



PBL Netherlands Environmental Assessment Agency

The Netherlands in 21 infographics

FACTS AND FIGURES ON THE HUMAN ENVIRONMENT



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Foreword

Correct and reliable data analyses are indispensable for governments. At the same time, statistical information is often presented in such a dry, esoteric, complicated and abstract manner, that it seems as if it is meant to be understood by a small circle of experts only.

Very encouraging in this regard is the emergence of ‘infographics’ – a countertrend according which statistics is given a layer of visuals that helps non-specialists to quickly see a particular connection, a counter-intuitive finding or basically a statistical fact. Images can truly bring statistics to life. Developments in IT and social media have generated massive interest in infographics and other visual techniques to present factual information in a simple and attractive way. New creative ways of depicting scientific analyses can also help us to better understand the challenges facing the human environment.

It is important for people to understand the order of magnitude of the problems we now face. How much space do we need for a fully sustainable energy supply in the Netherlands? How many wind turbines does it take to replace one coal-fired power plant? How do the CO₂ emissions from a flight between Amsterdam and New York compare with a daily commute by car?

The Netherlands in 21 infographics presents the facts and figures made by PBL Netherlands Environmental Assessment Agency, in a novel way. This booklet covers three important themes in our environment: food, energy and transport. Not only is the method new, but this is also the first time PBL Netherlands Environmental Assessment Agency has devoted an entire publication to these visualization techniques. I am proud to be able to say that the Dutch version of this booklet was awarded with the Dutch infographics prize 2013.

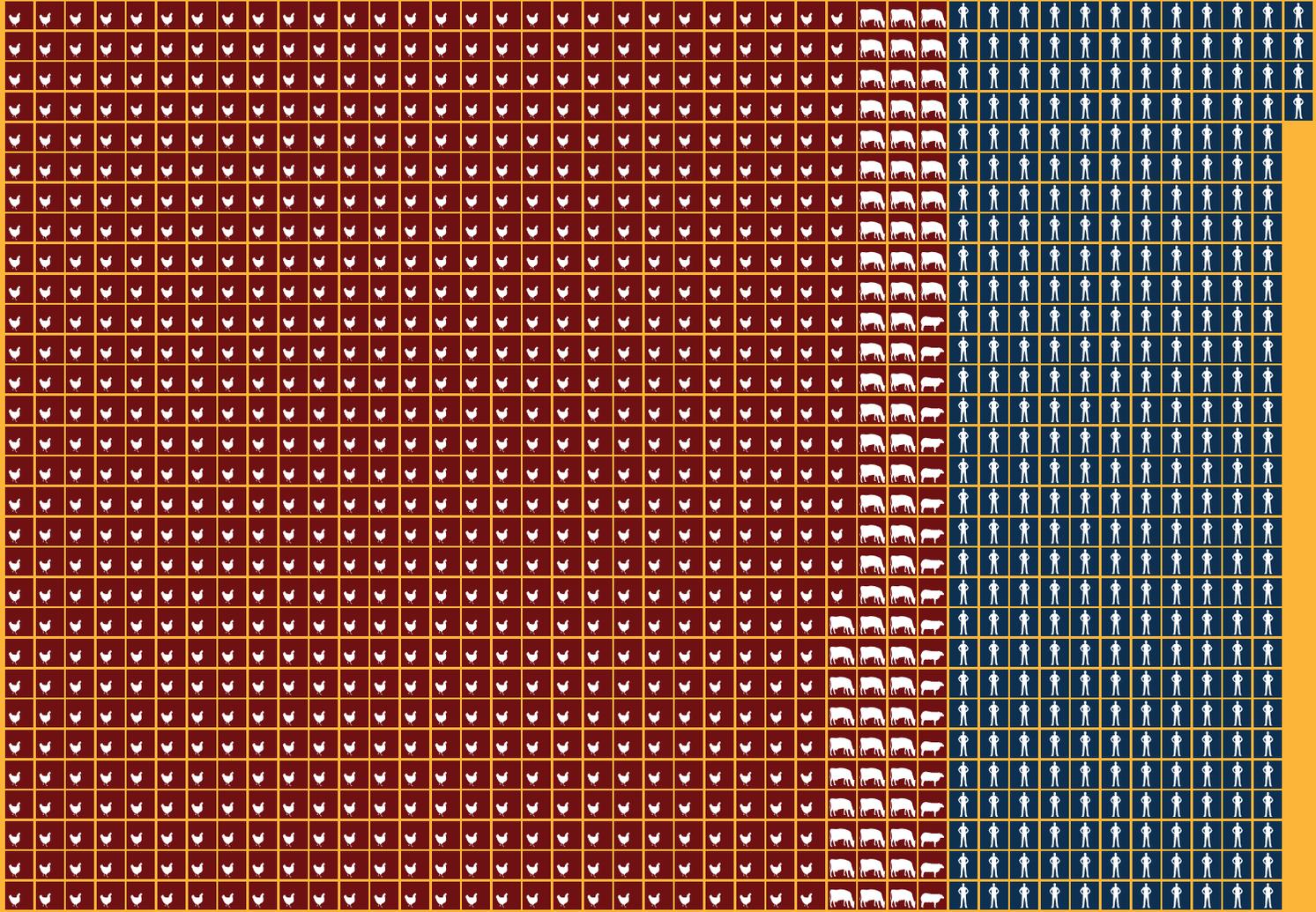
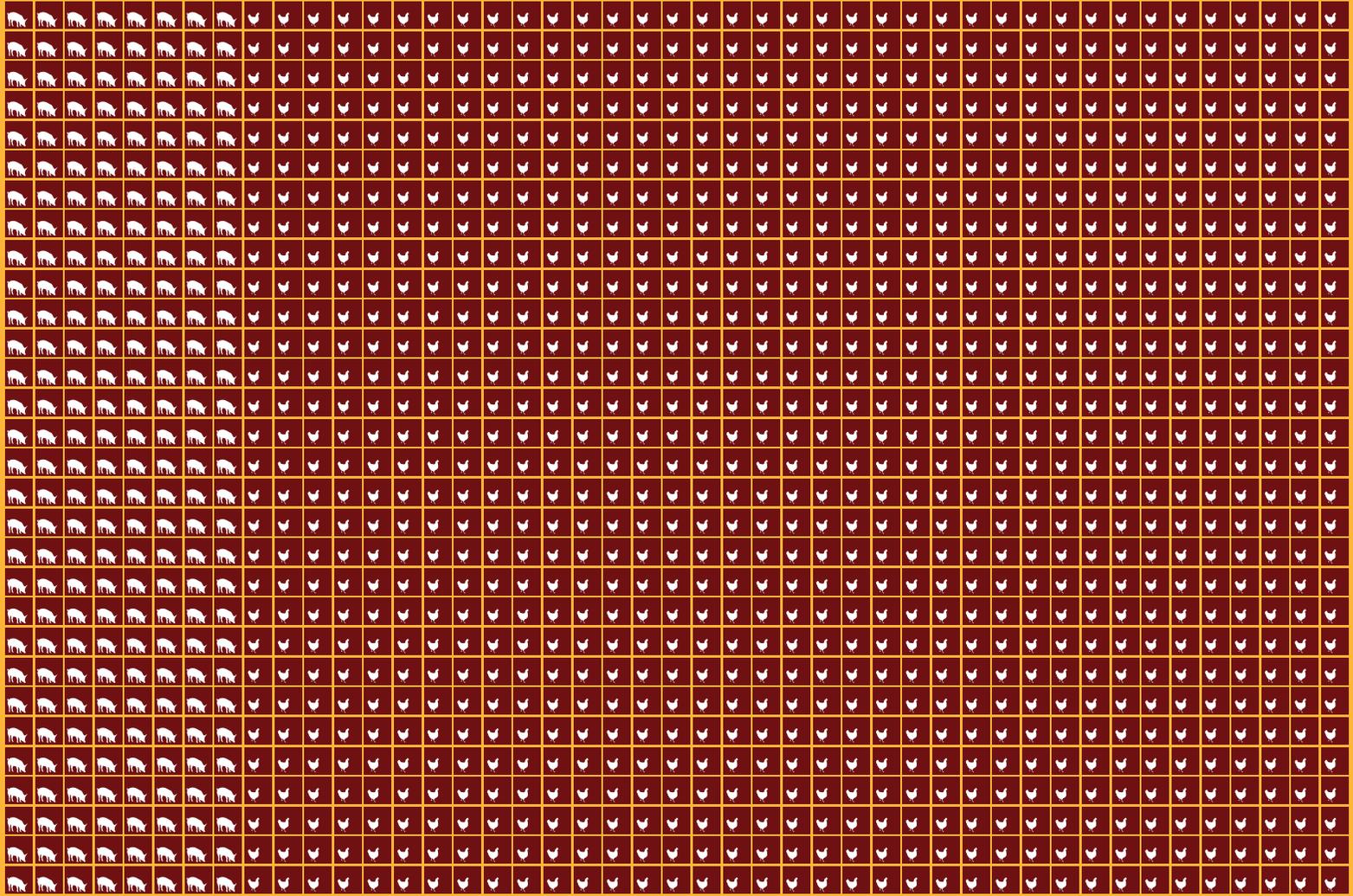
The booklet does not stand on its own. At PBL, we aim to communicate our knowledge and information in various ways, and using various media. Last year, we published an interactive website on the increase in global CO₂ emissions (pbl.nl/globalco2), and in 2012 we developed an app to accompany our report *Roads from Rio +20* (roadsfromrio.pbl.nl). Thus, we made complex studies on consumption patterns and sustainability more accessible and appealing by using modern communication techniques. The report also included videos of interviews with stakeholders (pbl.nl/roadsfromrio).

The digital platform ‘Environmental Data Compendium’ also works with new visualisation techniques (<http://www.environmentaldata.nl/>).

The Netherlands has a long tradition in visualizing statistical data. Even before the Second World War,

Otto Neurath and Gerd Arntz had developed an ‘isotype’ (International System of Typographic Picture Education), as well as other techniques, to present social issues in a clear and insightful manner. I like to think that applying infographic techniques is in the spirit of the work of those pioneers. Hopefully it helps us in our search for and implementation of widely supported solutions to the environmental problems we face today.

Professor Maarten Hajer
Director-general of PBL Netherlands Environmental Assessment Agency



food

On a given day in 2011 in the Netherlands there were:



16,7 million
people



1 million
sheep



4 million
cows



12 million
pigs



97 million
chickens

One pictogram represents 50,000

Compared to their grandparents and great-grandparents, Dutch people today have a much richer and more varied supply of fresh fruits and vegetables at their disposal. These fruits and vegetables come from all over the world and are available in all seasons. Daily portions of meat and dairy have also increased substantially. Food is relatively cheap in the Netherlands and malnutrition and physical ailments, such as rickets, are a thing of the past. So far, so good.

The improved food supply has some disadvantages, too. For example, people are contracting more food-related illnesses. Obesity, cardiovascular diseases, diabetes and colon cancer are partly the result of our dietary habits: we now consume too many sugars, too much salt, too many saturated fats (often in dairy food and meats) and not enough fibres, vegetables and fruits.

The improved food supply also has environmental consequences. In the wintertime, fresh fruits and vegetables are flown in from remote corners of the world. In addition, a large amount of land is needed

for meat and dairy production, which is mostly located outside the Netherlands. Dutch livestock farmers import grains from France and soya from Latin America. As the world population swells and becomes increasingly affluent, it demands more and more food. This demand requires more agricultural land – often at the expense of tropical forests, grasslands and other areas vital to biodiversity. Agriculture also is a major source of greenhouse gas emissions.

A third disadvantage concerns animal diseases and the use of antibiotics. Livestock farmers often use antibiotics to keep their animals healthy. Some people can become infected with resistant bacteria through contact with those animals or the consumption of meat. As a result, doctors are no longer able to treat these people with the same antibiotics. Because not many new antibiotics are being discovered, this can pose a threat to public health.

Finally, there is growing opposition to intensive livestock farming, on the basis of animal rights. The production of broilers

Food

(rapidly fattened chickens) has recently come under fire in the Netherlands. Thanks to new regulations and the construction of improved animal housing, the trend for animal welfare is cautiously optimistic, although serious animal-welfare issues continue to exist for all farmed species.

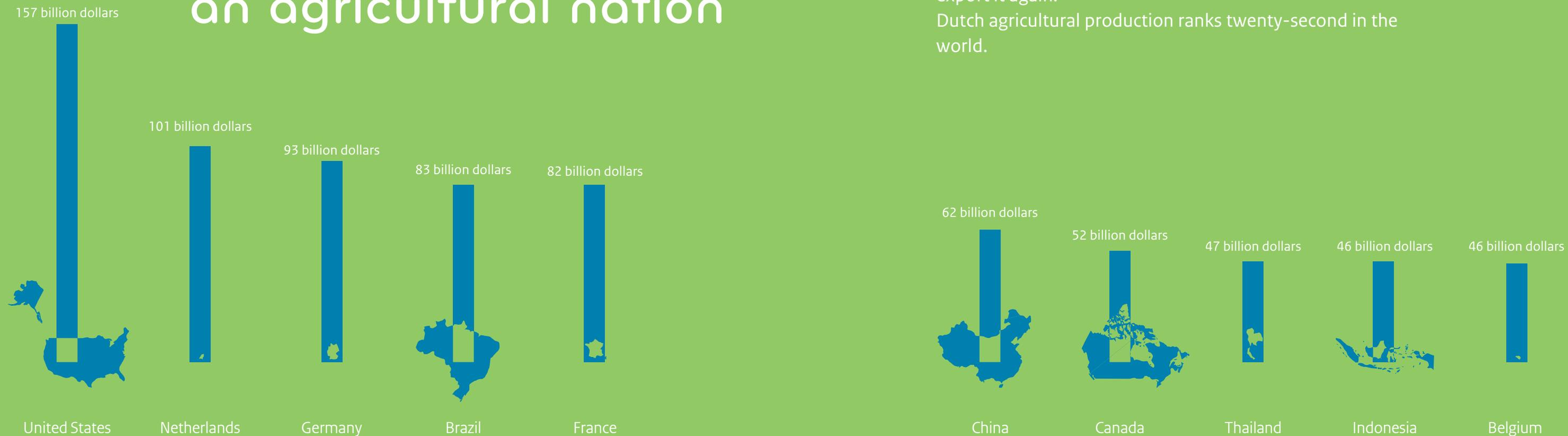
A variety of solutions are available to help make agriculture more sustainable. Some of these consist of increases in efficiency through further intensification, expansion and the application of more technology, such as genetic modification of crops or livestock. Others focus on sustainability of production. This means paying more attention to animal welfare, avoiding public health risks, and causing fewer local environmental problems. These production methods, however, often require more land.

