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Economic radar for the sustainable energy sector

On the 10th of June 2011 the study 'Economische radar duurzame energiesector[1]' has been published in Dutch on the website of Statistics Netherlands (click on link in footnote 1 for report). This study has been commissioned by the Ministry of Economic Affairs, Agriculture and Innovation. The mentioned report contains a Dutch management summary. This document is meant as a supplement to the Dutch report and describes the management summary in English.

Box 1- Background study on sustainable energy sector

The sustainable energy sector is part of the environmental goods and service sector, for which in recent years CBS has developed a new statistic. This statistic is compiled based on guidelines set at EU level (Eurostat). Several European countries compile data for the environmental goods and service sector (data available at Eurostat). The set-up of a system for structural monitoring of the sustainable energy sector is a further deepening and expansion of the environmental goods and services sector statistic and fits well in the work of Statistics Netherlands and in the developments at Eurostat. The statistic 'environmental goods and services sector' is also included in the standard 'System of Environmental Economic Accounting' (SEEA), which is expected to be adopted in 2012 by the Statistical Committee of the UN. The SEEA describes internationally harmonized concepts for compilation of various environmental accounts, including air emissions accounts, water accounts and the 'environmental goods and services sector'.

Strength of the methods used is that these are based on data already available at Statistics Netherlands in combination with expert knowledge from outside the CBS. Therefore, there is no additional administrative burden on business proceeding from this study. In addition, the concepts used are consistent with those used in the national accounts. This means that figures for the sustainable energy sector are comparable with the key macroeconomic indicators such as GDP and total employment.

Management summary:

A. Motive for this study

Energy supply and consumption are changing. In the near future, the demand and supply of sustainable energy will become increasingly important. Newly developed energy systems have little or no dependence on fossil fuels. Sustainable energy contributes to

[1] http://www.cbs.nl/NR/rdonlyres/4B1C4BCB-CE97-482B-A8EB-7B9EA402E3B4/0/2011economischeradarduurzameenergiesector.pdf

securing supplies, diversification of energy supply, the reduction of greenhouse gas emissions and the creation of green jobs. The sustainable energy sector – which cuts across all industries of the Standard Industrial Classification (NACE) – consists of companies and institutions that physically produce renewable energy as well as companies active in the value chains that come before it. Apart from renewable energy, the sustainable energy sector also includes companies and institutions that focus on energy saving activities. In 2011 Statistics Netherlands developed economic radar for the sustainable energy sector commissioned by the Ministry of Economic Affairs, Agriculture and Innovation.

B. Aim of this study

The aim of this study is to set up a consistent economic monitoring system for the sustainable energy sector, benchmarking one year (2008) and making recommendations on key issues in the development of the economic radar. These key issues include timely reactions to current issues with figures of other knowledge institutes[2] and/or the associations, monitoring international investments, analysing ownership constructions and map developments in the use of fossil fuels in the economy. This study describes the key indicators that were developed on the basis of the data available at Statistics Netherlands. Economic indicators were determined for various parts of the sustainable energy sector: value added, production, employment, exports, imports, investments and innovation. The physical data about the production of renewable energy (Protocol monitoring renewable energy[3]) and the data derived from the 'Economic radar for the sustainable energy sector' can be very valuable in supplementing each other.

C Definition of the sustainable energy sector

The sustainable energy sector is delineated as described by Ecorys (2010):

"Renewable energy is the energy we can use indefinitely without compromising the environment and the possibilities for future generations. Renewable energy, better called pure renewable energy, is not generated by using fossil fuels or chemical minerals, which are all finite. We assume that the sun, water and the air are infinite sources. We also look at activities with a direct impact on sustainable energy policy in manufacturing from an economic perspective and the 'Trias Energetica'. So energy saving will be dealt with(less energy consumption means less energy production) but we also examine activities such as developing the grid, electric transport, hydrogen technology, and capture and storage of CO2 (CCS)." (Ecorys, 2010).

