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Financing the transition:

seizing opportunities for a green recovery

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Financing the transition:
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DNB Occasional Study

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Any errors that remain are our sole responsibility.

Content

1 Introduction

1.1 Background

Over five years ago the world's leaders signed the Paris Climate Agreement. That set a clear limit for global warming, namely a maximum of 2°C or preferably 1.5°C. Many countries translated the Paris objectives into specific greenhouse gas reduction targets enshrined in climate laws. The EU aims to be climate-neutral in 2050, with an intermediate target of a reduction of at least 55% of CO_2 in 2030 compared to 1990. This is a more ambitious target than the Netherlands has set at national level in the Climate Act (-49%). Despite these clear, ambitious climate targets, the current efforts are still insufficient. The latest estimate by PBL Netherlands Environmental Assessment Agency shows that the Netherlands' adopted and intended policy will deliver a -34% reduction in CO_2 in 2030 compared to 1990. The current efforts are insufficient to reach the climate objectives (Study Group on the Fulfilment of the Climate Objectives, 2021). In addition, the faster the transition, the greater is the likelihood of abrupt adjustments. A sudden transition can be harmful to the economy and the financial sector (DNB, 2018). This risk will increase if the agreed targets for limiting global warming are not achieved. It is therefore of vital importance that the new coalition government substantially strengthens climate policy in the Netherlands.

In order to limit the financial risks and promote sustainable economic development, DNB is calling for an acceleration and scaling up of climate investment. This is investment that contributes to the achievement of the climate targets. Current investment in the climate transition is inadequate, despite the large volume of finance potentially available. The bulk of the climate investment will have to be made by private parties. The financial incentives for such investment are often insufficient, however. For example, the estimated volume of annual climate investment in 2019 totalled around EUR 580 billion worldwide, while in the energy sector alone it is estimated that between EUR 1,600 and 3,800 billion will be required annually to

achieve the 1.5°C target (CPI, 2019 and IPCC, 2018). This study identifies the underlying impediments to the scaling up of climate investment, with a focus on the financing side. Policy options will also be presented to tackle the impediments and promote a green recovery from the COVID-19 crisis.

1.2 Impediments to the financing of the transition

There are various reasons for the inadequate level of climate investment. The main reason is that the business case for carbon-intensive projects is often much more attractive than the business case for sustainable alternatives (impediment 1). This is principally because greenhouse gas emissions are often underpriced. The business case is also heavily dependent on (current or future) government policy, which is subject to significant uncertainty. This inhibits the necessary climate investment and improvements to the sustainability of the economy. That is reflected in a lagging share of sustainable finance in the overall financing flows. Furthermore, the energy transition requires investment in new, often unproven technologies and sustainable businesses that have only recently been established. This creates additional uncertainty for financiers with regard to the business case, leading to a mismatch between the risk profile of required climate investment and the risk preferences of private financiers (impediment 2). In addition to investment in relatively young sustainable businesses, more investment is also required to reduce carbon emissions of established businesses. As yet they have insufficient market incentives to make the transformation (impediment 3). This is due in part to inadequate carbon pricing but also due to a lack of binding standards and transparency on climate risks.

1.3 Policy options

Kick-starting climate investment requires a combination of pricing, support and regulation. Adequate pricing of carbon emissions through higher carbon taxes and the phasing out of fossil fuel subsidies is crucial to improve the business case (Chapter 3). In addition to taxes on polluting economic activities, support is required from innovative, sustainable business and techniques. In sectors affected by coordination problems between investors and financiers, the government must play a stronger coordinating and supporting role. The success of the energy transition for many sectors depends on successful technological innovations, but the businesses behind this type of innovation are often not market-ready. It is important that governments do more to promote innovative investment and its financing, through subsidies, co-financing and guarantees. This requires consistent and reliable government policy, so that private investors have sufficient certainty to provide the necessary finance on a long-term-basis. Another precondition is that these efforts must not jeopardise the stability of public finances. Regulators can boost the private financing of innovations by promoting the market for equity finance and financial innovations (Chapter 4). Finally, established businesses must be given incentives to reduce carbon emissions. That requires not only market incentives but also reporting requirements, including on climate matters, and binding supervisory and risk standards. Until better data are available, current indicators used to measure sustainability can already provide some insight (Chapter 5). In the review of the monetary strategy the ECB and national central banks such as DNB consider how climate risks can be incorporated in monetary policy. The policy options are discussed in greater detail in Chapter 6.

2 Investment task and financing sources

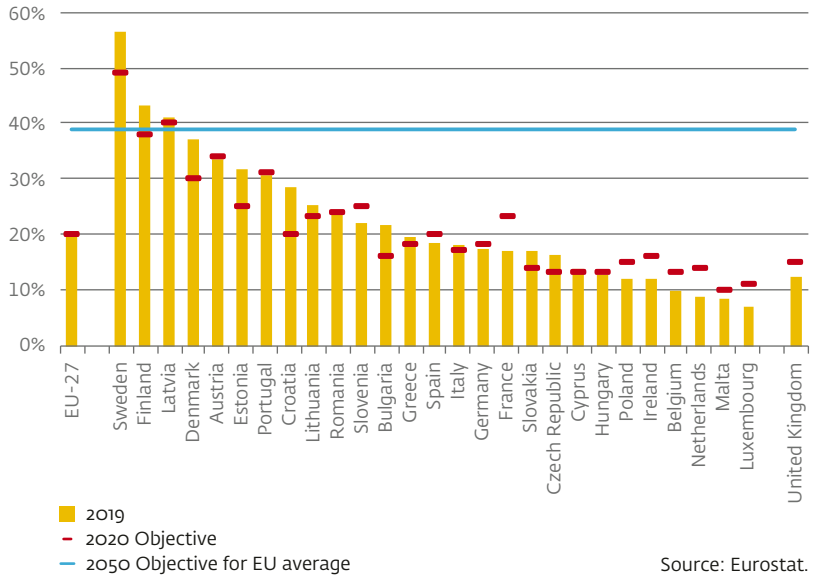
Climate investment needs to be scaled up to achieve the climate targets. This investment is financed by different parties (public and private) and in different forms (debt, equity). The type of investment, coupled with the risk-return profile, is crucial in determining the source and type of financing. Given the size and variety of the investment task, the energy transition theoretically requires all sources of financing.

2.1 Investment task

The energy transition requires large-scale investment in energy services and increased investment in reducing carbon emissions of manufacturing, transport, agriculture and buildings. Most investment is related to energy consumption, such as the generation of sustainable energy, electrification of energy consumption and increased energy efficiency. The energy sector, accounting for 35% of total emissions, is responsible for most greenhouse gas emissions around the world. A substantial scaling up of sustainable energy investment is required in order to achieve climate targets. The EU has set itself the target of generating 38% to 40% of its energy consumption sustainably by 2030. This means the share of renewable energy needs to be doubled in the decade ahead. In 2019 that share was an average of 20%, with the Netherlands, at just 9% of renewable energy, lagging far behind other EU Member States (Figure 1). The agreed Dutch target of 14% renewable energy in 2020 was therefore not achieved.

Figure 1 Objective and share of renewable energy of EU Member States

Percentages of gross final energy consumption in 2019



Source: Eurostat.

Table 1 uses data supplied by the International Energy Agency (IEA) to show that the gap between worldwide investment in sustainable energy according to the 'current policy scenario' and the 'sustainable development scenario' runs to hundreds of billions of dollars per year. Investment in energy efficiency also lags far behind the sustainable scenario under the current policy.
On a cumulative basis over 10 years that amounts to an investment gap of roughly USD 6,700 billion, equivalent to 7.6% of global GDP.[2] Apart from an increase in sustainable energy investment, the forthcoming decade will also

2 The investment gap is the difference between the sustainable scenario and the current policy scenario with regard to investment in 'sustainable energy', 'sustainable energy and other items' and 'energy efficiency'. The 'current policy scenario' is based on the existing policy in 2019. Since then the climate policy has been strengthened in a number of regions.

require a shift from fossil to sustainable energy. Table 1 shows, however, that under the current policy scenarios investment in fossil energy will continue to increase in the decade ahead, whereas a decrease is required in order to achieve the Paris target.

Table 1 Worldwide energy investments

USD billion, 2018

	Annual average 2014-2018	Annual average. 2019-2040	
		Current policy scenario	Sustainable development scenario
Fuel	930	1.060	727
Oil and natural gas	827	986	681
Coal	98	66	22
Biofuel	5	8	24
Power plants	775	832	1.014
Power plants	483	460	653
Fossil fuel	*138*	*120*	*66*
Nuclear energy	*41*	*53*	*62*
Sustainable energy	*303*	*288*	*524*
Electricity networks	291	360	345
Fuel and power plants	1.706	1.893	1.741
Energy efficiency	238	346	624
Sustainable energy and other	127	179	332
End use	365	525	957
Total	**2.071**	**2.418**	**2.697**

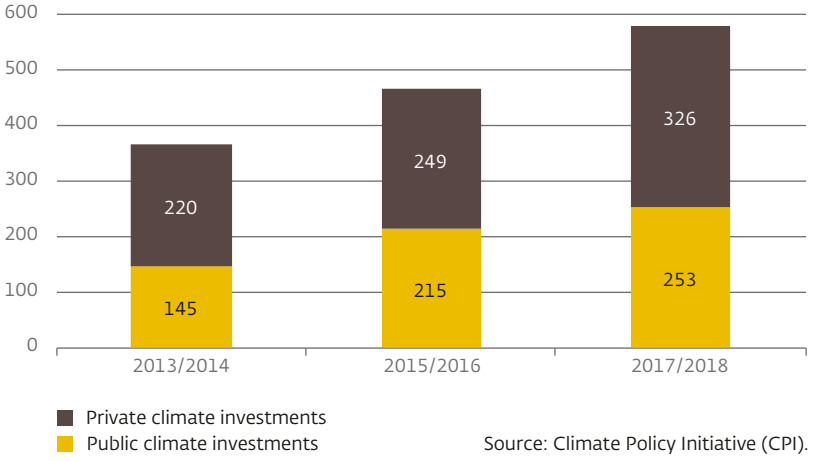
Source: IEA (2019)

2.2 Financing sources

According to an estimate by the Climate Policy Initiative, in the last few years slightly over half of global climate investment is being made by private parties, such as businesses and financial institutions (Figure 2). The bulk (84%) of this private climate investment goes to the sustainable energy sector. Public climate investment is spread more widely over different sectors, with most investment taking place in the transport sector (37% of the public total). By far the bulk of the public investment (84%) is made through public development banks or financing institutions. The direct contribution from government budgets has nevertheless increased in recent years, probably due to a tightening of climate policy.

Figure 2 Global climate investments 2013-2018

Two-year averages; USD billions

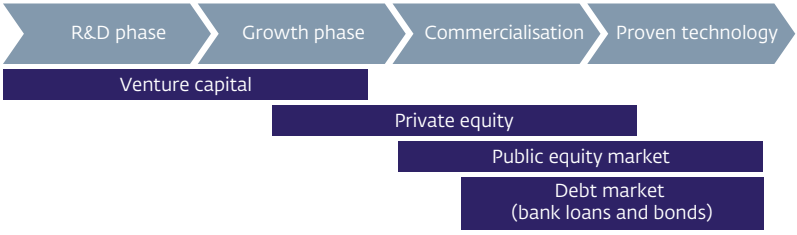


Source: Climate Policy Initiative (CPI).

