

GREEN PRODUCTION IN DENMARK

– and its significance for
the Danish economy

Danish Energy Agency / Ministry of Climate, Energy and Building
Danish Business Authority / Ministry of Business and Growth
Danish EPA / Ministry of the Environment

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Summary

This report is the result of work to establish new green business statistics on production of green technologies, goods and services by Danish enterprises. The purpose is to be able to monitor, on a statistical basis, the future development of green business in Denmark and its significance for the Danish economy. These statistics can serve as a common point of reference when discussing green growth in Denmark.

The green business statistics have been established according to Eurostat's guidelines. Denmark is among the first countries to use these guidelines for green statistics in practice. This report should therefore be considered as an initial, year 0, report and work to further develop the statistics will continue.

Key conclusions

- In 2010, green production in Denmark provided a turnover of more than DKK 250 billion. This is 9.2% of total turnover of Danish enterprises with at least one full-time employee.
- Green exports accounted for DKK 80 billion, which is 10.4% of total Danish exports. The green share of total exports increased by about 1 percentage point from 2005 to 2010.
- Green exports to emerging markets (BRIC and NEXT11) increased substantially more than total exports of goods to these markets. However, Denmark is far below the EU15 average for green exports to these markets.
- Almost 106,000 people were employed in green production in 2010. This means that 8.5% of employees in Danish enterprises are involved in green production.
- An estimated around 22,000 enterprises in Denmark produce and sell one or several green products (i.e. environmental technologies, goods and services). This means that around one in five Danish enterprises with at least one full-time employee have green production. The green products on average account for 40% of turnover in the enterprises that sell green products.
- The figures reveal that a broad cross-section of Danish enterprises, across all industries, produce solutions that are contributing to the transition to a green economy.
- In the energy area, renewable energy technologies make up the largest green business area, with a turnover of DKK 104 billion in 2010. In the environment area, waste management is the largest green business area with a turnover of DKK 55 billion in 2010.

Furthermore, the figures indicate that in enterprises with green production, added value per full-time employee generally matches the average for all Danish enterprises.

These green business statistics have been produced on the basis of key figures about enterprise turnover. However, to meet demands for a more complete description of environmental products in Denmark, the report also presents other key fig-

ures, although the underlying uncertainty of these is greater.

The report was prepared in November 2012 by the Danish Energy Agency/the Ministry of Climate, Energy and Building; the Danish Business Authority/the Ministry of Business and Growth; and the Danish EPA/the Ministry of the Environment. Statistics Denmark monitored the work. The statistics were prepared by DAMVAD.



Foreword

Denmark is undergoing a green transition and the Danish government is determined to make this transition compatible with economic growth.

We have ambitious energy, climate and environmental goals in Denmark, and we need to ensure that these goals are translated into green business growth. This will provide business opportunities to the many Danish enterprises offering important green solutions.

Today, Denmark produces technologies, goods and services across many industries; each contributing in various ways to enhancing resource and energy efficiency, protecting the environment and climate, as well as reducing the use of fossil fuels and chemicals etc. In other words, the transition to a green economy represents a potential for growth for a large cross-section of the Danish business community.

Denmark is good at producing green solutions – and profiting from them. A key aspect of Danish

business and economic growth policy is to enable Danish enterprises to exploit the increasing global demand for green products and solutions.

The Danish government therefore believes it is important to retain and promote Danish production of green technologies, goods and services and to support the growth potentials of Danish enterprises within this field. Moving forward with green technologies and a transition to a green economy can serve as the basis for creating new jobs in Denmark.

In order to achieve this, it is extremely important that we identify and obtain information about the financial results and characteristics of the Danish enterprises producing green technologies, goods and services. This information will provide part of the decision basis for Danish business and growth policies; policies to promote green transition.

This is the driving force behind these green business statistics.

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A black and white photograph of a stone wall. The wall is composed of large, irregularly shaped stones with visible mortar joints. A shadow of a building with a grid-like window pattern is cast onto the wall from the left side, creating a strong contrast and a sense of depth. The text "Green business statistics - objective and background" is overlaid in white on the upper left portion of the image.

Green business statistics – objective and background

The objective of these green business statistics is to identify and describe Danish enterprises' production of green technologies, goods and services (referred to as green products in the following). This identification will allow us to calculate and monitor the significance of green production for the Danish economy, including a comparison of Danish green exports with those of the other EU15 Member States.

In recent years, various analysis work has been carried out which fully or partially describe green production in Denmark. These analyses differ in scope; not all of them look exclusively at green production, and they use different data sources.

These current statistics differ from earlier analyses by establishing a population of enterprises with green production across industries in Denmark. Green production includes technologies, goods and services which in whole or in part aim to enhance resource and energy efficiency, protect the environment and climate, and reduce the use of fossil fuels, chemicals of concern, etc.¹

An enterprise is part of the population if it sells one or several products that can be characterised as green. Furthermore, in general, the figures are based only on the individual enterprise's green production. This is of great significance because some enterprises included in the population have a broad range of products, green as well as non-green. The green shares of the individual enterprises are calculated on the basis of their turnover.

Definition of green production

These statistics use Eurostat's definition of green production because it is the standard used in statistical contexts within the EU, and because future European Union legislation will be based on Eurostat's definition of green production. These statistics therefore follow international best practice and internationally recognised methods in the area, see box 1.

It is likely that the EU Member States will be required to report national green indicators to Eurostat in a couple of years according to the guidelines applied in these statistics. This will allow for comparing Danish indicators with the indicators of other Member States as, gradually, all EU Member States begin to establish similar statistics.

Box 1. Eurostat's guidelines and how the Danish green business statistics follow these

Eurostat's Handbook on data collection on Environmental Goods and Services from 2009 includes a description of recommended methods for establishing green statistics. Firstly, focus is on the supply side and not the demand side, i.e. on figures for the production of green products and not for the demand for these products. Secondly, the Handbook states that because enterprises with green production are not a pre-defined, separate sector (neither in reality nor in a statistical context), green products, and the enterprises producing these, should be identified according to Eurostat's definition and using several different sources. Subsequently they should be linked to the national statistical registers. The statistics should be updated on a regular basis.

The green business statistics presented in this report follow the above general steps in Eurostat's recommendations. See also annex 1 at www.ens.dk

1. See Eurostat's Handbook on data collection on Environmental Goods and Services (2009). See also box 2.

Box 2. Eurostat's definition of green production

Eurostat defines green production as having an environmental purpose. Thus green products include technologies, goods and services for the prevention, reduction, elimination and treatment of air emissions, waste and wastewater, soil and groundwater contamination, noise and vibration as well as radiation.

Environmental protection moreover includes prevention, reduction and elimination of soil erosion and salinity as well as other kinds of degradation, the preservation of biodiversity and landscapes as well as the monitoring and control of waste and the quality of environmental media.

Products for efficient use of resources (resource management) include technologies, goods and services to manage and/or conserve the stock of natural resources against depletion phenomena including both preventive and restoration activities as well as the monitoring and control of the levels and uses of natural resource stocks.

For a more detailed description, please see Eurostat's Handbook on data collection on Environmental Goods and Services (2009).

Green production has been broken down into nine green business areas adapted from Eurostat's guidelines, see box 3. This allows for a more detailed picture of the products (technologies, goods and services) sold by Danish enterprises at home and abroad.

Box 3. Green business areas

- Air pollution control
– see example 1
- Surface- and wastewater management
– see example 2
- Better utilisation of energy
– see example 3
- Protection of soil, groundwater and the aquatic environment
– see example 4
- Waste management
– see example 5
- Utilisation of renewable energy sources
- Measurement and analysis related to climate protection
- Noise and vibration abatement
- Protection of biodiversity and landscape

These business areas have been adapted from Eurostat's Classification of Environmental Protection Activities (CEPA). For examples of products in each green business area, see annex 6.

Source: Handbook on data collection on Environmental Goods and Services, 2009

Example 1

Air pollution control technologies

Around the world cities are experiencing increasing problems with air pollution from increasing traffic and energy production based on fossil fuels.

In order to help meet these challenges, a number of Danish enterprises have developed products which minimise pollution, such as catalytic converters for cars and lorries, subcomponents for ships' engines, more efficient wood-burning stoves, and efficient cleaning methods in large incineration plants.

Example 2

Effective water solutions

Access to clean drinking water is under threat in many places around the world due to over-exploitation, climate change or pollution.

A considerable number of Danish enterprises have specialised in developing solutions and sub-components for the sustainable use of water resources. These include solutions which minimise water wastage from pipelines; map groundwater resources from the air; treat sewage and wastewater more effectively; or which model and help prevent the negative effects of extreme weather events.

Example 3

Energy-efficient pumps

Pumps are used in many different contexts and often the principal purpose is not to address environmental problems but to distribute water, gas, slurry etc. However, operating pumps like these accounts for 13% of the world's total electricity consumption. Adapting pump technology so that it uses less energy therefore presents a huge environmental and financial potential.

For many years, Denmark has been well known for its export of pumps throughout the world, and both large and small Danish enterprises have received global acclaim for producing some of the world's most energy-efficient pumps.

Example 4

Resource-saving industrial cleaning

One Danish enterprise which specialises in cleaning equipment for the food industry, has developed new cleaning machines that reduce resource use considerably. The use of chemicals is reduced by 50% and water and energy consumption are reduced by 20% compared to competing products on the market.

The principal purpose of the product is to clean, however, with this new and adapted resource-saving product, the enterprise offers a green and cost-effective alternative to other solutions.

Example 5

Materials recycling

Both the extraction of resources for the production of goods, as well as the subsequent disposal of these goods, can be a substantial strain on the environment. Several Danish enterprises specialise in reusing and recycling resources. For example, they recycle old tyres to use in surfaces for sports fields etc., or old roofing felt to use in asphalt surfaces; or they recover important metals from shredder waste.

Delimitation of green enterprises and their products is not without challenges, despite extensive international preliminary work and common guidelines from Eurostat. The primary problem remains that green products are difficult to delimit in practice.

There will be situations in which the decision as to whether a product is a green product or not can be debated. In particular, it can be debated whether a product is produced with an actual environmental/resource-saving purpose or with another purpose.

The delimitation used in this report should therefore not be considered final. Furthermore, delimitation will clearly have to be updated on a continuous basis to allow for the inclusion of new green technologies, for example. Similarly, the solutions considered as the most resource-efficient today will be replaced by even more resource-efficient solutions in the future. Finally, the green share of production by the enterprises included in these statistics will also have to be revised regularly in connection with future updates.

How were the green business statistics produced?

In order to achieve as high a coverage rate as possible, four independent sources were used to produce these green business statistics.

The first and principal source is the product codes that state what an enterprise produces and sells. Identification of Danish green enterprises across industries was based on the official German list of green product codes published by *Statistisches Bundesamt Deutschland* in April 2012.

This German list of product codes is prepared on the basis of Eurostat's guidelines and is the result of many years of development work and ongoing dialogue with enterprises and stakeholder organi-

sations. The list is deemed to be the most comprehensive list of green products.

In order to ensure that the product codes reflect the Danish industrial structure, a panel of experts, with 19 experts from 9 green business areas, was set up in spring 2012 (see box 3). These experts reviewed and revised the German list of product codes, so that the list includes as many green products from Danish enterprises as possible.

The adaptation of the list by the experts to reflect Danish conditions also led to an expansion of Eurostat's break down of green products by business area. The business areas correspond to Eurostat's CEPA classes (Classification of Environmental Protection Activities). For the purpose of these statistics, the CEPA class *Protection of ambient air and climate* has been divided into: utilisation of renewable energy sources; better utilisation of energy; and measurement and analysis related to climate protection².

When the new categories are combined, the adapted divisions into green business areas are fully comparable with Eurostat's CEPA classes³.

The second source is the results from a questionnaire survey submitted to a sample of around 10% of all Danish enterprises with at least one full-time employee. A total of 3,052 enterprises participated in the survey, which was conducted in the spring of 2012.

The third source is the results of a review of the websites of 2,000 Danish enterprises. The purpose of this review was to obtain further information about the enterprises that sell green products and/or services. The review took place in the spring of 2012.

The fourth source is the most recent, complete count of all organic farms in Denmark (2009) conducted by the Danish AgriFish Agency.

2. The two CEPA categories resource efficiency and environmental protection across environmental domains have been omitted because it was not possible to obtain adequate data on these. See annex 6.
3. Note also that we have not produced statistics on Eurostat's CReMA segments (Classification of Resource Management Activities). The main reason for this is that it is difficult to distinguish between some CEPA and CReMA segments. As described in annex 7, some CReMA segments can be considered to overlap with CEPA segments.

The share of green production for each enterprise was calculated on the basis of these four sources. By using only the green share of an enterprise's production, we are able to calculate figures for the turnover, exports, employment and added value generated by green production. However, the same green weight could not be used for all statements in these statistics. For example, this applies to the figures for education, and for research and development investments. Thus for these figures, calculations are based on both the green and non-green production of enterprises.

For a complete description of the methodology, see the separate report in annex 1 at www.ens.dk. This website also has all the data and annexes linked to this report.

The first part of this report describes the trend in green business development for the period 2005 to 2010 on the basis of data from Statistics Denmark's enterprise statistics.

