October 2019

Klimarådet.

# A framework for Danish climate policy

*Input for a new Danish climate act with global perspectives*

# Table of contents

**Introduction, main conclusions and recommendations** ..... 3
**1. The need for targets in climate-policy** ..... 6
**2. The substance of a new Danish climate act** ..... 14
2.1 Determination and definition of targets ..... 16
2.2 Preparing climate plans ..... 21
2.3 Monitoring climate efforts ..... 25
2.4 Global climate efforts ..... 27
**Appendix A: Overview of the climate change policy frameworks of other countries** ..... 30
**References** ..... 31

The Danish Council on Climate Change was founded pursuant to the Climate Act adopted by the Danish Parliament (*Folketinget*) in 2014 with the objective to establish an overall strategic framework for Danish climate policy in order to transition to a low-emission society in 2050. Since 2015, The Danish Council on Climate Change has submitted its recommendations to the government in annual assessment reports, supplemented with individual analyses of selected climate-policy issues.

## Introduction, main conclusions and recommendations

A majority of the Danish Parliament (Folketing) has decided that Denmark is to have a new climate act. The aim of the new climate act is to support and steer the Danish transition towards a climate neutral society by the middle of this century. At that point in time Denmark and the rest of the world should be well on the way to eliminating the anthropogenic emissions of greenhouse gases causing ever more serious climate change across the globe, according to the UN Intergovernmental Panel on Climate Change (IPCC).

Early this year, 67,308 citizens in Denmark signed a petition for a new climate act. Since then, both sides of the Danish Parliament (*Folketing*) have expressed the need to revise and tighten the existing 2014 Climate Act. In addition, the current government and its supporting parties have presented an agreement (*Retfærdig retning for Danmark*), stating that the new government will "propose a climate bill with binding intermediate targets and binding long-term targets" in the next parliamentary year. There is thus a broad parliamentary desire to draw up a new and stronger climate act.

Ideally, the Danish Parliament will adopt a new climate act that can ensure progress in the green transition, and that can both ensure a sufficient level of ambition and ensure that these ambitions are realised. These elements are not part of the current Climate Act, which only includes a target for 2050, the establishment of The Danish Council on Climate Change, and a requirement that the Danish government present a climate-policy report every year.

If we are to achieve the goal of a green transition in Denmark, all parts of society must contribute. If the public and businesses are to develop and invest in green solutions, whether this be investment in a heat pump for a house or investment in a new plant to produce green fuels, a stable framework for climate policy must be in place. This means climate policies should avoid stop-go-politics and ensure that the public and businesses can have confidence in the planned political framework. Broad political support for a new climate act will be the best guarantee of a stable framework.

This analysis, *Framework for Danish climate policy - input for a new Danish climate act with global perspectives* has two chapters. Chapter 1 examines the need for national climate policy goals. Just as the Paris Agreement sets the course for international climate policy, it is appropriate to set targets that steer Danish climate policy, and therefore The Danish Council on Climate Change look more closely at the Danish objectives. There are good reasons to set both long-term targets, and intermediate targets. Long-term targets can help clarify what Denmark is working towards, while intermediate targets make political management towards reaching the long-term targets significantly easier and make the transition more tangible. The interaction between the two types of targets, the long-term targets and the intermediate targets, is crucial and it is appropriate to include both types of goals when planning Danish climate policy.

In the 2018 Energy Agreement, the Danish Parliament agreed that Denmark is to have net-zero emissions by no later than 2050. This means that we can only have very few emissions, which must be counterbalanced by an equal uptake of greenhouse gases from the atmosphere. The Danish government and its supporting parties have agreed on an intermediate target for 2030 on the way towards a society with net-zero emissions: Denmark must have reduced total emissions of greenhouse gasses by 70 pct. compared with the 1990 level. Since this agreement, a number of other parties have stated that they support this target. Both the target for 2030 and 2050 should be written into an upcoming climate act.

In chapter 1, The Danish Council on Climate Change also assesses whether the Danish targets can be considered as being consistent with The Paris Agreement. The answer depends on how much of the global efforts Denmark should take on. It is difficult to argue that Denmark should do less than what a principle of equity will demand of it. This principle states that all people have the same limited right to emit greenhouse gases. An analysis based on this principle shows that a Danish 2030 target of 70 pct. reduction in greenhouse gas emissions and a long-term target of net-zero emissions by no later than 2050 is fairly consistent with an international goal to limit the global temperature increase to 1.5 degrees. Other principles for effort sharing, such as the principle of historical responsibility or the capacity to reduce emissions, entail going further than the target in 2030 and 2050 by also helping to reduce emissions internationally.

After having discussed long-term targets and intermediate targets in relation to the Paris Agreement in the first chapter of the analysis, The Danish Council on Climate Change presents a proposal for the climate policy framework in a new act that can help ensure that the long term target and intermediate targets are actually met. In this second chapter, the Council provides ideas on how to design a framework that credibly and cost-effectively ensures actual and adequate emissions reductions.

The primary goal of a climate act should be to ensure that that climate policy leads to actual reductions in greenhouse gas emissions within Danish borders. This is achieved by setting intermediate targets, developing climate plans and monitoring efforts. These three elements and the interaction between them are described in sections 2.1, 2.2 and 2.3. This analysis primarily focuses on reducing emissions from Danish territory, but it is important to remember that Denmark could also directly help reduce emissions outside of Danish borders, and a climate act could contain elements aiming to limit emissions outside of Denmark, e.g. through a strategy for Denmark's international efforts. Section 2.4.describes this global focus of Danish climate policy.

Overall, Denmark is facing a significant transition of the society, and The Danish Council on Climate Change considers that one of its tasks is to map and recommend solutions for this transition. However, providing inputs to concrete initiatives for the green transition is outside the scope of this analysis. Instead, this analysis will focus on outlining a suggestion to a climate policy framework that can steer and ensure the necessary Danish efforts.

A climate act can contain more elements than those described in this analysis, and there are thus a number of more specific topics and issues that are not dealt with in the analysis. For example, the analysis does not take a position on the role of The Danish Council on Climate Change in a future climate act. The existing Climate Act describes the current role of The Danish Council on Climate Change and when this is revised, one needs to consider how and which tasks The Danish Council on Climate Change could and should contribute to. Another topic the analysis does not cover is adaptation to the unavoidable effects of climate change.

**Main conclusions and recommendations from The Danish Council on Climate Change**

Having ambitious targets in both the short and long term makes managing climate policy easier. Denmark has a long term target of achieving a balance between emissions of greenhouse gases and removal of greenhouse gases from the atmosphere by no later than 2050 (net-zero emissions). In addition to this long term target the government along with its supporting parties have agreed on a target that greenhouse gas emissions are to be reduced by 70 per cent in 2030 relative to the level in 1990. Together, these targets seem fairly in line with what can be considered Denmark's fair share of the efforts necessary to keep the global temperate increase below 1.5 degrees, which is what the Paris Agreement pursues. In addition to this, Denmark's wealth, skills and large emissions in a historical perspective call for Denmark to contribute more to combat climate change, for example by financing climate efforts in other countries and by developing and deploying green technologies, or similar efforts to reduce emissions outside of Danish borders. Climate efforts will not end in 2050, and therefore it is important that a climate act anticipate that Denmark is very likely to need negative emissions after 2050.