Notes: The CPI dataset of worldwide climate investments is incomplete, but it does provide a rough indication of total climate investments.

Private parties broadly use three types of financing for climate investment: retained earnings, external equity financing and debt financing (such as bank loans and bonds). The risk return profile of an investment is crucial in determining the type of investment that is appropriate (Kerste and Weda, 2010). Businesses and projects in their initial phase require financing for research, innovation and growth. This type of investment has a relatively high risk due to an uncertain payback period and low liquidity. This matches the risk appetite of private equity and venture capital funds, and the institutional investors backing them. These parties require more compensation due to the high risk. Businesses and projects at a more advanced stage of their life cycle need financing in particular to commercialise and consolidate their competitive position. This type of financing matches the risk profile of equity investors, bond investors and other debt issuers, such as banks (Figure 3).

Figure 3 Life cycle of a project/business and financing form



Source: Kerste, Weda, 2010, Financing the Transition to Sustainable Energy.

Given the size and variety of the required climate investment, all the aforementioned financing sources are theoretically required for a successful energy transition. Since many sectors and countries are still at the beginning of the transition, the emphasis in recent years has been on financing new technologies. Hence there is a need to scale up investment in technologies that contribute to carbon reduction and storage (Citigroup, 2021).
Other innovative investment is also required to increase the efficiency of industrial processes and reuse raw materials. Given the required volume of investment and pressure on government finances due to the pandemic, it is very important to scale up private investment. In order to obtain private financing, a good business case is required, as the next chapter shows.

3 Business case for climate investment

The level of climate investment is insufficient. The main reason is that the business case is often unattractive due to the underpricing of carbon emissions. Investment in innovative sustainable technologies is also subject to great uncertainty. That also has a negative impact on the business case. The uncertainty has been exacerbated by the COVID-19 crisis. More government involvement is therefore required in order to stimulate innovative climate investment.

3.1 Reasons for limited business case for climate investment

The business case for climate investment is often unattractive because the return is too low relative to the risk. The main reason for this is that carbon emissions are not taxed sufficiently (section 3.1.1), so sustainable investment plans are less competitive than fossil alternatives. At the same time the financing of new sustainable technologies entails high risk due to its long-term nature and uncertain payback period (section 3.1.2). Due to the unattractive business case the market is failing to generate the socially desirable volume of climate investment. As a result, the market outcome of climate investment differs from the social optimum (Dasgupta, 2021).

3.1.1 Underpricing of negative externalities

The main reason for the limited business case is the low pricing of harmful carbon emissions. Correct pricing assigns the costs of negative externalities to the party that is responsible for them. This is a so-called Pigouvian tax, a cost allocation that corrects any undesirable or inefficient market results due to defective pricing of negative externalities. In theory the optimal carbon price is equivalent to the present value of future damage caused by an additional tonne of carbon emissions. A carbon price that reflects the social costs of the externalities leads to a more efficient result and

encourages the allocation of production factors to cleaner sectors (OECD and World Bank, 2015). Such a tax creates market incentives for emission reduction, because consumption, investment decisions and production processes are based on this price. The costs of negative externalities can be attributed to the polluter through higher carbon taxes and the phasing out of fossil fuel subsidies and tax exemptions.

The average effective carbon tax, or the emission tax plus energy taxes, is currently below EUR 30 per tonne of carbon emissions in most countries (box 1). Due to the negative impacts on competitiveness and concerns about leakage and rising consumer prices, support for the introduction of a higher carbon tax is often lacking in practice. The effective carbon tax needs to be substantially higher to price the negative externalities correctly. The Netherlands Environmental Assessment Agency (PBL) and the Netherlands Bureau for Economic Policy Analysis (CPB) estimate, for example, that the carbon price in the Netherlands in 2018 should be EUR 103 per tonne of carbon emissions in order to achieve the climate targets (Box 1). Precisely how high the carbon price should be remains highly uncertain, however. The Carbon Pricing Leadership Coalition states, for example, that by around 2030 a price of EUR 42-84 per tonne of carbon emissions is required worldwide to bring emissions into line with the Paris targets (CPLC, 2017), with the upper limit determining the climate ambitions for 2050 (Stern and Stiglitz, 2021). Other studies estimate that the required worldwide carbon price must be considerably higher (see for example Ricke et al., 2017; Moore et al., 2017 and Pindyck, 2019).

Box 1 Effective emission tax too low

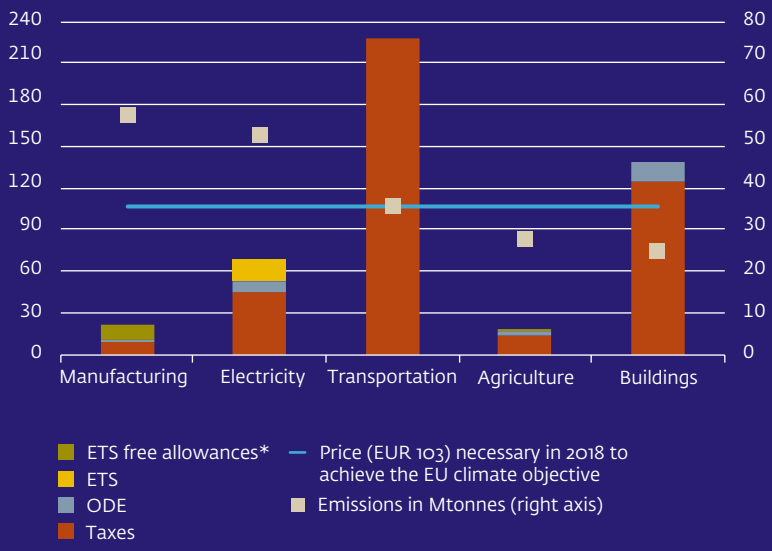
The *effective price* of greenhouse gas emissions comprises explicit taxes, such as a carbon tax or tradable emission allowances, and implicit taxes, such as taxes on fossil fuels and energy consumption. According to the PBL and CPB a higher effective carbon price is necessary to achieve the Paris objectives (Bollen et al., 2019). This price must rise every year, because the climate objectives become stricter over time, with more expensive options for emission reduction only becoming profitable at higher carbon prices. The PBL and CPB assume that achieving the climate targets requires an annual rise in the effective carbon price of 3.5%, so this should amount to EUR 103 per tonne in 2018, given the initial value of EUR 93 per tonne in 2015 (CPB and PBL, 2015 and Aalbers et al. 2016). In practice the carbon price is often significantly lower. Estimates by the OECD (2018), for example, show that for approximately 89% of carbon emissions in the 42 countries examined the 2018 price was below EUR 30.

If we use a similar calculation for PBL data, it can be seen that the proportion of emissions for the Netherlands priced below EUR 30 per tonne in 2018 was approximately 60%. The carbon price also varies widely among the sectors, both in the Netherlands and in other EU Member States. For example, manufacturing and agriculture in the Netherlands have relatively low effective carbon taxes, while private households (non-business emissions) and the service sector pay a relatively high price for their emissions (see Figure 4). This is mainly because a number of sectors have exemptions and degressive tax rates for competition reasons. Moreover, these taxes are aimed not only at carbon emissions, but also at the pricing of other external effects, such as traffic congestion and particulate matter. The latter explains, for example, the relatively high road traffic tax. The effective emission tax for manufacturing and the electricity sector is now higher than in 2018, particularly due to the sharp rise in the ETS price and to a lesser extent the

introduction of a national carbon tax for manufacturing. There are also large differences between businesses within sectors, for example because large energy-intensive businesses pay less tax due to degressive energy rates. It is also notable that within the transport sector the most carbon-intensive sectors, such as aviation and shipping, barely pay any energy tax. This is due to exemptions for aviation fuel and fuel oil. Compared to the other EU Member States, the effective emission tax in the built environment is relatively high in the Netherlands, particularly due to the Sustainable Energy Surcharge (ODE) on the consumption of natural gas. In the other sectors the picture in many EU Member States is similar to that of the Netherlands.

Figure 4 Effective carbon tax in the Netherlands by sector

Euro by ton CO_2 (left axis), Megaton emissions (right axis)



Source: Own calculations on data of PBL.

Many businesses base their investment decisions on a higher price for carbon emissions than the actual effective carbon tax. They do this by using a so-called shadow price or internal tax, which takes account of the assumed negative externalities in the investment costs. Around 1,400 private companies, such as Microsoft, DSM and Novartis, use such a price. The European Bank for Reconstruction and Developments does this, for example, when it finances industrial projects. This is calculated with a shadow carbon price of EUR 37-74 per tonne of carbon emissions in 2020, rising to EUR 72-144 in 2050 (EBRD, 2019). The level of the shadow prices used varies widely depending on the sector and the business, but it is usually well above the actual effective carbon tax. Although there is still much uncertainty concerning the "correct" pricing of carbon emissions, it is clear that the current effective carbon taxes are generally too low.

3.1.2 High risks for climate investment

Another reason for the unattractive business case is the high financing risk of climate investment. Such investment is often innovative, long-term and has an uncertain payback period. Furthermore, the profitability of climate investment depends on future government policy. This makes investment less attractive to private parties, unless they are offered high risk compensation. As a result, the financing of sustainable investment is relatively expensive. Although some investors are prepared to accept a lower return compared to the risk of sustainable investment, there are as yet few indications that this so-called 'greenium' is lowering the financing costs of climate investment (BIS, 2020).

The COVID-19 crisis has exacerbated the uncertainty surrounding investment with a high risk profile. Although the crisis has sharply increased savings at macro level, private investment is generally under pressure due to uncertainty surrounding the economic outlook and the financial position of businesses.

As a result, firms are reluctant to make new investments. This is reflected among other things in the demand for financing to invest in machinery and other production resources, which has fallen every quarter since the start of the crisis (ECB, 2021).

3.2 Potential to improve the business case

3.2.1 Pricing of negative externalities

A strengthening of the business case depends crucially on improved carbon pricing. Currently, polluting sectors, such as manufacturing and agriculture, pay very little for their emissions. The pricing of carbon emissions at international and European level is coordinated in order to protect competitiveness and limit carbon leakage effects (see Chapter 6). At the European level the emissions trading system covering the electricity sector, refining and the chemical industry should be expanded to include other sectors such as transport, shipping and buildings. The ETS also needs to be improved with a lower emission ceiling and fewer free ETS allowances for manufacturing. In order to prevent European businesses losing market share to polluting competitors outside the EU as a result of the stricter climate policy, a carbon-based levy on imports at the EU's external border is desirable (the so-called carbon border adjustment mechanism, or CBAM). It is important that this complies with WTO rules through the imposition of a levy on importers comparable to that imposed on EU producers. An additional policy is also required to reduce the 'waterbed' effect within the EU. Since the emission ceiling has been set at European level, additional emission reduction for ETS sectors at national level creates more scope to emit in other countries. If countries introduce a supplementary climate policy, the emission allowances thereby released must be cancelled. This can be done, for example, by further refining the market stability mechanism (MSR) so that unused allowances can be withdrawn sooner from the market. That would also give investors more certainty, because the ETS prices would then fluctuate less widely.