In the more detailed exports analysis in the report, the period is updated to 2006 to 2011, which was possible because the figures were extracted from Eurostat's COMEXT database in which data is updated more regularly than in Statistics Denmark's enterprise statistics.

Data for green exports

This report calculates figures for green exports in two different ways. *First*, green exports were calculated as the enterprise's total exports weighted by its green production share. For these calculations, export figures were not compared with statements from the other EU15 Member States. These figures are in chapter 1.

Second, green exports were calculated solely on the basis of the identified green product codes, which are not fully comprehensive for all industries but which allow for comparison across all

EU15 Member States. These calculations only cover goods, which means that services and organic products are not included. The reason for this is that the exports figures were extracted from Eurostat's COMEXT database, which contains only information based on trade in goods between countries. By using Eurostat's database we achieve comparability with other EU Member States. These figures are in chapters 4 and 5.

The figures on exports in chapter 1 therefore differ from the figures on exports in chapters 4 and 5. Read more about the methodology in chapter 4 and in annex 1 to this report.

Structure of the report

The full report is divided into five chapters.

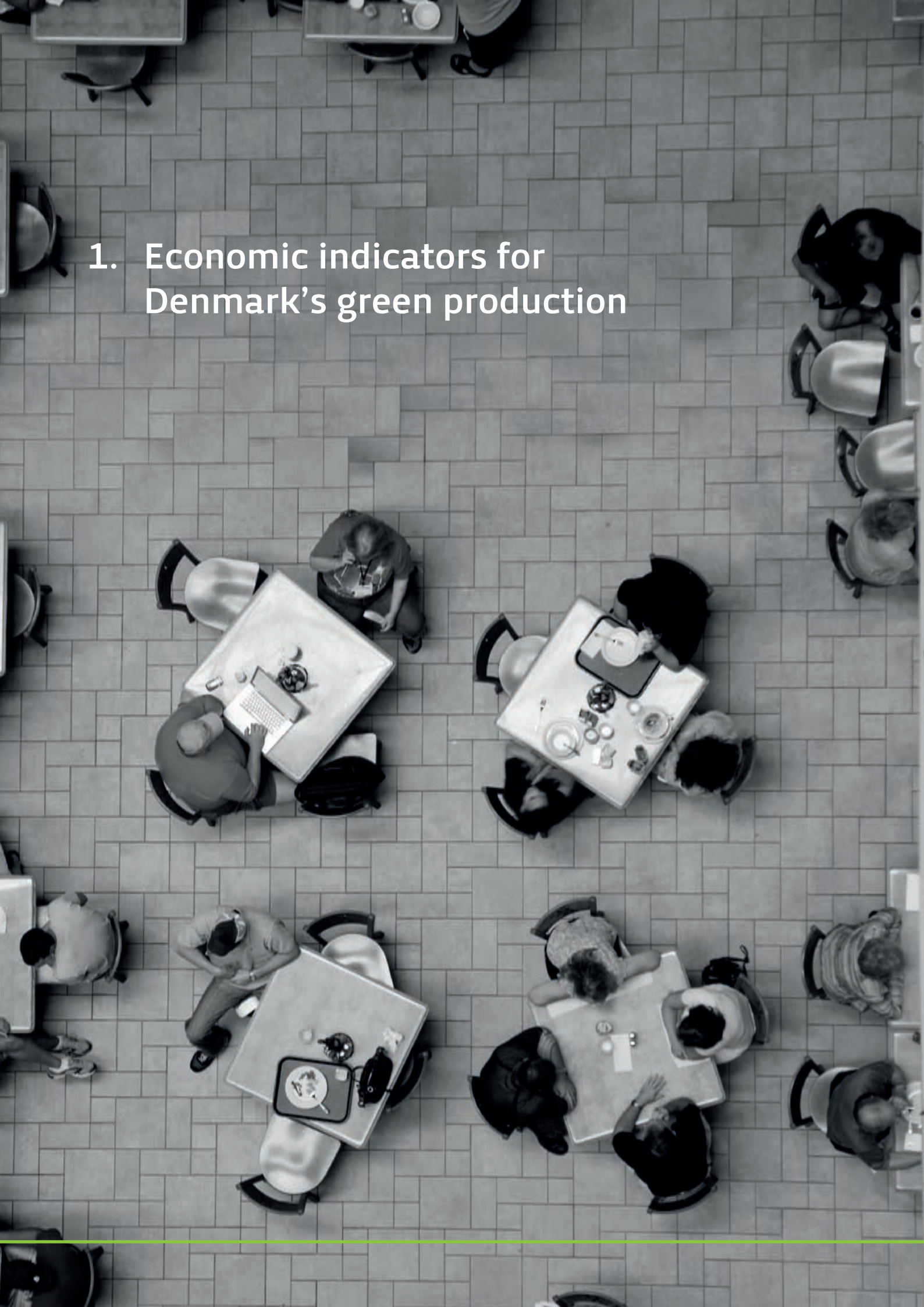
Chapter 1 describes a number of key economic indicators for green production by Danish enterprises: turnover, exports, export intensity, added value and added value per full-time employee (productivity).

Chapter 2 describes enterprise characteristics: breakdown by industry, breakdown by geography, enterprise size, types of employees, and more.

Chapter 3 looks at research, development and innovation in enterprises with green production.

Chapter 4 presents an analysis of enterprise exports of green products as well as identification of the markets to which Danish green products are sold, including the EU15, BRIC and NEXT11.

Chapter 5 compares Danish green exports with exports by the other EU15 Member States, and presents figures for the export specialisation of Danish enterprises for each of the green business areas. Furthermore, this chapter also presents the trend in Danish green exports in the EU15.

An aerial, black and white photograph of a meeting room. The room features a light-colored, square-tiled floor. Several groups of people are seated around square tables. In the upper left, two people are at a table with a laptop and a small table lamp. In the center, two people are at a table with a laptop and a small table lamp. In the lower left, two people are at a table with a laptop and a small table lamp. In the lower right, two people are at a table with a laptop and a small table lamp. The overall scene suggests a collaborative work environment.

1. Economic indicators for Denmark's green production

Green production accounts for a substantial part of the Danish economy⁴. As much as 9.2% of Danish turnover and 10.4% of Danish exports derive from green technologies, goods and services.

The sale of green products by manufacturing has been gaining ever more importance since 2005, as both turnover and exports stemming from green production in manufacturing have increased more than the overall economy⁵. Manufacturing's green production share of total turnover and exports increased each year up to 2009, but declined in 2010. Recent years' economic crisis has therefore

also affected manufacturing's green production and in 2010 green production by manufacturing declined more than other parts of the economy.

Manufacturing's green production is substantially more export intensive than this industry's overall production. Export intensity has gone up since 2005, also during the economic crisis.

From 2005 to 2010, green production had an added value per full-time employee equal to or higher than the rest of the business community.

4. The figures stated in the text are constant 2010 prices unless otherwise stated. The enterprise population has been delimited to private enterprises with at least one full-time employee, in the industrial categories A and C to N. The industry *financial and insurance* (K) has only been included in the statement of number of enterprises and employees, because for this industry data is missing for the other indicators. Due to an outlier, the 2005 values for green transport enterprises have been replaced by the 2006 values.

5. In the following the industries *energy supply*, *water supply* and *construction* have been included in manufacturing.

1.1 Turnover from green production

In 2010, turnover from green technologies, goods and services amounted to DKK 253 billion, of which the greater part came from manufacturing.

The statistics show that manufacturing sold green products for a total of DKK 143 billion in 2010, while the services and trade industries sold for DKK 45 billion and DKK 55 billion, respectively. Agriculture, forestry and fishing sold for around DKK 9 billion. Note that, in this context, part of the turnover in trade is actually linked to manufacturing, because some enterprises in manufacturing may have sold their products through their own trading companies.

Overall, from 2005 up to 2010, turnover from sales of green products increased annually by 2.1%, measured in constant prices. In 2009 and 2010, however, turnover dropped due to the economic crisis. This decline in turnover was slightly greater

er than for the Danish economy as a whole, due mainly to a decline in manufacturing, see figure 1.

The increase in turnover since 2005 reflects partly a general growth in the economy and partly a slight increase in the share of turnover from green production relative to total turnover. This means that even though green production in Denmark has seen a decline during the economic crisis, the effect of the crisis has not been great enough to prevent overall progress in the period 2005 to 2010.

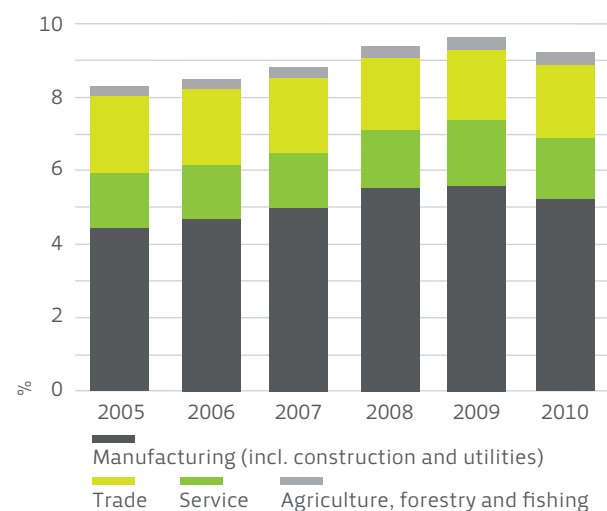
In 2010, Danish green production accounted for 9.2% of total turnover, while in 2005 it accounted for 8.3%. Manufacturing, in particular has been contributing an increasing share of the total green turnover. In 2005, manufacturing accounted for around 4% of total turnover, while in 2010 it accounted for around 5%. This is an indication that manufacturing's green production has fared better than the other industries during the period as a whole, see figure 2.

Figure 1. Sales of green technologies, goods and services, in 2010 prices



Source: DAMVAD 2012 on the basis of general enterprise statistics and accounts statistics (Statistics Denmark)

Figure 2. Green products' share of total turnover



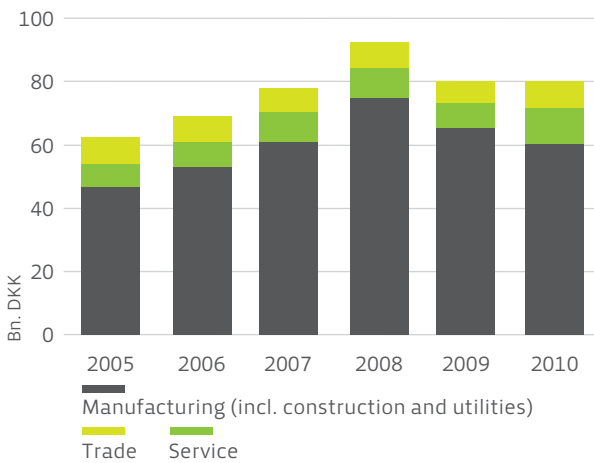
Source: DAMVAD 2012 on the basis of general enterprise statistics and accounts statistics (Statistics Denmark)

1.2. Danish exports of green products

In 2010, exports of green technologies, goods and services amounted to DKK 80 billion. The greater part of this amount came from manufacturing, which had exports of DKK 60 billion in 2010, see figure 3.

From 2005 to 2010, green exports by manufacturing increased by 5.1% annually, measured in constant prices. Total green exports by manufacturing increased by DKK 28 billion annually from 2005 to 2008, corresponding to an annual increase of 16.8%, and subsequently fell by DKK 15 billion up to 2010.

Figure 3. Exports of green technologies, goods and services, in 2010 prices



Source: DAMVAD 2012 on the basis of general enterprise statistics and accounts statistics (Statistics Denmark)

From 2005 to 2010, exports of green products by the service industry increased by DKK 4 billion, measured in constant prices. In 2010, exports of green products from the service industry accounted for around DKK 11 billion.

Exports from green trade have been relatively stable at around DKK 7 billion throughout the period.

The percentage of total Danish exports stemming from green technologies, goods and services increased from 9.0% in 2005 to 10.4% in 2010, see figure 4.

Manufacturing's green exports have increased their share of total Danish exports most significantly.

In 2005, manufacturing's share accounted for just under 7% of total exports, while by 2010 this share had increased to just under 10%. Manufacturing's share of total exports, however, fell by almost 2 percentage points in 2010, ending at 8%.

The service industry's share of green exports increased from 1% in 2005 to 1.5% in 2010, while the trade industry had a share of green exports at around 1% throughout the period.

Figure 4. Green products' share of total exports

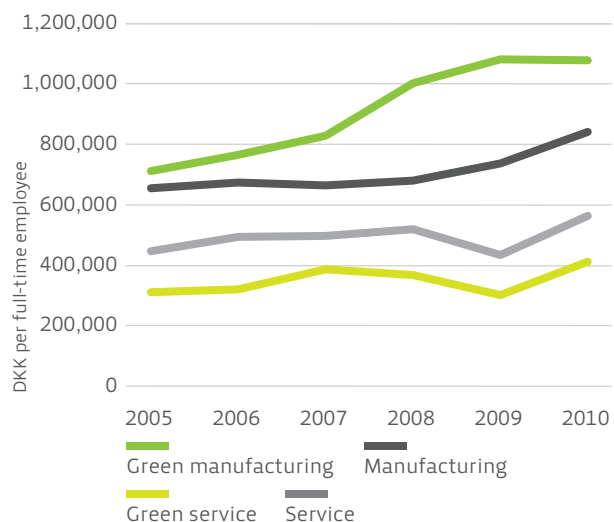


Source: DAMVAD 2012 on the basis of general enterprise statistics and accounts statistics (Statistics Denmark)

Throughout the period, enterprises with green production have been more export-intensive than other enterprises. In 2010, these green enterprises exported for around DKK 770,000 per full-time employee, while the average enterprise exported for DKK 660,000 per full-time employee. This should be seen against the fact that enterprises with green production are on average larger than other enterprises, and that large enterprises in general are more export-intensive than small enterprises.