A third solution is to change consumption patterns. People can help the environment by reducing their meat and dairy

consumption. Vegetable-based alternatives to meat are available that put less strain on the environment (e.g. require less land). Alternatively, people may choose to consume more carefully produced goods. Finally, preventing food waste is also worthwhile, as a substantial share of our food ultimately ends up in the rubbish.

Whatever combination of solutions is chosen, all parties involved in the production chain need to be on board. The government cannot do this on its own. Many supermarket chains already offer animal-friendly or organic products. Many farmers are producing more organic or animal-friendly food, or are introducing local products on to the market in collaboration with other producers. Ultimately, much will depend on consumers. Since most people are used to buying cheap food, particularly meat, they would have to be willing to look past that low price and pay a little extra for sustainable, animal-friendly and healthy meats and dairy products.

The Netherlands an agricultural nation



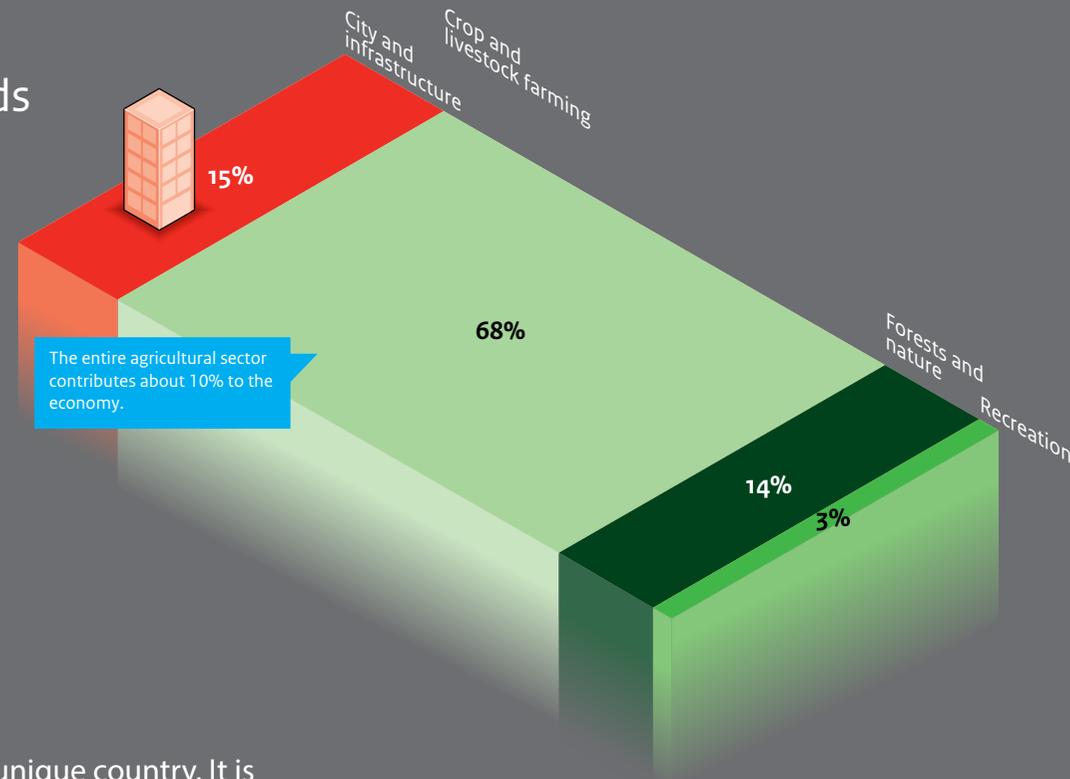
In terms of value, the Netherlands is the second largest agricultural exporter in the world. Most of the food is not grown here, though: we import it, process it, and then export it again.

Dutch agricultural production ranks twenty-second in the world.

The Netherlands: a low-density city

Land use in the Netherlands

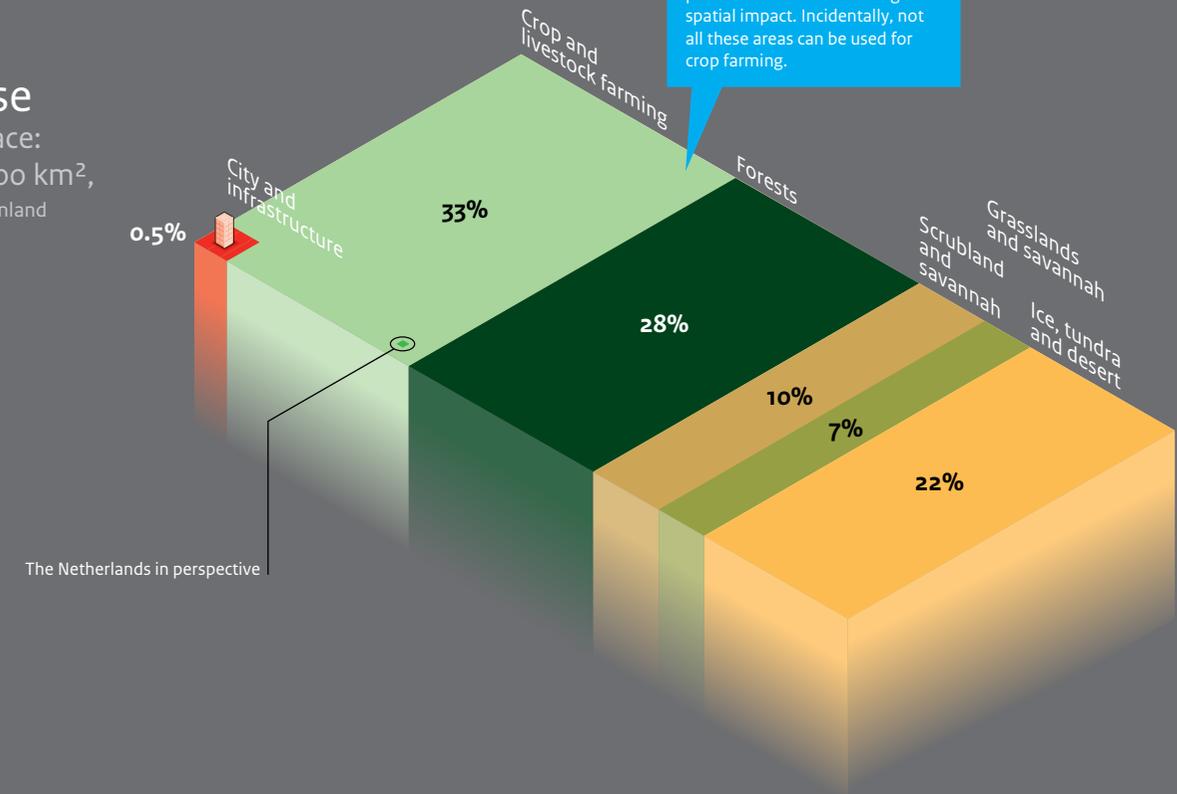
Land surface: 34,000 km²



The Netherlands is a unique country. It is an agricultural superpower within an urbanised society. This takes a high environmental toll.

Global land use

Land surface: 133,000,000 km², excluding Greenland and Antarctica



All that is left is manure

The Netherlands contains so much livestock that it cannot be fed only on nationally grown feed. A substantial amount of animal feed has to be imported.

A big share of Dutch meat products is then exported, mostly within Europe.

The manure that was produced in the process, however, remains in the Netherlands. Over the years, this has led to the accumulation of nitrogen and phosphorus in the agricultural soil and this has

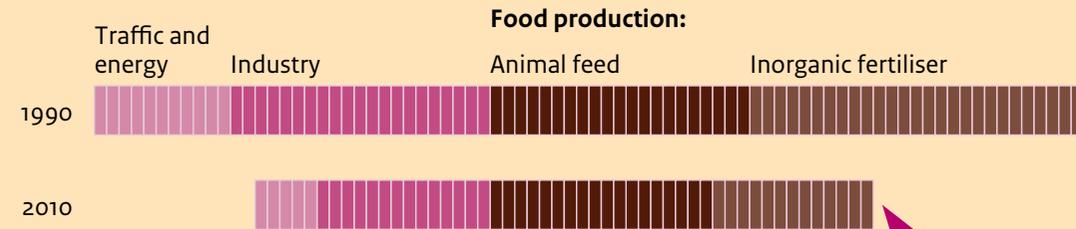
caused the eutrophication of nature areas, ditches, lakes, rivers and the North Sea.

In 2010, Dutch livestock produced 72 billion kilograms of manure, most of which ended up as fertiliser.

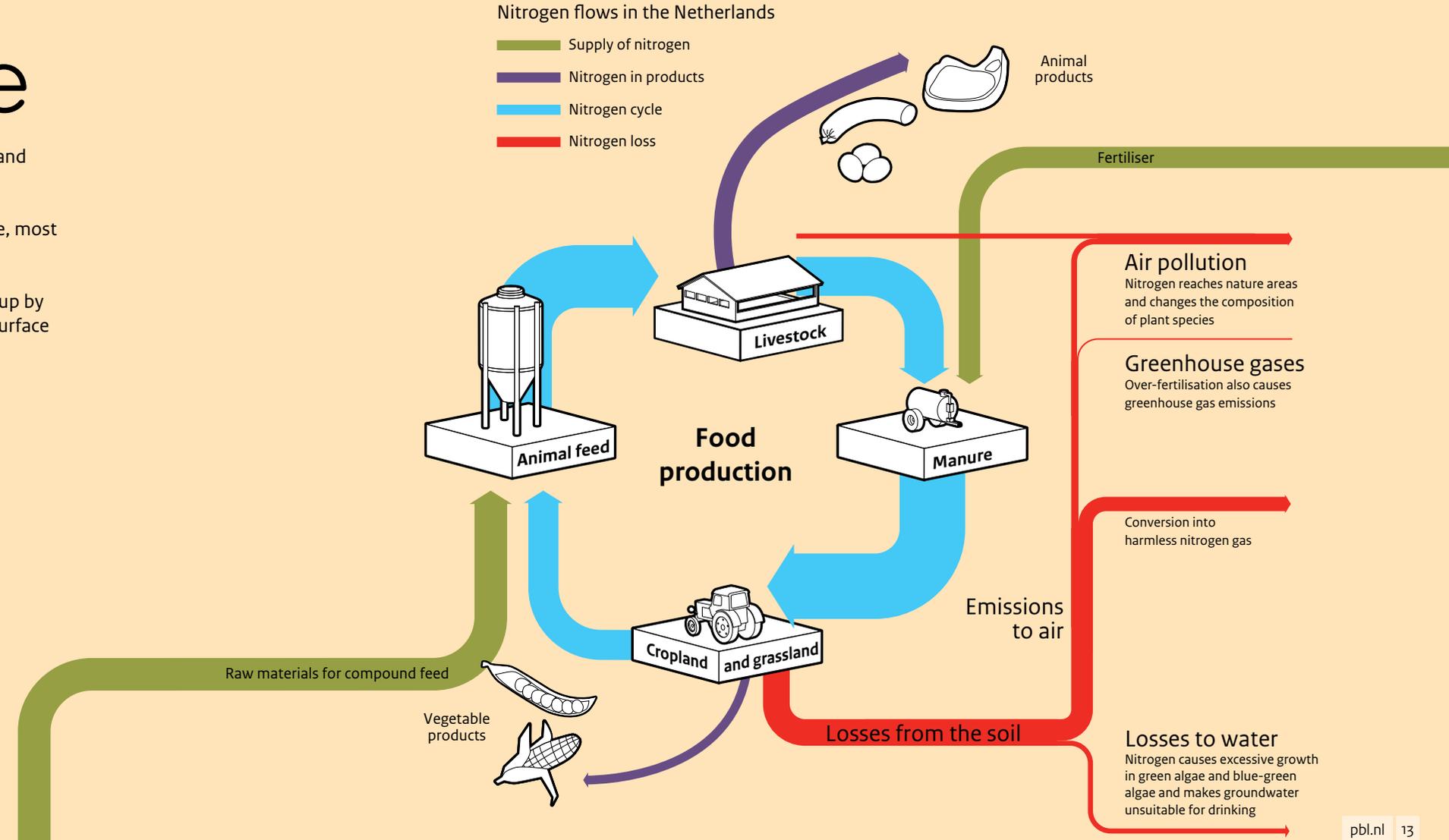
This fertiliser adds minerals to the soil. Some of these are taken up by plants and crops, the rest drains away into the groundwater or surface water, or evaporates as ammonia into the air.

Nitrogen losses in the Dutch economy

1 square represents 1 kg nitrogen per inhabitant



Over the past 25 years, the Netherlands have had a fertiliser policy in place to reduce the environmental burden. Since then, levels have been cut in half.



Meat

Livestock is responsible for 11% of greenhouse gas emissions in the Netherlands (nitrous oxide, methane and carbon dioxide).

Global meat production is increasing

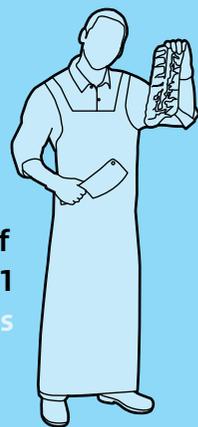
Per person per year



 = 1 kilo

Dutch livestock is mainly bred for export. From a European perspective, the Netherlands uses a modest amount of antibiotics in human health care, and a relatively large amount in the livestock sector. The many antibiotic treatments in the livestock sector lead to resistant pathogens, which sometimes means that the antibiotics are no longer effective.

The average Dutch person consumed



This is 230 grams of meat per day, including bones but excluding skins and intestines.

Dutch people eat an average of 95 grams of meat per day. The remainder is used in many different ways in production, retail and preparation, or is processed as dog or cat food.