A new Danish climate act should be drafted in a way so that climate policy leads to actual greenhouse gas reductions in a credible and cost-effective manner at the same time as bringing Denmark closer towards the long-term target of net-zero emissions by no later than 2050. This can be achieved by having targets, climate plans and monitoring efforts that interact to push the domestic transition forward while at the same time having a strategy for how Denmark can best contribute to reducing emissions outside of Danish borders. A future climate act should focus on reducing national emissions, so that Denmark can achieve its long-term target by 2050, and it should show the direction for Danish efforts to reduce emissions outside of Danish borders.

On the basis of this analysis, The Danish Council on Climate Change recommends that:

- The part of the Climate Act focusing on ensuring actual domestic greenhouse gas emission reductions should contain three closely entwined sub-elements: setting targets, preparing climate plans, and monitoring efforts:
    - The following is recommended with respect to setting and defining targets:

        - A target of 70 pct. reduction in 2030 relative to 1990, and a target of net-zero emissions by no later than 2050 should be included within the Climate Act.
        - The act should require that climate targets are set at least every five years with a ten-year time frame. These targets should be set politically based on developments in climate science and technological developments. The ten-year targets should not be written into the act in order to avoid unnecessary revisions.
        - Given the short time horizon, the target for 2025 should only be an indicative target.
        - Targets should be designed as targets for specific years in relation to the 1990 emissions defined by the UN, i.e. the so-called base-year emissions.
        - Targets should be achieved through actual greenhouse gas emission reductions in Denmark, and should not be met by cancelling carbon allowances, for example. Target achievement should generally follow the UN's methods of calculation. If the UN's method of calculation cannot guarantee that there is consistency between the calculated greenhouse gas emissions and actual greenhouse gas emissions, the method of calculation should be adjusted. For example, this may be relevant for biomass: If it is not possible to document this as climate-sustainable, it should not be counted as carbon-neutral in relation to achieving the targets.
    - The following is recommended with respect to drawing up climate plans:
        - The government should prepare climate plans every five years, which paves the way for reaching the ten-year climate targets.
        - A climate plan should include integrated sector specific strategies with initiatives within each sector, as well as indicators for trends within each sector. The sector specific strategies have to be integrated and coordinated, as challenges in one sector could be resolved through initiatives in another sector.
        - Sector specific strategies should be set with broad involvement of the public, organizations and businesses.
    - The following is recommended with respect to monitoring climate efforts:
        - A forecast should be prepared every year showing whether the climate plan seems to be achieving the target.
        - If the annual forecast shows that the climate plan is not likely to meet the ten-year intermediate targets, the government should prepare an updated climate plan with further initiatives that improves the likelihood of reaching the target.
        - An independent expert body should validate the forecasting process.
        - Calculations of climate change impacts should be made for all relevant new bills proposed.
- The part of the climate act focusing on reducing emissions outside of Danish borders, should contain the framework for a strategy, which seeks to reduce global emissions of greenhouse gases, both through domestic initiatives, such as technological development and reduced consumption of imported goods with large climate footprints, or through initiatives in other countries, such as assistance in developing countries. There should be regular follow up on whether the strategy is having the intended effect.

# 1. The need for targets in climate-policy

Just as the world's countries have the Paris Agreement as a guide, there is a need for Danish objectives to guide Danish climate policy. In this chapter, The Danish Council on Climate Change looks at the need for Danish climate targets, and whether these targets are aligned with ambitions to limit the global temperature increase, as described in the Paris Agreement.

**The Paris Agreement forms the framework for global climate change mitigation efforts**

The long-term target in international climate policy was set in the 2015 Paris Agreement. The Paris Agreement target is to keep the temperature increase "*well below 2°C above pre-industrial levels and to pursue efforts to limit the temperature increase to 1.5°C above preindustrial levels*". This is a challenging task and it will require very ambitious efforts across all countries where each individual country should contribute as much as possible according to the Paris Agreement. We can only reach this target if every country go through a major transition that limits total greenhouse gas emissions.

Moreover, this major transition must take place within a relatively short period of years, if temperature increase must be limited to 1.5°C. Already in 2030, the global emissions must be 39-51 per cent lower than in 2010, if we are to keep the temperature increase below 1.5°C. By 2050, global greenhouse gas emissions must be 81-93 per cent lower than in 2010, while emissions of $CO_2$, which is just one of several greenhouse gases, must be reduced by 94-107 per cent. A reduction of 107 per cent means that the world as a whole has to remove more $CO_2$ from the atmosphere. This is known as negative $CO_2$ emissions. To keep the temperature increase below 1.5 degrees, the world will need to achieve more or less zero anthropogenic $CO_2$ emissions by around 2050, and emissions of other greenhouse gases such as methane and nitrous oxide must be reduced significantly. After 2050, there is most likely a need for negative emissions. Figure 1 illustrate this by showing four scenarios from the UN IPCC 2018 report. Even in a scenario with significant reductions up to 2030 (yellow line), there is a need to remove $CO_2$ from the atmosphere after 2060.[1]

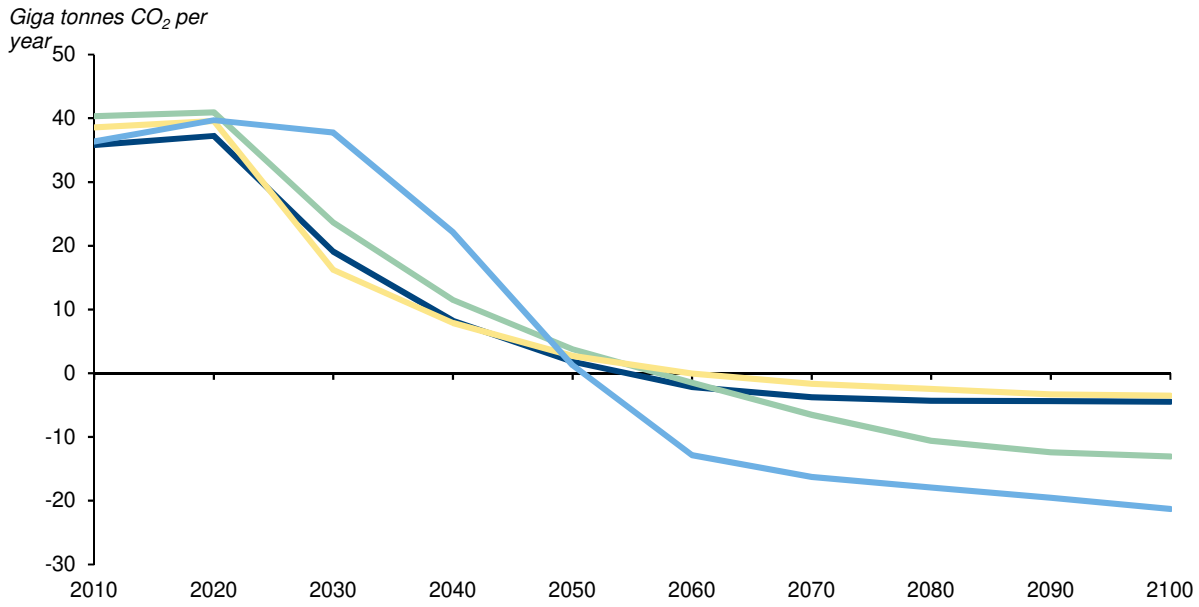


Figure 1 Four representative scenarios which lead to a temperature rise of 1.5 degrees or less

Note: 1: The four different scenarios are examples from the UN IPCC's 2018 report, Global Warming of 1.5°C. The scenarios are based on various assumptions about economic growth, availability of fossil resources, the resource demands of human lifestyle, food and energy demand, and technological development. This results in different reduction pathways, but all the scenarios result in a temperature increase of 1.5°C or less.