The manufacturing industry is responsible for raising Denmark's green export intensity. The export intensity of green production in this industry increased considerably during the period analysed, from around DKK 700,000 per full-time employee in 2005, to almost DKK 1,100,000 per full-time employee in 2010, measured in constant 2010 prices, see figure 5.

Figure 5. Green export intensity in constant 2010 prices



Source: DAMVAD 2012 on the basis of general enterprise statistics and accounts statistics (Statistics Denmark)

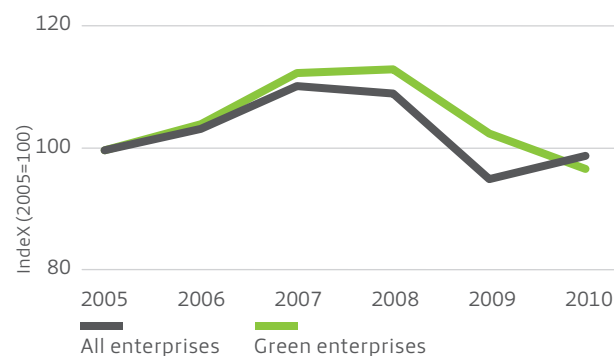
In 2010, green manufacturing was therefore about 30% more export-intensive than manufacturing as a whole. The picture is reversed for the green service industry, which, throughout the period, was less export-intensive than the service industry in general.

1.3 Added value from green production

Added value is a measure for how much the individual enterprise contributes to enhancing the value of goods and services through using labour and capital stock, e.g. machinery. Added value is calculated by deducting the expenditure on raw materials, auxiliaries and services purchased from other enterprises or abroad from the sales prices of the goods or services which the individual enterprise has sold.

Added value from green production went up by around 13% from 2005 to 2008, measured in constant prices. After peaking in 2008, added value fell by around 14% from 2008 to 2010, and today the figure is below the 2005 level. The trend is similar for the rest of the business community, which however experienced a smaller decrease than did green production, see figure 6.

Figure 6. Added value from green production, in 2010 prices



Source: DAMVAD 2012 on the basis of general enterprise statistics and accounts statistics (Statistics Denmark)

The contribution to added value by enterprises with green production increased steadily from 9% in 2005 to around 10% in 2009, after which it fell to just under 9% in 2010.

Looking at added value relative to the number of full-time employees, reveals a measurement of productivity. In 2005, the productivity in green production was more or less at a par with the average for all enterprises in manufacturing, trade and service, respectively.

From 2006 to 2009 the productivity in green production by service enterprises increased relative to other service enterprises, while green production in trade and manufacturing continued to be more or less at the same level as other production in trade and manufacturing.

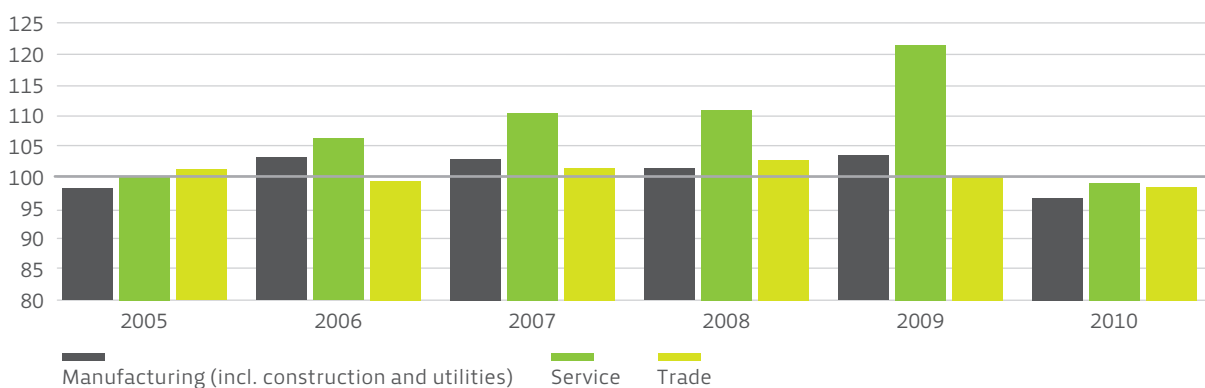
In 2010, the productivity in green production was below the average level for all enterprises in manufacturing, trade and service, see figure 7. The statistics do not therefore reveal any systematic differences between green and non-green production productivity.

In 2009, in particular, green service enterprises had very high productivity compared to non-green service enterprises. The high relative productivity of green service enterprises in 2009 can therefore be attributed to the fact that their productivity rose by around 4%, but also that the other service enterprises had a drop in productivity of 5%.

The large drop in the relative productivity of the green service enterprises in 2010 can be explained by the fact that their productivity fell by around 6%, but also that the service enterprises in the general population had an increase in productivity of 15%.

Furthermore, it should be noted that there are large differences in productivity across industries and across enterprise size, and these calculations have not taken this into account.

Figure 7. Added value per full-time employee from green production



Note: A value of 100 corresponds to the average productivity for the industry. Thus a value of 110 means that the enterprises are 10% more productive than the average for the industry.

Source: DAMVAD 2012 on the basis of general enterprise statistics and accounts statistics (Statistics Denmark)

2. Description of enterprises with green production



Green technologies, goods and services are produced across almost every industry in Denmark. Around 22,000 Danish enterprises produce and sell green products, which corresponds to one-in-five enterprises with at least one full-time employee⁶.

Thus, a very broad cross-section of Danish enterprises provides many different types of products of significance for Denmark's green transition.

The general picture, moreover, is that the majority of enterprises with green production produce both green and non-green products and are generally larger than the average Danish enterprise.

2.1 Green production by industry

The energy supply sector has the largest share of green turnover, i.e. 47%, relative to the sector's total turnover (2010), see figure 8. This is primarily because a major part of Denmark's energy supply has yet to be converted to renewables. Energy supply covers, for example, operating facilities that produce electricity, heating supply, etc. In other words, energy-technology enterprises are not covered in this sector; these enterprises are to be found across a number of other industries.

As much as 41% of the water supply and waste management sector's total turnover can be attributed to green production. Water supply and waste management's turnover is not 100% green. This is because water supply is not considered to be green in this report.

6. These statistics cover the industrial categories A and C-N

In machinery and in plastic, glass and concrete, the green turnover makes up between 35% and 40% of these industries' total turnover. The green turnover from the machinery industry derives e.g. from the manufacture of wind turbines and wind turbine components. Technologies for wastewater treatment are another example from this industry.

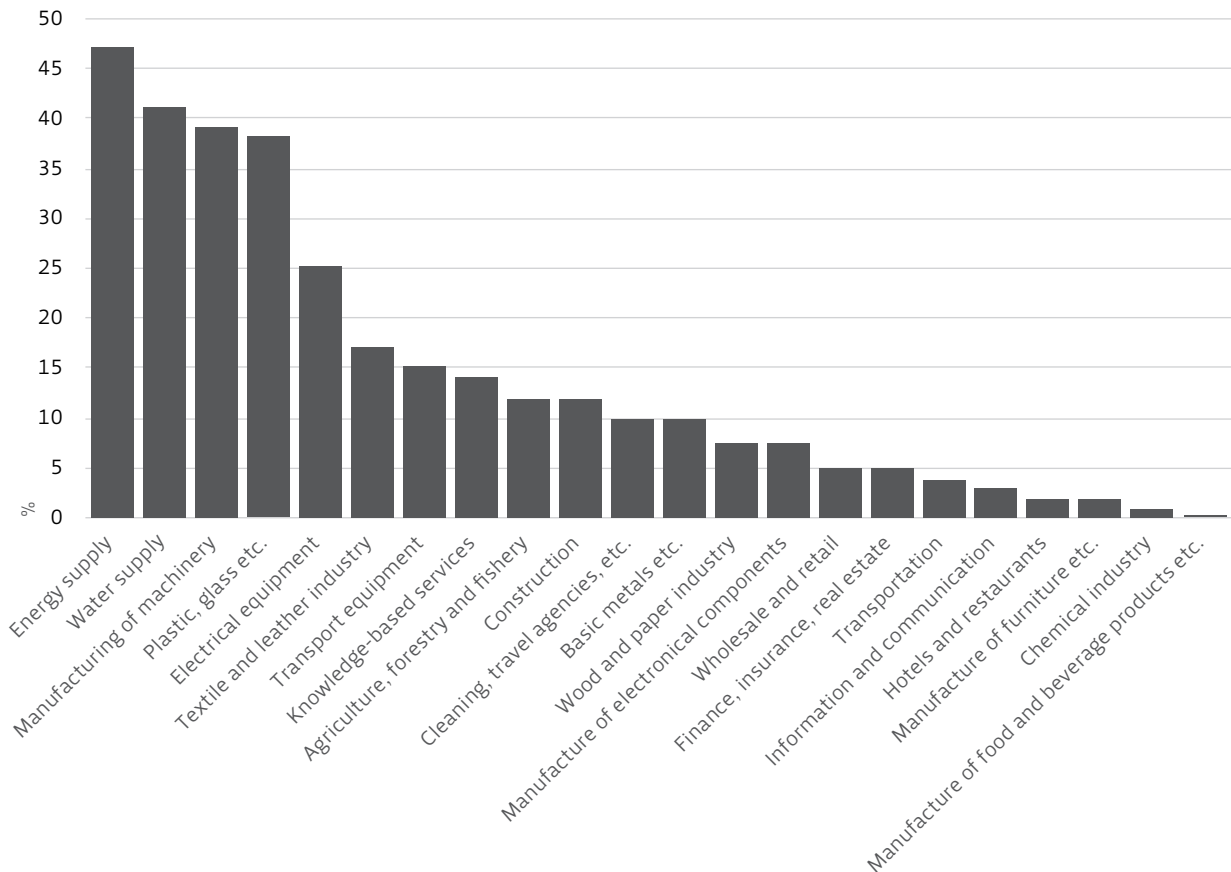
Machinery's green share is composed of around 500 enterprises with around 15,000 full-time employees. In the other industries, green turnover is less than 25% of total turnover, see figure 8.

An organic restaurant in the hotels and restaurants industry is an example of green products in industries in which green production accounts for a smaller proportion of the total turnover. Examples of green products in the knowledge-based

services industry are sustainable building and construction consulting, and technical consulting on wave power facilities, wind turbines, air pollution control and sludge treatment. An example in transportation is transport of recyclable waste, while examples in the real estate industry are renting of energy-efficient business properties and housing companies that rent out sustainable homes.

The statistics show that the food products, beverages and tobacco industry has only very little green production. The figures for green turnover from this industry may, however, be underestimated, since the statement may not have included the full scope of processing etc. of organic products. Organic products are included in the figures for organic farms and are therefore included in full

Figure 8. The green share of turnover by industry, 2010



Source: Calculations by DAMVAD on the basis of general enterprise statistics

in the column showing green turnover in agriculture, forestry and fishing, for which green turnover makes up 12% of total turnover, see figure 8.

A review of the sources behind these statistics shows that products from the 744 organic farms included in the data account for around 24% of the green part of agriculture, forestry and fishing.

2.2. Green products' share of total enterprise turnover

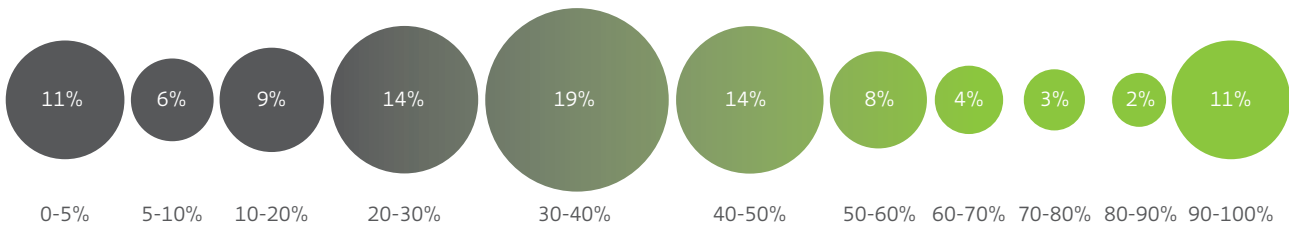
This statement of green production takes account of the fact that the individual enterprise does not necessarily produce only green products. Most of the enterprises that have green production sell both green and non-green products.

The figure shows that 11% of enterprises with green products get more than 90% of their turnover from green products, while 11% of enterprises get less than 5% of their turnover from green products. However, most enterprises with green production earn between 30% and 40% of their turnover from green products; this applies for 19% of enterprises. Almost 50% of the enterprises have a turnover from green production between 20% and 50% of total turnover, see figure 9.