3.2.2 Financial support from government

Although carbon pricing is the most effective instrument, international coordination problems and fear of loss of competitiveness often make it difficult in practice. Other government resources – such as guarantees, cheap loans and subsidies – are therefore required to improve the business case for climate investment. Even if worldwide emissions are adequately priced, these other forms of government involvement are required in order to stimulate climate investment. This type of investment is characterised by high uncertainty and high start-up costs. Moves to reduce emissions for the heat supply of buildings, for example, often run into an 'unprofitable peak' where sustainable alternatives such as heat networks cannot compete with natural gas. Forms of government support reduce this uncertainty and cost, so new technologies can be developed, scaled up and ultimately left to the market. This requires a tailor-made approach. The business case for increased sustainability in the housing market, for example, particularly requires higher subsidies, whereas the scaling up of investment in energy infrastructure requires guarantees and a stronger coordinating role for government in addition to subsidies. Government support, combined with a clear roadmap for offshore wind parks, has led to substantial cost reductions. Due to a combination of a minimum price guarantee and construction of infrastructure, part of the uncertainty has been eliminated and private investment in wind turbines has increased greatly. The cost of offshore wind energy consequently fell by 71% between 2013 and 2018 (Netherlands Court of Audit, 2018). As a result, this technology can now compete with fossil alternatives in the market without subsidies.[3] A precondition for government financial support is that the stability of public finances is not unduly strained. For the Netherlands, in any event, it appears possible to free up sufficient

3 Only the connection to the electricity grid is still paid for by the government through the network operator.

fiscal room in due course to finance these additional climate expenditures, partly because efficient climate policy will generate additional fiscal income (see 3.4).

3.2.3 Coordinating role

In markets where coordination problems exist between investors and financiers, governments must play a stronger coordinating role (Mazzucato, 2013). This coordinating role is required particularly in the financing of new sustainable technologies, such as sustainable hydrogen, heat networks, carbon capture and storage and other projects that require a network structure or adjustments to the existing network (IBO, 2021). The energy transition in Dutch manufacturing requires infrastructure and technologies that are not yet market-ready (Study Group on the Fulfilment of the Climate Objectives, 2021). There is also a coordination problem between supply and demand in investment in new infrastructure for electricity, heat and carbon capture. This is a 'chicken and egg' problem, with manufacturing holding back on plans to electrify because insufficient capacity is available in the network, while the network operator holds back on network expansion until demand from manufacturers increases (CE Delft, 2021). More government support is required to coordinate supply and demand effectively in the planning, financing and construction of the required infrastructure for energy services and manufacturing. When governments play a coordinating role, it is important that they state clearly the period and extent of support to be provided for certain technologies, before leaving it to the market.

3.3 Opportunities for more government involvement

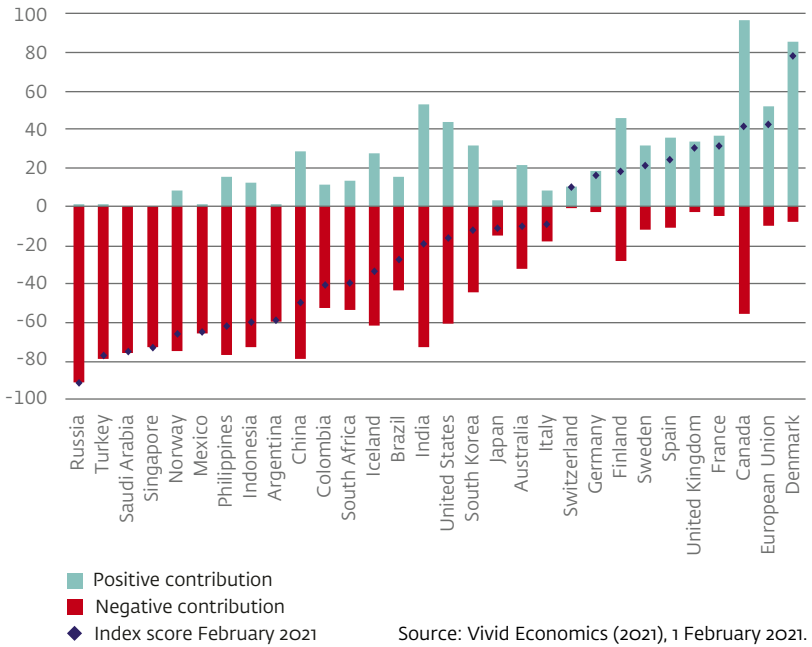
The extensive COVID-19 support packages from central banks and governments also offer potential for scaling up climate investment. Central banks around the world have introduced measures to keep financial conditions accommodative. The ECB's Pandemic Emergency Purchase

Programme, for example, has reduced the market premiums for credit, liquidity and term risk (Lane, 2020). The favourable market conditions also apply to sustainable investment. In addition, the government measures provide opportunities to strengthen climate policies. As well as immediate support, a number of countries have also announced long-term investment. These support packages provide an additional opportunity to stimulate both employment and the energy transition. According to the UN, a green recovery is crucial to fulfil the climate agreements (UNEP, 2020). If the policy response focuses largely on maintaining current production techniques, there is a risk of a long-term 'lock in' of the current carbon-intensive economy, with no prospect of achieving the Paris objective.

The survey of support measures in the 50 largest economies conducted by the Global Recovery Observatory (2021) shows that fewer than 20% of the long-term measures can be considered green. There are also major differences between countries. In China, Russia, India and the United States, for example, the support measures announced hitherto have predominantly been harmful to the climate and the environment (Vivid Economics, 2020; Climate Action Tracker, 2020; and UN 2020). In the United States the climate impact has improved recently due to the December 2020 stimulus package and various measures taken by the new Biden administration, but the net impact remains negative (Figure 5). The climate impact of the support measures in the United States will nevertheless be positive if the proposed infrastructure plan known as the 'American Jobs Plan' is adopted. The EU has made the energy transition an integral part of its joint policy response to the COVID-19 crisis. The EU recovery fund and the multi-year budget provide a combined stimulus of EUR 1,800 billion and at least 30% of this will be spent on climate objectives. The climate impact of stimulus measures has also been predominantly positive in individual Member States such as Germany, France, Spain, Denmark and Sweden. Germany, Spain and France, for

Figure 5 Climate impact of COVID-19 stimulus packages of G20 countries

(>0 means a positive impact on climate and environment, <0 means a negative impact on climate and environment)



Source: Vivid Economics (2021), 1 February 2021.

example, have responded to the COVID-19 crisis by announcing additional investment in research and development into sustainable technologies, electric transport and sustainability measures for the built environment. Furthermore, Germany has recently introduced a carbon tax for the transport sector.

The Dutch policy response to the COVID-19 crisis is not included in the above analysis, but it is clear that it has so far included few concrete measures that directly promote a green recovery. Climate policy during the COVID-19 crisis was focused on the further implementation of the 2019 climate agreement, which to a large extent has yet to be converted into concrete measures. The Netherlands has, however, recently established the National Growth Fund of EUR 20 billion for the next five years, with climate impact included in the allocation of funds. The end of 2019 also saw the formation of Invest-NL, a EUR 1.7 billion fund aimed partly at stimulating public-private financing for the energy transition. Due to the COVID-19 crisis, however, Invest-NL has recently focused on emergency assistance for businesses. It is important that Invest-NL is given room to primarily use its resources to finance the energy transition.

Hence there are still many opportunities at national level to improve the business case for climate investment through subsidies, guarantees and co-financing. The sustainability of owner-occupied homes should be made financially more attractive, for example, because such investment is often unprofitable under the current subsidy schemes. Improvements in the sustainability of social housing can also be accelerated through discounts on the landlord levy tied to climate investment. This type of measure would not only contribute to the energy transition, but would also boost the wider economy in the short term. For manufacturing and energy services more government support and coordination is also required to resolve the 'chicken and egg' problem of infrastructure. It is important that the Netherlands seizes the opportunities for a green recovery, since current efforts are failing to achieve the specified targets (Study Group on the Fulfilment of the Climate Objective, 2021).

3.4 Obstacles to greater government involvement

A more active role on the part of European governments requires fiscal room to grant subsidies, guarantees or direct finance for the transition and hence improve the business case for climate investment. The deterioration of public finances due to the COVID-19 crisis, however, means there is less fiscal room available for climate policy. The European Commission estimates average government debt in the EU at 94.6% of GDP in 2021, with a majority of EU Member States exceeding the 60% benchmark (European Commission, 2020b). The debt ratio has never been as high since the establishment of the monetary union. Although low interest rates are keeping the high debt relatively affordable, many countries will ultimately have to reduce their debt levels, in line with EU fiscal rules. Higher public debt often leads to lower public investment (Picarelli et al. 2019). After the financial crisis too, public investment in a number of EU Member States fell due to the severe cuts required under the Stability and Growth Pact (SGP). In southern Member States with high government debt such as Greece, Italy, Portugal and Spain, government investment after the financial crisis decreased over the long term and remains lower (measured as a percentage of GDP) than before the crisis.

The level of public expenditure required to achieve the climate objectives in the Netherlands and the EU remains unclear. It will depend on the implementation of the EU Green Deal and the application of the European reduction target of 55% to national policy. A rough indication of the budgetary implications can nevertheless be given on the basis of an impact assessment by the European Commission (European Commission, 2020a). This estimates the total annual energy investment required for a 55% emission reduction in 2030 to be EUR 420 billion for the EU, i.e. 2.9% of GDP annually. This includes both private and public investment.[4] Assuming that

4 This estimate does not include investment in the transport sector.

public climate expenditure accounts for less than half of the total investment costs (roughly in line with Figure 2), this means the annual commitment of government finances in most EU Member States will be no higher than 1.4% of GDP, and probably lower. The recent recommendation by the 'Study Group on the Fulfilment of the Climate Objectives of the Green Deal' estimates that in the Netherlands public expenditure will have to rise from EUR 4.5 billion to EUR 10 billion per year, or 1.2% of GDP, to achieve a 55% emissions reduction.

The reduction in fossil fuel subsidies and better carbon pricing provides more fiscal room for government support for pubic climate expenditure. Part of the additional expenditure on climate policies can be financed by allocating the increased revenues from more effective carbon taxation and phasing out fossil fuel subsidies. According to the Ministry of Economic Affairs and Climate Policy, annual fossil fuel subsidies amount to at least EUR 4.5 billion (Ministry of Economic Affairs and Climate Policy, 2020). The bulk of these are excise duty exemptions for airline companies (EUR 2.5 billion) and shipping companies (EUR 1.5 billion). However, this estimate does not include degressive energy taxes and exemptions for refining, fuel consumption and power generation from coal and gas. If these are added, the fossil fuel subsidies are estimated to be EUR 17 billion, or 2.1% of GDP (Metten, 2021). Not all fossil fuel subsidies can be phased out immediately, however, as emissions could leak away and competitive positions could be adversely affected. In addition, such measures must be coordinated well internationally. For example, international treaties will need to be amended to reduce exemptions for airlines and shipping. The preferred route for phasing our degressive energy tax rates is likewise through increasing minimum fuel excise duties and doing away with mandatory and other energy tax exemptions at the EU level. Also, minimum energy tax rates can be better aligned to the carbon intensity of energy carriers at the EU level (EC, 2020).