Source: Intergovernmental Panel on Climate Change, Global Warming of 1.5°C, 2018

With the current ambitions in the countries' announced climate targets, global temperatures will increase by around 3°C, so if the Paris Agreement targets are to be reached, there is a need for significantly higher ambitions from the world's countries.[2] The Paris Agreement is designed with the objective to encourage countries to set targets that are ever more ambitious. The Paris Agreement does not stipulate how much different countries should reduce their emissions, but instead the countries have committed to strengthen their targets over time. Every five years, starting from 2020, the countries will submit new climate targets that cannot be less ambitious than the previous target.[3] For example, the current EU target is to reduce emissions by 40 per cent by 2030 compared with 1990, but discussions are currently underway to submit a higher target of 50-55 per cent. At the same time, there is ongoing reporting and monitoring of whether countries are likely to reach the targets they have set. Three years after the targets have been submitted, there will be a global stock take looking into whether the overall targets in the Paris Agreement are likely to be realised with the targets submitted. The process of updating individual country targets and tacking stock of their effect on the overall goal of the Paris Agreement will continue every five years, with targets being updated in 2025 and a new stock take in 2028 and so on. Figure 2 outlines this process. Thus, the Paris Agreement has a built-in dynamic by which the countries are expected to adjust their targets upwards regularly, as this is made possible by lower prices on mitigation efforts and technological improvements, or as smaller reductions are made necessary by new climate knowledge.

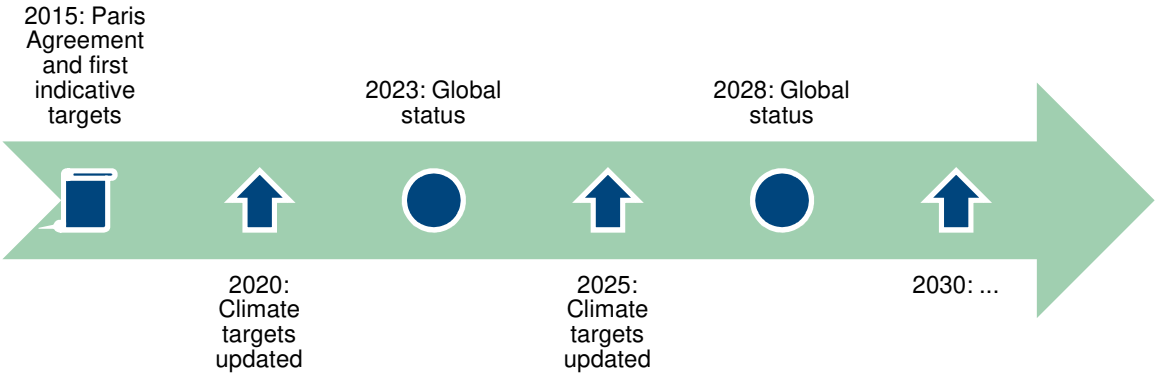


Figure 2: Paris Agreement process for international climate policy

Source: The United Nations Framework Convention on Climate Change, Paris Agreement, 2015

**Long-term targets are necessary**

Achieving the Paris Agreement target is a huge task, demanding persistent efforts for many years. In order to achieve the Paris Agreement targets, the world must stop exacerbating global warming with significant greenhouse-gas emissions. Therefore, there is an explicit target in the Paris Agreement that global emissions of greenhouse gases cannot be higher than the amount of removal of greenhouse gases from the atmosphere. This is also called as net-zero emissions. Net-zero emissions must be achieved in the second half of this century.

Hence, the time horizon as stated in the Paris Agreement is longer than the five-to-ten-year perspectives, often applied in other policy areas. Therefore, long-term targets are required in order to ensure that the Paris goals are reached. These targets must at least have a 2050-horizon, and pontentially climate targets going beyond 2050 will be necessary. As figure 1 illustrates, there is a need for climate change mitigation, even after 2050 where $CO_2$ needs to be removed from the atmosphere. A planning horizon with just a five-ten-year perspective could cause problems, because we risk choosing technologies that are not viable in the long term. For example, increasingly

efficient petrol-powered cars will reduce carbon emissions now, but will not remove the actual source of emissions: burning petrol. Therefore, the long-term targets set the direction for efforts in the shorter term.

Parts of the transition will take a very long time to complete, if it is not to be unnecessarily expensive. For example, most cars last for about 15 years. This mean that it is not possible to convert all these cars to zero-emission cars within 10 years without scrapping many well-functioning cars, which is costly. A long-term target for emissions in 2050 makes it possible to organise the transition better and to enact the right initiatives in time, to ensure successful transition in the most cost-effective manner and achieve the Paris Agreement targets.

**Denmark's long-term targets**

All countries will have to contribute if the Paris Agreement targets are to be achieved. Therefore, Denmark has to contribute as well, but Denmark cannot use the the Paris Agreement temperature targets as its own long-term targets because achieving these depends greatly on what other countries do. Instead Denmark can translate the Paris Agreement targets, and the global greenhouse gas emission reductions required to meet these targets, into a target for Denmark's efforts.

The Danish Parliament agreed in the 2018 Energy Agreement that Denmark's long-term target is to have net-zero emissions by no later than 2050. This target was based on the Paris Agreement, and is meant to guide the transition of Danish society. Net-zero emissions can be seen as a target of a 100 per cent reduction in greenhouse gas emissions, however, there is room for emissions provided these are offset by a corresponding uptake of greenhouse gasses. Danish climate policy should always have this long-term target in mind.

**The long-term target is not sufficient without intermediate targets**

It is difficult to achieve a long-term target, if you have no intermediate targets along the way. The long-term target can be difficult to relate to and it does not provide an answer to what or how much work should be done in the short term. There is a risk that the long time horizon could be a pretext for inaction and delay efforts until it is too late. Intermediate targets can encourage the transition towards a society with net-zero emissions in the short term, and they can set the pace of the transition. This will ensure that Denmark does not postpone the transition and leave a large part of the work for later. Thus, intermediate targets help instill credibility in the long-term targets. Intermediate targets also make it easier to ensure that cumulative emissions are limited. In theory, without intermediate targets it would be possible to continue the emission of greenhouse-gases right up to 31 December 2049 and then stop the emission completely in 2050. Intermediate targets can help ensure more gradual progress towards 2050, thereby reducing the total amount of emissions over a given period of time.