In figure 9, the figures below the circles state how large a share of total turnover is green. The figures inside the circles state the proportion of enterprises that have the specific green share of total turnover.

On average 40% of turnover in enterprises with green production can be ascribed to green products. Thus, the typical green enterprise sells both green and non-green products.

Figure 9. Enterprises' green share, 2010



Source: DAMVAD 2012 on the basis of general enterprise statistics 2010

2.3 Green production by green business area

All green products (technologies, goods and services) are divided into green business areas. These business areas focus on different environmental and climate protection activities. Services and research and development activities are not stated as two separate categories. Instead these types of product are placed in the green business area to which they belong in terms of their specific contents.

Products for the utilisation of renewable energy sources contribute the greatest turnover. The turnover from products for the utilisation of renewable energy sources account for 41% of total green turnover, corresponding to DKK 104 billion (2010). This production includes, in particular, wind turbines, but also technologies used to exploit biomass for energy purposes and technologies in the production of photovoltaic solar modules.

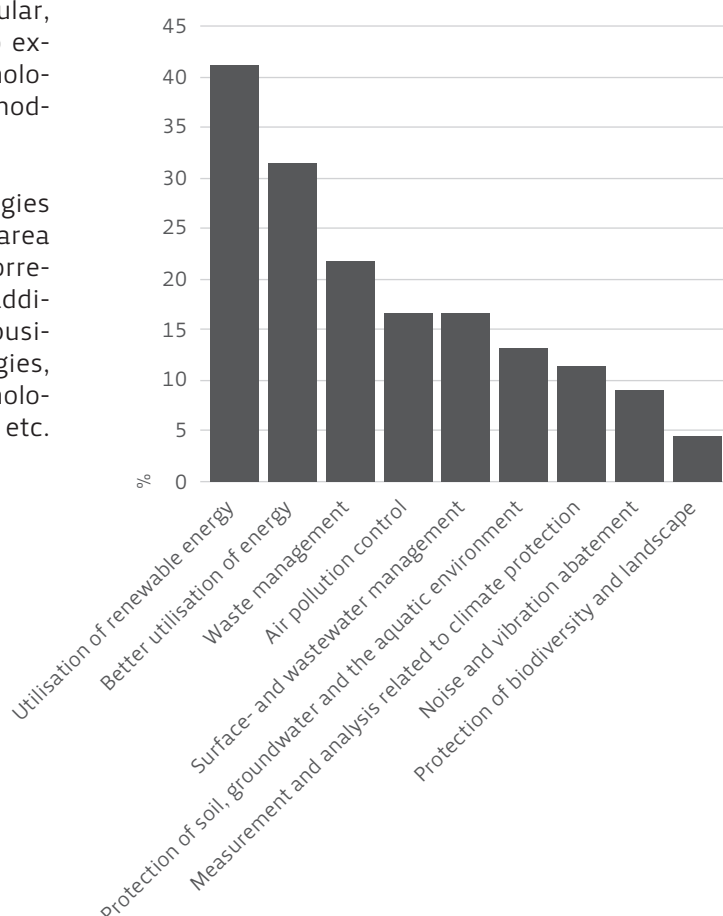
The second-largest business area is technologies for better utilisation of energy. This business area contributes a turnover of DKK 80 billion, corresponding to 32% of total green turnover. In addition to electricity-saving technologies, this business area also covers smart-grid technologies, insulating materials for buildings, CHP technologies, products for green transport solutions, etc. (see annex 6 for more).

The third-largest green business area is waste management, the turnover of which makes up almost 22% of total green turnover (2010). This corresponds to around DKK 55 billion.

Several green products may fall under several of the green business areas. Therefore, the different shares of total green turnover in figure 9 add up to more than 100%.

Fibre cloth is an example of a product that falls under more than one category as it is used, for example, to protect soil and ground water, manage surface- and wastewater, and to limit air pollution.

Figure 10. Green business area's estimated shares of total green turnover in %, 2010



Source: DAMVAD 2012 and general enterprise statistics.

Note: The business areas overlap somewhat, which means that the shares add up to more than 100% and that the categories therefore cannot be totalled. The shares for each business area cannot be used in other percentage calculations for other indicators. See annex 1.



2.4 Adapted green products

Green production not only concerns products which have protection of the environment and climate as their primary purpose. Green production also covers goods, technologies and services which offer a *green alternative* to products which do not have environmental and climate protection as their primary purpose, but which have been adapted to this end, such as an energy-saving light bulb. Its principal purpose is to provide light, however it is also a green alternative to incandescent bulbs, because it consumes less energy than these.

The growth potentials from green transition therefore also include these *green alternatives*, which Eurostat terms *adapted goods*⁷.

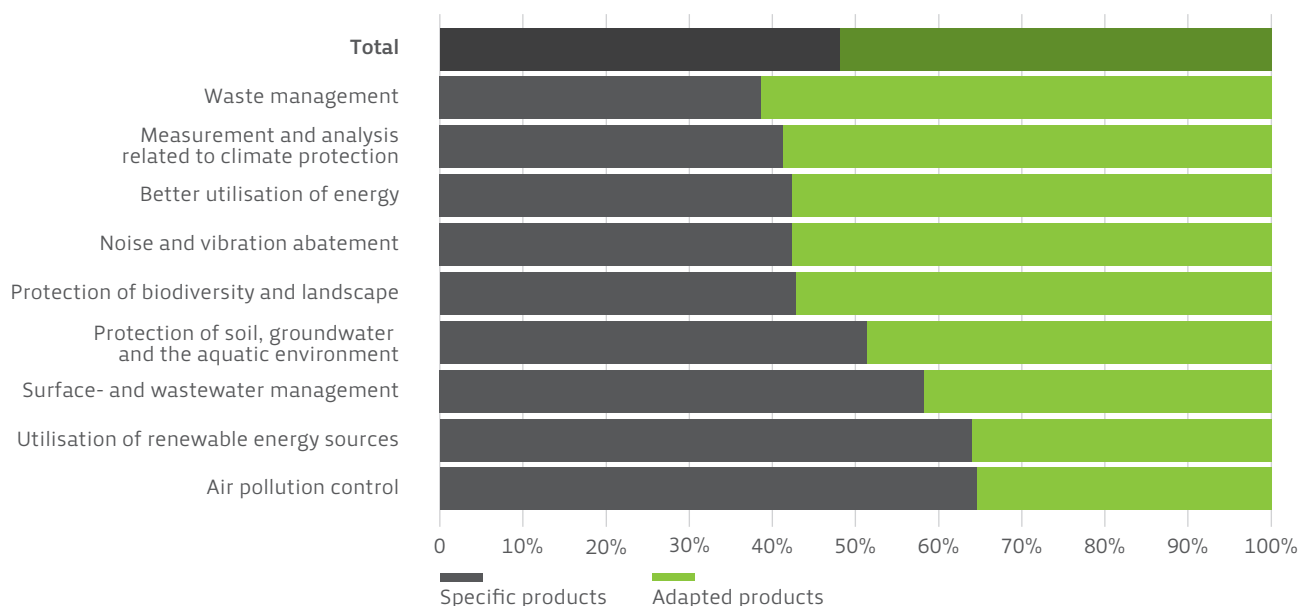
Green products are therefore either environmental/energy-specific or adapted. The primary purpose of the specific products is to manage resources or to protect the environment and/or

climate, for example water treatment solutions and particle filters. The adapted products result in less pollution or less resource consumption than similar products with the same uses.

A closer look at these adapted products will help to identify the existence of these products in industries which are traditionally not considered to be green. The aim is to arrive at a total picture of the technologies, goods and services required for green transition.

Figure 10 shows the distribution between environmental and energy-specific products and adapted products in the nine green business areas in Denmark. The figure shows that for all of the green business areas in total, there are more adapted products than specific products. In five out of nine green business areas, more than half of Danish green products are not produced specifically for a green purpose but have been adapted relative to similar products so that they e.g. use less energy or generate less waste.

Figure 11. Distribution of environmental/energy-specific and adapted green products, 2012



Note: This figure shows estimates, since the distribution was based solely on the questionnaire survey. See the methodology in annex 1 (www.ens.dk).

Source: DAMVAD 2012

7. See Eurostat's 'The environmental goods and services sector' (2009)

The products in air pollution control, utilisation of renewable energy sources, and surface- and wastewater management in particular are primarily developed and produced for a specific green purpose.

Waste management is the business area that produces most adapted products. In this business area, adapted products account for more than 60% of the total production. The following business areas: measurement and analysis related to climate protection, better utilisation of energy, noise and vibration abatement, and protection of biodiversity and landscape, follow with shares of adapted products of just below 60%.

In protection of soil, groundwater and the aquatic environment there is an equal distribution between specific and adapted products.

Example 6

Energy-efficient production technologies

There is a huge potential to be harvested from developing more energy-efficient production technologies. One Danish enterprise has developed a new energy-efficient technology for automated separation processes which separate substances and liquids e.g. in the manufacture of food products and pharmaceuticals.

Another Danish enterprise has developed a new metalworking technology which more than halves the energy consumption from the manufacture of thin metal sheets.

Example 7

Energy-efficient ventilation

Ventilation in buildings uses huge amounts of energy. In step with increasingly better insulated buildings, ventilation will become an ever more important for a healthy indoor climate. Several Danish enterprises have consequently developed energy-efficient ventilation systems that ensure minimal use of energy.

For example, a small Danish enterprise has developed a ventilation system that, with its especially high heat recovery rate, cuts energy consumption by half compared with current standards on the market.

2.5 Number of enterprises with green production by size of enterprise

An estimated around 22,000 enterprises in Denmark produce and sell one or several green products (i.e. technologies, goods and services). This means that around one in five Danish enterprises with at least one full-time employee have green production.

Danish enterprises with green production are generally larger than the average for all of the enterprises. In 2010, 84% of all enterprises had between 1 and 9 employees, while this was the case for only 75% of the enterprises with green produc-

tion. Around one in five enterprises with green products had between 10 and 49 employees, and 6% had more than 50 employees. Of all of the enterprises, 13% had between 10 and 50 employees, while less than 3% had more than 50 employees, see table 1.

The table also shows that enterprises with green production account for close to 50% of all enterprises with at least 250 employees.

A statement of the trend in the number of small enterprises with green production shows that this number went up by 17% during the period 2005 to 2010, see annex 2.

Table 1. Distribution of enterprises by number of full-time employees, 2010

Enterprise size	Number		Percentage	
	All enterprises	Enterprises with green production	All enterprises	Enterprises with green production
1-9 employees	96.400	16.700	84	75
10-49 employees	14.800	4.200	13	19
50-249 employees	2.500	1.000	2	5
≥ 250 employees	530	250	1	1
Total	114.230	22.150	100	100

Note: The number of observed green enterprises in the data material is 5,580. Using a multiple imputation model, the total number of green enterprises was calculated at 22,150. For a description of the methodology, see annex 1. Figures in the column 'number of enterprises' have been rounded.

Source: DAMVAD 2012 on the basis of general enterprise statistics (Statistics Denmark)

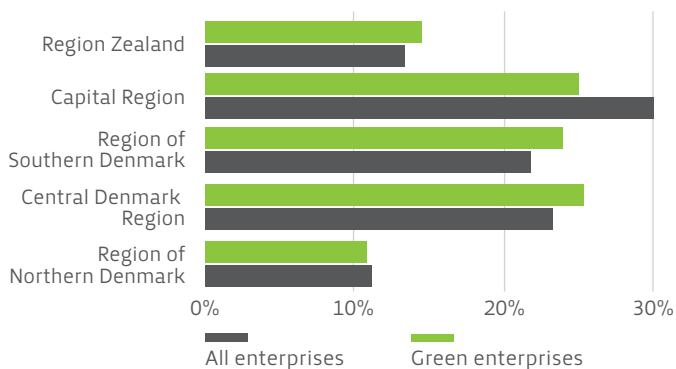
2.6 Enterprises with green production by region

Enterprises with green production are represented throughout Denmark, however they distribute differently than total Danish enterprises. There is a slight under-representation of enterprises with green production in the Capital Region of Denmark where 30% of all Danish enterprises are head-quartered⁸ but there are only 25% of enterprises with green products, see figure 12.