The sustainable energy sector in this study is broken down into:

The exploitation phase: The actual production of renewable energy
The pre-exploitation phase: Companies active in value chains preceding the exploitation phase, such as the production of renewable energy systems, R&D focusing on sustainable energy technologies, transport of windmills, trade in biomass. Also included are companies and institutions dealing with energy saving .

[2] For example: AgentschapNL.
[3] In order to determine the share of renewable energy production in the Netherlands, this protocol has been set-up. The protocol prescribes the definition of renewable energy. Statistics Netherlands uses this protocol in order to compile statistics on renewable energy production.

For the pre-exploitation phase there are figures available for the variables employment, production, value added, international trade, investments and innovation. There are no figures available on innovation and international trade for (parts of) the exploitation phase.

The sustainable energy sector is broken down into 16 product profiles and 7 process profiles. The various product profiles are 'solar PV', 'solar CSP', 'solar thermal energy', 'bio gas', 'bio mass (solid) & waste', 'bio fuels', 'bio refining', 'wind on land', 'wind at sea', 'heat & geo thermal energy', 'energy from water', 'energy saving', 'electric transport', 'smart grids', 'hydrogen technology' and 'CO2 capture and storage'. The process profiles are 'R&D', 'consultancy', 'transport', 'preparation/raw material production', 'supply, assembly and construction', 'production of energy carriers', 'installation and maintenance'. In this study we determined economic figures for these different profiles.

D. Results

Economic key figures

Employment in the sustainable energy sector in 2008 equalled 17.300 full-time equivalents, the production and value added amounted to 5.160 and 1.710 million euro respectively. Excluding the energy saving profile, employment equalled 11.600 full-time equivalents, the production and value added were 3.960 and 1.280 million euro respectively. Energy saving plays a key role in the sustainable energy sectors just like wind, geothermal heat, solar PV, biomass and bio gas. The other technologies played a limited role in 2008. The sustainable energy sector mainly consists of small and medium sized companies.

A. Indicators for the sustainable energy sector

Economic key indicators (rounded)	
Production (million euro	5 160
Value added (million euro)	1 710
Employment (labour volume in FTEs)	17 300
Innovation aspects pre-exploitation phase	
R&D as a percentage of production (%)	4%
Percentage innovators (%)	54%
International trade	
exports (million euro)	1 806
imports (million euro)	2 232
Investments pre-exploitation phase (million euro	234

Table A- Key indicators for the sustainable energy sector

Share of the sustainable energy sector in the Dutch economy

The share of sustainable energy sector in Dutch GDP is about 0.32 percent. Its share in total production is 0.45 percent and in total employment 0.25 percent. This is because the sustainable energy sector is relatively capital intensive. The sustainable energy sector employs relatively few people who each contribute quite a lot to the value added and production in the Netherlands with the help of the capital invested. Both production and

value added per unit of labour volume in the sustainable energy sector exceed that of the economy as a whole.

In terms of employment the sustainable energy sector is larger than oil and gas extraction and the oil industry (refineries) and about 30 percent smaller than the industry energy companies.

Profiles in sustainable energy sector highlighted

The 16 different product profiles in this study find themselves in different stages of development. So comparing the figures for the different profiles is not straightforward. Some profiles, after all, are in the early phases of growth and may show substantial increases in employment, value added or production, whereas other profiles operate in a mature market. The same is true for the sector sustainable energy as a whole. On average, the sector is in a different phase than many of the more traditional sectors.

The value added per unit of labour volume for solar-PV is considerably smaller than average in the sustainable energy sector. The value added per unit labour volume for 'biomass' and also for 'wind on land' are substantially larger than average in the sustainable energy sector. In 'Biomass' it is mainly the waste incinerators that play a key role in this observation. The costs for wind energy are mainly the high depreciation costs.