Figure 3 shows the difference between the two scenarios up to 2050. One scenario has an intermediate target of 70 per cent reduction in 2030 compared with 1990 which was set out in the political understanding between the Social Democrats, the Social-Liberal Party, the Socialist People's Party and the Red-Green Alliance. The second scenario shows a scenario without an intermediate target in 2030 and without additional climate initiatives before 2030. Without further climate initiatives, according to the latest calculations from the Danish Energy Agency, emissions will be approximately 38 million tonnes $CO_2$-equivalents in 2030, corresponding to a reduction of about 45 per cent compared with 1990 (green dotted line). If the long-term target is net-zero emissions by 2050, the pace of the green transition will have to accelerate significantly after 2030 (pink dotted line). In comparison, the 70 per cent target will lead to a significant reduction in greenhouse gas emissions up to 2030 (the yellow dotted line). This results in a smaller annual rate of reduction for the last 30 per cent of emissions (blue dotted line), and this makes it possible to achieve the target of net-zero emissions earlier. The shaded area shows the amount of greenhouse gasses not emitted by having a 2030 target of 70 pct. compared with not having a 2030 intermediate target. This illustrates the point that intermediate targets can help reduce cumulative emissions, and which is what determines the temperature rise.

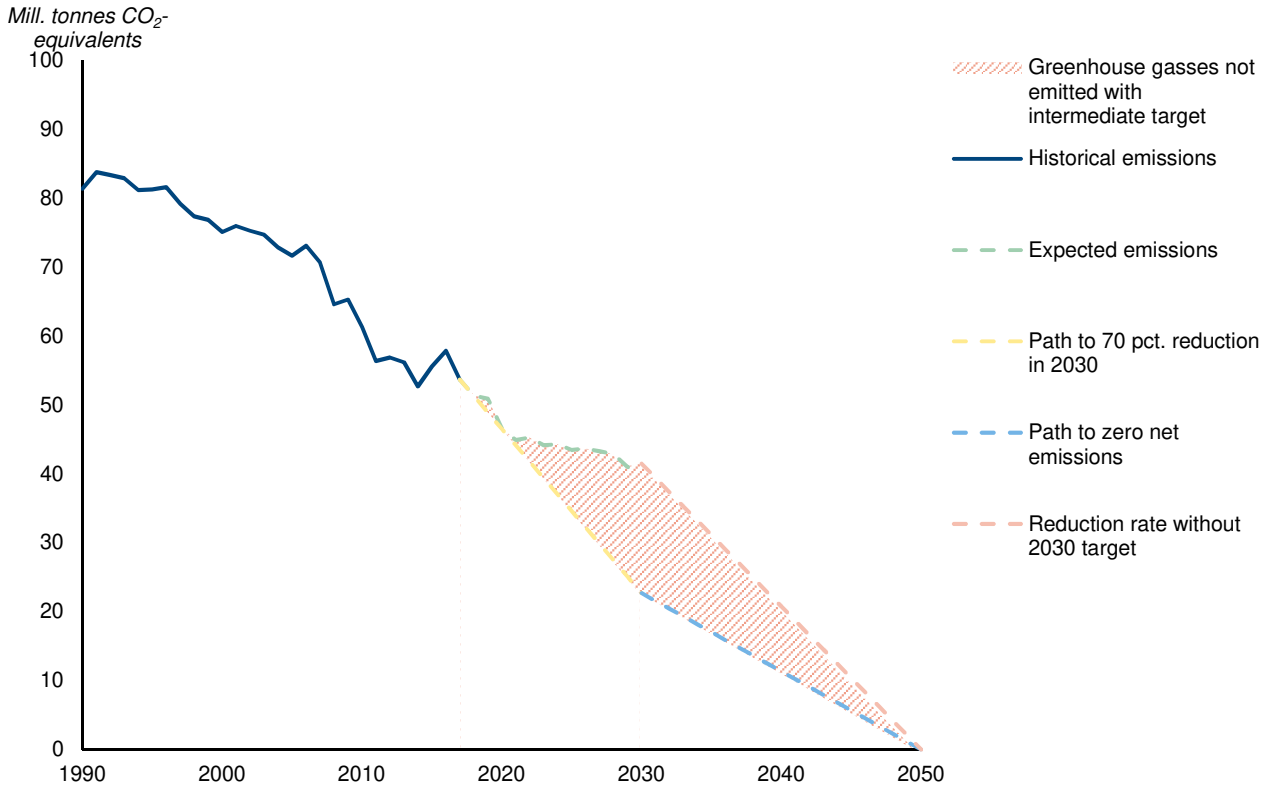


Figure 3 Danish greenhouse gas emissions up to 2050

Note: 1 Emissions include emissions in the LULUCF sector
Note: 2: Emissions have been corrected for weather and electricity trade
Source: Danish Energy Agency, Denmark's Energy and Climate Outlook 2019, 2019

**Consistency with the Paris Agreement requires compliance with the carbon budget**

Consistency with the Paris Agreement requires long-term targets and intermediate targets. The level of ambition in countries' targets will determine whether the Paris Agreement temperature targets are met. In this connection, the government and its supporting parties have agreed on a climate policy "*that ensures that Denmark lives up to the Paris Agreement*". This is stated in the political document of understanding. The document also states that "The Danish Council on Climate Change is to assist a new government in deciding on reduction targets and instruments to ensure that Denmark lives up to the temperature targets in the Paris Agreement". When assessing whether Denmark's overall climate targets (70 per cent reduction in emissions by 2030 compared with 1990 and 100 per cent reduction by 2050), are consistent with the temperature target in the Paris Agreement, it is important to bear in mind that the Paris Agreement only includes an obligation to commit to a target. This means that the countries define themselves how ambitious their targets are and the countries are not legally bound to comply with the targets they submit.[4] However, when assessing whether a country's climate policy is consistent with the Paris Agreement it often means assessing whether a country has targets that correspond to its reasonable share of what is required if the world as a whole is to achieve the temperature targets of the Paris Agreement. In the context of this interpretation, the section below examines more closely, whether the Danish climate targets are consistent with the Paris Agreement.

As mentioned above, the target in the Paris Agreement is to keep the temperature increase "well below 2°C above preindustrial levels and pursuing efforts to limit the temperature increase to 1.5°C above preindustrial levels" (article 2.1 (a)). In 2018, the UN IPCC published a report that concluded that the 1.5 degree target is possible, but it requires action now and to a hitherto unseen extent. The report also concluded that a 1.5-degree rise in global temperature would result in significantly better conditions for most societies than a 2-degree rise. Many risks, such as flooding or heatwaves, are significantly less likely with a 1.5-degree rise than with a 2-degree rise.[5] Furthermore,

a number of researchers have demonstrated that if the global temperature rises by 2°C (or more), there will be a greater risk of climate change becoming self-reinforcing, and some of the natural processes that remove greenhouse gases from the atmosphere will be impaired. This will cause the temperature to rise further, with negative consequences for humanity.[6] The time of climate change becoming self-reinforcing and irreversible is uncertain, so a precautionary principle also dictates aiming for a 1.5-degree target instead of 2 degrees. Therefore, in this chapter we assess whether Denmark's target is consistent with a global target to maintain the global temperature rise at a maximum of 1.5°C.