Improving carbon pricing and freeing up budgetary room for making the expenditures needed to pursue climate policies and effecting public investment will necessarily give rise to budget allocation issues. Some sectors will need to adapt to carbon pricing, and the government may need to provide support. Furthermore, a choice to pursue climate policies means other budgetary priorities may need to be put on the back burner to ensure public finances remain sustainable. Difficult though such political choices are, they must be made to mitigate the risks of climate change. Not acting now means future generations must necessarily adapt to an even greater extent.

Climate investment is currently also being held back by EU state aid rules. These rules are necessary to maintain a level playing field, but can limit governments' scope to increase sustainability. This is due to the uncertainty and complexity involved in meeting conditions for the provision of public finance for businesses. The European Commission recognises this problem and has therefore begun to revise state aid rules as part of the Green Deal. The Commission wants to simplify the rules and grant exemptions for national and European co-financing of projects in energy infrastructure, renewable energy and energy efficiency.

4 Supply of finance for sustainable businesses

A climate-neutral economy requires investment in emerging sustainable businesses and in reducing carbon emissions of established carbon-intensive businesses. There are currently too few successful private financing initiatives that target sustainable businesses. This is partly due to the mismatch between risk return preferences of private financiers and the profile of the required investment. Governments must therefore take on a coordinating role in the financing of innovative investment, and boost equity financing as well as financial innovations.

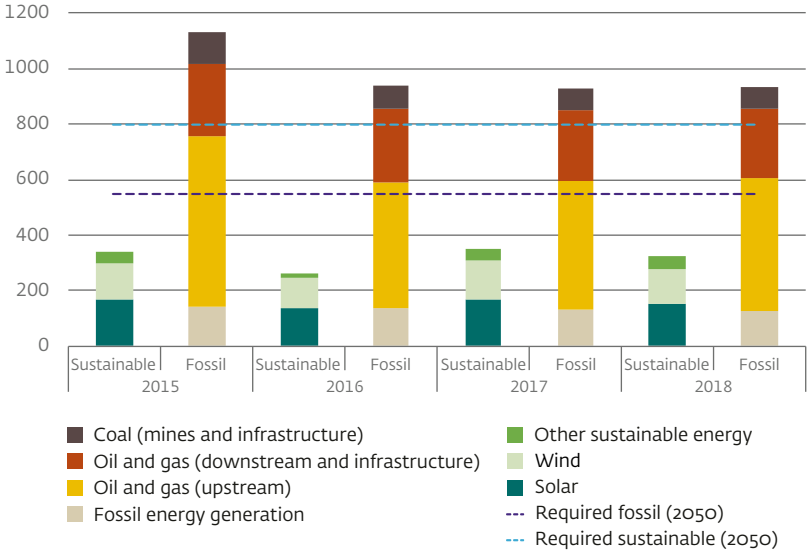
4.1 Supply of private finance for climate investment

Private parties have become increasingly interested in climate financing since the COVID-19 crisis. This is evident among other things from growing inflows into *environmental, social and governance (ESG)* funds. Private parties play an important role in climate investment particularly in the energy sector (see Chapter 2). Despite the growing supply of finance from private parties, sustainable investment is insufficient to meet the Paris objectives. For example, worldwide private investment in fossil fuels and infrastructure is still three times higher than sustainable energy investment (Figure 6).

The unattractive business case of sustainable investment projects due to underpricing of carbon emissions is an important but not the only factor behind the lag in private investment. Another reason is the mismatch between risk-return preferences of private financiers and the risk-return profile of sustainable investment. Such investment is usually innovative and therefore involves inevitable financial uncertainty (van Tilburg, 2016). This type of investment aligns with the risk appetite of issuers of private equity finance, such as venture capital, private equity and investment funds. These parties have only limited representation around the world, however.

Figure 6 Annual private investment in fossil energy exceeds investment in sustainable energy

Annual figures; USD billion



Sources: IRENA and CPI 2020.

For example, assets under management in the global private markets in 2019 amounted to USD 6,500 billion, which is equivalent to only 8% of the total public equity market capitalisation and 3% of outstanding debt in public markets (McKinsey, 2020). Such financing also plays a limited role in climate investment in Europe. In 2019, for example, only 2% of European climate investment was financed by private equity, venture capital and infrastructure funds (CPI, 2019).

4.2 Representation of sustainable businesses in current financing flows

To gain an indication of the financing potential for climate investment, we examine the scale of the financing flows into sustainable European businesses. We focus on the financing flows in the European capital market as well as on financing through Dutch banks and institutional investors. We use multiple indicators to identify 'sustainable' businesses, as there is no single standard available that can be applied to all financing flows (Box 2).[5] Since sustainable businesses are often highly innovative, their risk-return profile is particularly appealing to equity providers (see Chapter 2). Sustainable businesses are therefore likely to be represented more in the equity markets compared to debt markets and bank financing.

Box 2 Varying market standards for measuring greenness and sustainability

International bodies such as the IFRS Foundation, the European Commission, the NGFS and the ECB are working on standards and indicators to measure the sustainability of businesses and economic activities (see for example ECB 2020). The quality, coverage and comparability of the currently available commercial data is limited. Moreover, the composition of carbon indicators is subject to methodological challenges (see Janssen et al. 2021). There is also a lack of consistent data on emissions within the overall production chain (so-called Scope 3 emissions). It is therefore advisable to use a combination of indicators and be transparent about the advantages and disadvantages of these indicators, the methodologies used and underlying assumptions.

5 Due to data limitations we focus only on the financing of sustainable businesses, and not on sustainable investment by non-sustainable businesses. This is covered in the next chapter.

In this study we also use various data sources and indicators to assess the sustainability and greenness of financing flows:

i. To determine the greenness of Dutch bank loans, as well as pension and insurance investments, we use the EU taxonomy. This is a classification system for 'green activities'. The taxonomy contains screening criteria for various climate adaptation and mitigation activities in the agriculture, forestry, manufacturing, energy, transport, water and waste, ICT and real estate sectors that "can make a substantial contribution to combating climate change". The taxonomy enables sustainability scores to be awarded to sector exposures of Dutch banks, insurers and pension funds. The disadvantage is that the taxonomy cannot be linked at a granular level to the loans and investment data, so we only have an approximate and not a precise estimate. The taxonomy does not classify activities on a continuous scale.

ii. In order to assess the sustainability of European market finance, we use a sustainability classification provided by Bloomberg. According to the Bloomberg classification, businesses are sustainable if they derive 50% to 100% of their value from activities in the renewable energy sector. Those activities are defined as carbon storage, generation of renewable energy, energy-conservation technologies and carbon trading. Unfortunately it is not (yet) possible to apply the EU taxonomy consistently to the market financing data.

iii. To identify polluting businesses, we use data on carbon emissions and intensity levels in the next chapter. The intensity levels have been calculated on the basis of the Weighted Average Carbon Intensity (WACI) method recommended by the Taskforce for Climate Related Disclosures (TCFD). The WACI is a relative carbon indicator because the absolute emissions are weighted on the basis of business revenues ('tonnes of carbon equivalents/million EUR of sales). This allows for comparison between businesses.

4.2.1 Dutch bank finance

Many businesses in Europe depend on bank finance. In this section we investigate the extent to which Dutch banks provide finance for 'green' non-financial corporations in Europe. The dataset contains almost EUR 440 billion of loans (end of 2020 Q3), or 23% of the total loan portfolio.[6] According to the analysis, around one-third of this (38%) concerns loans to possibly green businesses on the basis of a rough approximation of the EU taxonomy (Table 2).[7] The majority of these loans fall within the real estate sector. When this sector is excluded, a remainder of 11% of the loan book is classified as possibly green.

The figure of 38% possibly green loans is a rough approximation of the actual share, as the loan data do not contain any granular information that can be linked directly to the sustainability criteria in the taxonomy. The actual percentage of green loans is likely to be lower. Within the real estate sector, for example, no distinction can be made between loans which do or do not have a sufficiently high energy label to actually be classified as green according to the EU taxonomy. A substantial proportion of these loans are not likely to be classified as green.[8] Similarly, in the energy generation subsector (part of the energy services sector) no distinction can be drawn between the proportion of solar, wind or fossil energy, so as a result the entire subsector is designated as 'possibly green'. Given that the composition of energy investment is still heavily

6 Derived from the AnaCredit dataset, which covers 91% of the loans on Dutch banks' balance sheets. At the end of 2020 Q3 this amounted to EUR 1,708 billion of a balance sheet total of EUR 1,883 billion. In this section we focus on the loans granted by Dutch banks (including their foreign branches, in the 28 EU Member States (including the United Kingdom). At EUR 1,413 billion, these loans represent around 75% of the total. In the case of loans granted by banks to other financial institutions, it is not known to which industries (in the real economy) these loans were ultimately granted. The analysis also excludes loans for which no NACE sector code is available. If both categories of loans are eliminated, the remaining coverage amounts to around 23% of the balance sheet total (EUR 440 billion, end of 2020 Q3).

7 The EU taxonomy states that various climate adaptation and mitigation activities within eight (of the total of 22) economic NACE sectors are possibly green. Table 2 shows how much Dutch banks are currently lending to entities in the EU Member States, divided into the eight wider NACE sectors and their underlying possibly green subsectors.

8 The EU taxonomy states that for real estate only the top 15 most energy-efficient homes (e.g. capable of being demonstrated as such on the basis of national energy labels) may be earmarked as green.

skewed towards fossil fuels, it is unlikely that all loans within the energy generation subsector are actually green. At the same time the figure of 38% possibly green loans could also be an understatement, because loans drawn, for example, by oil businesses for investment in wind parks are currently not being designated as 'green'. The table below therefore provides a rough indication, but not a full picture of the greenness of bank loans.

Table 2 Possibly green loans of Dutch banks to European businesses

EUR billion or percentages of total

NACE	Sector*	2018 Q4 EUR billion	% total	2020 Q3 EUR billion	% total
A	Agriculture, forestry and fisheries	8.1	1.5%	8.6	2.0%
C	Manufacturing	4.5	0.8%	3.5	0.8%
D	Energy services	5.9	1.1%	7.0	1.6%
E	Water companies and waste management	4.1	0.8%	4,0	0.9%
F	Construction	8.5	1.6%	8.8	2.0%
H	Transport and storage	24.7	4.6%	8.2	1.9%
J	Information and communication	8.0	1.5%	7.4	1.7%
L	Real estate	101.2	19.0%	121.2	27.6%
Total / percentage possibly green[9]		**165.0**	**31.0%**	**168.6**	**38.4%**

Source: DNB on basis of AnaCredit.

* For the sake of readability, only the main sector is shown here, not possibly green subsectors within the main sector.

9 The percentages are based on the totals excluding financial institutions: EUR 532 billion at end of 2018 Q4, EUR 440 billion at end of 2020 Q3.

4.2.2 European market financing

The risk profile of innovative sustainable investment is a better match for equity providers than (bank or non-bank) debt issuers. Europe's market for private equity finance is relatively small, and so is the role of this type of finance in climate investment. Surprisingly, sustainable businesses are also poorly represented in public equity markets. For example, only 1.4% of the total of 494 non-financial corporations listed on the European Eurostoxx600 equity index are in the most sustainable category according to the Bloomberg classification(Box 2). In the debt market the representation of sustainable businesses is even lower; barely 0.05% of bonds within a widely used European debt index belong to the most sustainable category.[10] The limited representation of sustainable businesses in the equity and debt markets raises the question of whether this type of business can attract sufficient private financing to increase its scale and strengthen its competitive position.