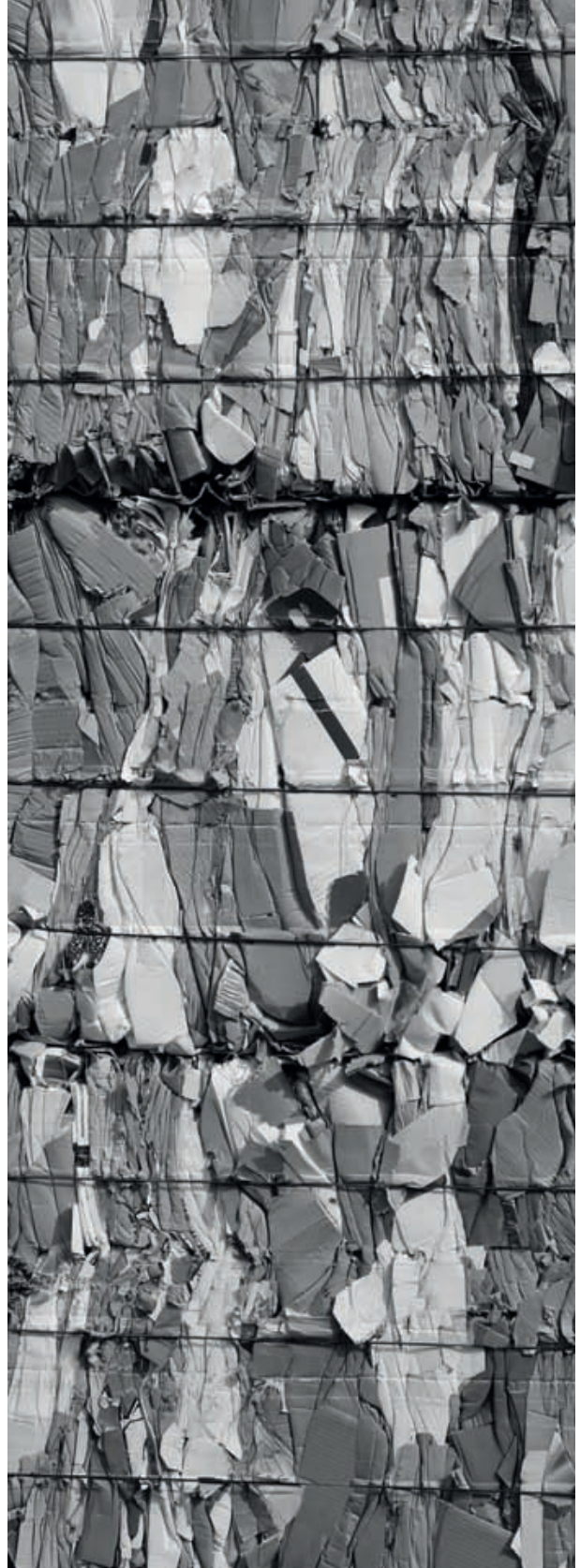
Region Zealand, Central Denmark Region and Region of Southern Denmark have a slight over-representation of enterprises with green production. This is the case, in particular, for Central Denmark Region and Region of Southern Denmark where about 25% of enterprises with green production were head-quartered in 2010.

An overview of the Regional distribution of enterprises with green production by industry is presented in annex 2.

Figur 12. Regional fordeling af virksomheder i 2010.



Source: DAMVAD 2012 on the basis of general enterprise statistics



8. The Regional distribution of enterprises is based on where the individual enterprise has its headquarters.

2.7 Employment in green production

Around 106,000 employees were involved in green production in 2010. This corresponds to almost 9% of all full-time employees in all enterprises with at least one full-time employee. The majority of these employees worked in manufacturing.

In 2010, 15% of all employees in manufacturing worked with green production. This was the case for 12% of employees in the agriculture industry and 6% of employees in the service industry.

Table 2. Employment by industries, 2010

Industry	Employment No. persons		Percentage of employees involved in green production
	Total	In green production	%
Agriculture	29,300	3,500	12
Manufacturing, incl. construction and utilities	398,200	55,900	15
Service	826,900	46,600	6
Total	1,254,400	106,000	9

Note: For enterprises with green production the figures have been rounded due to uncertainty (see annex 1). In addition to traditional industries (C), manufacturing also includes the energy supply, water supply and construction industries.

Source: DAMVAD 2012 on the basis of general enterprise statistics

In the period 2005 to 2010, the number of employees in enterprises with green production dropped by around 6%, see annex 2. However, the drop was smaller than for all enterprises.

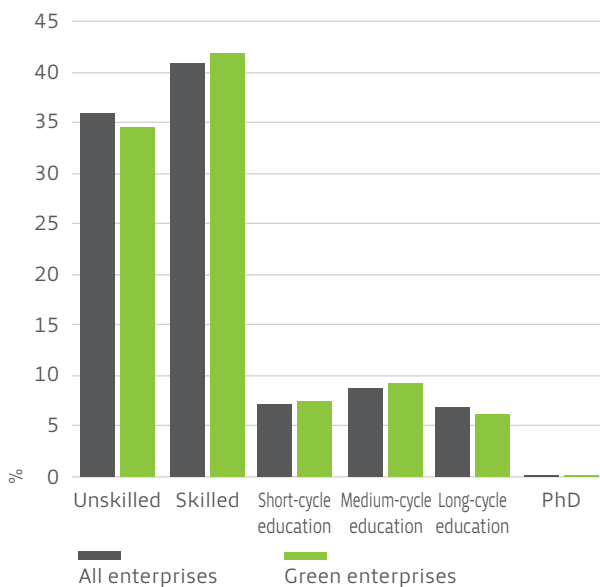
2.8 Education and pay in enterprises with green production

Enterprises with green production employ a slightly larger proportion of skilled labour and a slightly smaller proportion of unskilled labour than all enterprises as a whole⁹.

Across all enterprises, 36% of employees were unskilled, while the proportion of unskilled employees in enterprises with green production was 35% in 2010. The proportion of skilled employees in enterprises in total is 41%, while this figure is 42% for enterprises with green production.

Enterprises with green production do not differ noticeably from other enterprises in terms their employment of employees with short-, medium- or long-cycle higher education or a PhD, see figure 13.

Figure 13. Employment by level of education in %, in 2010



Source: DAMVAD 2012 on the basis of education statistics (UDDA; Statistics Denmark)

For enterprises in total and for enterprises with green production, the number of employees with long-cycle higher education or a PhD increased in the period 2005 to 2010, while the number of other employees dropped. See data in annex 2.

The number of employees with long-cycle higher education in all Danish enterprises increased by around 13% during the period. In enterprises with green production, the increase was at around 17%.

The number of employees with a PhD increased by just under 25% for all enterprises, while in enterprises with green production the increase was around 19%.

The proportion of unskilled employees in enterprises with green production fell from around 39% in 2005 to around 35% in 2010. For Danish enterprises in total the proportion of unskilled employees fell from 40% in 2005 to 36% in 2010.

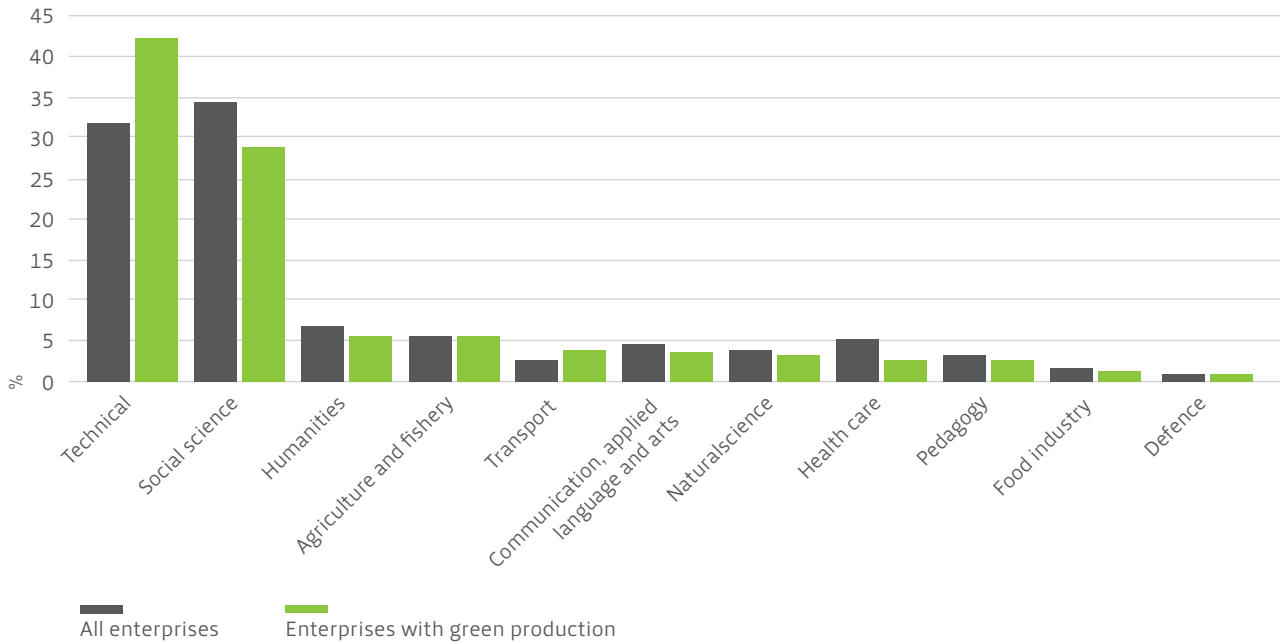
Figure 14 shows how employees in all Danish enterprises and in enterprises with green production, respectively, distribute among fields of education within short-, medium- and long-cycle education and PhDs (2010).

The figure shows that green production is more technical than other production, in Danish enterprises in total, 34% of the employees with a higher education have social science backgrounds, whereas this is only the case for 29% of the employees with a higher education in enterprises with green production.

On the other hand, more than 42% of the employees with a higher education in enterprises with green production have technical backgrounds, whereas this is the case for only 32% of employees in total.

9. This section is based on the total activities in enterprises with green production, because the green proportion of employees with the different levels of education has not been estimated.

Figure 14. Employment by field of education in %, in 2010



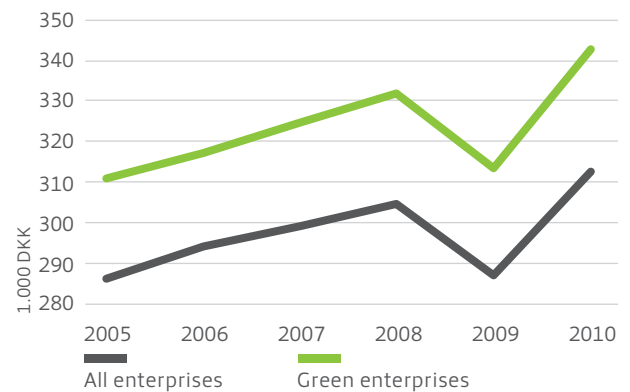
Source: DAMVAD 2012 on the basis of Statistics Denmark's education statistics (UDDA)

The skilled employees in enterprises with green production are trained primarily in commercial and clerical trades (around 37%) or within the iron and metals industries (around 27%). The same applies for Danish enterprises in total: here the figures are around 40% and 22%, respectively (2010). For a further breakdown of employees by levels and types of education see annex 2.

Figure 15 shows the average trend in earned income for the period 2005 to 2010 for both Danish enterprises in total and for enterprises with green production.

Throughout the period, the level of salary has on average been higher for employees in enterprises with green production, from around 8% above average in 2005 to more than 9% above average in 2010.

Figure 15. Trend in nominal pay



Source: DAMVAD 2010 on the basis of income statistics (the Central Customs and Tax Administration (SKAT) and Statistics Denmark)

Note: The average earned income was calculated as follows: First, the average earned income was calculated across employees within each enterprise. Then, the average was calculated across enterprises. In the table above, the green enterprises are stated as green irrespective of the size of their green production.

2.9 Foreign-owned enterprises

The share of foreign-owned enterprises is higher among enterprises with green production than among enterprises in total. However, the share of employees in the foreign-owned enterprises is lower, see table 3.

This can be attributed to the fact that foreign-owned enterprises with green production on average are smaller than the other foreign-owned enterprises.

The share of employees in foreign-owned enterprises increased in the period 2005 to 2009; for enterprises in total as well as for enterprises with green production.

Table 3. Foreign-owned enterprises 2005-2009

	All enterprises		Enterprises with green production	
	2005	2009	2005	2009
Enterprises	Number			
Total	108.300	114.600	20.300	22.100
Foreign-owned	2.850	2.950	900	950
Percentage of foreign-owned	2,6	2,6	4,4	4,2
Employees				
Total	1.331.600	1.308.500	112.200	110.400
Foreign-owned	243.800	274.600	18.700	21.800
Percentage of foreign-owned	18,3	21,0	16,7	19,7

Source: DAMVAD 2012 on the basis of statistics on foreign-owned enterprises (IFATS)

Note: For green enterprises, full-time employees have been weighted by the enterprises' green shares.



3. Research, development and innovation in enterprises with green production

Research, development and innovation are vital if Danish enterprises are to be leaders within their field. Innovation by enterprises is the ability to convert research, knowledge and ideas into new products and processes that have commercial value. The business community's ability to innovate is therefore a crucial competition factor and a prerequisite for growth and prosperity.

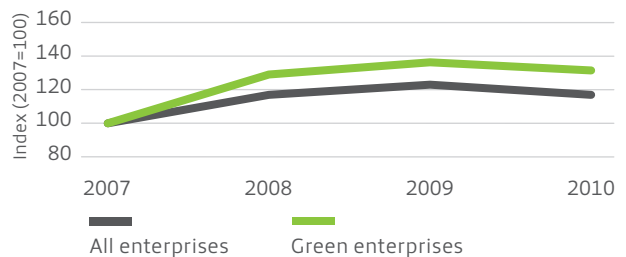
Danish enterprises are investing substantially in research, development and innovation, and these investments increased over the period 2007 to 2010. Danish enterprises are moreover collaborating with, for example, universities and other knowledge institutions, and enterprises with green production generally have more interaction with other enterprises and institutions than enterprises with no green production.

Changes in the calculation method in 2006 for research and innovation mean that figures in this chapter cover the period 2007 to 2010¹⁰.

