growth accounts of the Netherlands, which are also published on an annual basis. The depletion of mineral and energy reserves is monitored by Statistics Netherlands in its annual Environmental Accounts publication.

This paper briefly reviews the methods used to estimate land and mineral and energy assets. The main results of these balance sheets are presented first.

MAIN RESULTS

A summarized balance sheet for the Netherlands, as presented in Table 1, shows the importance of natural resources, particularly land, in terms of their contribution to national wealth. These data can be obtained from the online Statline database of Statistics Netherlands. The value of land makes up for almost a third of the total wealth represented by all non-financial assets. Land under dwellings represents about 80 percent of the total value of all land. Otherwise the Netherlands is not a particular rich country in terms of natural resources.

The contributed wealth of mineral and energy resources is rather modest, certainly compared to land. Most of this wealth represents natural gas deposits under ownership of the Dutch government. Mineral reserves in the Netherlands represent a range of rather low valued asset categories (clay, peat, sand, salt, gravel and limestone) which contribute rather insignificantly to the national wealth.

Table 1 shows that in recent years land owners in the Netherlands are confronted with substantive holding losses. In 2012 the decline in land prices was more than 10 percent. Together with an on-going decline in real disposable income of households, these holding losses are expected to contribute significantly to the continuous fall in household consumption over the last two years. The economic crisis that currently strikes the Netherlands is expected to be amplified by these wealth effects. Balance sheets provide therefore important statistics that supplement the product and income accounts.

Table 1

Opening and closing balance sheet for the Netherlands, 2012

	Opening balance sheet	Changes			Closing balance sheet
		Revaluation	Accumulation	Other changes in volumes	
	billion Euro				
Total non-financial balance sheets	3312	-112	16	-7	3208
Fixed assets	1977	-23	13	-	1967
Inventories	100	2	3	-	105
Land	1081	-111		3	974
Mineral and energy reserves	153	20		-10	163
Consumer durables*	157	1	-4	-	154

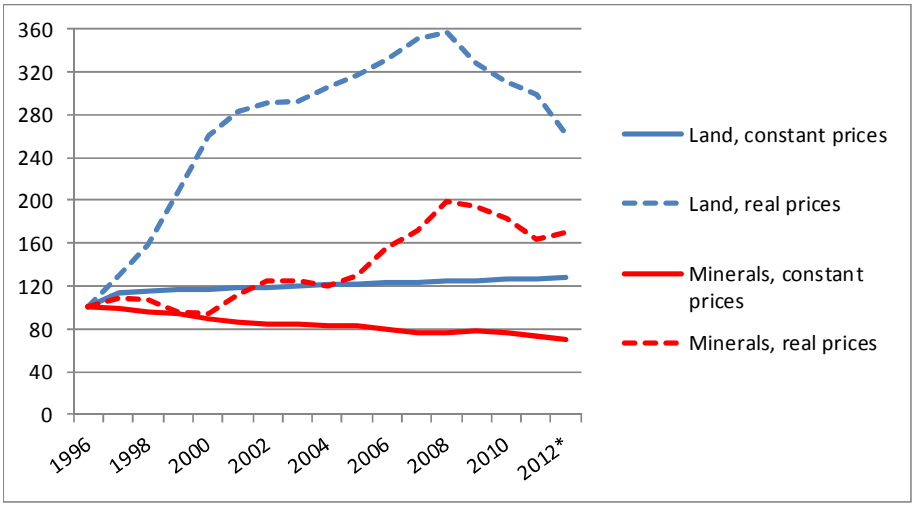
* memorandum item
Differences may occur due to rounding

The other changes in volumes, as presented in Table 1, represent reclassifications of land, mainly caused by (1) the reallocation of agricultural land and other land for the development of new real estate areas (3 billion euro) and (2) the depletion of oil and gas reserves (-10 billion euro).

The significance of (real) holding gains and losses is further illustrated in Figure 1. The indexes in constant prices indicate the ownership of assets, land and mineral reserves, in volume terms. As mineral reserves are gradually depleted and new findings are nowadays rare, the corresponding index shows a declining trend. A less strong but opposite trend is shown for land. These volume increases of land are mainly due to the continuing expansion of land underlying buildings.

Figure 1

Natural resource stock values for the Netherlands in constant prices and real prices, i.e. corrected for general inflation, indexes (1996 = 100)



The other two indexes show the ownership of land and mineral reserves in real prices, i.e. in constant euro values. Real holding gains are reflected by the differences in the constant price value changes and value changes in real prices. The figure points out that in the 1996-2008 period real holding gains for land were substantial. The Dutch real estate bubble started to burst in 2008 which is very well shown by the fall of land asset values in real terms in the subsequent period.