The targets in the Paris Agreement do not directly say anything about what is required from Denmark, if they are to be met. Defining what the Danish objectives should be in light of the Paris Agreement therefore requires that we consider the volume of greenhouse gas the world as a whole can continue to emit. If the temperature rise is not to exceed 1.5°C, the world as a whole can only emit a limited amount of greenhouse gases. This can be calculated using a number of scenarios collected by the UN IPCC that comply with a given temperature target and then examining the level of emissions of the various greenhouse gases. A carbon budget can be derived from these scenarios. The carbon budget states approximately how much $CO_2$ we can emit if the temperature is not to increase by more than 1.5°C. However, the carbon budget requires that emissions of the other greenhouse gases follow the scenarios forming the basis for the carbon budget. Therefore, the carbon budget only indirectly considers the permitted size of emissions of the other greenhouse gases such as methane and nitrous oxide. See also Box 1. The best estimate from the UN IPCC is that the global budget is between 420 and 570 bn. tonnes $CO_2$, but the exact figures depend on the method of calculation. This means that, if the world as a whole does not emit more $CO_2$ than 420-570 bn. tonnes, there is a 66 pct. probability[7] that the temperature rise increases no more than 1.5°C.[8] If we maintain the current level of emissions, the global 1.5°C budget will be exhausted between 2028 and 2032.

**Denmark's domestic targets are reasonably consistent with the temperature targets in the Paris Agreement**

The Danish Council on Climate Change estimates that total Danish $CO_2$ emissions will be about 325-525 million tonnes, provided Denmark meets its climate targets. See box 1 for more details. The question is whether this level for total carbon emissions is more or less corresponding with what can reasonably be said to be Denmark's percentage of the global $CO_2$ budget.

**Box 1: How large can Danish $CO_2$ emissions be with the current climate targets?**

The UN IPCC report, Global Warming of 1.5°C, states how global emissions of greenhouse gases will have to develop in the future to keep the global average temperature rise below 1.5°C and 2°C, respectively. In the calculations, the UN IPCC differentiates between $CO_2$ and other greenhouse gases such as methane and nitrous oxide. Among other things, this is because the different greenhouse gases affect the temperature rise in different ways, and because they do not have the same lifetime in the atmosphere. The UN IPCC's calculations show the total amount of $CO_2$ that can be emitted into the atmosphere while still keeping the temperature rise below 1.5°C and 2°C – the so-called carbon budget. The size of the carbon budget is thus calculated depending on the amount of the other greenhouse gases emitted.

The assessment of whether Danish climate targets are consistent with the Paris Agreement is based on whether expected future Danish $CO_2$ emissions are within Denmark's carbon budget. How much $CO_2$ Denmark emits in total until 2050 depends on two factors. The first is how greenhouse gas emissions develop up to the 2030 and 2050 climate targets. If Denmark reduces emissions significantly early on in the period, this will result in lower total emissions of greenhouse gases, than if the reductions are not made until later in the period. The second factor is how the reductions are spread between $CO_2$ and other greenhouse gases such a methane and nitrous oxide. If emissions of methane and nitrous oxide are not reduced, larger reductions in $CO_2$ emissions will be required for Denmark to fulfil its climate targets. This will lead to lower total $CO_2$ emissions than if emissions of all greenhouse gases were reduced equally.

If Denmark both reduces $CO_2$ emissions and emissions of the other greenhouse gases by 70 pct. in 2030, and 100 pct. by 2050, expected total $CO_2$ emissions will be around 525 million tonnes up to 2050. However, it may turn out to be more difficult to reduce emissions of the other greenhouse gases than to reduce $CO_2$ emissions. If

the other greenhouse gases are reduced by less than 70 pct. in 2030, and 100 pct. by 2050, this will require that $CO_2$ emissions be reduced by more in order for Denmark to live up to its climate targets. The Danish Council on Climate Change considers that Danish climate targets mean that total $CO_2$ emissions will be about 325-525 million tonnes, depending on how the reductions are split between $CO_2$ and non-$CO_2$ greenhouse gasses.

The UN IPCC describes four different overall principles for effort-sharing of the global carbon budget: responsibility, capacity, equality and right to development.[9] Furthermore, a effort-sharing principle could be based on uniform reductions for all countries. Table 1 describes the different effort-sharing principles.

| Effort-sharing principle | Explanation |
|---|---|
| Uniform relative reduction for all countries | This approach dictates that all countries should reduce emissions by an equal percentage. The 1.5-degree target means that the world's $CO_2$ emissions as a whole have to be reduced by about 45 per cent in 2030 compared to 2010, according to the UN IPCC,[10] and therefore all countries have to reduce emissions by 45 per cent compared to 2010, according to this effort-sharing principle. |
| Equality (equal per capita emissions) | This principle means that all people can have equal emissions, and all the world's inhabitants share the carbon budget equally. There are different methods to reflect the different population growth in different countries, or one could take outset in a specific year and then share the carbon budget according to the countries' share of the world's population in that year. This principle means that the countries emitting more per capita today have to reduce emissions significantly more than countries with low per capita emissions. |
| Capacity | This approach reflects that wealthy countries have more capacity and resources to reduce emissions, and therefore they should do more. |
| Right to development | Poor countries should be allowed to emit more than wealthy countries because development and poverty reduction is more important than combating climate change. Therefore, poor countries should have a larger proportion of the carbon budget. |
| Responsibility for historical emissions | Countries that have historically had high emissions should do the most to reduce emissions. Some people even suggest that there is a climate debt to be paid by the Western countries to developing countries.[11] |

Table 1 Different principles for effort-sharing global climate efforts

Source: Among others, The UN Intergovernmental Panel on Climate Change (UN IPCC), Climate Change 2014 Mitigation of Climate Change, Working Group III Contribution to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change: Chapter 4: Sustainable development and equity, 2014

The principle of uniform reduction for all countries is generally considered not to be a fair effort-sharing principle. For example, this would mean that all countries have to reduce emissions by 45 per cent in 2030 compared to 2010, regardless of the size of their current emissions and their development need. The principle thus does not comply with the principle that the developed countries should lead the way in combating climate change, as described previously.[12]

The equality principle means that the countries with high per capita emissions today have to reduce emissions most, and countries with low per capita emissions have to reduce less. It is hard to argue that a wealthy country like Denmark should have a larger share of the carbon budget than what corresponds to the Danish proportion of the world population. Sharing the global carbon budget based on the equality principle could be viewed as a good starting point for assessing the level of ambition for Denmark.

The equality principle implies that, with a population of around 0.075 per cent of the world's population, Denmark can emit 0.075 per cent the global carbon budget, corresponding to about 325-425 million tonnes $CO_2$, see box 1. However, there is much uncertainty about the size of the carbon budget. As mentioned above, with the current targets, Denmark's $CO_2$ emissions would be around 325-525 million tonnes $CO_2e$ throughout the period up to

2050, when Danish net greenhouse-gas emissions will be zero. Given the uncertainty about both the global carbon budget and Denmark's expected emissions of $CO_2$ and other greenhouse gasses up to 2050, Denmark's 2030 target of a 70 per cent reduction relative to 1990 and net-zero emissions by no later than by 2050, seem to be fairly consistent with ambition of Article 2 of the Paris Agreement to pursue effort for limiting the temperature increase to 1.5-degree, when the equality principle is applied. If Denmark reduced emissions faster, total emissions in Denmark would be lower, and this would reduce the uncertainty about whether Denmark is consistent with the 1.5-degree target.