3.1. Investment and employment in research and development

Investment by enterprises themselves in research and development increased in the period 2007 to 2010 for both enterprises in general and for enterprises with green production. This increase was slightly greater for enterprises with green production than for enterprises overall, although both categories experienced drops from 2009 to 2010, see figure 16.

Figure 16. Investments by enterprises in research and development (index 100 = 2007)



Source: DAMVAD 2012 on the basis of statistics on research and development (FUI) and general enterprise statistics (Statistics Denmark)

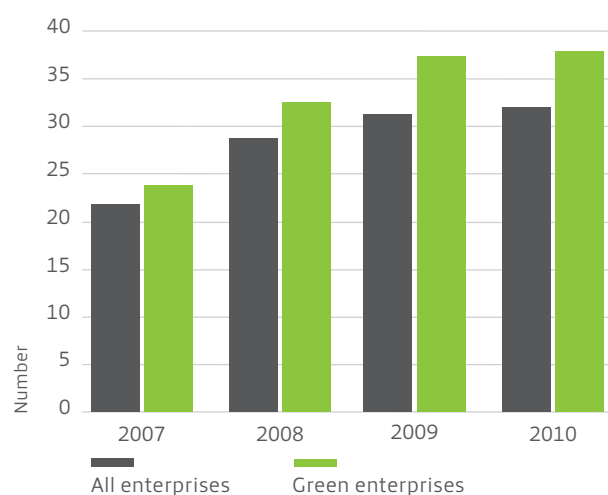
10. This chapter is based on the total activities in enterprises with green production, because it was not possible to estimate the green share for research and development etc. in each enterprise.



The number of research and development (RD) employees per 1,000 employees went up in the period 2007 to 2010. In 2010, enterprises with green production on average had 38 employees in RD, for every 1,000 employees. This corresponds more or less to 6 employees more than in enterprises in general, see figure 17.

Also seen over the entire period, enterprises with green production had more RD employees than enterprises in general.

Figure 17. Number of employees in research and development per 1,000 employees



Source: DAMVAD 2012 on the basis of statistics on research and development (FUI) and general enterprise statistics (Statistics Denmark)

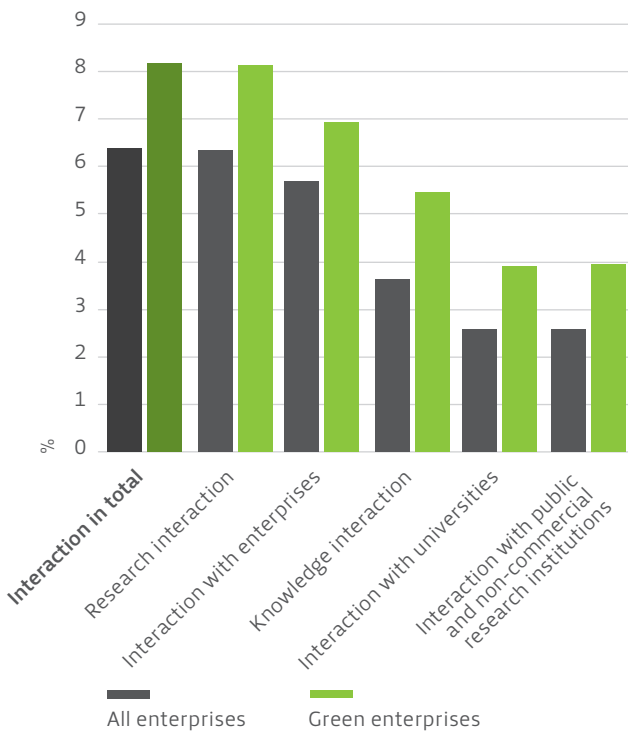
Expenditure on research, development and innovation per RD employee is more or less at the same for enterprises with green production and enterprises in general.

3.2 Interaction with research, development and innovation

Enterprises can interact with other enterprises, universities and public and non-commercial research institutions about research and development, or about knowledge sharing in general.

Enterprises with green production interact more with others than enterprises in general, see figure 18.

Figure 18. Share of enterprises interacting regarding research, development and innovation, 2009



Source: DAMVAD 2012 on the basis of statistics on research and development (FU); Statistics Denmark

Example 8

Components for solar plants

In interaction with relevant research communities in Denmark, one large Danish enterprise has developed new inverters for photovoltaic solar plants. Their efforts have evolved into a billion-dollar business with several hundred workplaces and growing exports.

The new generation of inverters have higher effect and are more user-friendly. They can also serve efficiently in electricity systems that are less stable than the average northern European electricity system. This means that marketing and exports can be expanded to include sunnier markets in southern Europe. Similarly, Denmark's stronghold position in this market in the BRIC countries Brazil, Russia, India and China can be exploited to an ever greater extent.

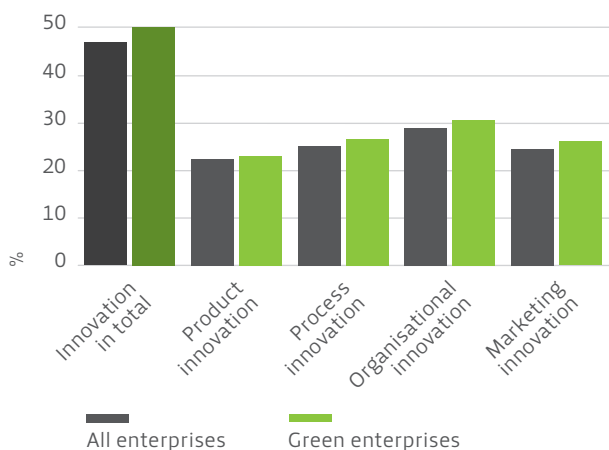
3.3. Innovation

Innovation is the introduction of new, or substantially improved, products, production processes, organisational methods or marketing approaches.

Enterprises with green production are more innovative than other enterprises. As much as 50% of green enterprises were innovative in the period 2008 to 2010, while this figure was 47% for all enterprises.

The difference can be explained by the fact that a greater proportion of green enterprises than other enterprises introduced new, or substantially improved, production processes, organisational methods and marketing approaches in the period. However, in terms of product innovation, enterprises with green production are not more innovative than other enterprises, see figure 19.

Figure 19. Innovative enterprises by type of innovation in %, in 2010



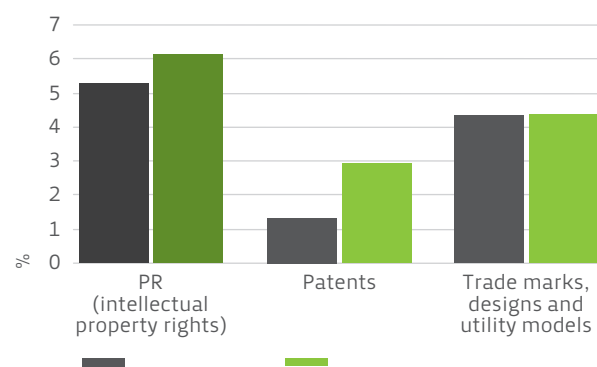
Source: DAMVAD 2012 on the basis of statistics on research and development (FU; Statistics Denmark)

3.4 Trade in intellectual property rights, patents and trade marks

Overall, in 2010 enterprises with green production traded more in intellectual property rights than enterprises in general.

The share of enterprises with green production which trade in patents is 50% higher than the share of enterprises in total. For trade in trade marks, designs and utility models, enterprises with green production are more or less at par with the other enterprises, see figure 20.

Figure 20. Share of enterprises which have traded in IPR etc., 2010



Source: DAMVAD 2012 on the basis of statistics on trade in IPR (Statistics Denmark)

Note: Data on intellectual property rights (IPR) only cover enterprises with at least 10 employees.

The difference between green and non-green enterprises grew from 2008 until 2010. The share of enterprises with green production which traded in patents increased by 0.7 percentage points from 2008 to 2010, while enterprises' trade in patents in general increased by 0.1 percentage points.

The trade in trade marks decreased in the period 2008 to 2010 for enterprises with green production as well as for enterprises generally. This decrease was slightly stronger for enterprises with green production than for enterprises in general.



4. Danish green goods exports



Exports are of great significance in a small and open economy like the Danish economy. Furthermore, the environment and climate is high on the global political agenda and it is likely there will be an increasing demand for green goods and solutions. It is against this backdrop that it is relevant to look at the trend in Danish green goods exports.

The UK, Germany and the US make up the largest markets for Danish green exports. Since 2006, exports to the UK have been rising, while they have been falling to the US and Germany.

Overall, the EU buys two-thirds of Danish green exports, while emerging markets are still only relatively small export markets, despite a steeply increasing trade to these markets.

Around half of green exports are renewable-energy technologies, but waste for recycling and technologies for surface- and wastewater management also account for a substantial part of exports.

This chapter is about Danish exports of green goods, while chapter 5 contains an international benchmarking of Danish green exports.

4.1 Methods applied in the exports analyses

In these statistics, figures for green exports have been calculated in two different ways. In this chapter exports have been calculated on the basis of foreign trade in goods and Eurostat's COMEXT database. This database contains information about all goods exports by EU Member States, which allows for an international comparison of green exports¹¹.

The green goods were identified using the list of green product codes used as one of the data sources in chapters 1-3. For a more detailed description of the identification of green product codes, see section 1.3 in DAMVAD's methodology in annex 1 at www.ens.dk.

Note also that although the figures for product codes were stated at the most detailed level, one code may cover several different goods. This applies, for example, to "glass fibres, incl. glass wool, and articles thereof". This product code was identified as being green as it covers wind turbine blades. However, glass fibres are also used for other purposes that cannot be considered green.

The green share for each product code has not been calculated, and green exports should therefore be understood as exports of product categories that are assessed to be mostly green.

11. In contrast to this chapter, in chapter 1 the export figures are calculated on the basis of the individual enterprise's green share and on the general enterprise statistics from Statistics Denmark. The general enterprise statistics only contain information about Danish enterprises and therefore do not provide data for a consistent international comparison of Danish exports with other European countries. Furthermore, the exports figures in chapter 1 only cover exports from enterprises in the following industries: agriculture, as well as manufacturing and service (DB07 industrial categories A and C to N). The figures from the COMEXT database cannot be calculated at industry level.

4.2 Total green exports

Total green exports amounted to DKK 64 billion in 2011 and thus made up almost 11% of total goods exports. Since 2006, green exports have gone up by almost DKK 6 billion, corresponding to an increase of around 10%. Total exports, on the other hand, increased by 1.6%, see table 4.

Table 4. Danish exports of green goods and total Danish goods exports in 2011 prices, in DKK bn.

	2006	2007	2008	2009	2010	2011	Changes in % 2006-2011
Total	616,1	617,9	631,5	515,2	562,4	606,4	-1,6
Green	57,7	65,8	71,4	60,2	59,0	63,6	10,2
Percentage share	9,4	10,7	11,3	11,4	10,5	10,5	

Note: Constant prices are calculated using the price index for goods exports. The percentage share is the green share of total goods exports.

Source: DAMVAD (2012) on the basis of COMEXT (Eurostat)

4.3 Exports by green business area

Danish green exports include primarily renewable-energy technologies, in that more than half of Danish exports fall within this category. Next come waste management and surface- and wastewater management, both of which accounted for close to 20% of green exports in 2011, see figure 21.

Technologies for better utilisation of energy (including smart-grid technologies) and products for air pollution control accounted for 14% and 12%, respectively of Danish green exports.

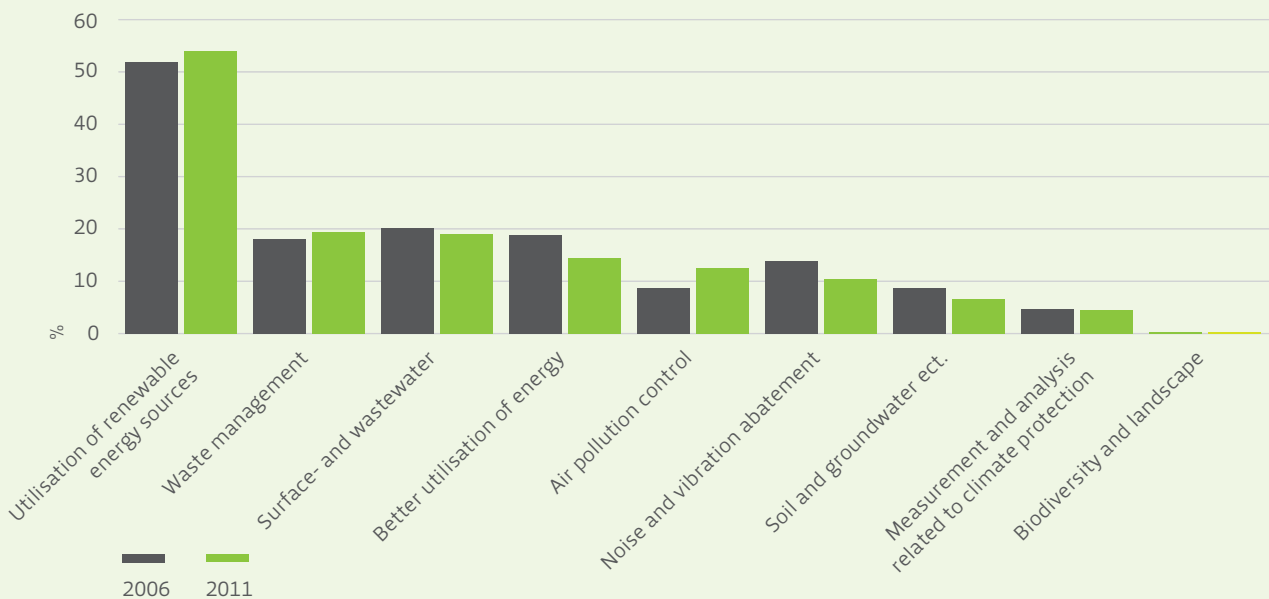
Products for air pollution control have shown the largest percentage progress in exports. In this

business area, exports increased by DKK 3.4 billion during the period 2006 to 2011, corresponding to 60% at constant prices. Then comes exports of renewable-energy technologies, which increased by around 17% at constant prices, corresponding to DKK 7.6 billion.