Real holding gains on mineral reserves have on average been quite large as well. The exception is the 2008-2011 period in which oil and gas prices fell as a result of the global economic crisis. Overall the holding gains more than offset asset value losses due to depletion.

MEASUREMENT ISSUE

Measurement of land

Valuation of land

Land values should be derived from representative market transaction values, i.e. prices reflecting the sales and purchases of land. Usually, the most expensive land is that underlying buildings and structures. As agricultural land, or land at the outskirts of cities or in rural areas, is usually significantly lower priced, such prices cannot be used to approximate the land component of a real estate transaction.

The only alternative is a proper decomposition of a real estate transaction in a land and a fixed asset (dwelling, building) component. The values of two identical houses (or buildings) including the land may differ on different locations. Such price differences are for example the outcome of differences in the presence of environmental and other amenities of land, e.g. the presence of recreational parks, highways, public services, job opportunities. The price of land will usually include the features of the surrounding area as the value of a building or structure, excluding the land on which it is built, is equal to the depreciated cost of producing the building or structure. The perpetual inventory method (PIM) is used to calculate the depreciated value of the buildings and structures. These estimates can be used to derive land values from real estate transactions as a residual item. This is sometimes called the indirect method.

Scope of land

According to national accounts conventions, all land subject to ownership should be valued on the basis of representative market prices. In cases where ownership cannot be identified, the government could be considered the land owner by default. This means that all land within the borders of the national territory is to be represented in the nation's balance sheet. The economic values of certain parts of land, like remote and inaccessible deserts or tundra's, may be close to zero.

For the value of certain parts of government owned land, like land underlying roads and public parks, one could argue that these are already (at least partly) reflected in the prices of adjacent privately owned land. Including a separate value of this particular category of land could lead to double counting. One of the amenities reflected in real estate values its connection to public infrastructure. An easily accessible dwelling (including the land) will have a higher value than a remote house besides a dirt road.

This line of argumentation is under discussion by a Eurostat Task Force which is currently investigating issues around land and other non-financial assets. The final recommendations of the Task Force may bring about some modifications in the Dutch balance sheets.

Land use statistics

In the Netherlands land use statistics are a key source for compiling balance sheets for land. They provide a breakdown of all land and inland water bodies into various land use categories. Land use statistics are published on a three year basis derived from aerial photographs. Using land use statistics ensures consistency between the sum of the areas of all types of land and the total area of land in the Netherlands. A disadvantage of the land use statistics is that they are not always aligned to corresponding SNA 2008 classifications. For example, land under small roads within a neighbourhood is classified as land underlying dwellings.

Agricultural land is divided into two separate groups, open farmland and land underlying greenhouses. The scarce data that exist about the price differences between land for cattle breeding and land for arable farming show that these prices are fairly equal, so distinguishing between these two kinds of open farmland does not add much quality to the estimates. Open farmland is further divided into land subject to a lease, and other land. Data shows that a lease contract lowers the price on agricultural land on average with 50 percent.

The agricultural census is being used for interpolation and extrapolation of open farmland estimates that are derived from the land use statistics. This census provides annual data on the use of agricultural land.

Several sources are used to determine the price per hectare of agricultural land. In the Netherlands several institutes are involved in related data collection. The most recent data source is the Economic Institute for Agriculture (LEI). All data sources provide the weighted average price per hectare of

agricultural land for the whole of the Netherlands, as well as for different regions. The value of the agricultural land is subsequently estimated by multiplying the agricultural area with the price per hectare. This means that farmyards and land underlying farms obtain the same price as 'actual' agricultural land.

For land underlying greenhouses, neither the areas nor the rate of change in areas from the agricultural census are anything like the data from the land use statistics. The main reason is that greenhouses are increasingly used for non-farming purposes, like storage of camper trailers and vans. The agricultural census only registers the land that is actually used for greenhouse farming. Since other data sources are unavailable, linear interpolation and extrapolation is used to estimate the area of land underlying greenhouses. Data from the LEI is used to value land underlying greenhouses. One problem with the data is that the price per hectare of land underlying greenhouse depends on how square the area is. A square area is cheaper to heat and the underlying land will therefore be higher priced. Unfortunately good data on the contours of greenhouses is unavailable. Some assumptions are therefore needed to estimate the average price of land underlying greenhouses.