There can be good reasons for taking account of other principles in addition to the equality principle. The three other principles (capacity, the right to development and responsibility for historical emissions) all suggest that wealthy countries like Denmark should do more than just ensure that everyone has the right to equal emissions. Historical emissions from developed countries have contributed significantly to current climate change, and one could argue that developed countries therefore have a historical responsibility. At the same time they are richer and have better opportunities to contribute to the global transition. However, it can be difficult to assess how much more wealthy countries should do, and this is discussed regularly in international climate negotiations.
Overall, The Danish Council on Climate Change assesses that the Danish climate targets are fairly consistent with the Paris Agreement.On the other hand, there is no basis for arguing that Denmark's targets deliver more than a reasonable share of the necessary global reductions required to achieve the 1.5-degree target.

One way Denmark could make a further contribution, in addition to that dictated by the equality principle, could be by contributing climate financing and supporting specific climate projects in developing countries, or by helping to implement green technologies to help developing countries to reduce their emissions faster. The end of chapter 2 describes in more detail how Danish efforts to reduce greenhouse-gas emissions outside of Denmark could be included in a future climate act.

#### Greenhouse gas reduction targets are the driving force in climate efforts

Denmark also has a number of other 2030 goals and obligations that an overall greenhouse gas reduction target should consider.[13] These are:

- 55 per cent renewable energy
- Phase-out of coal in electricity production
- 39 per cent reduction of emissions in the non-ETS sector, which primarily consists of transport, agriculture and buildings (EU obligation)
- 7 per cent renewable energy in the transport sector (EU obligation).

As can be seen, total Danish emissions are already subject to EU regulation - both in the ETS sector and in the non-ETS sector. Therefore, one could argue that Denmark has no need for national greenhouse gas emissions targets. However, the EU ETS is not working as intended, and there is a need for a generally high level of ambition to live up to the Paris Agreement:

- **The ETS sector:** Emissions from industry and electricity production are regulated by the EU ETS.
  The Danish Council on Climate Change has previously demonstrated that in its current form the EU ETS is not adequate to drive the green transition forward, and therefore it makes good sense to have a national reduction target that goes beyond what the EU ETS requires. The reason why the EU ETS is not enough is described in more detail in box 2.
  **The non-ETS sector**: Denmark already has an EU obligation to reduce greenhouse gas emissions in the non-ETS sector. However, The Danish Council on Climate Change has previously argued that Denmark could benefit from reducing emissions by more than is dictated by the EU obligation. This is because, among other things, the EU's (and most other countries') current submissions to the Paris Agreement are not sufficient to achieve the target in the Paris Agreement,[12] and therefore it is expected that the EU will at some point increase its climate targets, as the new President of the European Commission, Ursula von der Leyen, has proposed. The reason to go further than the Danish EU obligation is described in The Danish Council on Climate Change's analysis of the transition towards 2030[13].

**Box 2: The ETS sector and cancelling allowances**

The EU ETS aims to regulate emissions of greenhouse gases from the enterprises covered by the system. The EU ETS covers the energy sector and energy-intensive industry in all EU Member States as well as Iceland, Lichtenstein and Norway. The system works by the EU issuing a number of allowances for enterprises to emit $CO_2$ and other greenhouse gases.

An allowances system will usually have a so-called water-bed effect. This effect means that, if an enterprise reduces its emissions, and thereby its need for allowances, then allowance prices will fall and another enterprise will purchase the allowances and emit more. Therefore, in theory, emissions in an allowances system will be constant, like the water in a water-bed.

However, the EU ETS is not functioning like a water-bed. There are a number of reasons for this, and these are described in more detail in The Danish Council on Climate Change's analysis "*Det oppustede kvotesystem*", and Silbye and Birch Sørensen's "*Towards a more efficient European carbon market" (*2018). Two of the most important reasons why reduction initiatives in the ETS sector have an effect on total emissions are described below:

1. Today, there is a very large surplus of allowances. This means that, if an enterprise uses one less allowance today, then other enterprises will only to a very limited extent increase their emissions this side of 2050.
2. The large surplus of allowances has led the EU to implement a mechanism by which some of the allowances are cancelled. In very simple terms, this mechanism entails cancelling some of the surplus allowances. The mechanism means that, if an enterprise uses fewer allowances today, some of these allowances will be permanently cancelled.

This means that, if emissions are reduced within the ETS sector, e.g. by building wind turbines, only very few of the excess allowances from lower consumption of fossil fuels will be used by other enterprises. Some of the allowances made available will not be used until the distant future, while some of the excess allowances from the deployment of wind turbines will be cancelled. Ultimately, emissions will fall when countries like Denmark reduce emissions in the ETS sector.[14] See a more detailed explanation in The Danish Council on Climate Change's analysis *"Det oppustede kvotesystem*", and Silbye and Birch Sørensen's *"Towards a more efficient European carbon market"* (2018).

## 2. The substance of a new Danish climate act

A new climate act should ensure that Denmark reduces greenhouse gas emissions in the most cost-effective and appropriate manner. The act should not identify specific initiatives and instruments, but rather define the goal clearly and unambiguously, lay down a process for preparing climate plans, and determine a framework for monitoring and follow-up. As Denmark can also directly affect emissions outside of Danish borders, a climate act should also contain a process for preparing a strategy that focusses on reducing emissions outside of Danish borders.

The current 2014 Climate Act should be strengthen. The 2014 Act primarily includes a target for 2050, the establishment of The Danish Council on Climate Change, and an obligation for the government to prepare a climate policy report. However, the Act does not include any elements that directly support the achievement of the long-term target. A new climate act should therefore strengthen the existing Climate Act with the following three elements:

- **Actual and adequate greenhouse gas emission reductions:** A climate act should first and foremost create the framework for ensuring that Danish emissions are reduced to an extent that represents a reasonable Danish contribution to the global targets in the Paris Agreement. A climate act should also ensure that the targets are met through actual greenhouse gas emissions reductions.
- **Credibility:** A climate act should help to ensure that people and businesses are confident that climate-policy goals will be translated into action.
- **Cost effectiveness:** A climate act should serve to ensure the most cost-effective climate policy.

With outset in these three elements, The Danish Council on Climate Change has designed a climate policy framework.

#### A framework for a new Danish climate act

Based on the overall considerations regarding climate efforts, The Danish Council on Climate Change proposes a framework for a new climate act.

The purpose of the proposed framework is to establish a framework, which ensures actual and adequate greenhouse gas emission reductions, credibility in regards to achieving targets and a cost-effective green transition. Firstly, Denmark must reduce its own emissions to contribute its fair share to the overall Paris target, and therefore the climate act should have a clearly defined domestic focus. Furthermore, Denmark can also affect global emissions through a number of initiatives in areas that do not directly contribute to reducing domestic emissions. The analysis by The Danish Council on Climate Change has focused on specific recommendations for the domestic part of the climate act, while the analysis only provides reasons for the need for a globally focused strategy but does not recommend a specific design of the globally focused strategy. Figure 4 illustrates The Danish Council on Climate Change's suggested framework.