Fish

Fish smaller than 25 cm

90%

80%

70%

60%

50%

Before 1980, 30% of caught fish was larger than 25 cm

1980

20%

Fish larger than 25 cm

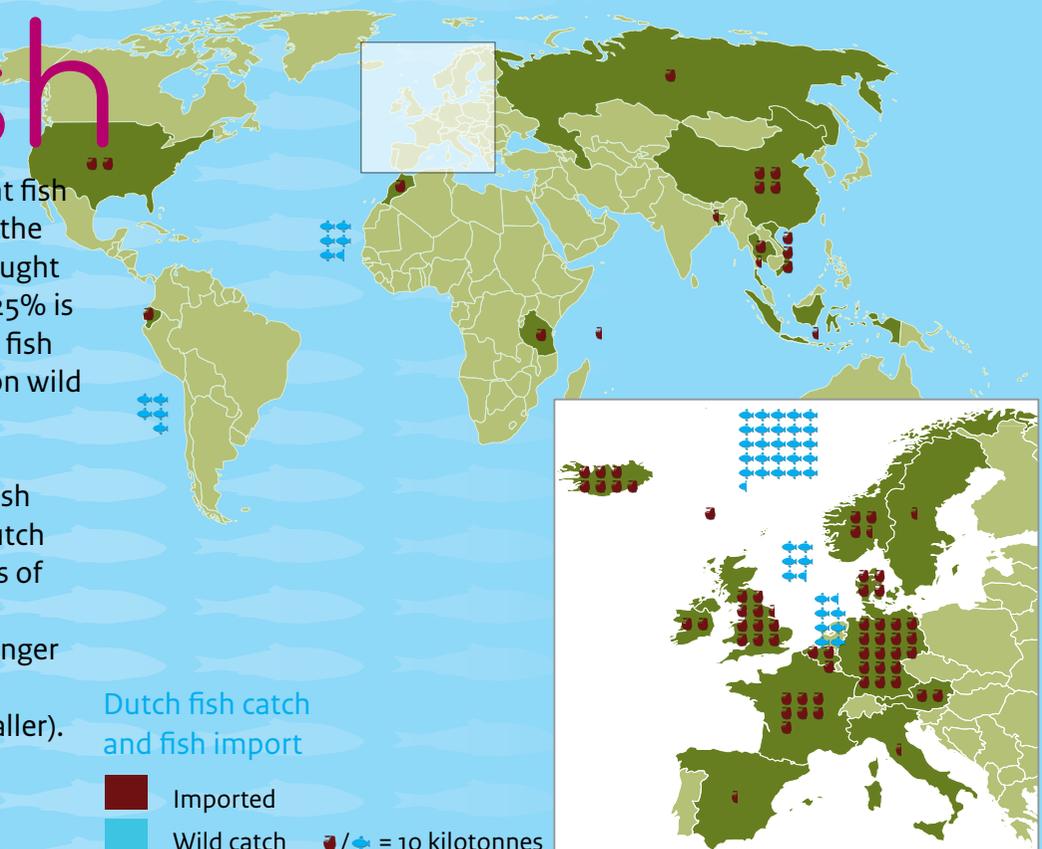
10%

Dutch people eat fish from all around the world. 75% is caught in the wild and 25% is farmed. Farmed fish are usually fed on wild fish.

The age of the fish caught in the Dutch territorial waters of the North Sea is increasingly younger (and therefore increasingly smaller).

Dutch fish catch and fish import

 Imported
 Wild catch   = 10 kilotonnes



Around 2010, 8% of caught fish was larger than 25 cm

What we use comes from far away

Average annual Dutch consumption, per person, requires about 0.6 hectares to produce. Thus, for the entire population, about 10 million hectares are needed for all the food, timber, cotton and other resources.

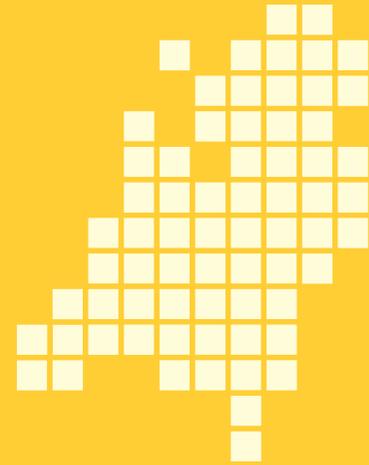
Yields per hectare of cropland are high in the Netherlands, for two reasons: the agricultural land is fertile, and the agricultural technology ranks among the world's best.



Per Dutch person, 0.6 hectares is needed. This is slightly less than a UEFA football field.

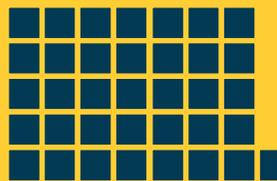


Accommodating the entire population requires a total land surface three times the size of the Netherlands.

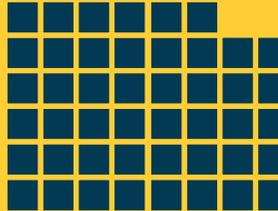


Most land related to Dutch consumption is located outside the Netherlands

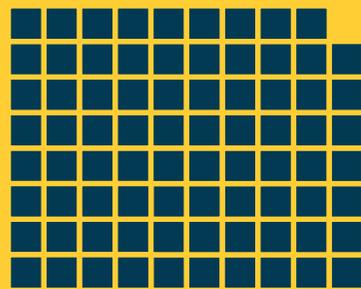
Dutch consumption of vegetable-based food requires 1.8 million hectares of land.



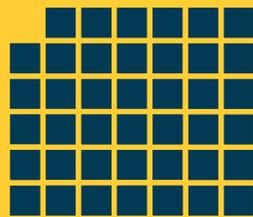
Dutch consumption of meat, dairy and eggs requires 2.3 million hectares of land for growing animal food crops.



■ = 50,000 hectares



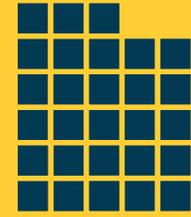
Western Europe



South America



North America



Netherlands



Central Europe



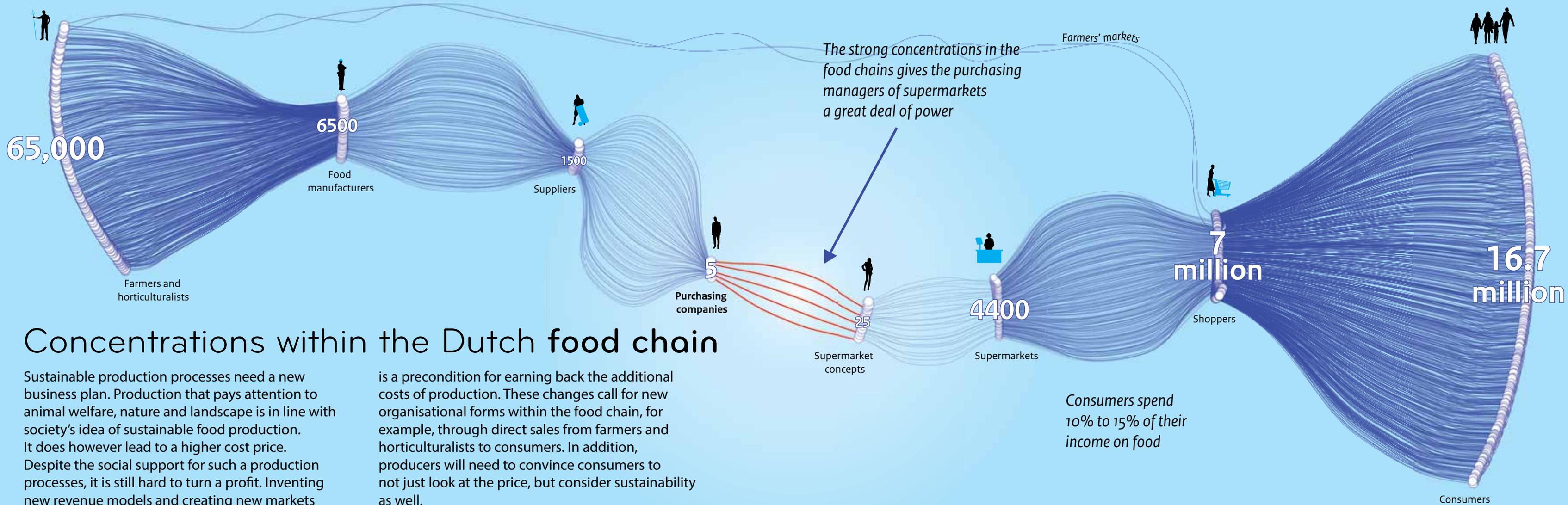
Asia



Africa



Russian Federation



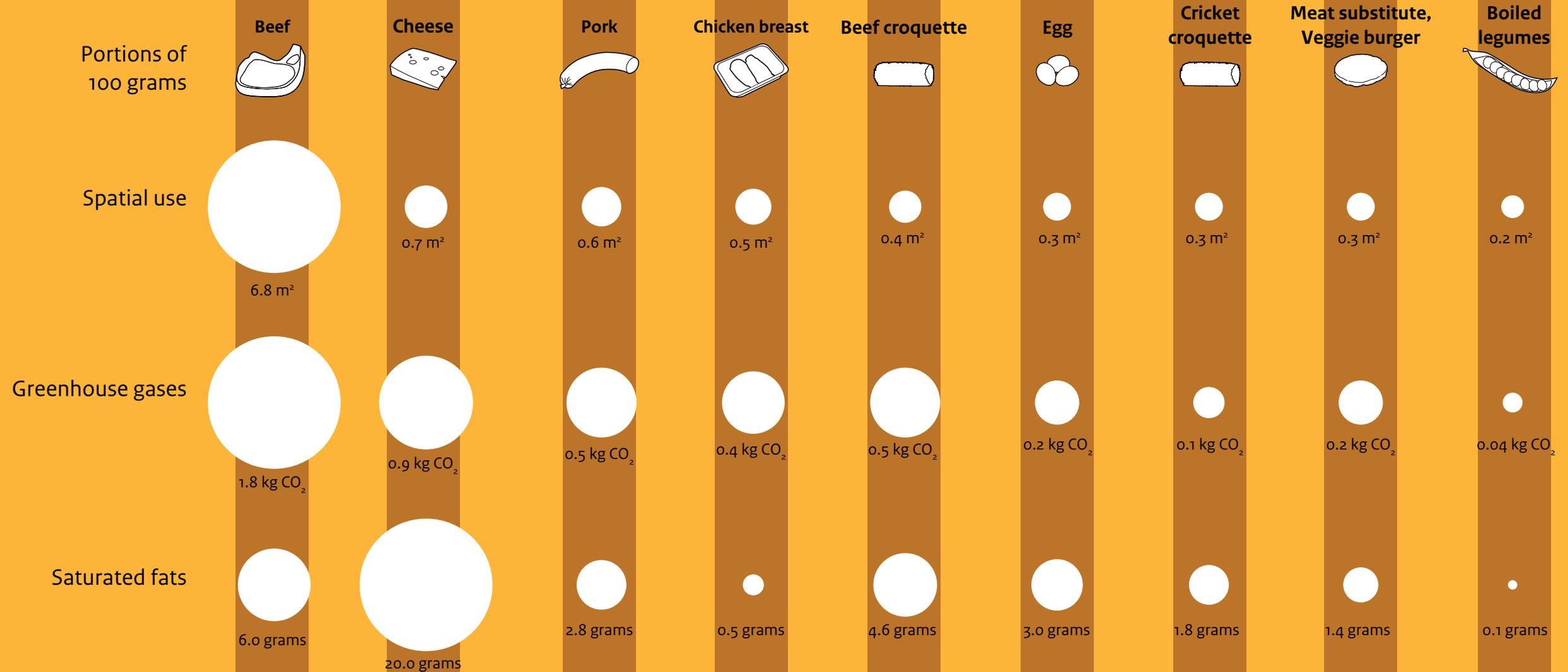
Concentrations within the Dutch food chain

Sustainable production processes need a new business plan. Production that pays attention to animal welfare, nature and landscape is in line with society's idea of sustainable food production. It does however lead to a higher cost price. Despite the social support for such a production processes, it is still hard to turn a profit. Inventing new revenue models and creating new markets

is a precondition for earning back the additional costs of production. These changes call for new organisational forms within the food chain, for example, through direct sales from farmers and horticulturalists to consumers. In addition, producers will need to convince consumers to not just look at the price, but consider sustainability as well.

Products and their impacts

If people in the Netherlands were to consume less meat, they would need to rely on other foodstuffs for their protein intake. At the Dutch Wageningen University and Research Centre, the potential of algae, seaweed and insects is being studied, and alternative food products are being developed; even including hot snacks (Dutch croquettes) containing crickets!



Diets and their impacts

If all Europeans would become vegetarians today – i.e. they would eat no meat, meat products or eggs – the EU would achieve about half of its environmental targets for 2020. This clearly shows the environmental burden of meat consumption.

Saturated fats

People run an increased risk of cardiovascular diseases when they eat large amounts of saturated fats.

Greenhouse gases

95% of greenhouse gases consists of carbon dioxide, nitrous oxide and methane.

Surface area

Croplands compete with livestock production over land. Because the growing middle class consumes more meat per capita, this is becoming an ever-increasing global problem.

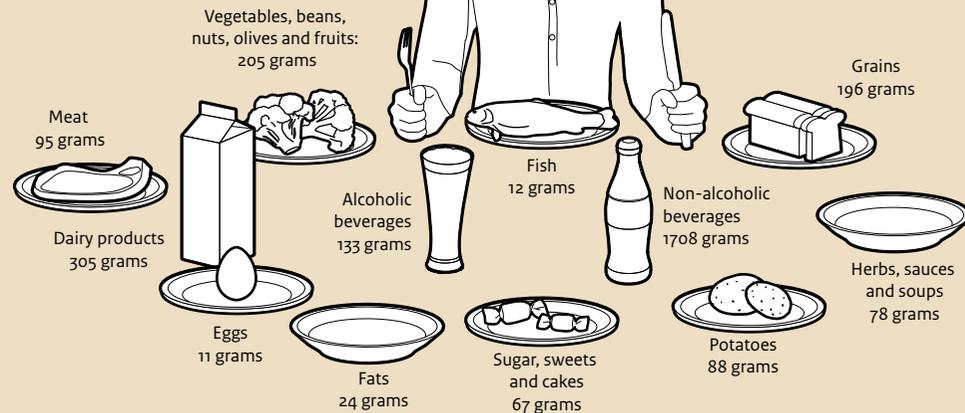
Water

The production of agricultural goods for Dutch consumption contributes to water shortages around the world, such as in Spain.

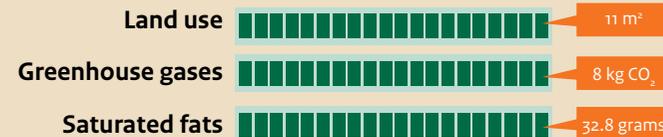
Natural resources

Agriculture depletes many natural resources, such as fuels and phosphate in inorganic fertiliser.