Land underlying dwellings

The value of land underlying dwellings is measured as the value of the dwelling including the land minus the depreciated value of the building the dwelling. The value of the dwelling including the land is derived from tax registers. In the Netherlands for tax purposes the (so called) WOZ-value of every dwelling including land is assessed and registered.[1] This value is based on actual prices of dwellings sold and therefore provides an accurate estimate of the market price.

The Perpetual Inventory Method (PIM) is used to determine the depreciated cost of dwellings. The PIM measures the net value of dwellings excluding the underlying land, but including the depreciated value of ownership transfer cost. Since the WOZ-value is the price for which the dwelling is expected to be sold, it excludes the transfer of ownership cost. For estimating the value of land underlying dwellings, the PIM-value excluding transfer of ownership cost is therefore subtracted from the WOZ-value.

Not only land values but also volume changes in land use can be derived from the above mentioned sources. It is important to emphasize that the volume change of land is not necessarily equal to change in concomitant land areas. This is because land underlying dwellings can not be treated as a homogeneous asset. Land in the middle of a city has usually a much higher value and is therefore considered to be of higher quality than land underlying smaller villages. In practice, the volume change of land underlying dwellings appears to be higher than the increase in the area of land underlying dwellings. This is consistent with the observation that in the Netherlands a larger part of dwellings are being built in the highly populated areas where land prices are above average. However, more research is probably needed to determine whether the results are plausible.

Land underlying non-residential buildings

In principle the value of land underlying non-residential buildings can be estimated in a similar way as the value of land underlying dwellings. A WOZ-value is available for almost all non-residential buildings with the exception of tax exempted buildings like churches. The main difference is that WOZ-values for non-residential buildings including land cannot be used directly. Unlike dwellings including land, the WOZ-values for non-residential buildings including land are not based on actual transactions. The reason for this is that transactions in non-residential buildings take place less frequently. For estimating the

[1] In the Netherlands, certain taxes are levied on the basis of the values of real estate property. This is laid down in the Dutch Real Estate Appraisal Act (WOZ). The value that the government subsequently assigns to each dwelling and building is called the WOZ-value.

WOZ-value of non-residential buildings including land, various methods are being applied by the tax authorities. When possible, the net present value of future rentals is applied as a valuation method. Other valuation methods as applied by the tax authorities are making use of depreciated values of construction costs.

It appears that the PIM-value of all non-residential buildings (excluding land) is higher than the WOZ-value of the building including the land. The service lives in the PIM are quite similar to the guidelines for estimating WOZ-values so this cannot explain the difference. However the applied depreciation profile are very different. The depreciation profile used in the PIM is almost geometrically shaped. The WOZ-values are based on a linear depreciation method. Since linear depreciation lead to lower net asset values than geometric depreciation rates, this might explain the unexpected difference between the two estimates.

Therefore, the PIM-value of non-residential buildings (excluding transfer of ownership cost) is recalculated with the help of a linear depreciation profile and subtracted from the WOZ-values to arrive at the estimate of land values underlying non-residential buildings.

The price index used for estimating WOZ-values in constant prices is obtained from the WOZ-register and logically corrected for price changed due to depreciation.

Assigning ownership and use to sectors and industries

The breakdown of the balance sheets for land by institutional sector is strictly based on *economic ownership*. The industry classification is particularly useful for productivity measurement and based on the *use* of land in production, which does not necessarily correspond to land ownership. Van den Bergen et al. (2010) explain in the detail the methods applied to classify land ownership by institutional sector and land use by industry.

Mineral and energy reserves

In the Netherlands, the government sector is the owner of all subsoil assets and as such responsible for granting mining concessions to mining companies. The exploitation of mineral and energy reserves in the Netherlands includes oil, gas, clay, peat, sand, salt, gravel and limestone. All Dutch coal mines were closed in the seventies. Under present market conditions coal mining in the Netherlands is economically infeasible and the economic value of coal deposits is therefore considered zero.

For estimating the value of energy and mineral reserves, the different assets categories are divided into those with finite, and those with infinite, service lives. Pure theoretically, mineral reserves with infinite service lives do not exist, however, for some assets the ratio between physical extraction and reserves indicates that extraction is guaranteed for the foreseeable future.

Oil and gas reserves

The value of an asset as reflected in the balance sheet should reflect its market price. As oil and gas reserves are not widely transacted, alternatively the net present value method is used to determine the monetary value of oil and gas reserves in physical terms. The future earning streams are calculated by multiplying projected yearly physical extractions with the expected income per unit of extracted oil or gas (unit resource rent).