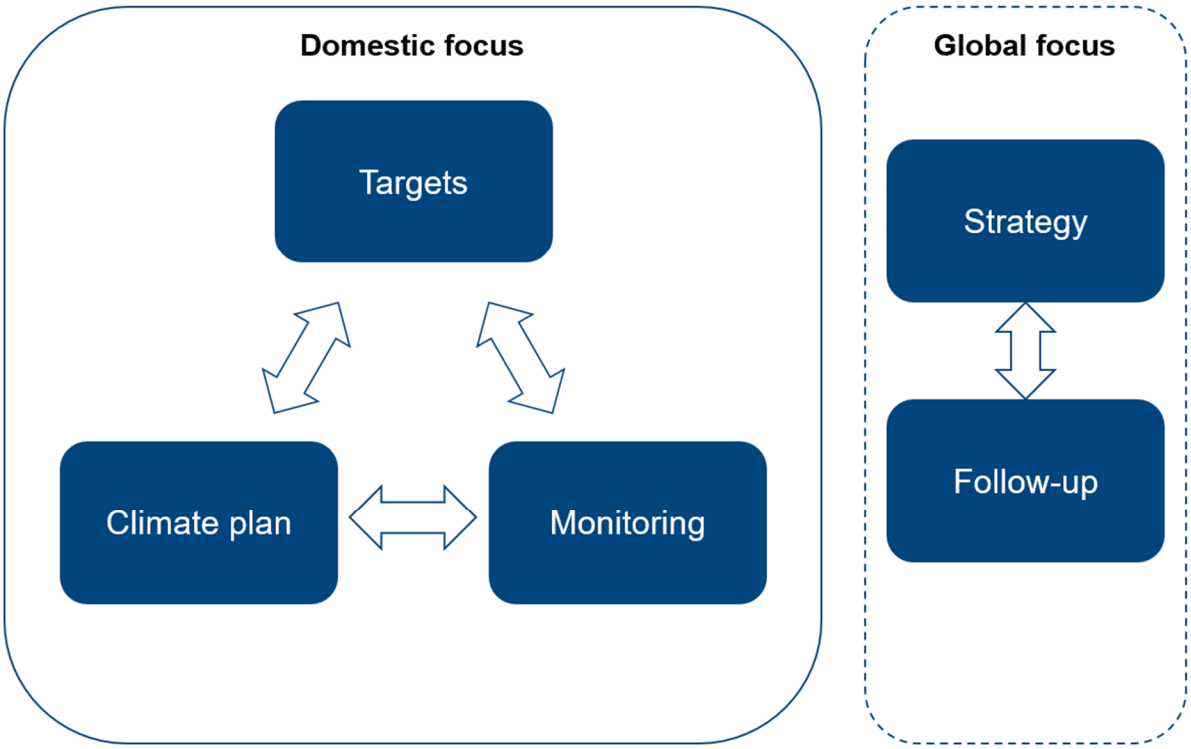


Figure 4 The Danish Council on Climate Change's proposed framework for a new climate act

The part of the climate act dealing with reductions in domestic emissions should define a reoccurring process for setting intermediate targets, preparing climate plans and monitoring efforts in order to reduce domestic emissions. These three sub-elements are mutually interconnected in the sense that a target is set which leads to the development of a climate plan. The work required by the climate plan should be continuously monitored to assess whether policy initiatives are sufficient to achieve the target. If the monitoring finds that the climate plan is unlikely to meet the intermediate targets, the climate act should require the government to update the climate plan. The three elements are described in more depth in sections 2.1-2.3. The framework requires all three elements to interact effectively. This relationship is shown in the left part of figure 4.

With regards to the global focus, it will be beneficial if the climate act requires the government to draw up a global climate strategy. Denmark can influence and reduce emissions abroad, and there is a number of different ways Denmark can contribute to reduce emissions outside its borders. These include areas such as international diplomacy, green projects and investments abroad, reduced consumption of goods with a large climate footprint outside

Danish borders, development of green technologies and deployment of these in other countries, reducing emissions from international shipping and aviation, reducing effects of fossil-fuel production in the North Sea, and increased international climate assistance and exports of green energy, all of which affect total global emissions. These areas are described in more detail in section 2.4. In order to ensure cost-effectiveness and credibility, concerning the internationally focused climate strategy, it is important to follow-up on efforts in order to see whether the initiatives introduced by Denmark are actually having the desired effect. This is illustrated in the right-hand part of figure 4.

**Overall process for the part of the climate act with domestic focus**

The proposed framework for the domestic part of the climate act should be considered as a single cohesive structure. Every five years, a new climate target should be set for the following ten years. At the same time, in order to secure credibility for the target, a climate plan should be prepared and this plan needs to show that the targets are likely to be reached. The target of 70 pct. covers the first period from 2020-2030. In 2025, a new climate target

should be set with a ten-year horizon, i.e. a 2035 target. Furthermore, a new ten-year climate plan should be drawn up which shows the initiatives in the plan will likely be sufficient to reach 2035 target. This shall occur in parallel with efforts in the first climate plan aiming to achieve the 2030 target. The system is to ensure that, from 2025 and onwards, in reality there are five-year climate targets with a ten-year run-up period. Figure 5 illustrates the timeline suggested for the climate policy framework.

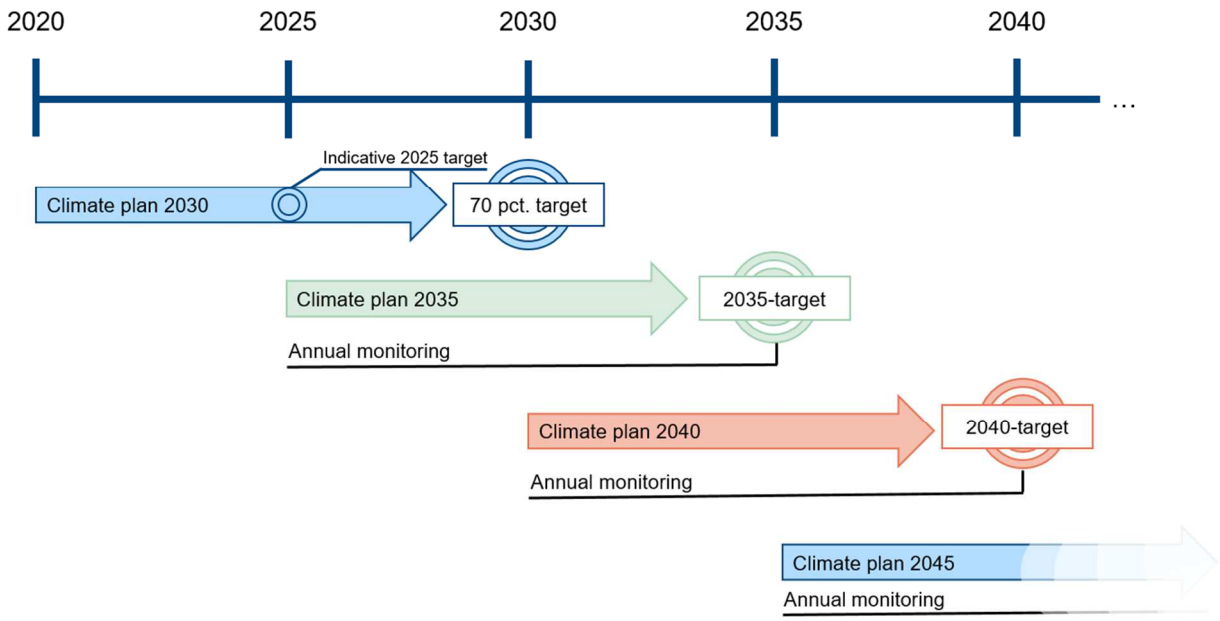


Figure 5 Climate Council framework of the climate policy process

Note 1: Only indicative targets should be set in 2020 for 2025 due to the shortened time horizon and they will therefore not have the same status as other ten-year targets with regard to the requirements and obligations they entail.