4.2.3 Dutch institutional investments

Institutional investors are another potential source of private finance in the energy transition. In the Netherlands they can make a relatively large contribution, because pension funds and insurers have extensive investment portfolios (equivalent to 241% and 69% of GDP respectively in 2020). As in the case of banks, a rough indication can be given of the greenness of the pension funds' and insurers' investments on the basis of the EU taxonomy. In the case of banks we have analysed the loan portfolios and in the case of pension funds and insurers we have analysed the equity and bond investment in Eurostoxx600 businesses (Table 3). The analysis shows that around 27% of the equity and bond portfolios of pension funds and 26% of those of insurers are 'possibly green' on the basis of a rough approximation

10 The Bloomberg Barclays Aggregate Debt Index in EUR has been taken as the starting point. Debt instruments of financial institutions are not included in the analysis.

of the EU taxonomy. Again, the actual percentage of green loans is expected to be lower.[11]

Table 3 Possibly green EU equity and corporate bond investments of insurance companies and pension funds in Eurostoxx600-companies

2020 Q3; EUR billion or percentages of total

NACE	Sector	Pension funds		Insurers	
		EUR billion	% total	EUR billion	% total
A	Agriculture, forestry and fisheries	0.0	0.0%	0.0	0.0%
C	Manufacturing	2.8	2.6%	1.1	3.7%
D	Energy services	5.7	5.2%	2.4	8.1%
E	Water companies and waste management	0.7	0.6%	0.4	1.4%
F	Construction	1.2	1.1%	0.5	1.5%
H	Transport and storage	0.8	0.8%	0.2	0.6%
J	Information and communication	7.9	7.2%	2.7	9.0%
L	Real estate	10.1	9.3%	0.5	1.6%
Total/percentage possibly green *		**29.2**	**26.8%**	**7.7**	**25.9%**

Source: DNB.

* Percentages are based on the total Eurostoxx portfolios in the dataset, excluding financial institutions: EUR 109.1 billion for pension funds and EUR 30 billion for insurers (end of 2020 Q3).

11 The same comments apply here as in the case of the bank analysis (e.g. concerning the lack of granular data at subsector level for energy generation and the lack of data with regard to real-estate energy labels).

4.3 Options for scaling up private financing of sustainable businesses

The above analysis shows that sustainable and green businesses have very limited representation in the current market financing flows. They still make up a minority of loan books and investment portfolios of Dutch financial institutions and institutional investors. This reflects the fact that the economy is at the beginning of the energy transition. Naturally, the sustainability of banks' loan books, the investment portfolios of insurers and pension funds and the capital market is a reflection of the sustainability of the economy as a whole. The European economy now runs for 20% on sustainable energy, with the Netherlands lagging behind with a share of around 9% (see Chapter 1).

The proportion of green bank loans and green investment increases as the economy becomes more sustainable. The speed of that increase depends greatly on technological innovations. The limited supply of private finance for risky innovative investment is a generic problem in Europe. It arises increasingly in the financing of the energy transition, because the transition itself depends upon technological innovations with an uncertain payback period and over a long term. Traditional parties (such as banks) are less inclined to provide this type of finance. There is also a coordination problem, because entire chains of products and processes need to be adapted, requiring more interaction between the various players in the chain and a coordinating role on the part of the government (see section 3.2.3 and Van Tilburg et al., 2018).

It is also important that the equity finance market in Europe continues to develop. Sustainable projects, which are often based on new technology, make relatively more use of equity finance. Research therefore shows that economies with highly developed equity markets generally see higher investment in emission reduction than economies that are more dependent

on debt financing (de Haas and Popov, 2020). External (private or public) equity financing is only available to a limited extent in Europe. As a result, sustainable businesses are relatively dependent on retained earnings or public organisations (such as governments or public agencies).

Financial innovation is necessary to link the supply of finance to the demand for green investment. A growing number of investors are looking for sustainable investment opportunities through which they can not only generate a financial return but also have a positive impact on the climate. At the same time a large number of innovative sustainable projects need to be financed. Many of these types of projects require large up-front capital investment. Financial innovation is required to spread these additional credit risks among different groups of financiers or make sustainable investment scalable. An example is the combining of multiple wind farms in a single portfolio, making the project more attractive to institutional investors who wish to make large investments. Another example of a financial innovation that contributes to the financing of sustainable activities is the combining, securitising and reselling of leases for solar panels (Citigroup, 2020).
The European Capital Markets Union intends to stimulate equity financing and financial innovation for sustainable projects. The European Commission is investigating, for example, how the use of long-term investment funds and securitisation can be promoted safely. Progress needs to be made with this type of investigation and the further completion of the Capital Markets Union.

Finally, capital providers must have sufficient information on the extent to which a company is operating sustainably and is exposed to climate-related risks. Information asymmetries on the sustainability profile of a company lead to rationing of the desired investment (Box 3). For example, research by Hafner et al. (2020) shows that defective reporting on climate risk is a

barrier to new financing. Since climate change is a global problem and businesses finance themselves through international markets, it is important that businesses worldwide report consistently on climate risks. Since many businesses are still at the beginning of the energy transition, historical data on emission levels and climate risks are less relevant. Climate reporting should ideally be forward-looking, enabling investors to assess whether new innovative businesses are contributing sufficiently to the transition and whether established businesses are investing sufficiently to bring their activities into line with the Paris targets. Forward-looking indicators (such as the PACTA tool) are therefore useful for assessing whether carbon-intensive businesses are indeed making the transition.

Box 3 Information asymmetries

In the financing literature, impediments to financing are ascribed to frictions, or imperfections in the financing market. Frictions can occur on the supply side among financiers and on the demand side among investors (see Freixas and Rochet, 1997). The supply of finance can be impeded by liquidity or solvency constraints among investors or banks. On the demand side investors' weak balance sheets make it harder to obtain finance. Financing decisions are partly dependent on investors' net assets and collateral.

Financial frictions are mostly based on economic factors. One of those is asymmetric information on the profitability of a business or investment project. Information asymmetries are relatively large in new businesses or technologies, because the financier is less familiar with them. This is the case for investment in sustainable technology where cash flows are uncertain and the investment horizon is long. The owner often has more information on the profitability of a project than the financier, who therefore has to incur costs to monitor the project (Diamond, 1984). That applies both to the financing of new sustainable businesses and to the financing of sustainable investment by existing businesses.

In practice the monitoring costs are expressed as a premium on the financing costs. Asymmetric information can also lead to the exclusion (rationing) of investment. That is a factor particularly if there is insufficient collateral for the financing or if the risk premium is prohibitively high (Stiglitz and Weiss, 1981). Financiers then feel they are receiving too little compensation for the investment risk.

5 Sustainability incentives for carbon-intensive businesses

Established businesses need incentives to adapt their business models. Governments can provide the strongest incentive by pricing climate and environmental damage appropriately. In addition, private investors, central banks and supervisory authorities can give incentives to enhance the sustainability profile of businesses, by means of instruments that influence capital markets and bank loans.

5.1 Incentives through capital markets

Carbon-intensive businesses have good access to market finance and can thus relatively easily raise money for investment to improve the sustainability profile of their businesses. This type of business is overrepresented in European financing markets.[12] The proportion of carbon-intensive sectors in the equity and debt markets is greater than their economic contribution (Table 4). This applies particularly to the energy services and manufacturing sectors. The energy services sector, for example, represents 6% of the equity market and 17% of the debt market, whereas it makes considerably smaller contributions to European GDP (2%) and employment (1%).[13] At the same time this sector accounts for approximately one-third of annual European carbon emissions. The manufacturing sector also accounts for a large part of the carbon emissions and has a large share in both markets, while at the same time its contribution to the European GDP and employment is modest.

12 The total carbon emissions of all businesses in the public equity and debt market indices amount to just over half of direct annual European carbon emissions. In 2018, emissions of the 497 non-financial corporations in the Eurostoxx index amounted to almost 2 billion tonnes per year and emissions of approximately 207 businesses in the European debt market amounted to approximately 2.1 billion tonnes per year (based on Trucost scope 1 and 2). In that same year total European emissions (including the United Kingdom) amounted to 3.7 billion tonnes per year (based on Eurostat scope 1 and 2).

13 Based on market capitalisation and outstanding European corporate debt in the Bloomberg Barclays Aggregate debt index (in EUR) in 2020 Q3. The GDP and unemployment data also relate to 2020 Q3. The carbon emissions are the direct emissions per sector (based on scope 1 and 2 and end-2019 data). The financial sector has been excluded because it represents almost 70% of the European debt market and thus distorts the distribution.

Table 4 Sectoral share in Dutch banking finance, European market finance and broader economy

Percentages

NACE	Sectors	Bank loans	Equity market	Debt market	Employ-ment	GDP	CO_2 emissions
A-U	All economic activities	100%	100%	100%	100%	100%	100%
A	Agriculture, forestry and fisheries	3%	0%	0%	5%	2%	4%
B	Mining and quarrying	1%	3%	0%	0%	0%	1%
C	**Manufacturing**	**10%**	**62%**	**43%**	**15%**	**17%**	**31%**
D	**Energy services**	**2%**	**6%**	**17%**	**1%**	**2%**	**34%**
E	Water companies and waste management	1%	0%	3%	1%	1%	2%
F	Construction	2%	2%	2%	7%	6%	2%
G-I	**Trade, transport and the catering industry**	**12%**	**8%**	**9%**	**25%**	**20%**	**21%**
J	Information and communication	2%	11%	17%	3%	6%	0%
L	Real estate rental and trade	28%	2%	7%	1%	12%	0%
M-N	Business services	12%	4%	2%	13%	11%	2%
O-Q	Government and healthcare	27%	1%	1%	24%	20%	3%
R-U	Culture, recreation and other services	1%	1%	0%	6%	3%	1%

Source: AnaCredit: bank loans to entities in EU Member States (2020 Q3), Bloomberg: equity and debt markets (2020 Q3), Eurostat: employment, GDP (2020 Q3) and CO_2 emissions based on scope 1 & 2 (2019)

Given the dominant position of carbon-intensive sectors in European equity and debt market indices, investors play an important role in encouraging polluting businesses to invest in sustainability. Passive investment strategies that automatically track market indices unintentionally sustain the over-representation of carbon-intensive businesses in markets. Active investment strategies can actually encourage businesses to increase climate investment. These kinds of strategies are increasingly common among investors (Table 5).

Existing sustainable investment strategies, however, do not yet provide adequate incentives for the wider market and economy. Sustainable investment is an umbrella term for a wide range of strategies, only a small proportion of which are aimed explicitly at greening the economy (through "impact investing", see Table 5). Even 'impact investing strategies' do not always lead to the desired increase in the sustainability profile of businesses. A readily accessible means of applying impact investing, for example, is by investing in shares of companies that outperform their competitors in terms of climate performance. This is also known as 'best in class', with the most sustainable businesses being selected, for example, on the basis of *environmental* scores ("E-scores"). Research shows, however, that investing in businesses with high E-scores is not a suitable strategy for bringing about a carbon reduction (OECD, 2020).