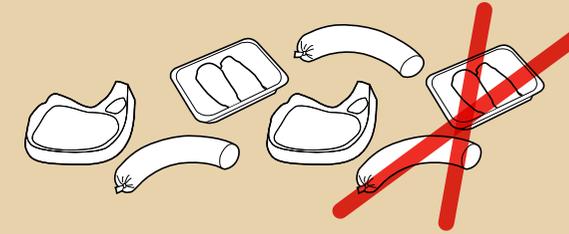
Average Dutch daily diet



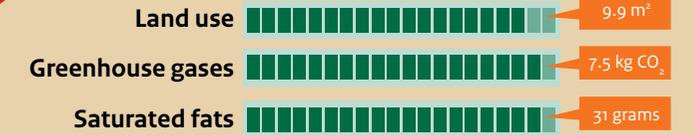
Per Dutch person per day:



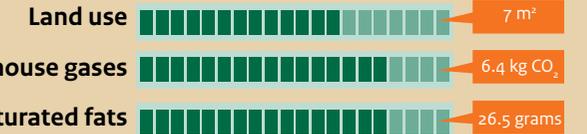
Flexitarian diet: twice a week no meat



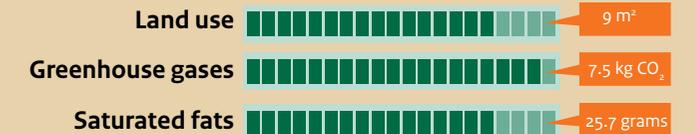
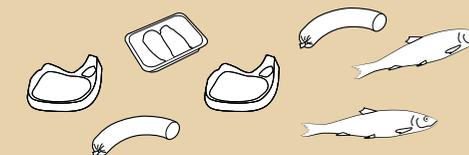
Per Dutch person per day:



Vegetarian diet



Netherlands Nutrition Centre guidelines

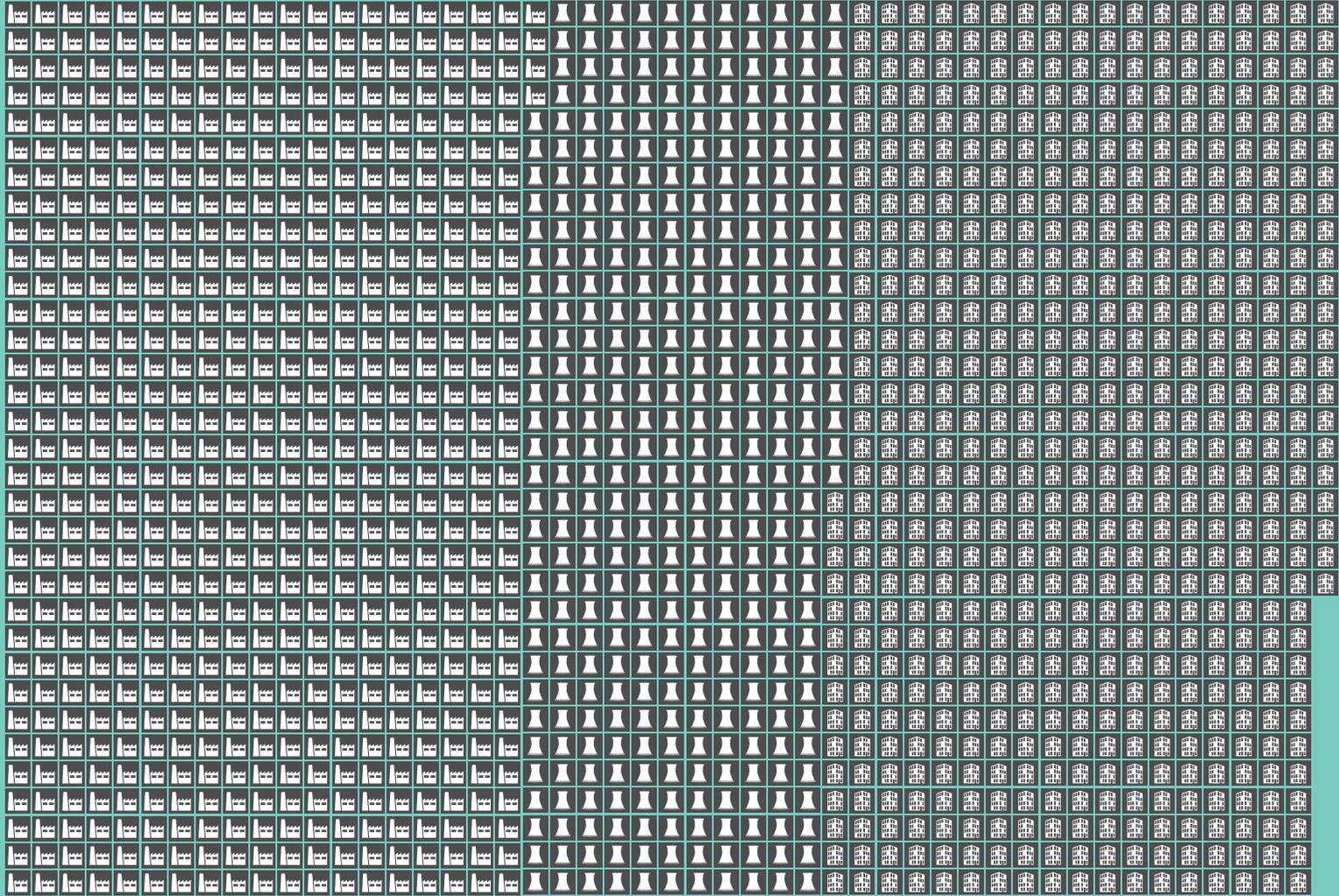
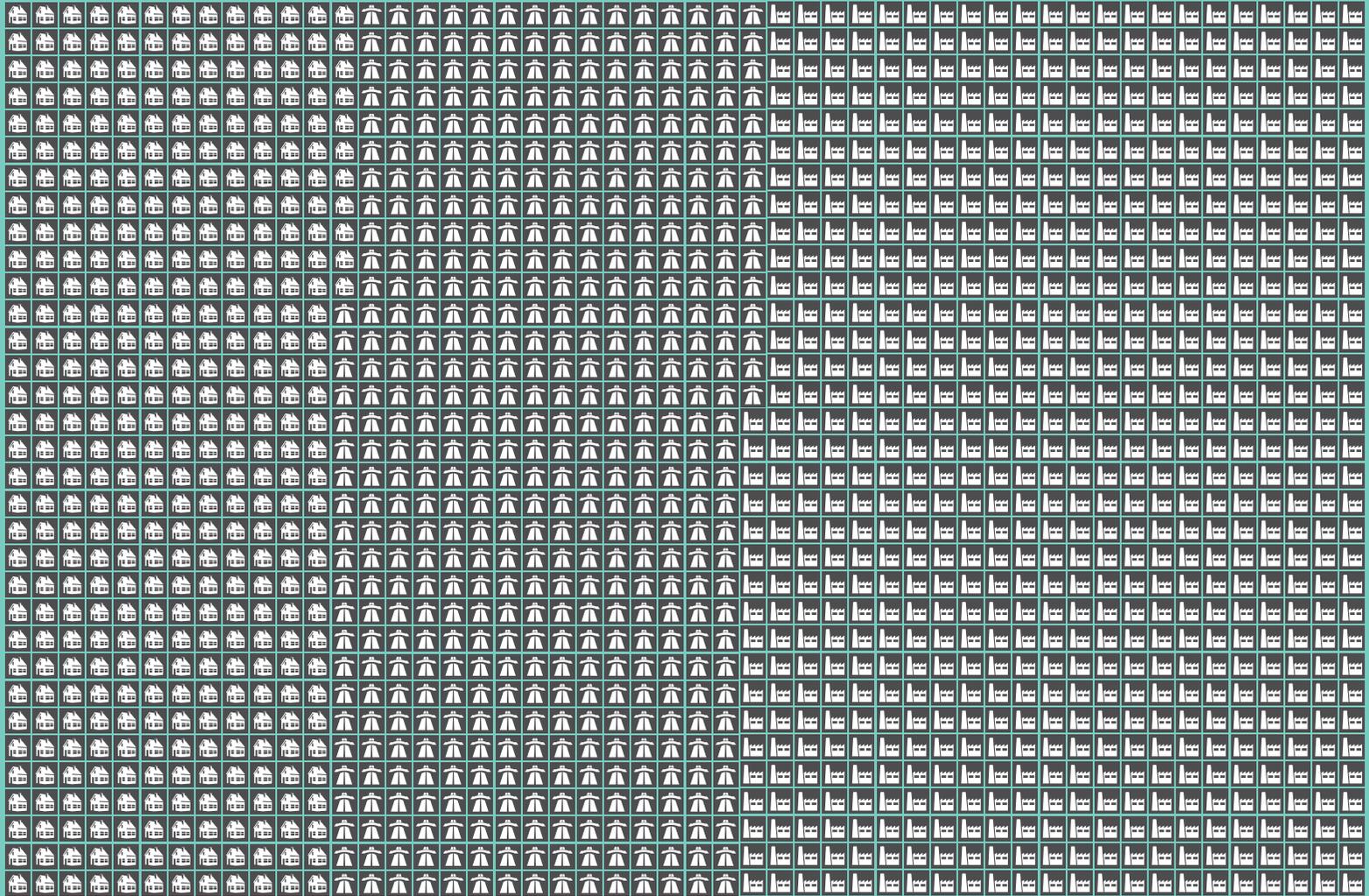


More information:



- PBL (2011), The Protein Puzzle. The consumption and production of meat, dairy and fish in the European Union
- PBL (2012), Assessment of the Human Environment
- PBL (2012/2013), The size and impact of the Dutch footprint on the planet
- PBL, CBS & Wageningen UR (2012), Environmental Data Compendium, www.environmentaldata.nl

Background information on the data can be found on www.pbl.nl/nederlandverbeeld (in Dutch).



energy

In 2011, the Netherlands used 3,258 petajoules of energy



407 PJ by households



499 PJ by traffic and transport



1,375 PJ by industry



377 PJ by energy companies



598 PJ by other energy consumers (e.g. agriculture, horticulture, construction, trade, services and government)

One square represents 1 petajoule
1 PJ is 277,777,778 kWh

Energy

Energy is one of the building blocks of society. People need energy for heating, lighting and transportation. Modern industry only became possible when coal was introduced as a fuel to replace wood. Today, machines run mainly on electricity, and lots of it. In fact, the industrial sector uses most of all the energy produced.

In previous decades, energy was relatively cheap in the Netherlands, but now that has changed. The average Dutch household spends 2000 euros of their income on gas and electricity, annually, which is more than double the amount of 20 years ago.

The Netherlands is an important country as far as global energy flows are concerned. It is the seventh largest gas exporter and the ninth largest oil importer and an oil-products exporter. The Slochteren gas field turned the Netherlands into a 'gas country'; the share of gas in total energy use in the Netherlands is among the largest in the world. Dutch gas production, however, has peaked. The share of imported gas is increasing and the dependency on foreign suppliers is growing.

Imported fuels have sometimes made the Netherlands dependent on unstable foreign regions. In addition, burning oil, coal and gas also is one of the main causes of climate change. It is therefore essential to search for new ways to save energy and find better energy sources.

Increasing energy efficiency and promoting a transition towards more sustainable forms of energy are important policy objectives, at both national and European levels.

The Netherlands is attempting to curb the increase in energy consumption by promoting the insulation of homes and other buildings and more energy-efficient appliances and vehicles. This has been partly successful. On average, Dutch consumers use less gas for heating than before, but their use of electricity is still rising – mainly due to new electric appliances.