The largest decline in exports took place for goods for soil and groundwater protection and noise and vibration abatement. Here exports fell by 15% and 17%, respectively, at constant prices, from 2006 to 2011.

See annex 6 for a list of what is covered by the individual green business area.

Figure 21. Danish exports of green goods by green business area, 2006 and 2011



Note: The percentage figure indicates the individual green business area's relative contribution to Danish green exports. The percentages add up to more than 100 because each product code may fall under several business areas.

Source: DAMVAD 2012 on the basis of COMEXT (Eurostat)

4.4 Exports by goods

Although Danish green exports include 500 unique goods, the majority of the exports is concentrated on relatively few goods. Thus the 15 most exported goods accounted for around 56% of total green exports in 2011, see table 5.

The individual goods that contribute the largest share of green exports relate primarily to renewable-energy technologies. For example, exports of generating sets, wind-powered account for just under 17% of green exports. Furthermore, towers and lattice masts contribute almost 9%. Both of these are used in the production of wind turbines.

Inverters, which are used e.g. in photovoltaic solar plants, are also among the goods that account for a large proportion of green exports. Overall, inverters account for 5.9% of green exports.

Waste management is another important area in green exports. Denmark annually exports waste

for recycling and other recovery. Waste and scrap of iron and steel account for 4.4% of green exports. This is because the treatment technologies available are different from country to country. Therefore waste can be treated in an environmentally sustainable manner in different countries. More than half of exported waste in 2009 was in the category *green waste for recovery*¹².

The goods in the bottom part of the top-15 list include heat-exchanging units, which are used e.g. in renewable energy facilities (for example thermal solar heating systems), windows and French windows, regulating or controlling instruments and apparatus, and articles of non-malleable cast iron. The latter are used e.g. in systems for managing surface and wastewater. Each of these accounts for less than 2% of total Danish green exports.

See annex 4 for a list of the 40 most significant green products including their green use.

Table 5. Top-15 list of Danish green exports by product code, 2011

Product code	Description	Green exports DKK bn.	Share %
85023100	Generating sets, wind-powered	10,6	16,7
73082000	Towers and lattice masts, of iron or steel	5,5	8,7
84129080	Parts of non-electrical engine and motors, n.e.s.	3,1	4,9
72044990	Waste and scrap of iron or steel	2,8	4,4
85044088	Inverters having power handling capacity > 7,5 kVA	2,5	4,0
70199099	Glass fibres, incl. glass wool, and articles thereof	1,9	3,0
84137030	Glandless impeller pumps for heating systems and warm water supply	1,4	2,2
85030099	Parts suitable for electric motors and generators, electric generating sets and rotary converters, n.e.s.	1,4	2,2
85044084	Inverters having power handling capacity ≤ 7,5 kVA	1,2	1,9
84195000	Heat-exchange units	1,0	1,6
44181050	Windows and French windows and their frames, of coniferous wood	0,9	1,5
90328900	Regulating or controlling instruments and apparatus	0,9	1,4
73251099	Articles of non-malleable cast iron, n.e.s.	0,9	1,4
87059090	Special purpose motor vehicles	0,9	1,4
84834051	Gear boxes for machinery	0,8	1,3
Total		35,8	56,6

Note: The percentage figures indicate the individual product code's relative contribution to total Danish green exports.

Source: DAMVAD 2012 on the basis of COMEXT (Eurostat)

12. Danish EPA 2012, http://www.mst.dk/Virksomhed_og_myndighed/Affald/Import_og_Eksport_af_affald_Shipments_of_waste/FAQ_Import_og_Eksport_af_affald/



4.5 Exports to the EU, BRIC and NEXT11

The major part of exports of green products goes to the EU, which buys close to two-thirds of Denmark's green exports. In 2011, Danish enterprises sold green goods at a value of almost DKK 42 billion to other EU Member States. This constitutes an increase of DKK 7.7 billion since 2006. The share of green exports to the EU, was relatively stable throughout the period 2006 to 2011. This suggests that neighbouring markets are very important buyers of Danish exports of green products.

The BRIC¹³ and NEXT11¹⁴ countries are expected to have higher economic growth rates in future years than the developed countries¹⁵. It is therefore essential that Danish enterprises exploit the export potential present in these markets.

During the period 2006 to 2011, Danish green exports to NEXT11 more than doubled, and green exports to BRIC increased by as much as 93%. For comparison, total Danish goods exports in general to these markets increased by 63% and 82%, respectively.

The positive development in sales to the emerging markets means that Danish exports to these countries have gained ground in the total exports. The share of exports to NEXT11 went up from 2.2% of total green exports in 2006 to 4.0% in 2011. For BRIC, the share of exports increased by 2.3 percentage points ending at 6.5% in 2011, see table 6.

The share of green exports to other countries, which includes North America, fell by 3.6 percentage points in the period 2006 to 2011.

Table 6. Danish exports of green goods to the EU, BRIC, NEXT11 and other countries, in constant prices

	2006	2007	2008	2009	2010	2011
EU						
Exports, DKK bn.	34,0	38,1	45,2	39,3	37,0	41,7
Percentage share	66,0	63,7	67,4	68,8	64,4	65,6
BRIC						
Exports, DKK bn.	2,1	3,2	3,4	3,2	3,1	4,2
Percentage share	4,2	5,4	5,0	5,6	5,4	6,5
NEXT11						
Exports, DKK bn.	1,1	1,8	3,2	1,6	2,9	2,5
Percentage share	2,2	3,0	4,8	2,8	5,0	4,0
Other countries						
Exports, DKK bn.	14,2	16,6	15,3	13,1	14,4	15,2
Percentage share	27,6	27,9	22,8	22,9	25,1	24,0

Note: Current prices. The percentage figure indicates the share of Danish green exports sold to each region.

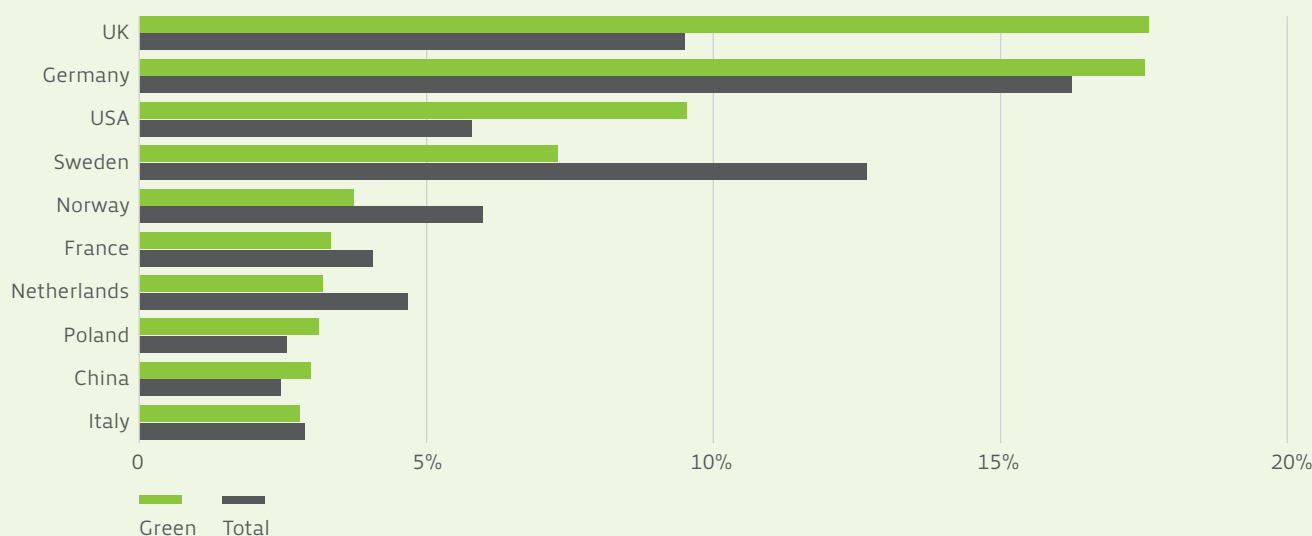
Source: DAMVAD 2012 on the basis of COMEXT (Eurostat)

13. BRIC stands for Brazil, Russia, India and China. The categorisation of countries follows Eurostat's definitions, and Hong Kong is therefore not a part of China.

14. NEXT11 includes Bangladesh, Egypt, Indonesia, Iran, Mexico, Nigeria, Pakistan, the Philippines, Turkey, South Korea and Vietnam.

15. World Economic Outlook IMF, 2012..

Figure 22. Denmark's 10 largest export markets for green products, in % of green exports, 2011



Source: DAMVAD 2012 on the basis of COMEXT (Eurostat)

4.6 The 10 most important export markets for green goods

The largest green export markets for Danish green products mainly include markets for which moderate growth is predicted in the years to come.

In 2011, the UK, Germany and the US were the largest green export markets. The expected annual growth¹⁶ in GDP in these countries is less than 3%

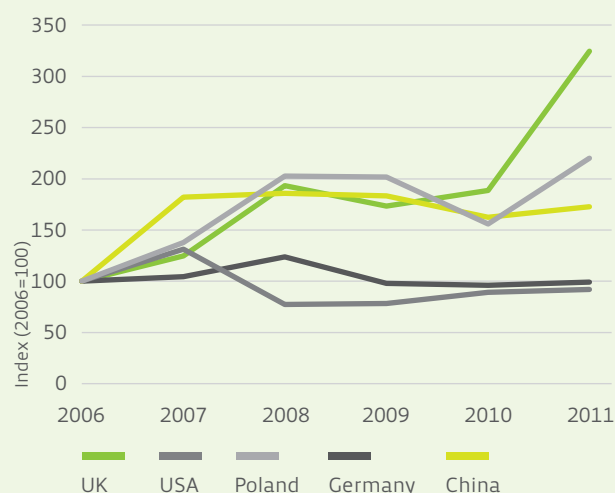
The UK, Germany and the US together bought 45% (DKK 28.4 billion) of Danish green exports in 2011, see figure 22.

The UK, Poland and China are the markets which showed the largest increase in green exports in the period 2006 to 2011, see figure 23.

Green exports to the UK increased by almost DKK 8 billion in the period, corresponding to 225%. In five years the UK has moved from being the fourth largest green export market for Denmark to being the largest green export market.

Green exports to China increased by 73% (DKK 0.8 billion) in the period 2006 to 2011, while Poland, with a growth of 120% (DKK 1.1 billion), has replaced Spain as the eighth-largest green export market.

Figure 23. Danish exports of green goods to selected markets 2006-2011



Source: DAMVAD 2012 on the basis of COMEXT (Eurostat)

Note: The index is based on current prices.

Germany was Denmark's largest export market up to 2010. However, exports of green goods to Germany have declined slightly and Germany is now only the second-largest export market.

A similar pattern is seen for the US market, where green exports dropped by 8% (DKK 0.5 billion) during the period.

5. International benchmarking



The global market for green goods and solutions is expected to grow in forthcoming years. Danish enterprises must realise the potential which this growth offers. This chapter therefore takes a closer look at Danish green exports compared to the green exports of the other EU15 Member States.

The benchmarking analysis in this chapter shows that, compared with the other EU15 Member States, Denmark's export specialisation in 2011 was in 7 of the 9 green business areas, and that this specialisation was especially pronounced in the areas of renewable-energy technologies, measurement and analysis related to climate protection and noise and vibration abatement.

Denmark's export specialisation in green products increased during the period 2006 to 2011¹⁷. Despite this, Denmark's export share has been following a downward trend. In 2011, exports of green goods made up 3.5% of total green exports by the EU15. This constitutes a drop of 0.2 percentage points relative to 2006. Denmark has lost market shares in renewable-energy technologies and noise and vibration abatement, in particular. If Denmark had retained its export share, Danish green exports would have been DKK 3.6 billion higher.