The problem of insufficient visibility and oversight of the ultimate impact of sustainable investment strategies is also a factor in the green bond market. Sustainable businesses make limited use of green bonds, which means that investment in green bonds does not automatically lead to increased investment in sustainable businesses. Indeed, the least sustainable businesses (based on the above Bloomberg classification) in Europe account for around two-thirds of green corporate bond issues (excluding issuances by

Table 5 Assets of various sustainable investment strategies (2018)

Scope (USD trillion)		Strategy	
$28	ESG integration	Engaging ($10)	Influencing of (management of) business on specific ESG themes
		ESG integration ($18)	Systematic and explicit incorporation of ESG factors in financial analyses
$25	ESG exclusions	Negative exclusions ($20)	Exclusion of sectors, businesses or activities based on ESG criteria
		Norm-based screening ($5)	Screening based on international standards for healthy operational management
$3	ESG impact investment	Positive/best-in-class screening ($2)	Investment in sectors, businesses or activities with high ESG return compared to peers
		Thematic investment ($1)	Investment aimed at specific sustainable themes (e.g. low emissions or recycling)
		Other impact investment ($0,4)	Investment to achieve social or sustainable return

Source: Global Sustainable Investment Review 2018.

financial institutions).[14] This suggests that green bonds are used mostly by carbon-intensive businesses to green their business model. There are indications, however, that when a business reduces emissions by means of green bonds, the reduction is often negated by a rise in emissions elsewhere in the business (Ehlers et al., 2020).

The current sustainable investment strategies thus have a limited explicit focus on reducing carbon emissions. The Taskforce for Climate-related Financial Disclosures (TCFD) therefore advises investors to adopt an active investment approach, for example by taking carbon intensity levels into account in the composition of their investment portfolio. The carbon intensity indicator measures the amount of emissions businesses need in order to generate USD 1 million of revenues and applies a correction for the size of the business.[15] The TCFD recommendation advises investors to allocate more to businesses that operate in a carbon-efficient way compared to their competitors. This creates a financial incentive for businesses to invest in emission reduction (TCFD, 2020). This investment strategy can already be applied effectively to European equity and debt markets. Some businesses are already producing more efficiently than their competitors, with relatively low carbon emissions.[16] Figure 7 shows that the weighted average carbon intensity of three sectors (energy services, water companies & waste management, mining and quarrying) far exceeds the average of the rest of the equity index. Within these polluting sectors some businesses operate

14 DNB itself also invests EUR 400 billion in green bonds issued by states, development banks and supranational organisations. In order to guarantee that the capital raised with these green instruments is actually used to finance green projects, DNB purchases only green bonds that have been certified by the Climate Bonds Initiative or comply with the ICMA Green Bond principles. DNB currently has no green corporate bonds in its own portfolios.

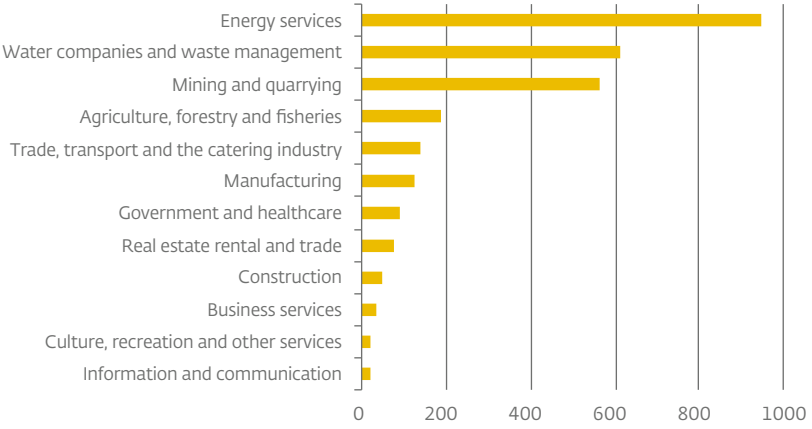
15 The methodology of the TCFD guidelines has been used to calculate the Weighted Average Carbon Intensity (WACI) of the different sectors in the equity market. This is based on the non-financial corporations (494) in the EuroStoxx 600 index. The bulk of these businesses are also represented in the debt market. See Box 2 with regard to the deficiencies of the WACI approach.

16 The European equity market has been used as a basis for this, because the coverage of carbon data is almost 100% and the bulk of the listed companies are also active in the capital market.

much more carbon-efficient than others. The maximum carbon intensity level in the energy sector is almost 6,000 tonnes per USD 1 million of sales, while the minimum level in the same sector is barely 3 tonnes per USD 1 million of sales (average is 945 tonnes per USD 1 million of sales). An analysis of the investment portfolios of Dutch pension funds and insurers suggests that they already take the carbon intensity of their investment portfolios into account to some extent (Box 4).

Figure 7 Weighted average carbon intensity of equity market

Tonnes of carbon emissions per USD million of sales



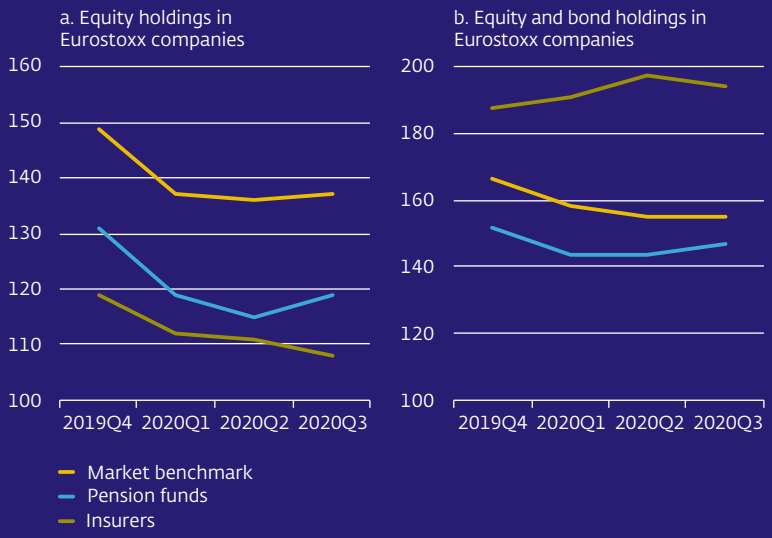
Source: Trucost for scope 1 and 2 carbon emissions data (2019), Bloomberg for market capitalisation (2020 Q3).

A disadvantage of an active strategy based on carbon intensity is that it is retrospective. Such a strategy does not account for the capital that polluting businesses invest in future carbon emission reduction. Investors are therefore advised to consider not only historical carbon intensity levels, but also forward-looking data concerning carbon reduction paths. A good example of an investment instrument focused on future carbon reduction is the so-called sustainability-linked bond. In contrast to green bonds, this type of bond is linked to the forward-looking sustainability targets of the company itself and not to a specific project. If the company does not achieve these targets, extra interest must be paid on the bond. The market for this type of bond is still very small, however (around USD 23 billion versus USD 1,300 billion in the case of green bonds).

Box 4 Carbon intensity levels of institutional investment portfolios

The degree of carbon intensity of institutional investment portfolios differs depending on the asset class. Looking at the equity investment in Eurostoxx600 companies, we see that both pension funds and insurers invest relatively more sustainably than the market average (Figure 8a). This picture changes if we also include investment in European corporate bonds (Figure 8b). For insurers, the carbon intensity level of the combined equity and bond portfolios in Eurostoxx companies is then higher than the market average.

Figure 8 Carbon intensities of EU investment portfolios of Dutch insurers and pension funds



Note: The TCFD methodology has been used to calculate the carbon intensity. The carbon intensity as a weighted average of the investment, where the weights are determined by the amount of EUR that Dutch institutional investors have invested in Eurostoxx 600 companies, either through equities, corporate bonds or combinations of those assets. Trucost carbon intensity data have been used in the calculation for 2018. The figure shows the development of carbon intensity levels based on direct emissions (i.e. scope 1 and 2 according to the GHG protocol). This picture is comparable to an analysis that includes scope 3 emissions (not shown here). Since this is a short observation period and statistical carbon intensities are used, inflation and exchange rate effects are negligible (see Janssen et al. 2021). Investment portfolio positions are based on closing positions of the quarter. Investments in financial companies have been excluded from the calculation.

5.2 Incentives within the financial sector

The transition to a climate-neutral economy requires extensive long-term investment in sectors such as construction, manufacturing, transport and energy (Chapter 1). Because many businesses in Europe depend on bank financing, banks play an important role in the financing of the transition. That also applies to institutional investors, because they have large investment portfolios, typically with long-term horizons.

The transition to a climate-neutral economy is also relevant to DNB as a prudential supervisor. As a prudential supervisor DNB is responsible for ensuring that material climate risks are sufficiently addressed by the Dutch financial sector. Both physical and transition risks due to climate change lead to financial risks for financial institutions (NGFS, 2020b) and are therefore very important to the financial sector and DNB. Institutions are required to take material risks into account in their risk assessment. This means they must guarantee that these risks are measured, assessed and controlled as part of their processes. The Dutch financial sector is increasingly aware of climate risks and is taking steps to mitigate them. For example, many financial institutions have identified which carbon-intensive sectors they are exposed to. The Dutch financial sector has also committed n to reporting on the climate impact of its financing and investment and to reduce its impact.

Financial companies and their directors must continue to devote attention to climate risks. Directors are responsible for future-proofing their companies and for controlling climate risks in their risk management processes and governance structures. Consistent transparency and reporting standards are required to incorporate climate risks more effectively into the risk management. The European taxonomy and the Sustainable Finance Disclosure Regulation (SFD) are useful steps in this regard, as they provide greater insight into the sustainability profiles of financial market participants and their customers.

The taxonomy requires businesses, including financial institutions, to report on the extent to which their business activities and investments are in line with the sustainable economic activities set out in the European taxonomy. The SFDR sets requirements for financial market participants with regard to reporting on sustainability in their investments and financial products. The Joint European Supervisory Authorities are currently consulting on proposals for the further application of these rules by both institutional investors and banks (EIOPA/ESMA/EBA, 2021).

The next step is to examine whether additional prudential measures or changes are desirable. Climate risks can already be reflected in the creditworthiness of counterparties and the value of collateral. The uncertainty concerning climate risks makes it difficult to quantify these risks, however. This does not mean they can be ignored. As risks become more certain, financial institutions can make provisions for them, but prudential rules are also intended to make financial institutions resilient to unexpected losses. This can be achieved, for example, by using concentration limits to ensure that the institution is not financially endangered by a specific unexpected loss. Despite the lack of perfect data, DNB therefore supports the exploration of further means of integrating climate risks into the prudential framework. This section sets out how the supervisory framework can help address climate risks to which banks, pension funds and insurers are exposed.

5.2.1 Climate risks in the banking supervisory framework

The prudential framework for banks is intended to make institutions more resilient to unexpected – but not unlikely – losses and specific stress situations. The existing prudential framework does not deal explicitly with climate risks. For example, it does not distinguish between loans that are susceptible to the consequences of climate change and loans that contribute to the goals set out in the Paris Climate Agreement. In some cases, however, climate

risks are implicitly addressed in the supervisory framework. If climate risks result in a credit rating downgrade from a rating agency or a reduction in collateral value, capital requirements will increase. In addition, the 'EBA guidelines on loan origination and monitoring' require banks to take account of environmental factors and climate change in their risk appetite, policy rules and procedures in the field of credit risk.