The process profiles provide an insight in the position of the companies in the value chain. Through these process profiles we can sketch the Dutch manufacturing industry in the sustainable energy sector. The profile 'Supply, assembly & construction', of which the manufacturing industry is a part, has a share of more than 50 percent in total employment of the pre-exploitation phase (see table 5.1). So the manufacturing industry has a large share in the sustainable energy sector. Studies by Statistics Netherlands show that the total manufacturing industry is responsible for a very large share of Dutch exports and is a force in innovation. For instance, manufacturing applies for many patents. The future will show if this is true specifically for manufacturing in the sustainable energy sector. It is very important to monitor the data in time. The major exporters are in the product profiles solar PV, the bio chain, energy saving and wind at sea. The sector consists mainly of small specialised companies in the pre-exploitation phase, which indicates that the sector is young and developing (infant industry).

Clustering in the sustainable energy sector

The Rijnmond region houses most companies in the pre-exploitation phase. The proximity of the port of Rotterdam undoubtedly plays a major role especially for wholesale in the sector. The value added of a company in Rijnmond is relatively small on average. There also seems to be a cluster of companies in the south east of the province North Brabant belonging to the sustainable energy sector. The traditionally strong presence of electrical engineering and the technical university play a key role in this. There are also many companies close to the technical universities of Delft and Twente. Furthermore the southern and middle parts of the province of Limburg are home to many sustainable energy companies. The companies in the middle part of Limburg play a large role in the total Dutch value added.

In Limburg the pre-exploitation phase of the sustainable energy sector is best represented in the regional economy (mainly solar energy). About half a percent (measured in value added) of the economy is formed by these companies.

International trade by the sustainable energy sector

The total export of goods by companies in the sustainable energy sector had a value of 1,806 million euro in 2008. The products 'solar PV' and 'energy saving' are mostly exported by wholesale and manufacturing. Bio fuels are mainly exported by wholesale. The total import of the sustainable energy sector is 2,232 million euro. The imports consist mainly of bio fuels from the rest of the world. A part of these bio fuels and bio mass is sold on the domestic market, but an even larger part is re-exported. Also the product profile wind on land has a large share of imports, mainly due to importing turbines from Germany and Denmark. Exploitation subsidies aiming to increase the share of sustainable energy in 2020 stimulate these imports. The sector as a whole had a negative balance of trade in 2008.

Investments by the sustainable energy sector

In 2008 companies in the pre-exploitation phase of the sustainable energy sector invested 234 million euro. The investments in capital goods for the production of sustainable energy and energy saving (exploitation phase), based on information of the EIA regulation, are much greater, namely close to 1.2 billion euro. The data of the EIA regulation may be too limited (lower threshold) to portray the demand side of the market.

Innovation and R&D in the sustainable energy sector

Approximately 54 percent of the large and medium-sized companies in the pre-exploitation phase of the sustainable energy sector with 10 or more employees indicated in the period 2006-2008 that they introduced new products or services (product innovation) or started using new methods (process innovation). About 30 percent of the companies indicated that they applied for a patent in the period 2006-2008.

Spending on in-house R&D, by large and medium-sized companies in the pre-exploitation phase, averaged 3.9 percent of the production value. In comparison, spending on in-house R&D in the total Dutch economy averages about 1 percent.

Innovation activities can be supported by subsidies, tax breaks or other forms of government support. The national government measures are used most often. Approximately 35 percent of the major and medium-sized companies in the pre-exploitation phase make use of one or more central government measures. They often use the tax breaks provided, such as the WBSO and innovation programs.

E. Methodology

Reliability of the estimates

The methods and sources used have led to figures with a reasonable level of reliability for the sustainable energy sector. The figures for production, value added and employment are more reliable than the figures for the other variables such as investments, exports, imports and innovation. The results of the latter variables should be considered as experimental.

Strong point of the methods used is that they rely fully on data known at Statistics Netherlands in combination with expert knowledge from outside Statistics Netherlands. Therefore the study did not pose an administrative burden on the private sector. Furthermore the methodology is fully in line with that of the National Accounts, which make the figures directly comparable with macro-economic key indicators such as GDP and total employment.