The net present value estimate relies, among other things, on the current available reserves and on future extraction patterns.[2] Data on the available reserves and on the physical extraction are derived from a series of reports (Minerals and Geothermic Energy in the Netherlands, in Dutch: Delfstoffen en Aardwarmte in Nederland) as published by the Netherlands Organisation of Applied Scientific Research (TNO). The physical extraction schedules are based on the remaining reserves, on observed trends in the physical extraction of oil and gas and on government enforced limits on annual extraction levels. This information results in linear declining extraction patterns from one year to another.

The unit resource rent is calculated endogenously. The exogenously estimated user cost of fixed assets and profits from secondary activities are subtracted from the gross operating surplus in order to determine the resource rent for the extraction of oil and gas.[3] Subsequently, the resource rent has to be divided into a resource rent for extracted oil and for gas. Due to lack of data, the division is for the time being based on the ratio between the output values of oil and gas. Future research is required to improve these calculations.

For both oil and gas, the resource rent is in a following step divided by the physical extraction to arrive at the unit resource rent. Due to large variations in the price of oil and gas from one year to another, the estimated unit resource rent will be equally volatile. Expectations on future resource rents may not necessarily be as volatile as ex post oil prices. For calculating future income streams it is assumed that the expected future real unit resource rent equals the average resource rent in the last three years.

Mineral reserves

Mineral reserves in the Netherlands cover clay, peat, sand, salt, gravel and limestone. The value of related reserves should be estimated in the same way as those of oil and gas reserves. Estimates of physical reserves of these assets are not available and probably not meaningful. The size of these reserves is relatively unimportant, since each of these subsoil assets are available in abundance. The relative insignificance of these mineral assets in terms of economic value is another reason why extensive research on the available reserves, as is done for oil and gas, is not carried out.

Alternatively, it is assumed that service lives of mineral reserves in the Netherlands are infinite. This assumption is expected to lead to minor measurement errors. As a logical consequence these mineral reserves are not subject to resource depletion. For extraction patterns in physical terms, it is assumed that the future yearly extraction equals the average extraction in the past three years. Data on the physical extraction are obtained from several government agencies.

In the Netherlands two industries are responsible for the extraction of mineral reserves: the mining and the chemical industries. For the latter industry resource rents cannot be calculated in a meaningful way as generated income from non-mining activities are so much higher than the resource rents under investigation. Alternatively, unit resource rents in the chemical industry are assumed to correspond to those found in the mining industry.

As with energy reserves, it is assumed that the expected future real unit resource rent equals the average real resource rent over the last three years. As both the real unit resource rent and the yearly physical extraction are assumed to remain constant over infinite time, the net present value represents the resource rent in constant prices divided by a real discount rate. As a real discount rate is set at 4 percent, the value of mineral reserves equals 25 times the average resource rent obtained over the last three years.

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2 The future income is based on the expected extraction schedule at the moment of valuation, not on the actual extraction as is measured years later. The reason behind this is that we want to value the reserve at the moment the balance sheet is made. Data on the realised (future) extractions are not yet available at this moment.

3 In the Dutch national accounts, extraction of oil and gas is classified in one single industry.

FUTURE RESEARCH

The following points for future research are identified for the Dutch balance sheets for land, minerals and energy reserves:

- The issue of land under roads and public parks may require further investigation;
- Estimates of land are still incomplete and exclude land under construction sites and privately owned recreational land. Land underlying tax-exempted buildings, like churches, are excluded in the figures, since no data on the value of these real estate objects is available from the tax registers;
- The breakdown of land by industry could be improved. For example, company reports may be a useful source of information to improve estimates of land ownership in the banking and insurance industry. This requires further investigation;
- Specifically for productivity analysis, the quality dimension in the volume change of land may require further research;
- The precise split between resource rents of gas and oil requires further investigation.

Given current resources, it will be infeasible to pick up each of these issues on short notice. Of course, in prioritising this research agenda, the recommendations of the Eurostat Task Force on land and other non-financial assets will be taken into consideration.

REFERENCES

Bergen, D. van den, P. Taminiau-van Veen and E. Veldhuizen (2010) Paper prepared for the Taskforce QSA, *"Compiling complete balance sheets for the Netherlands",* 1-2 June 2010, Frankfurt.

Veldhuizen, E., C. Graveland, D. van den Bergen and S. Schenau (2009), *"Valuation of oil and gas reserves in the Netherlands 1990-2005"*, Statistics Netherlands, The Hague-Heerlen, discussion paper nr. 09029.