Moreover, the current regulations require that banks and supervisory authorities consider all material risks. European supervisory authorities are therefore taking initiatives to assess climate risks, to increase banks' awareness of these risks and to strengthen their risk management. Both DNB and the ECB have recently published their expectations for prudent management of climate and environmental risks within the existing supervisory framework (DNB 2020, ECB 2020). This year all Dutch banks will be required to explain to the ECB or DNB how they address climate risks. Climate risks will also be included in the European stress test for banks in 2022 (ECB 2020). The NGFS has also published a number of guides for supervisory authorities and institutions (NGFS, 2020a and b). DNB supports these developments and also sees stress tests as a good means of gaining greater insight into climate risks.

International bodies are considering whether and how prudential risks of climate change can be addressed in the prudential framework. The Basel Committee on Banking Supervision (BCBS) recently investigated the effects of climate change on financial risks. The research showed that banks are exposed to the consequences of physical and transition climate risks through various micro- and macroeconomic channels (BCBS, 2021). The next step is to explore the extent to which the existing framework allows for the incorporation of climate risks, which gaps exist and which solutions may be effective (BCBS, 2021). The European Banking Authority is conducting a similar exploration, but is looking at sustainability risks in the broad sense.

Academics have already made proposals for adjustments to macro- and microprudential instruments to address the risks of climate change. An example is limiting the size of exposures to carbon-intensive assets, based on the example of the existing prudential 'large risk exposure limits' (Schoenmaker and Van Tilburg, 2016).

5.2.2 Climate risks in supervision framework for insurers

Climate risks can also lead to financial risks for insurers, both on the assets side, through their investments, and on the liabilities side, through an increase in the cost of claims. The prudential framework for insurers should guarantee their financial soundness, address material risks and protect policyholders. It is therefore important that climate risks are integrated consistently into insurance regulation (such as Solvency II).

There is still room to improve the way in which climate risks are taken into account both on the assets side of the balance sheet as well as on the liabilities side (technical provisions), for example through the use of the latest claims data in the modelling of physical and transition risks and in forward-looking scenarios (EIOPA, 2019). Climate risks can also be further integrated into the product pricing methodology. Non-life insurers can do this at short notice, because contracts are often short-term (one year), so they can adjust prices annually if the risk changes. This will not necessarily lead to an immediate structural rise in product prices, but that may nevertheless happen, for example after years of substantial catastrophic losses. The product prices of insurance contracts often do rise in such cases, partly because consumers are more prepared to insure risks. Better pricing enables insurers to give policyholders financial incentives to reduce the impact of climate risks (EIOPA, 2020a).

As well as an impact on technical provisions and product prices, sustainability and climate can also be taken into account in investments. EIOPA intends to amend the *Supervisory Handbook* this year to enable insurers to take the long-term impact of their investment on the climate and other ESG factors into account within the Prudent Person Principle. EIOPA is also working on proposals to incorporate climate risks in the calculation of the amount of capital that an insurer is required to hold for unexpected losses due to natural disasters, such as floods or severe storms (EIOPA, 2020b). DNB is supporting and contributing to this work. EIOPA has also looked at differentiating the capital requirements for green and brown investments. This has not been possible hitherto, because current data do not (yet) show differences in the risk profile of those investments.

As in other sectors, data limitations, such as the limited usability of historical data, make it more necessary to use scenario analyses. There is also a role for Pillar 2 requirements, particularly for the compulsory annual risk analysis that insurers must conduct (*Own Risk and Solvency Assessment* (ORSA)). This year EIOPA will issue guidance on the inclusion of climate risks in the ORSA (EIOPA, 2020c). The guidance follows forecasts published previously by DNB (DNB, 2019a, 2019b). DNB also examined the impact of climate risks on insurers in its own stress tests, both for transition risks (impact on investment) and for physical damage risks (DNB 2017, 2018).

As well as incorporation in European legislation, DNB believes a globally consistent approach is important for supervision of climate risks, so that the global insurance sector as a whole can be given the same incentives. The International Association of Insurance Supervisors (IAIS) works with the Sustainable Insurance Forum (SIF) to issue (non-binding) guidance on the inclusion of climate risks in insurance supervision.

5.2.3 Climate risks in the supervisory framework for pension funds

In the case of pension funds, climate change leads to financial risks particularly on the assets side. Following the implementation of the IORPII Directive in the Pensions Act at the beginning of 2019, pension funds are obliged to include risks relating to the environment and climate, human rights and social relations (ESG factors) in the risk control framework and their own risk assessment. In their annual reports, pension funds must state how they take account of ESG factors in their investment policy and must share this information more widely in the framework of the SFDR – for example on their website. The Pensions Act addresses sustainability in the broad sense, but in this Occasional Study we focus on climate risks.

In 2019 EIOPA published an opinion with explanatory notes for supervisory authorities on what they can expect from pension funds with regard to the management of climate risks (EIOPA, 2019). In practice this shows that the implementation is still under development. DNB provides various encouragements to pension funds to continue developing their risk management. In cooperation with the Federation of the Dutch Pension Funds and a number of large pension funds, DNB has organised workshops to explain how pension funds can incorporate climate risks in their own risk assessments. The pension sector takes a proactive stance on this point. In 2021 DNB will conduct research among pension funds on the integration of climate risk factors in their risk management. DNB will share any identified good practices with the sector. EIOPA will include a separate scenario for climate change in the European pension fund stress test for 2022 to gain a better understanding of the impact on institutions in Europe.

Many pension funds devote attention to climate-related targets in their investment policy. The law specifically requires them to do so. The leading funds gather relevant and reliable information to better integrate the risks

related to climate change it in their investment decisions. DNB has published a letter to the sector[17] with practical examples to help ensure successful implementation of a sustainable investment policy. In contrast to the compulsory management of climate risks, however, pension funds are not required to include climate-related targets in their investment policy. This is based on the 'prudent person principle', which focuses on investment in the interest of members and pensioners. The extent to which a pension fund includes climate targets in its investment policy is therefore an ideal subject for consultation between the fund's governing board and its other bodies and members. A number of pension funds already actively involve their members, for example by conducting surveys or arranging member panels. A positive development in this regard is SFDR's encouragement of funds to disclose the long-term impact of their investment portfolio so that members are better informed.

5.3 Central bank incentives

In addition to private investors, central banks, with their large balance sheets, can also play a role in financing the energy transition. Central banks work to increase the transparency of their investment portfolios. This year's DNB's annual report, for example, included reporting based on TCFD standards for the first time (DNB, 2021). By setting a good example itself, DNB is advocating transparency of climate risks in financial markets. Ultimately the Eurosystem could include reports on carbon emissions in the collateral framework as a precondition for banks' participation in monetary operations or as a precondition for the purchase of corporate bonds.

17 https://www.dnb.nl/media/obilmqbb/01829-03_sectoral-letter-on-sustainable-investment-by-pension-funds.pdf

The ECB has been purchasing corporate bonds as part of its monetary policy since 2016. The purchase breakdown in the corporate sector purchase programme (CSPP) is based on the size of the existing debt of non-financial corporations in the capital market. This way the ECB intends to exert the least influence possible on differences in financing costs between specific companies by means of its purchases (this is also known as market-neutral purchasing). The market neutrality principle ensures that the CSPP is an almost perfect reflection of the corporate bond market (with the exception of financial institutions). Since the debt market is relatively carbon-intensive, the Eurosystem buys a proportionately large amount of bonds of carbon-intensive companies (Box 5[18]). That may be a reason for examining the CSPP purchasing benchmark (see Chapter 6).

A number of economists have suggested that the ECB could link green criteria to banks' long-term refinancing operations (LTROs), see for example Van 't Klooster and Van Tilburg (2020). A case can be made for this on the basis of risk factors. The financial risks to the Eurosystem are mitigated in the design of the operations, for example in the collateral requirements. There may be grounds for linking stricter conditions to the operations due to specific risks in bank loans. That may also apply to climate risks to which banks are exposed. There is currently no objective criterion for measuring these risks, however. This requires an EU taxonomy that qualifies non-sustainable assets. The question arises of whether a refinancing instrument that specifically promotes green loans is compatible with the ECB's mandate. The current review of the ECB's monetary strategy includes an examination of the potential inclusion of climate risks in monetary policy.

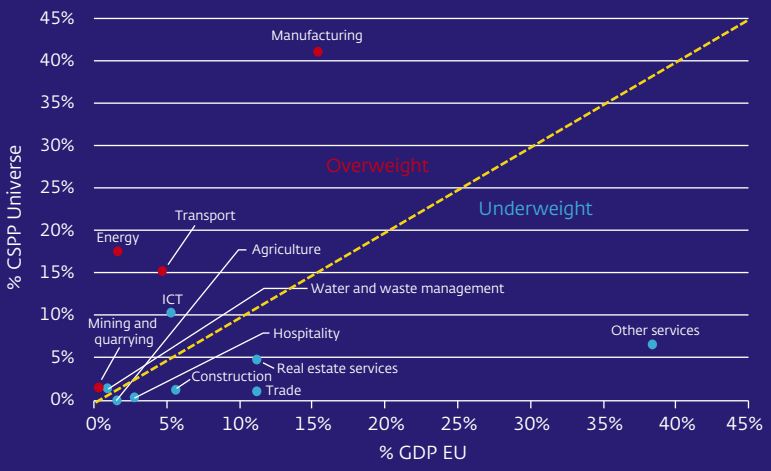
18 Calculations are based on Trucost carbon emissions data. Both direct (scope 1 and 2) and indirect (scope 3) emissions are included in the calculation of the absolute sector carbon emissions and the carbon intensities expressed in USD millions of sales.

Box 5 CSPP universe

More than 90% of businesses' total carbon emissions purchased in the CSPP are concentrated in three sectors, namely (i) energy, (ii) transport and storage and (iii) manufacturing (Figure 9). The final category can be divided into a number of subsectors. Energy companies are on average the most carbon intensive; an average energy company produces almost 930 tonnes of carbon per million of sales. That is twice as much as the average of the entire debt index (479 tonnes). In manufacturing the average is approximately 650 tonnes and in transport and storage approximately 22 tonnes. The distribution within these polluting sectors is very wide.

Figure 9 Carbon-intensive sectors (red spheres) are overweight relative to their contribution to European GDP

Percentages of CSPP and percentages of GDP



Source: Trucost and Eurostat.

6 Summary of policy proposals

Large-scale investment is required to make the European and Dutch economy climate-neutral by 2050. In this chapter we provide a summary of the policy measures required in order to improve the business case for climate investment, to reduce the mismatch between climate investment and financing and to strengthen the market incentives to bring the financing of existing businesses more in line with climate targets.

In this study we identify three impediments to the financing of the required climate investment. The first and most important impediment is that the business case for climate investment is unattractive, particularly because carbon emissions are underpriced (Chapter 3). The second impediment is the mismatch between the risk profile of innovative climate investment and the supply of finance in Europe. This is also reflected in the limited representation of sustainable businesses in current financing flows (Chapter 4). Thirdly, established business lack the necessary incentives to reduce their emissions, partly due to a lack of transparency about their climate-related risks and their plans to invest more in sustainability (Chapter 5). Below we provide an overview of the policy measures that can eliminate or reduce these impediments. Most policy measures address multiple impediments (Table 6).