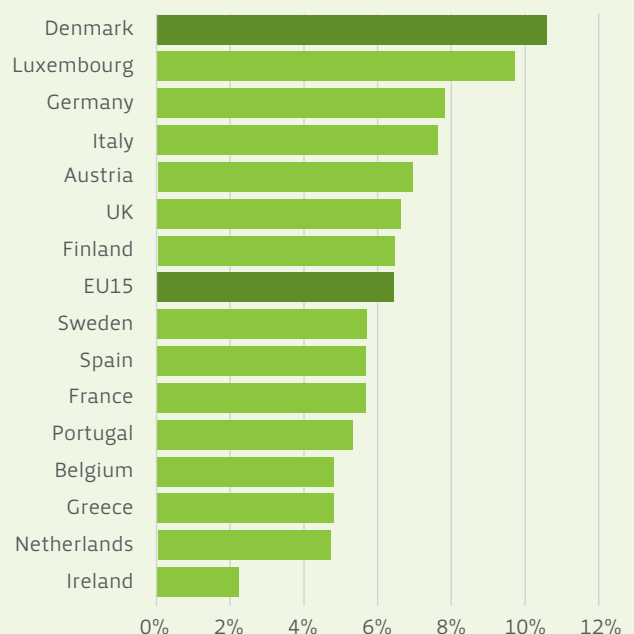
Finally, the international benchmarking of Danish green exports reveals that Denmark is less prominent on the emerging BRIC and NEXT11 markets than the other European countries.

5.1 The green share of goods exports

Green goods account for a large share of Danish exports compared with the other EU15 Member States.

Danish green exports account for more than 11% of total goods exports, which is the highest percentage share for all the EU15 Member States. For the EU15 as a whole, the green share made up 6.4% of total exports in 2011. Denmark thus lies considerably above average, see figure 24.

Figure 24. The green share of total goods exports by the EU15, 2011



Source: DAMVAD 2012 on the basis of COMEXT (Eurostat)

17. Graden af eksportspecialisering defineres som forholdet mellem den danske eksportandel og andelen for EU15 under ét. Definitionen følger publikationen 'Vækst, klima og konkurrenceevne', Økonomi- og Erhvervsministeriet, 2008

5.2 The development of the green share of exports

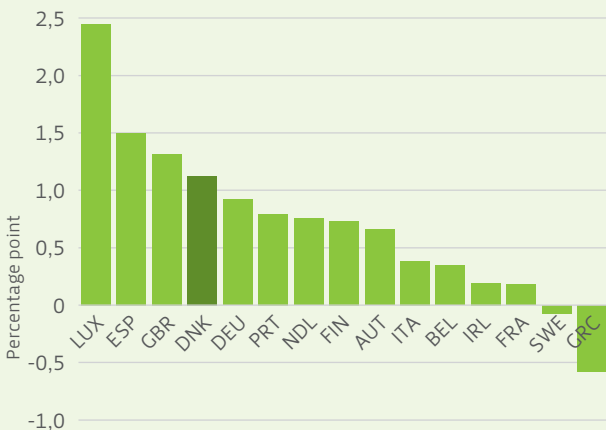
Green goods accounted for a greater share of EU15 exports in 2011 than in 2006. Thus, 13 of the 15 Member States saw an increase in the share of green exports.

For Denmark, the green exports' share of total goods exports increased by about 1 percentage point from 2006 to 2011. This gives Denmark a fourth place among increased green export shares, see figure 25.

In general, the countries with a high green export share today have also experienced increases in their green exports since 2006, relative to their total national goods exports.

This suggests that the countries with the largest green export shares in 2011 have specialised in green areas to a greater extent than the rest of the EU15.

Figure 25. The growth in green shares of goods exports by the EU15, 2006-2011, percentage points



Source: DAMVAD 2012 on the basis of COMEXT (Eurostat)

Note: The figures are calculated in current prices.



5.3 Green export specialisation

The degree of export specialisation is defined as the relationship between the Danish exports' share and the export share for the EU15 as a whole¹⁸. A relationship greater than one equals export specialisation.

In 2011, Denmark had export specialisation in 7 of the 9 green business areas, compared with the other EU15 Member States.

Denmark had the highest degree of export specialisation among the EU15 Member States in renewable-energy technologies, in that as much as 5.7% of total Danish exports fell under this business area. In the EU15 as a whole, renewable-energy technologies account for 2.2% of total exports, see table 7.

It appears that Denmark has a high degree of export specialisation in noise and vibration abatement and in measurement and analysis related to climate protection. Denmark places second and

third, respectively, with regard to specialisation in these in the EU15.

Although figure 21 indicated that Danish exports of goods related to waste management accounted for just under 20% of Danish green exports in 2011, compared with the other EU15 Member States, Denmark actually has only a small degree of specialisation in this business area.

The period 2006 to 2011 saw a greater degree of Danish export specialisation in air pollution and measurement and analysis related to climate protection.

The greatest percentage decrease in Danish export specialisation is seen for e.g. renewable energy and noise and vibration abatement; areas in which Denmark, however, still holds first and third places, respectively.

For a total overview of the export specialisation for all the EU15 Member States, see annex 5 at www.ens.dk.

Table 7. Danish export specialisation of green goods by green business area, 2006 and 2011

Green business area	Share of total exports, %				Export specialisation	
	2006		2011		2006	2011
	DK	EU15	DK	EU15	DK	
Renewable-energy technologies	4,9	1,7	5,7	2,2	2,9	2,6
Measurement and analysis related to climate protection	0,4	0,3	0,5	0,3	1,4	1,5
Noise and vibration abatement	1,3	0,7	1,1	0,8	1,8	1,4
Wastewater management	1,9	1,5	2,0	1,6	1,3	1,3
Air pollution	0,8	1	1,3	1,1	0,8	1,2
Protection of soil, groundwater and the aquatic environment	0,8	0,8	0,7	0,6	1,3	1,2
Waste management	1,7	1,8	2,0	1,9	1,1	1,0
Better utilisation of energy (incl. smart grid, etc.)	1,8	1,5	1,5	1,5	1,1	1,0
Protection of biodiversity and landscape	0,01	0,03	0,02	0,04	0,5	0,5

Source: DAMVAD 2012 on the basis of COMEXT (Eurostat)

Note: The percentage figure indicates the share of total exports from Denmark and the EU15, respectively, within each green business area. The percentages add up to more than the total green exports, because each product code may belong to several business areas. Export specialisation shows the proportion of goods exports which can be attributed to the individual green business area in Denmark relative to the EU15 average.

18. This definition follows the publication "Vækst, klima og konkurrenceevne" (growth, climate and competitiveness) from the Ministry of Economic and Business Affairs (now the Ministry of Business and Growth Denmark), 2008.

5.4 Developments in green export shares

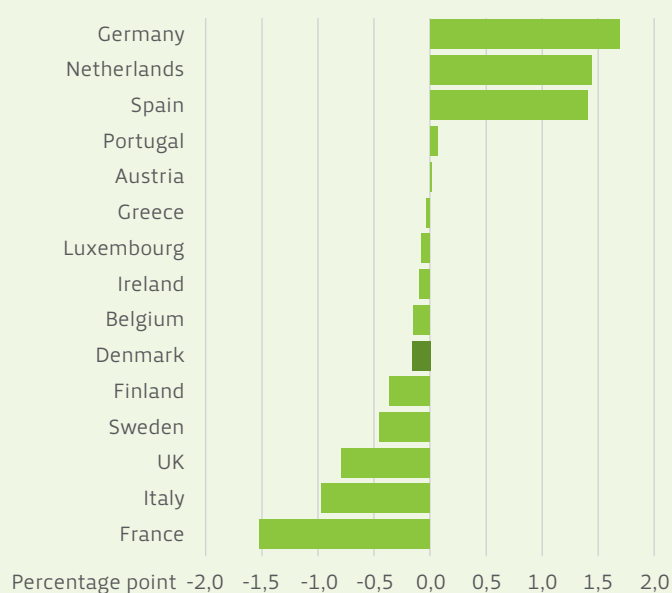
In 2006, Danish green exports accounted for almost 3.7% of the EU15's total green exports, however, in 2011, this share had dropped to 3.5%. Denmark's export share relative to the rest of the EU15 has therefore been reduced by 0.2 percentage points, see figure 26.

If Denmark had retained its export share of 3.7%, Danish exports would have amounted to DKK 67.2 billion in 2011, or DKK 3.6 billion more than the actual green exports in 2011.

Other countries have succeeded in winning new export shares during the same period. These include, in particular, Germany, the Netherlands and Spain.

As a consequence of these developments, Denmark has gone from being the eighth largest exporter of green goods in 2006 to being the ninth largest in 2011, surpassed by Austria.

Figure 26. Changes in export shares from 2006 to 2011 for the EU15 Member States, in percentage points



Source: DAMVAD 2012 on the basis of COMEXT (Eurostat)

Note: States the percentage-point change from 2006 to 2011 in the green exports of the individual country measured as the percentage of total green exports by the EU15, in current prices.

Denmark has lost export shares, in particular, in noise and vibration abatement and renewable-energy technologies, see table 8.

The Danish share of EU exports in noise and vibration abatement fell from 4% in 2006 to just below 3% in 2011.

In renewable energy, the Danish share fell by 0.8 percentage points, while for technologies for better utilisation of energy and for soil and groundwater protection the fall was 0.4 percentage points in both business areas.

However, Denmark has also won new export shares in products used in air pollution control and in waste management. The Danish share of total EU15 exports within these areas is now around 2.5%

Table 8. Change in Danish export shares by green business areas, 2006 and 2011

	Export share		Change, percentage points
	2006	2011	
Air pollution	1,88	2,60	0,73
Waste management	2,13	2,34	0,21
Measurement and analysis related to climate protection	3,13	3,25	0,12
Protection of biodiversity and landscape	1,00	1,04	0,04
Wastewater management	2,77	2,73	-0,04
Protection of soil, groundwater and the aquatic environment	2,84	2,46	-0,37
Better utilisation of energy (incl. smart grid, etc.)	2,54	2,15	-0,39
Renewable-energy technologies	6,39	5,58	-0,82
Noise and vibration abatement	4,05	2,98	-1,07

Source: DAMVAD 2012 on the basis of COMEXT (Eurostat)

Note: The share indicates the Danish export percentage of total EU15 exports for each business area. The exports for all business areas add up to more than total exports, because each product code may belong under several of the business areas.

5.5 European presence in global emerging markets

Denmark is not as prominent in the new BRIC and NEXT11 markets as our European competitors. This presents a challenge if Denmark is to gain new market shares.

Of total Danish green exports, 10.5% go directly to the new emerging markets. The corresponding figure for the EU15 Member States as a whole is 17%, see figure 27.

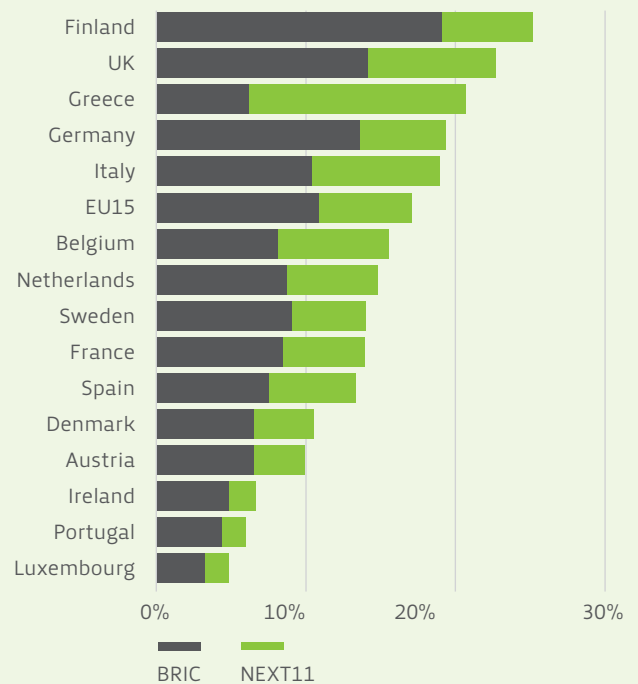
Looking only at BRIC and NEXT11, Denmark still lies below the EU15 average, with green export shares of 6.5% and 4 % for BRIC and NEXT11, respectively, in 2011.

Germany, the UK and Italy, in particular, raise the EU15 average for green exports to BRIC and NEXT11.

Denmark generally places low compared with those countries with which we normally compare ourselves, including Germany, Sweden and the UK.

It is a generally accepted fact that countries which are geographically close to each other trade more with each other. Finland's and Greece's high export shares to BRIC and NEXT11 should therefore be seen in this light. For example, Finland sells a relatively large percentage of its green exports to Russia, while Greece exports relatively many of its green goods to Turkey.

Figure 27. EU15 green exports to BRIC and NEXT11, as a percentage of total green exports, 2011



Source: DAMVAD 2012 on the basis of COMEXT (Eurostat)

Note: The percentage figure indicates the share of each country's green exports sold to BRIC and NEXT11, respectively. The EU15's share has been calculated as the sum of green exports to BRIC and NEXT11 from the individual EU15 Member State relative to the sum of total green exports from these countries.



List of annexes

All annexes to this report is available at www.ens.dk
(however, not all of them are in English)

1. Description of the methodology, by DAMVAD (including a list of the product codes used and estimation tables)
 2. Data available in Excel format for chapters 1-3
 3. Data available in Excel format for chapters 4 and 5 (the exports analysis)
 4. The 40 most exported products including examples of their green use.
 5. Green export specialisation for the EU15 Member States
 6. Green business areas in Denmark (CEPA segments)
 7. Correlation between the Danish green business areas and Eurostat's CEPA and CReMa classifications
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– and its significance for the Danish economy



DANISH MINISTRY OF
CLIMATE, ENERGY AND BUILDING



MINISTRY OF BUSINESS AND GROWTH
DENMARK



Danish Ministry of the Environment

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