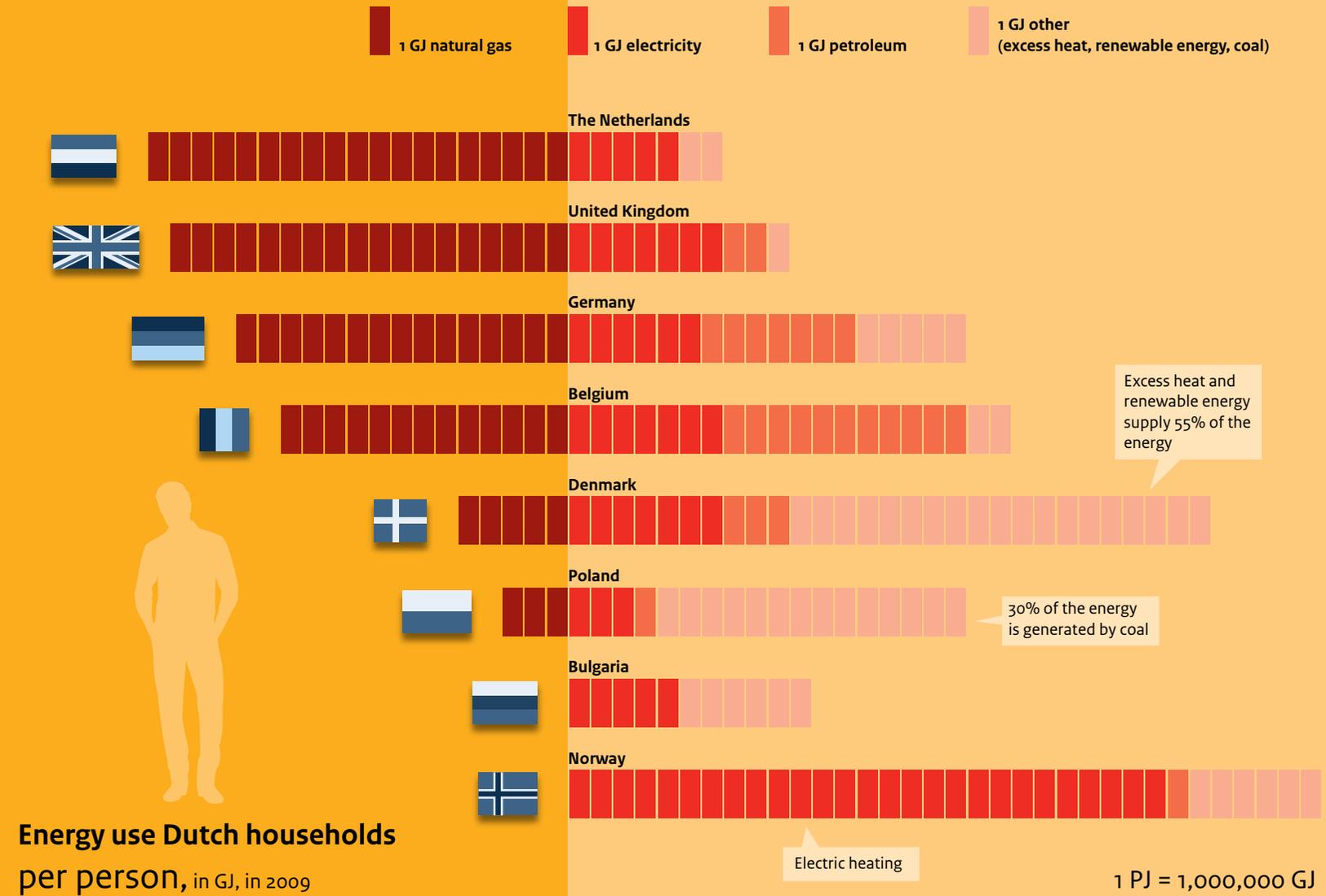
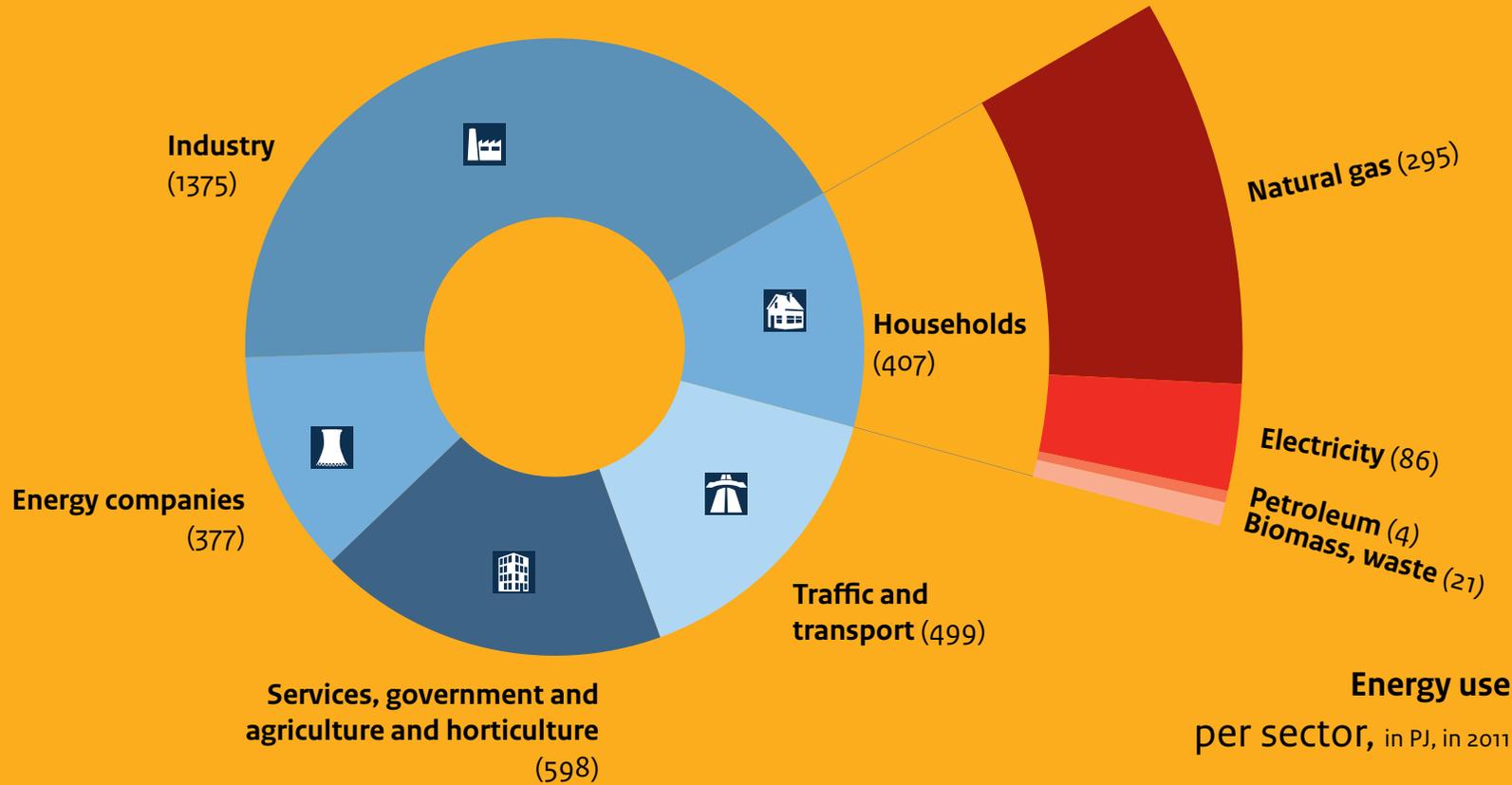
In addition to saving energy, the search is on across Europe for clean forms of energy that can be produced locally and, preferably, will

never run out (i.e. are renewable). At the moment, this mostly consists of biomass, but there is not enough land available in Europe to be able to return fully to wood combustion. Wind and solar energy remain necessary, but just like biomass, these also have drawbacks. Many people find wind turbines ugly or loud. Moreover, a huge number of turbines would be needed to satisfy all our energy needs: all the currently installed wind turbines in the Netherlands, together, provide no more energy than a single coal-fired power plant.

Energy has made the Netherlands rich, particularly because of the profits from selling gas. This will come to end when the gas supply runs out. At present, renewable energy is still expensive and requires subsidising. Gas, oil and coal seem relatively cheap, but their contribution to climate change and air pollution carry hidden costs. Energy brings great benefits, but has great costs, too. It all comes down to finding the right balance.

Dutch homes consume a great deal of natural gas

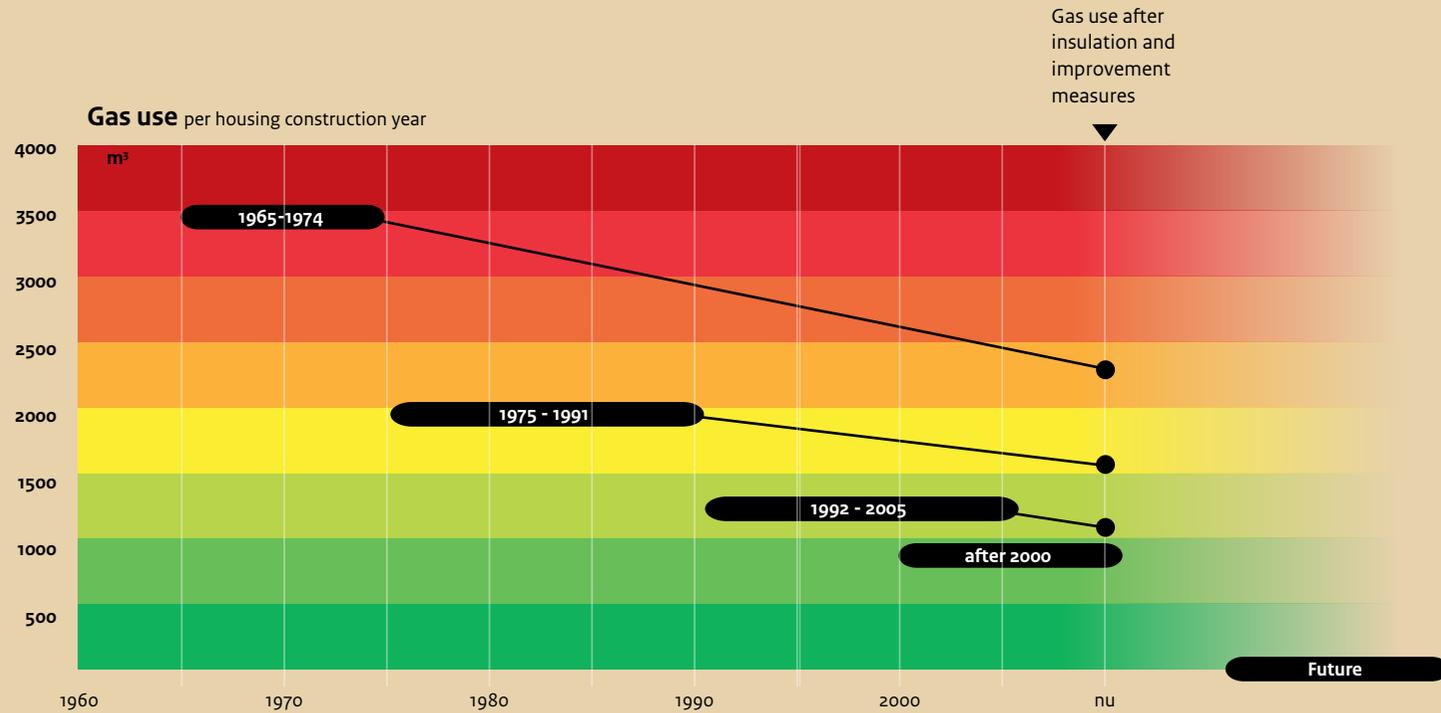
The structure of the Dutch economy is energy-intensive. To ensure energy security for the future and mitigate climate change, the Dutch need to become more efficient energy consumers and find other, renewable energy sources.



Efficient homes save on energy consumption

In the Netherlands, a lot of energy can be saved by insulating homes and offices and by using excess heat. In addition, smarter transport can save energy (see next chapter).

Over the past 30 years, average Dutch household gas consumption has nearly been cut in half. This achievement is almost entirely due to high-performance boilers and better housing insulation.

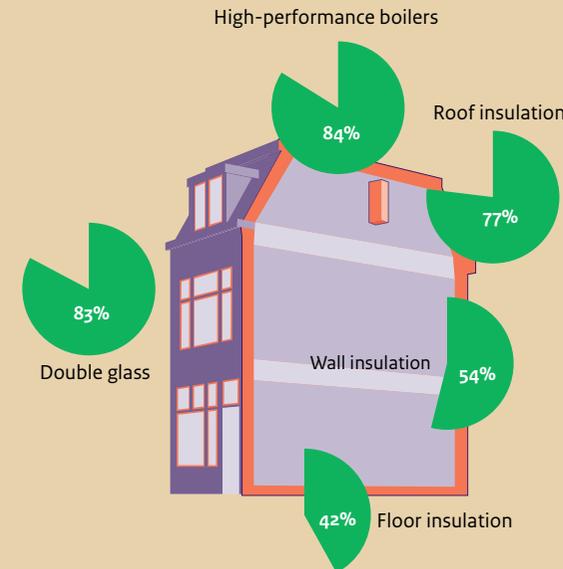


And with additional measures ...

The number of Dutch homes with good insulation is growing steadily. An important part of this growth is due to the construction of well-insulated housing and the demolition of badly insulated homes.

1 Through better housing insulation

Much has been achieved already. Most Dutch homes already have:

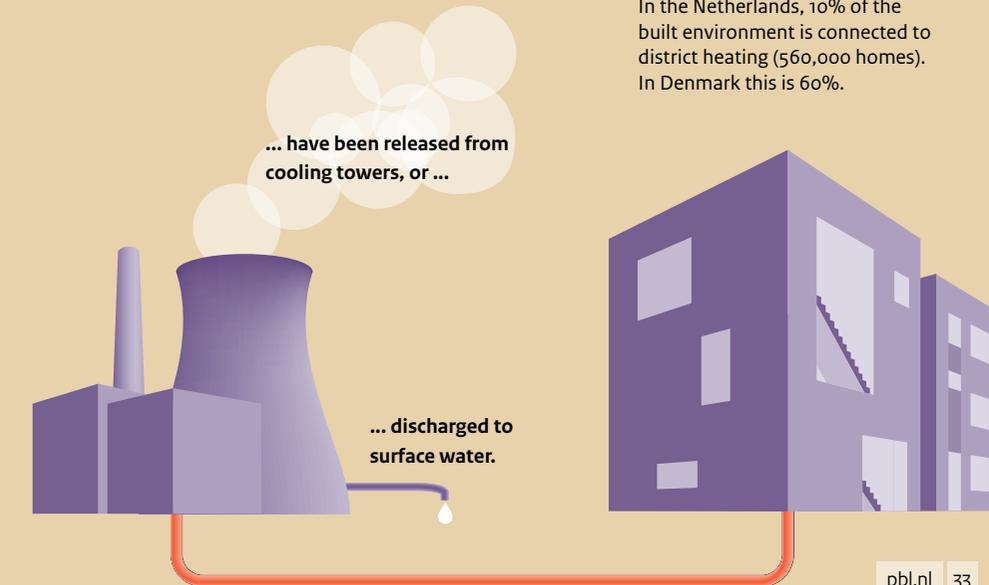


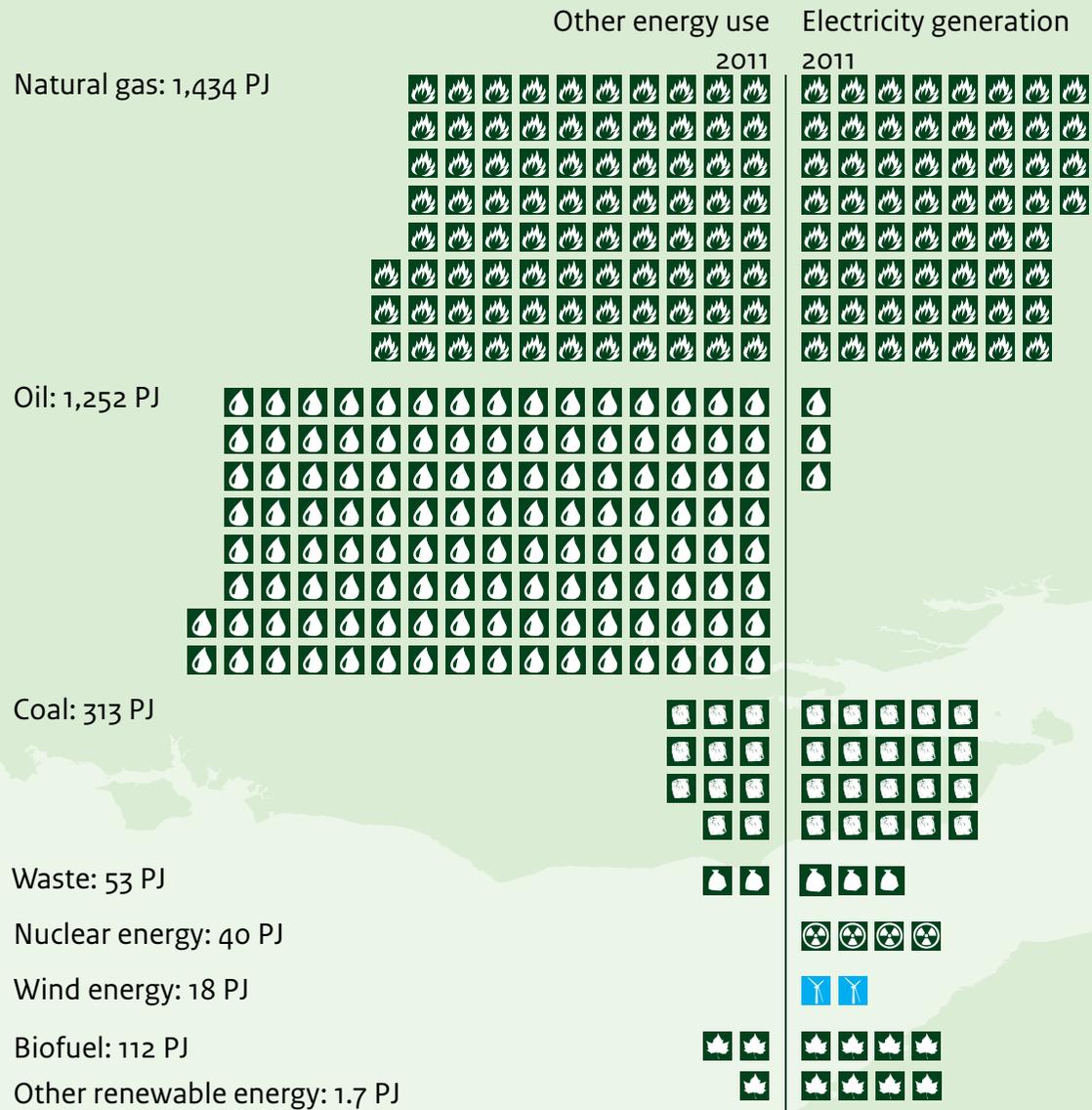
... the Dutch could save even more

Excess heat is energy that is not used in energy conversion. For example, when electricity is generated or during industrial processes.