Table 6 Overview policy measures

Policy recommendations	Who?	Impediments: Limited business case for climate investment	Impediments: Mismatch in risk profile between climate investment and supply of finance	Impediments: Insufficient sustainability incentives in financing of established businesses
1. Adequate carbon pricing	Governments	■	■	■
2. Coordinating role for government in innovative investments	Governments	■	■	■
3. More government support for climate investments	Governments, EC	■	■	■
4. Spurring financial innovation	Governments, EC	■	■	■
5. Climate accounting standards and data	Standard setters	■	■	■
6. Climate risks in monetary operations	Central banks	■	■	■
7. Climate risks in financial sector and supervisory framework	Supervisory authorities	■	■	■

Legend
- ■ has direct impact on impediment
- ■ has indirect impact on impediment
- ■ has little or no impact on impediment

6.1 Improving business case for climate investment

The required climate investment must generate sufficient returns in relation to the risk, i.e.: if the business case is good. This is rarely the case at present (Chapter 3). The most effective measure for boosting climate investment is therefore improving the business case, by means of adequate carbon pricing and more government support.

Policy recommendations:

1. **Adequate carbon pricing.** Improving the business case of climate investment and sustainable financing depends crucially on adequate pricing of carbon emissions through higher carbon taxes and the phasing out of fossil fuel subsidies and tax exemptions. Currently, carbon intensive sectors, such as manufacturing and agriculture, pay very little for their emissions. Better pricing of carbon emissions is therefore necessary. This will preferably be coordinated at international and European level, so that the competition disadvantages for businesses are smaller and carbon leakages are limited. For better carbon pricing in the manufacturing and electricity sector, the ETS must be strengthened, for example by lowering the emission ceiling and reinforcing the Market Stability Reserve (MSR). The revision of the MSR will also restrict the waterbed effect and give more certainty to investors on future ETS prices. In order to protect competitiveness and limit carbon leakage, a carbon levy could also be introduced at the EU's external border. This would also make it easier to phase out the number of free allowances, while still requiring exemptions for exports outside the EU. For sectors that are not currently covered by the ETS, stricter European agreements on minimum national energy taxes are desirable. The ETS could also be expanded to include more sectors, such as real estate and mobility. It is also necessary to phase out European and national subsidy schemes that harm the environment, such as agriculture and fossil fuel subsidies. In addition, taxes at national level should be aligned more closely

with the extent of pollution, for example by phasing out degressive energy tariffs. Large carbon intensive companies in the Netherlands pay considerably less energy tax than small and medium-sized enterprises, because large energy consumers receive tax rebates. Finally, more coercive measures are required to make agriculture more sustainable. In the Dutch agriculture sector the effective carbon tax is relatively low and no European pricing measures are expected in this area. In addition to greenhouse gas emissions, the nitrogen problem requires additional national agriculture policy in the Netherlands, for example through better carbon pricing. At the same time it is important to give consumers better financial incentives for more sustainable choices.

2. **Coordinating role for government in supporting innovative sustainable activities.** In markets affected by coordination problems between investors and financiers and where innovations are dependent on a specific infrastructure, the government must take on a stronger coordinating role, in addition to taxing carbon intensive economic activities. Government support is required to coordinate supply and demand effectively in the planning, financing and construction of the required infrastructure for energy services and manufacturing, because supply and demand in these sectors are not aligned with investment plans ('chicken and egg' problem). Clear transition paths and guarantees can assist in this regard. More public-private partnerships will help to develop and scale up new technologies, such as sustainable hydrogen and CCS. New, unproven technologies that are not yet competitive can be supported temporarily with subsidies, for example. Governments at European and national level can also reduce uncertainty through co-financing and guarantees, as provided for in the European Green Deal. This requires a tailor-made approach. An important precondition for this is consistent and reliable government policy, so that there is sufficient certainty for private investors to provide the necessary financing over

the longer term. A good example is offshore wind, where minimum price guarantees played an important role in the industry scale-up in the Netherlands, after which costs fell sharply.

3. **Boosting climate investment for green recovery**. The COVID-19 crisis provides momentum for measures that contribute to the energy transition and also give the economy an investment boost in the short term. The recently formed National Growth Fund offers opportunities in this regard, because the climate impact is factored into the allocation of funds. The EU recovery fund has also earmarked EUR 5.5 billion for the Netherlands, at least 37% of which must be used to achieve climate objectives. Invest-NL can also contribute. It is important that Invest NL is given room to primarily use its resources to finance the energy transition. Additional government support is also required to increase the sustainability of the housing market, for example by increasing the Sustainable Energy and Energy Conservation Investment Subsidy (ISDE). Investment in the sustainability of owner-occupied homes is often unprofitable under the existing subsidy schemes, despite the relatively high effective carbon tax for real estate. It is also necessary to enhance the sustainability profile of the social housing stock, for example by means of higher discounts on the landlord's levy for more sustainable investment. At European level the European Commission can stimulate public-private partnerships by simplifying government support rules and granting exemptions for the co-financing of climate investment by governments. A precondition for extra government financial support is that the stability of public finance is not unduly strained. Improved carbon pricing and the reduction of fossil fuel subsidies helps create fiscal room to step up public climate expenditure.

6.2 Reducing the mismatch between the risk profile of climate investment and financing

The energy transition requires investment in new technologies and sustainable businesses. The limited supply of private finance for risky innovative investment is a generic problem in Europe. It is relatively important for the financing of the energy transition, however, because the transition is characterised by technological innovations with an uncertain payback period and over a long term. In addition to the above measures to improve the business case for climate investment (1-3), governments need to take additional measures to better align supply and demand for climate finance in the private market.

Additional policy measures:

4. **Boosting equity financing and financial innovation**, by reducing tax incentives for debt finance and speeding up the creation of the European Capital Markets Union, with a focus on equity financing and sustainable financial instruments (Schnabel, 2020). The new action plan for the European Capital Markets Union is focused among other things on a sustainable, inclusive and resilient economic recovery through better access to financing for European businesses.[19] Here the European Commission is focusing its action on greater transparency and facilitating investment in equity instruments.[20] As well as encouraging equity financing, it is also necessary to pursue financial innovation in Europe, for example by promoting a safe and efficient securitisation market. The European Commission should therefore conduct an evaluation of the securitisation market.

19 https://ec.europa.eu/info/publications/200924-capital-markets-union-action-plan_nl

20 The Commission will put forward a renewed sustainable finance strategy to increase private investment in sustainable projects and activities. Backed by deep capital markets, this strategy will support the actions set out in the European Green Deal to manage climate and environmental risks and integrate them into the EU's financial system." (https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=COM:2020:590:FIN).

5. **Climate accounting standards and consistent data and indicators**. Information asymmetries are relatively large in the financing of new technologies or business models, because the financier is often less familiar with them. It is therefore necessary to develop binding global accounting standards for sustainability risks. When investors can see the sustainability aspects of their investment, they can gauge the required risk premium more accurately. In this context DNB welcomes the plans of the International Financial Reporting Standards (IFRS) Foundation to establish a Sustainability Standards Board (SSB).[21] The SSB intends to translate the various existing initiatives in the field of sustainability reporting into a harmonised global reporting standard. It is important for proper risk assessment that the ultimate standard includes both the reporting of the sustainability risks borne by the reporting company (so-called *single materiality*), as well as the reporting of the impact of the reporting business on climate, biodiversity and the living environment (*double materiality*). Climate reporting must also contain forward-looking indicators, enabling investors to assess whether a business is making the transition. There is an urgent requirement for such reporting standards and in their development it will be necessary to strike a balance between completeness and speed. There should also be scope for different jurisdictions to add additional requirements to the standards and thereby align them with local sustainability ambitions. Regulation and harmonisation of commercial data providers is also desirable in order to improve the quality and range of data and transparent methods must be developed. Various data sources must be combined to produce indicators that give an accurate and consistent picture of the levels and changes of the climate risks and the climate impact of financial institutions'

21 The recent IFRS consultation paper and DNB's response can be found here: https://www.ifrs.org/news-and-events/2020/09/ifrs-foundation-trustees-consult-on-global-approach-to-sustainability-reporting/

portfolios.[22] To this end DNB has already taken the first steps in cooperation with the ECB and through other international bodies. In view of the urgency, however, the regular use of estimates, model data and a range of different methods will be unavoidable until better data based on harmonised standards become available.

6.3 Strengthening market incentives to increase the sustainability of established businesses

In addition to financial incentives, binding standards and rules for financial and non-financial businesses are necessary to ensure that climate risks are taken into account. In addition to carbon pricing and sustainability information (measures 1 and 5), better information on climate risks must be made an integral part of risk models and frameworks of private (institutional) investors, commercial banks, central banks and supervisory authorities. It is important that these players do not wait until 'perfect data' are available on climate risks; they must take action now, for example by amending risk and reporting frameworks on the basis of available standards and data (and where necessary switching to estimates or modelled data).

Additional policy measures:

6. **Climate risks in monetary operations**
   - **Transparency on climate risks in monetary operations.** The current review of the ECB's monetary strategy includes an examination of the potential inclusion of climate risks in monetary policy. It is important that the central bank is transparent about the climate risks on its own balance sheet. By setting a good example itself, it is advocating the transparency of climate risks in financial markets. Ultimately the

22 See, for example, European Central Bank (2020) on the long-term research agenda for climate indicators, data sources and methodologies.

central bank could include reports on carbon emissions in the collateral framework as a precondition for banks' participation in monetary operations or as a precondition for the purchase of corporate bonds.

- **Integration of sustainability criteria in risk framework of monetary operations.** Given that the ECB is also exposed to climate risks through its asset purchase programmes, the current risk frameworks and purchasing allocations should be evaluated. For example, an alternative benchmark could be used for corporate bond purchases that better reflects the energy transition. The ECB should preferably adopt climate benchmarks developed by the EU for this. The basis will then be EU climate policy and the ECB will not have to shape this policy itself. Such factors are part of the review of the ECB's monetary strategy. The results of this review will be announced in the second half of 2021.

7. **Climate risks in the financial sector's risk frameworks and supervisory frameworks**
   - **Supervision of the financial sector's climate risk management.** DNB expects banks, insurers and pension funds to analyse the materiality of climate risks and include material risks in their risk assessment. DNB monitors this, for example during the annual risk assessments (SREP, ORSA and ERB). DNB is also focusing on the further integration of climate risks in stress tests in these three sectors. For banks it is important to devote attention to climate risks when granting loans. It must also be possible for insurers and pension funds to take the long-term climate impact of investments into account in their investment policy within the 'prudent person principle', with pension funds ultimately taking fuller account of the preferences of their members. For insurers it is important that climate risks are reflected in pricing, for example through the use of risk-based premiums and the consistent inclusion of own risk.
   - **Prudential regulation.** DNB wants climate risks to be adequately reflected in prudential regulations, with adjustments to the framework

where necessary. The planned exploratory work by the Basel Committee and the EBA are an important next step in this regard. Specifically, DNB wishes to investigate whether a concentration limit is a suitable means of addressing climate risks for banks. For insurers it is important that the effect of climate risks on the necessary capital requirements is frequently analysed. Attention must be devoted to natural disasters and the impact of climate risks on the market risks of investments. A regular analysis by EIOPA of the need for differentiation (increase or decrease) of the capital requirement for market risk for green and brown investments is therefore appropriate.

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