There are relatively small differences in employment for the sector as a whole with other studies such as the ECN (2010) and Ecorys (2010). The same picture emerges from these studies.

It should be put in mind that the information about R&D and innovation does not take small companies into account because they are hardly ever surveyed within this framework.

The study by Statistics Netherlands is still in a stage of development, requiring improvements in certain areas. During monitoring we can gain experience and complete the gradual learning curve. Any future adaptations by changes in the methodology will be applied back in time so that the sequencing of the data can be guaranteed.

Monitoring strategy

The methods used can be applied to new reference years and the necessary sources are periodically available. This makes it possible to monitor the sustainable energy sector consistently on a yearly basis. The focus will be on developments in time ('growth figures') rather than levels. The method used is mainly suitable for monitoring at the macro level. We do not advise to look at developments of the various aspects in too much detail and draw conclusions from them, because the methodology used is not always suitable for that (for example developments in very small profiles). Since it should be possible to repeat the study and because the energy sector is very dynamic, we recommend monitoring the sector every year. The structural data of the sector could be monitored each year for the year t-3.

Possibilities for 'fast' indicators

In this study we analysed year t-3. This means that we produced figures in 2011 for reporting year 2008. It is possible to produce figures for certain economic indicators faster. For the variable employment we can indicate the direction for year t-1, using an alternative indicator, namely the number of jobs which is an approximation of the development in the labour volume in FTE. It is also possible to monitor international trade (imports and exports) faster when needed, namely t-2 instead of t-3. For the key variables value added and production, t-3 is the earliest data possible. The innovation aspects are surveyed once every two years, so they cannot be monitored annually through the Innovation Survey. Data from other sources, such as patent offices, may provide a solution here.

F. Follow-up research and harmonisation in the European Union

The study by Statistics Netherlands is still in a development phase. It is possible and necessary to come up with improvements in certain areas. Below we list some issues for follow-up studies. International comparability is a major aim. We point out several possible actions to reach that point.

Population dynamics

Population dynamics have to be monitored closely in order to continue to include starters in the estimates. Once every three to four years we must determine for each company which of the activities are relevant for the sustainable energy sector (sustainable energy shares). It is important to work closely together with expert organisations such as AgentschapNL and Energy research Centre of the Netherlands (ECN).

Depreciation

Depreciation in the sector should be better understood, because it plays a key role in the decision making process about investments by entrepreneurs in sustainable energy. The variable is also very relevant in ascertaining the level of investments needed to maintain or expand the production capacity.

Capital goods

Compiling information about the capital goods specific for the sustainable energy sector can provide interesting information. Comparing the capital goods available in the sustainable energy sector with the capital goods of the total Dutch energy sector gives an indication of the degree to which the energy transition has developed in terms of capital.

Harmonisation at the European level

There are still very few figures about the sustainable energy sector available at the European level, provided by the national statistical institutes. The data are also not yet comparable due to differences in definition and estimation methods. It is important to be able to make comparisons with other European countries to see how the Netherlands is doing in the sustainable energy sector. The method presented in this report can also be applied by other statistical institutes, precisely because the source material used is also available for the other European countries. More international cooperation between the statistical institutes in this area may lead to more harmonisation. Possibilities to cooperate bilaterally with Germany, for example, should also be investigated.

Link with policy instruments

From a policy perspective it is very interesting to verify how effective and efficient certain incentive-inducing measures are. It is hard to determine the effectiveness of such measures on the basis of the figures presented in this kind of report alone. A European databank with micro data would be very valuable for studying the sustainable energy sector and testing causal relationships. A micro database at the European level should be set up so that there is a sufficient number of data points to test in a scientific manner. The statistical institutes should work together to create such a database. Since this is a substantial and challenging project, such a database is unlikely to be realised in the short term.

Key words: sustainable energy sector, renewable energy, energy saving, economic significance, employment, production, value added, international trade, investments, innovation