2 By heating homes with excess heat from industry that would otherwise ...

In the Netherlands, 10% of the built environment is connected to district heating (560,000 homes). In Denmark this is 60%.

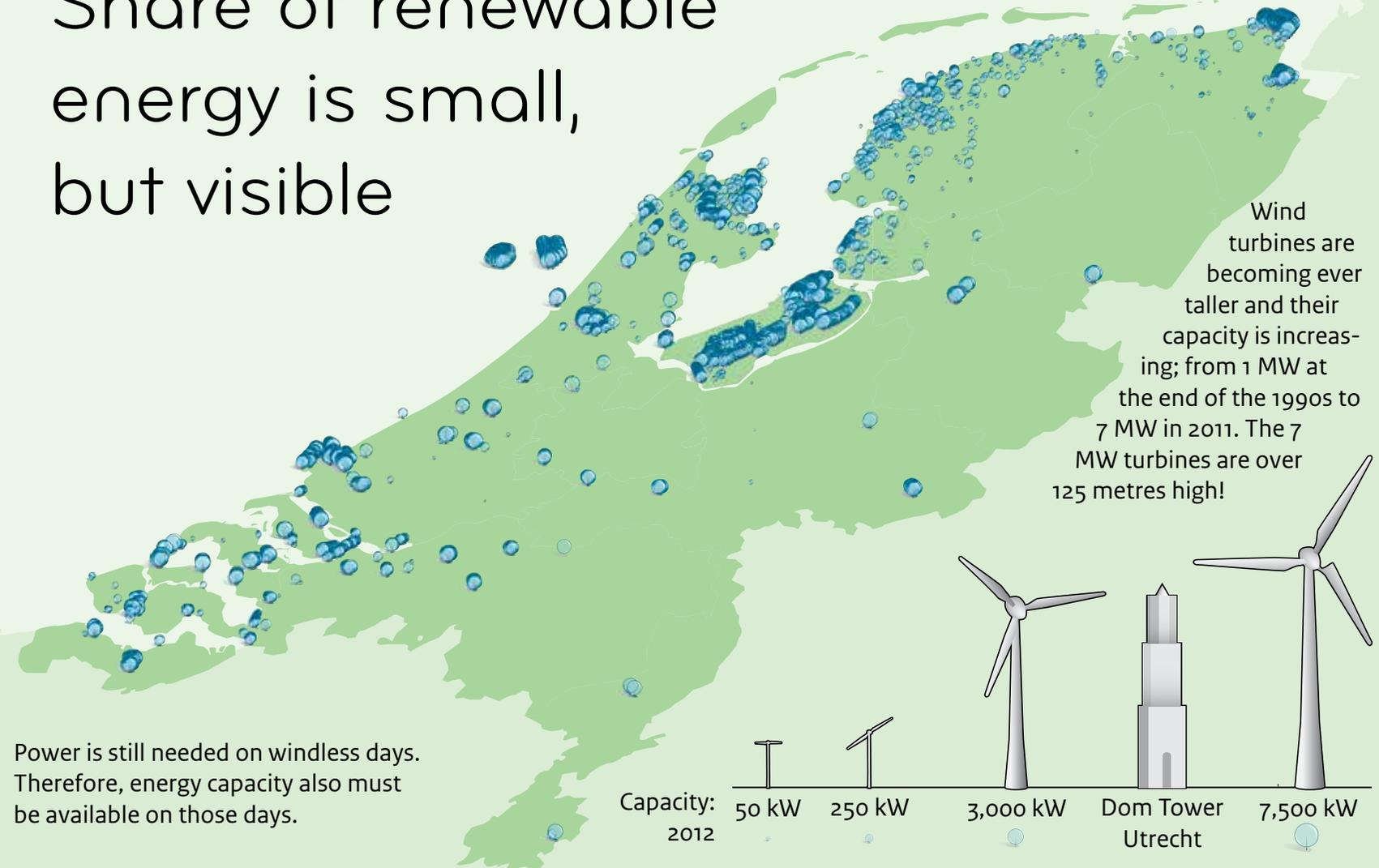




4% of Dutch electricity consumption is generated by wind energy. In particularly windy months this can reach 7%

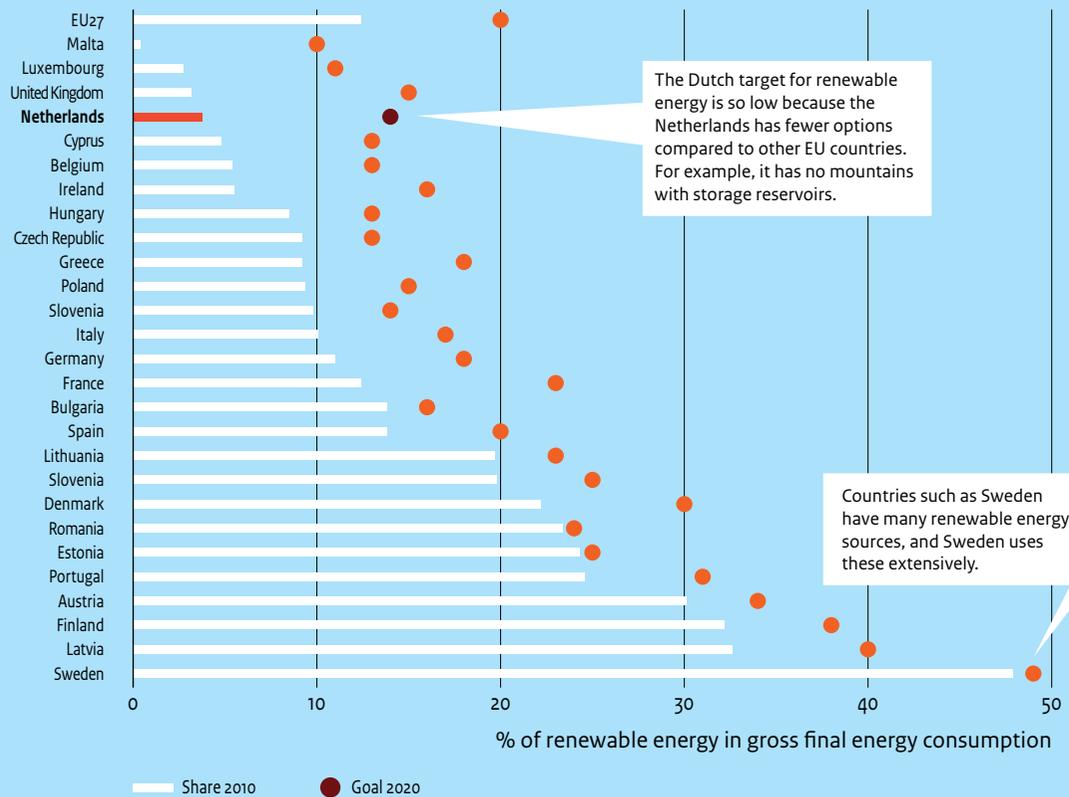
Share of renewable energy is small, but visible

Power is still needed on windless days. Therefore, energy capacity also must be available on those days.



Change requires space

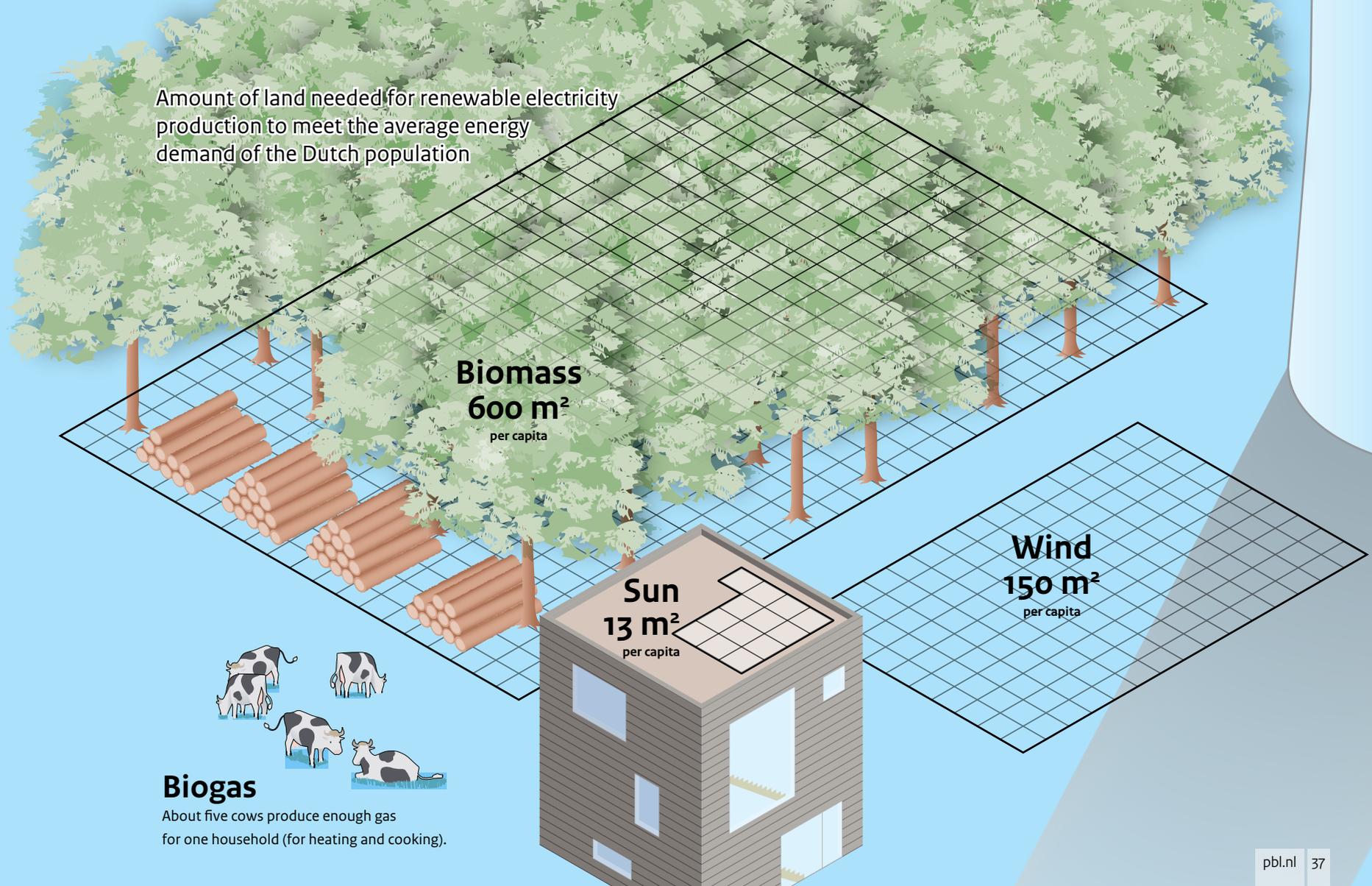
The Netherlands has a relatively small share of renewable energy, and a low EU target for renewable energy compared to other EU Member States in 2012



The Dutch target for renewable energy is so low because the Netherlands has fewer options compared to other EU countries. For example, it has no mountains with storage reservoirs.

Countries such as Sweden have many renewable energy sources, and Sweden uses these extensively.

Renewable energy production takes up a great deal of space. The Netherlands is unable to meet its energy demand using domestically grown biomass – there is simply not enough land available.



All Dutch wind turbines together ...

... supply as much power as the 'Amercentrale' power plant



3,727,000 tonnes CO₂
2,300 tonnes NO_x
40 tonnes PM₁₀
700 tonnes SO₂

21 PJ
Electricity
(+ 3.7 PJ Heat!)

The Amercentrale is fuelled for 65% by coal and for 35% by biofuel in the form of wood chips.

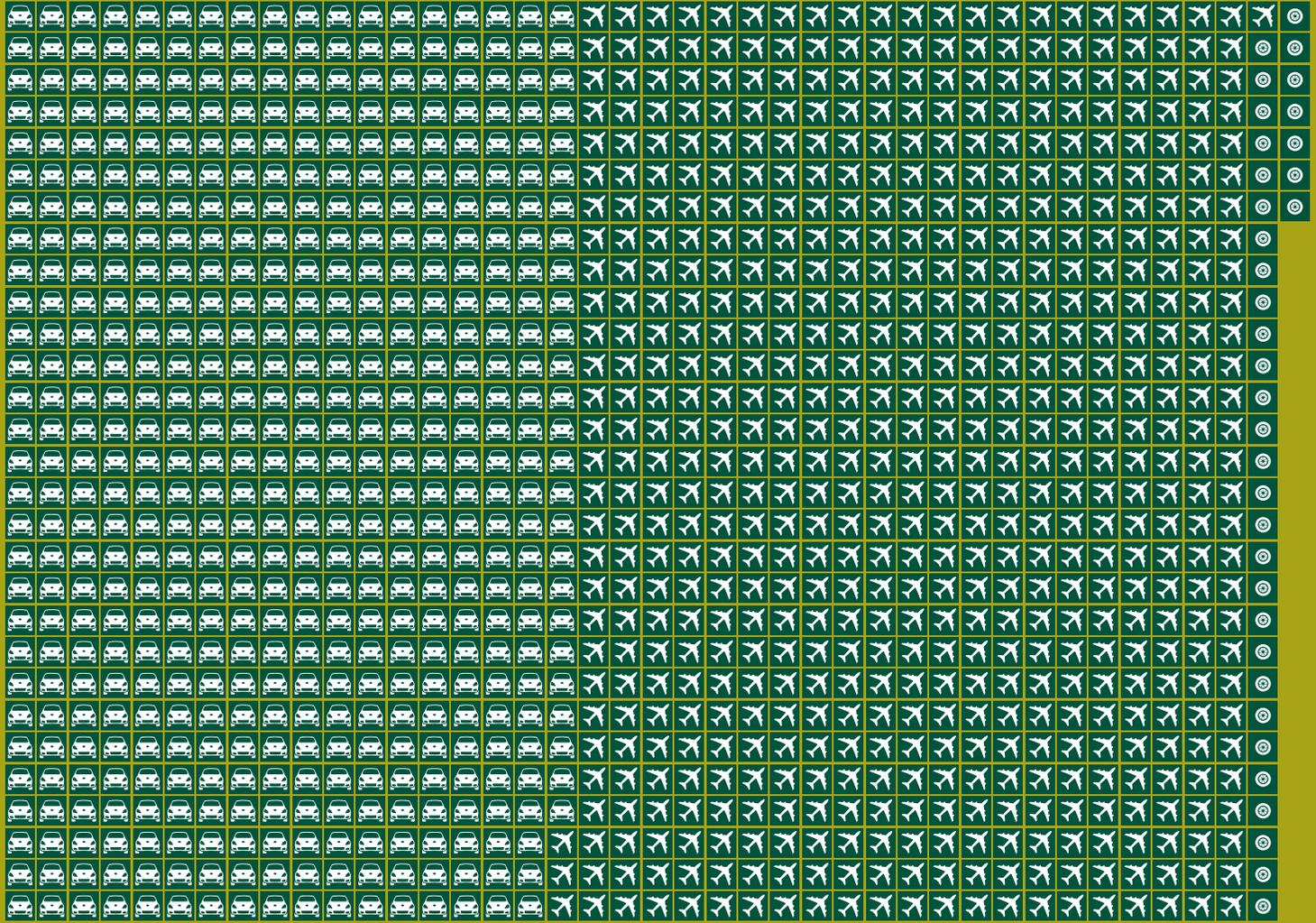
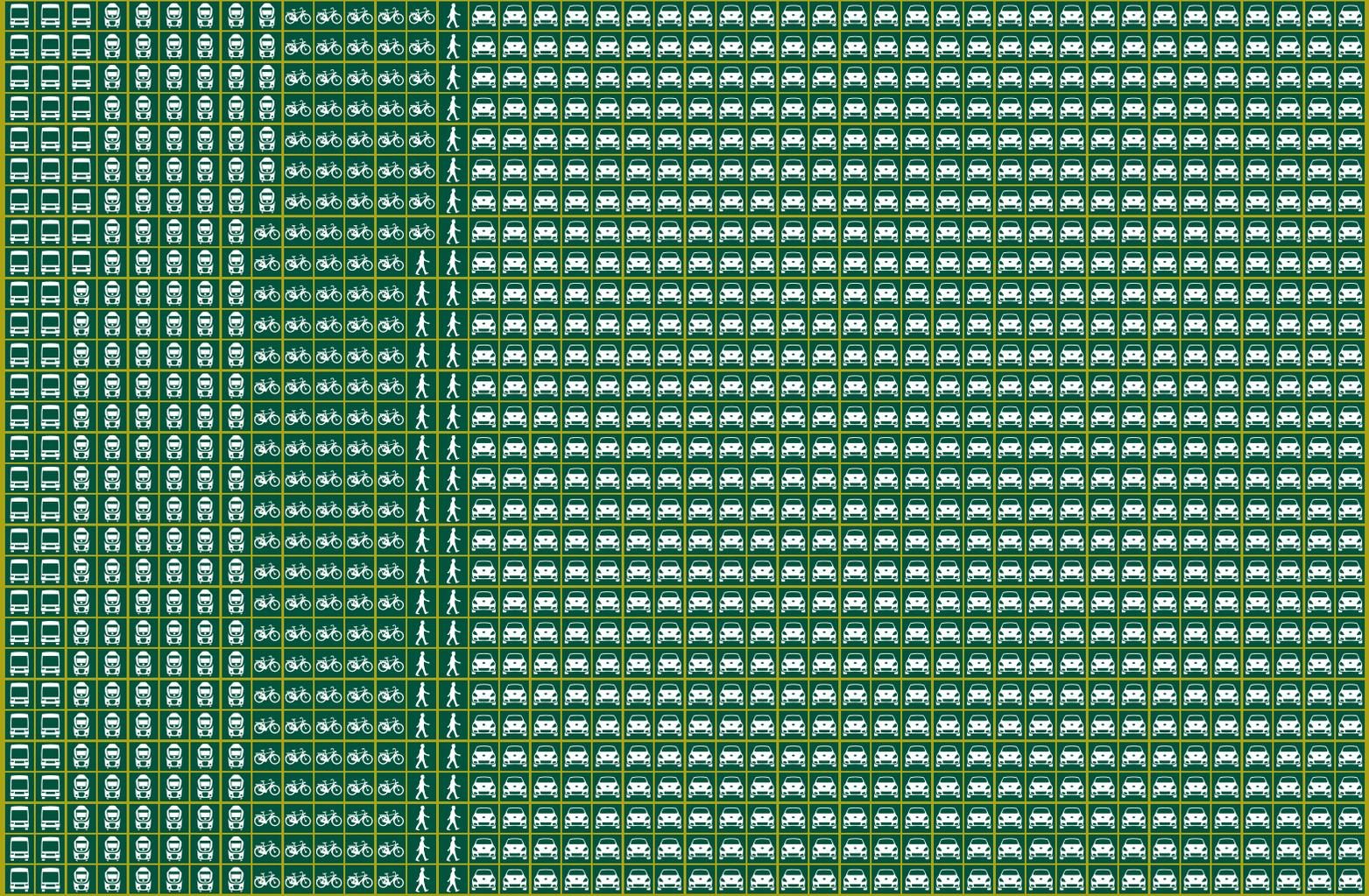
Energy production in 2011

More information:



- PBL (2012), Assessment of the Human Environment
- PBL (2012), Assessment of Green Deals Energy ((in Dutch) Ex-ante evaluatie van Green Deals Energie)
- PBL (2011), Exploration of pathways towards a clean economy by 2050: How to realise a climate-neutral Netherlands
- PBL, CBS & Wageningen UR (2012), Environmental Data Compendium, www.environmentaldata.nl

Background information on the data can be found on www.pbl.nl/nederlandverbeeld (in Dutch).



transport

Kilometres travelled in the Netherlands in 2010



One square represents 100 million kilometres

Transport

Without transportation, everything literally grinds to a halt. The Dutch are real travellers; they travel to work, to the shops, to school, to visit family or friends, to play sports, to restaurants, theatres, cinemas, parks and holiday destinations. And they travel increasingly further away from home. The strongest growth is in air travel.

People in the Netherlands use a diversity of transport modes. The very young travel in buggies, on the backs of bicycles or in the back seats of cars. Schoolchildren usually ride bicycles. University students frequently use the public transport system. Working adults travel most often by car, and the elderly often walk or cycle. Although cars dominate the transportation landscape, bicycles are equally popular for short distances, and public transportation is used by many for longer distances.

Passenger vehicles have changed over time. They have become more comfortable, heavier, faster and much cleaner than before. Over the past years, they have become much more fuel efficient. Dutch traffic also has become safer. Despite the growth in distance travelled, the number of fatalities has decreased dramatically – although the number of injured people has increased.

Transport is not just about people, it is also about goods. Freight transport is growing even faster than passenger transport, although that growth is sensitive to the economic crisis. Goods are most often transported by truck, with inland shipping a close second, followed by pipelines and finally by rail.

There are also disadvantages related to motorised transportation; it is relatively expensive, noisy and polluting. It also emits more greenhouse gases and can cause serious accidents. Still, the biggest frustrations of travellers are traffic jams and delays.

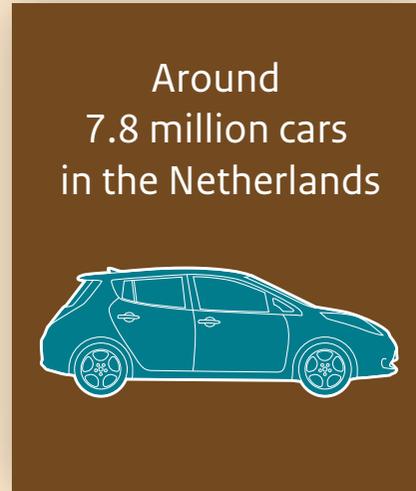
Improving accessibility is always a current topic. Such improvement, however, involves more than just preventing traffic jams; delays caused by traffic jams usually are just a small part of the total journey time. The total distance travelled is at least as important.

In order to reduce traffic jams, improve accessibility and to make traffic cleaner and more fuel-efficient, policies are in place internationally (EU), nationally, provincially and even locally. Recent examples include the construction of rush-hour lanes and additional roads, adjusting speed limits, abolishing the road tax for fuel-efficient cars and offering higher trade-in prices to those who wish to trade in their old, polluting cars for a cleaner version (new or even second-hand). There are also policies that stimulate the use of public transport and bicycles, provide incentives for travelling outside rush-hour times, and that promote the use of electric vehicles and teleworking.

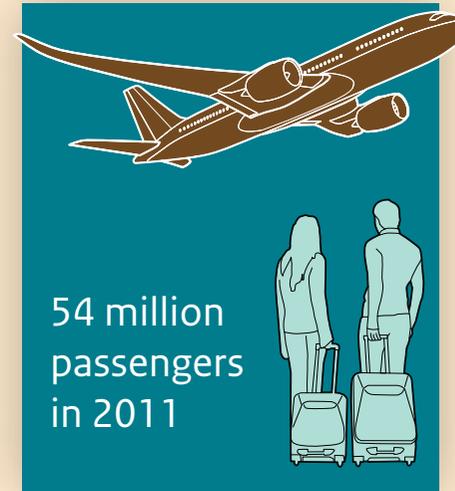
The Dutch Government is not the only party responsible. Many developments are being initiated by businesses and forces within society. Examples are electric cars and bicycles and travel information provided via smartphones. Public-private collaboration in the future hopefully will lead to cheap, fast and clean transportation for everyone!

The environmental consequences ...

The Dutch have never been more mobile. Having the freedom to move around makes life more pleasant. Passenger vehicles and aeroplanes have enabled people to spend their leisure time wherever they want. Compared to a decade ago, Dutch commuters today live further away from their jobs, but – thanks to higher travel speeds – they still spend about the same time commuting. This despite all the fuss about traffic jams. The challenge of drastically reducing greenhouse gas emissions, however, remains.

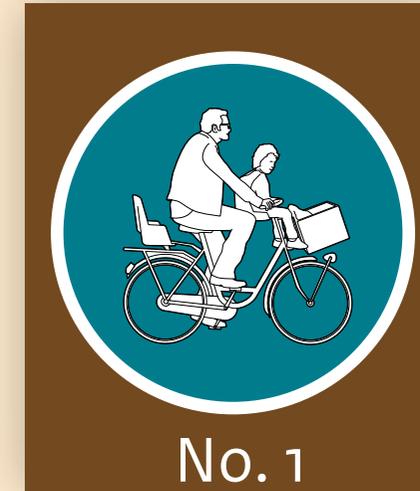


This is a 50% increase compared to 1990 levels.

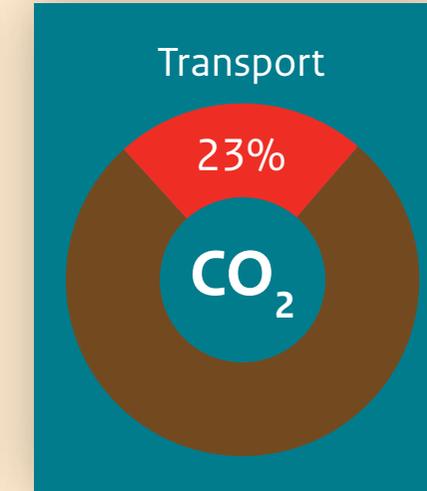


Air traffic to and from Dutch airports has tripled since the 1980s.

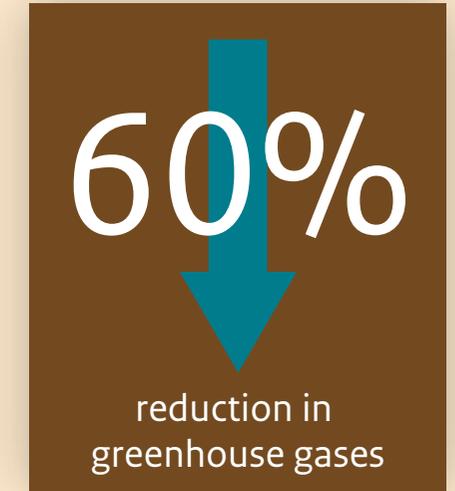
... of increased motorised travel



The Netherlands is the world's number 1 bicycle country. A quarter of all journeys takes place by bicycle.



Motorised transport is responsible for a quarter of CO₂ emissions in the Netherlands, not even counting the emissions from international shipping and aviation.



The EU has set a target of 60% reduction in greenhouse gas emissions from transport for 2050, compared to 1990 levels.

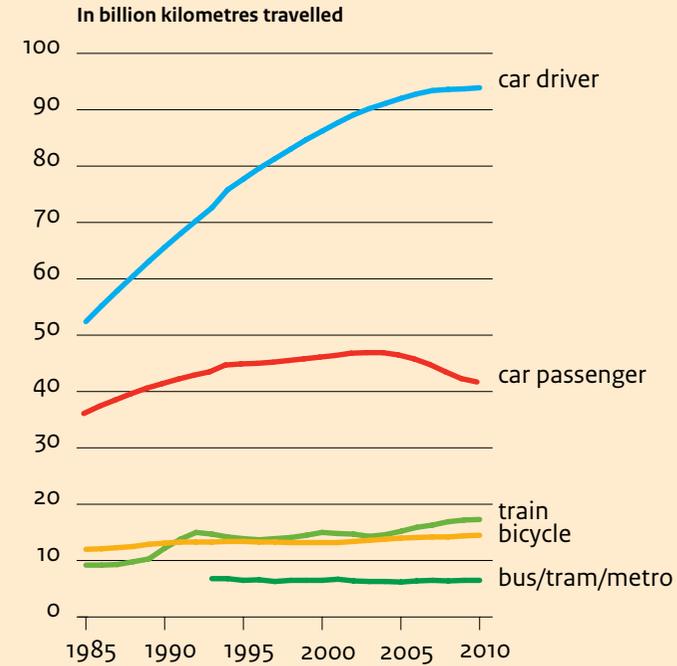
The Dutch travel mostly by car ...

Kilometres travelled in 2010

Car 136,000,000,000 km

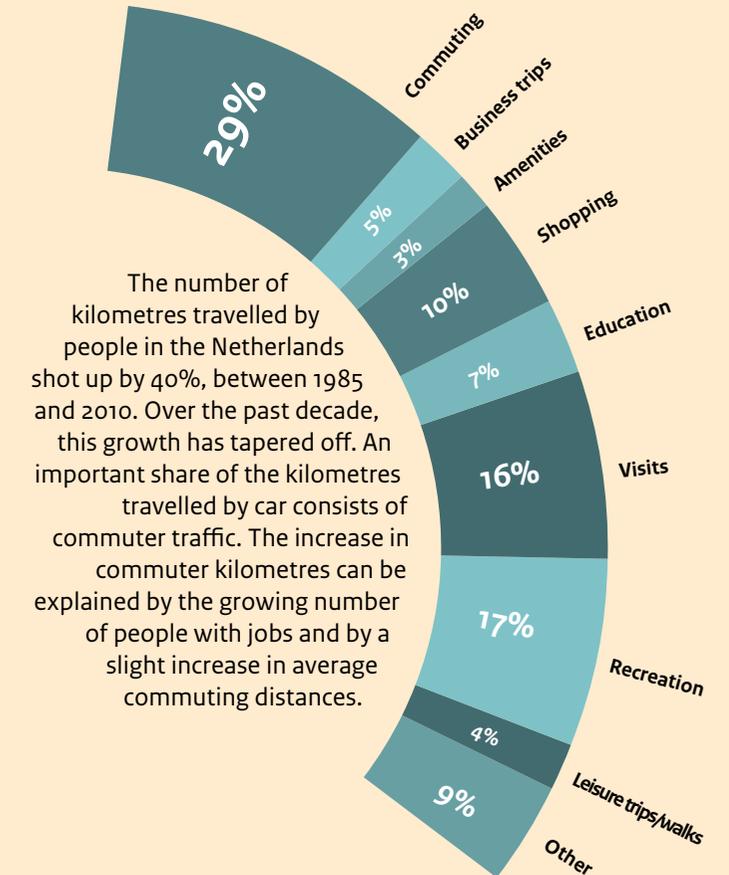


... but the strong growth in car transportation seems to have tapered off



183,000,000,000 km

Where do Dutch people travel to?

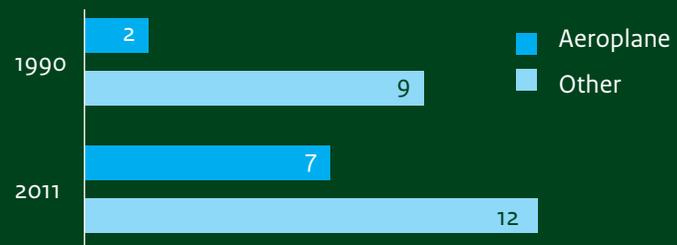


More journeys, longer distances

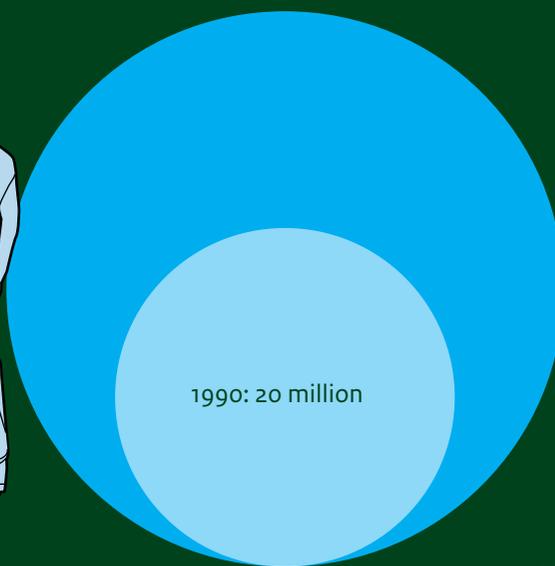
International travel has increased, both in the number of journeys per year and in the distance per journey.

For longer distances, the Dutch often travel by aeroplane, because it is fast and, since the arrival of low-cost carriers, increasingly affordable.

Number of Dutch holidays spent abroad (million):



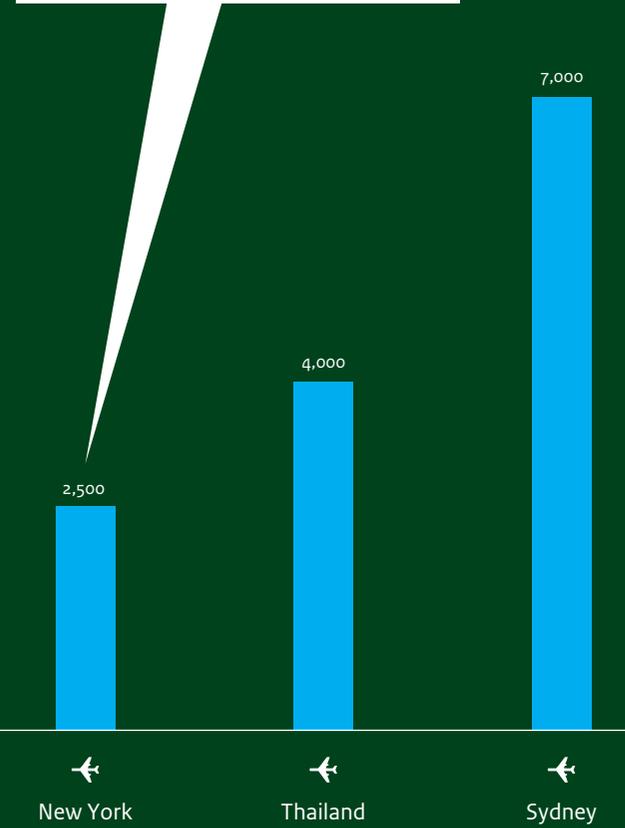
Number of travellers through Dutch airports in 2011: 54 million



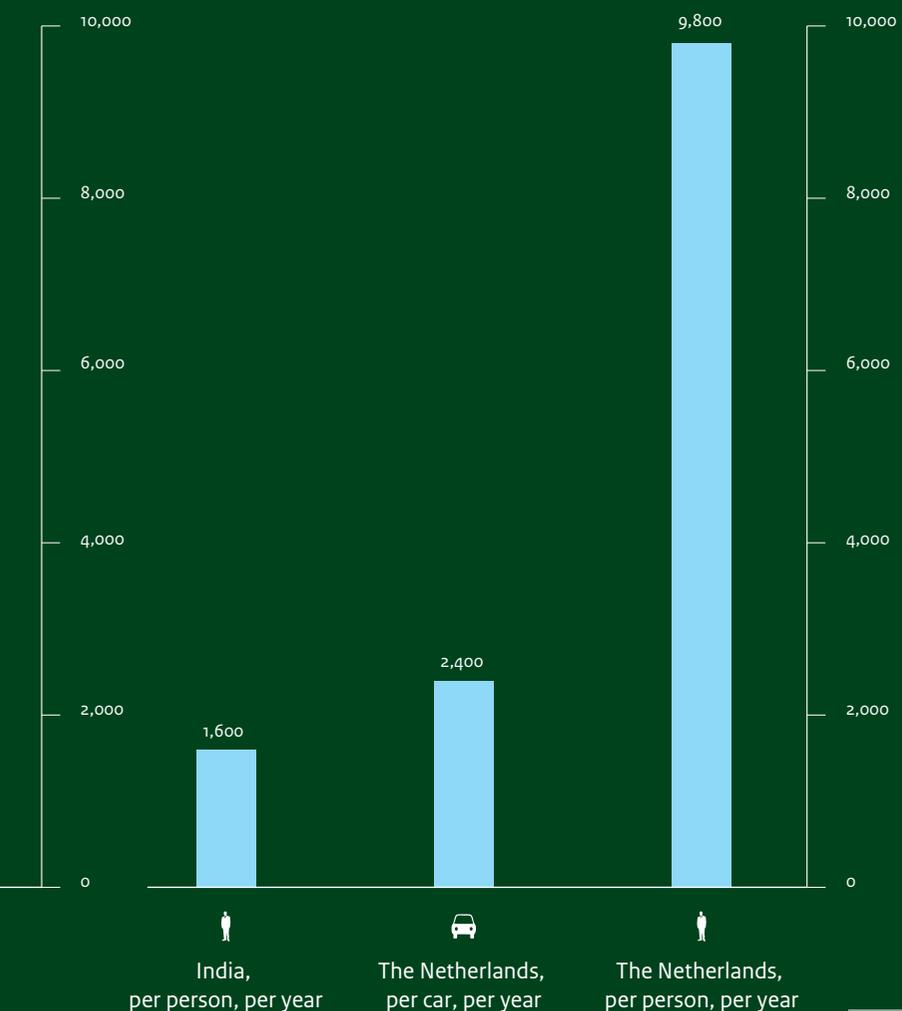
Greenhouse gas emissions in kg CO₂ equivalents, per person, per destination (return trip)



A return flight to New York causes the same amount in CO₂ emissions as a daily car journey of 35 kilometres for one year.

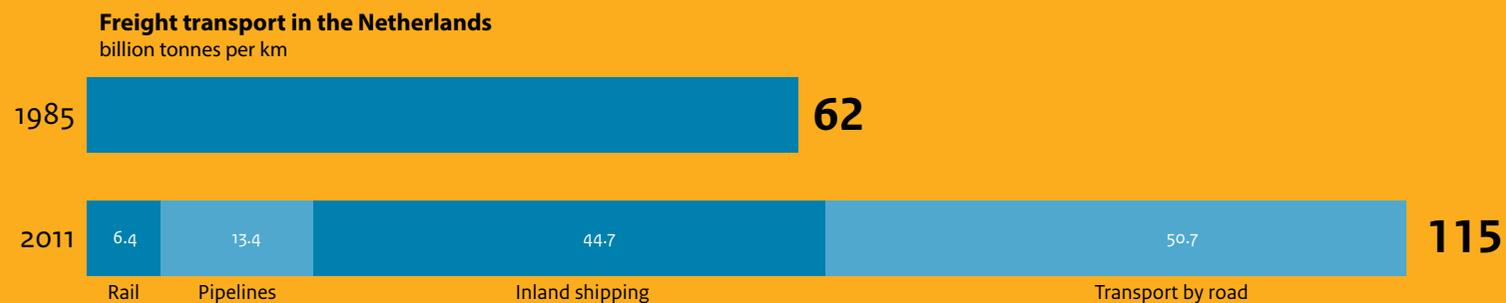


Greenhouse gas emissions in kg CO₂ equivalents, per person, per destination (return trip)



The Netherlands,

The Netherlands is a country of transport flows. Every day, goods are shipped from Dutch ports to the European hinterland, by road and rail, through the air and over water.



a transport-oriented country

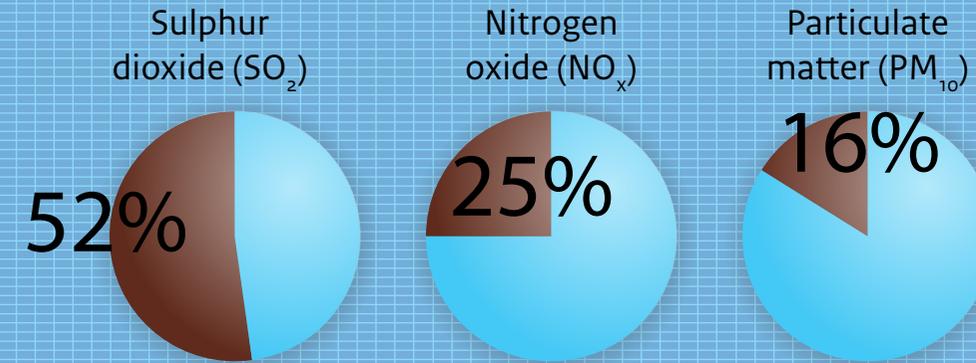
Freight transport
total in 2011, in million tonnes



International shipping

Due to the enormous carrying capacity of ships, maritime freight transport of goods has a relatively low greenhouse gas emission rate per tonne of material, compared to road transport. It seems a relatively environmentally friendly mode of freight transport. On the other hand, environmental policy has sharply reduced the sulphur content in diesel fuel for trucks, but not yet in bunker fuel. Nevertheless, some international shipping emission control measures were recently agreed on, despite the difficulties of multilateral decision-making.

Share of international shipping in air pollutant emissions



Shipping is responsible for a large share of the total emissions of harmful pollutants in the Netherlands, including Dutch territorial waters.

Maersk Emma
the largest
containership
ever built

More information:



- PBL (2012), Assessment of the Human Environment
- PBL (2011), The Netherlands in 2040, a country of regions, Spatial Outlook 2011
- PBL (2012), Electric driving in 2050: consequences for the human environment ((in Dutch) Elektrisch rijden in 2050: gevolgen voor de leefomgeving)
- PBL, CBS & Wageningen UR (2012), Environmental Data Compendium, www.environmentaldata.nl

Background information on the data can be found on www.pbl.nl/nederlandverbeeld (in Dutch).

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