In order to make sure that Denmark actually reduces emissions, forward-looking monitoring is important. Each year a projection to assess whether the goals in the ongoing climate plans are likely to be met should be prepared. Projections make it possible to identify early on any need for new climate-policy measures, and thereby commit the government to updating the climate plan. As projections are thus a central control instrument in the initiatives, it is crucial that the act establish a framework to ensure a high degree of quality and transparency in projections.

## 2.1 Determination and definition of targets

Targets will be a central element in a new Danish climate act. Chapter 1 described why it is necessary to have both long-term targets and intermediate targets on the road towards the long-term targets. This chapter will go into more detail about the process for setting targets, and how these targets should be designed.

**The current climate targets should be written into the climate act itself**

The current Climate Act contains a goal that, by 2050, Denmark is to be a low-emissions society. However, the Climate Act does not contain targets or goals in the shorter term. Short-term climate targets have instead existed in various government programmes or political agreements, and they have not always been clearly defined. For example, the 2018 Energy Agreement states that, "the parties have allocated funds to show the way to reach a renewable share of about 55 pct. in 2030", and this has since been interpreted as a Danish target.

To create certainty and transparency around goals and targets, and to ensure that these are not altered, the current climate targets should be written into the new climate act. In other words, the 2030 target of 70 pct., and the target of net-zero emissions by no later than by 2050 should be written into the new act. This will make Denmark's targets clear for everyone. The target will bind current and future governments, as long as a majority of the Danish

Parliament (Folketing) has not passed a law to change the target. Writing the targets into the act establishes a higher degree of stability and predictability, which is a necessary precondition for a cost-effective transition. All else being equal, this stability and security for investors and citizens will make it cheaper to invest in the green transition, for example because enterprises that invest in developing green technologies can expect a demand for their products or services because of the climate targets.

Writing the long-term target into the new act will ensure that the long-term target will be taken into consideration when acting to meet the intermediate targets. This means that the intermediate targets will be met via measures and initiatives that also contribute to reaching the long-term target, and all else being equal, this will improve cost-effectiveness in the transition. Net-zero emissions could be rewritten as a target of a 100 pct. reduction in net emissions of greenhouse gases by no later than 2050, which allows emissions to the extent that there is a corresponding uptake of greenhouse gases. Defining the target as a 100 pct. net reduction makes it clearer how the intermediate targets and the long-term target are related.

A climate act should also take into account that 2050 is not the final target for climate policy. Figure 1 shows how the UN IPCC expects that there will be a need for potentially very large uptakes of greenhouse gases after 2050, if temperature rises are to be held below 1.5°C. Denmark is also likely to have to contribute with negative emissions, and Denmark should aim at having negative net emissions after 2050. However, it is not currently necessary to define when and how many tonnes of greenhouse gases Denmark should remove from the atmosphere. Sweden has a similar target to achieve negative net emissions after 2045, also without defining this more specifically.

In connection with the 2014 Climate Act, it was decided not to include a 2020 target in the text of the Act itself, but instead state this in the remarks to the proposal, among other things because there was not a Danish legislative tradition of writing targets into legislation. However, a long-term climate target was included in section 1 of the Act. Other countries have written both intermediate targets and long-term targets into the act itself, e.g. the UK and Norway. In Sweden, the targets are not in the act itself, but they have been adopted by Parliament in another way.[15] If it is decided not to write climate targets into the Danish act, some of the security and predictability that may be possible to achieve could be lost. In this case, as a minimum, a there needs to be a politically broad supported climate agreement with clear and well-defined targets.

**New climate targets every five years**

The Climate Act should set the framework for efforts towards net-zero emissions by no later than 2050. In order to improve clarity and predictability, the climate act should include a process to ensure that future intermediate targets after 2030 are set well ahead of time. The act should emphasise that these targets should be based on Denmark's international obligations, such as the Paris Agreement, and developments in climate science.

It is not possible to set all intermediate targets up to 2050 already in 2019. For example, climate science may demonstrate the need to reduce greenhouse gas emissions at a different rate than stated in the 2018 UN IPCC report. Costs and technological possibilities may also change. It is therefore not recommended to set intermediate targets up for the period after 2030 already at this point.

A compromise between flexibility and knowing the intermediate targets well-ahead of time could be that the act require the government to set new greenhouse gas reduction targets every five years beginning in 2025 and these targets should have a 10-year horizon. This is illustrated in figure 5. Overlapping intermediate targets will then be set every fifth year, with a time horizon of ten years, beginning with the target for 2030. This will provide ample time to implement policies to reduce greenhouse gas emissions as well as provide time horizons that make it difficult to postpone climate efforts, adding credibility to climate policy. This corresponds to the obligation described in the remarks of the current Climate Act. However, in the new act, The Danish Council on Climate Change recommends writing this obligation into the act itself.

Other countries have similar systems. For example, the United Kingdom determines its five-year greenhouse gas emission budgets 12 years before they enter into force. This means that they are currently in their third budget period (2018-2022) but have already set their targets for 2023-2027 and 2028-2032. To avoid having to change the climate act every five years and to avoid the uncertainty this would entail, the government

should determine the ten-year intermediate targets without requiring that they be written into the act. The climate act should require that a new government either adopts the targets set by the previous government or sets new targets.

This system would not set an intermediate target for 2025. However, to ensure that efforts towards 2030 are not postponed, an indicative intermediate targets should be set for 2025 in the upcoming climate plan. This could be in the form of an interval instead of a hard number or a similar "soft" target. This target does not necessarily have to be on the straight line from the 2020 emissions and the 2030 target which would require the 2025-indicative target to approximately 55 pct. Five years is a very short time in the context of climate policy and a certain level of flexibility may be necessary up to 2025.

**Single year targets or multi year emissions budget?**

Multi year emission budgets are an alternative to setting a single year climate targets with five year intervals. Greenhouse gas emission budgets are a form of goals that do not merely require reaching a specific level of emissions reduction in a given year, they also require that total emissions for a given period are kept below a specific level. This approach is used in the United Kingdom, for example, and was included in the petition presented to the Danish Parliament at the beginning of 2019.

In theory, greenhouse gas emission budgets provide a greater incentive for short-term action than a normal single year target. If Denmark sets a greenhouse gas emission budget, greenhouse gas emission reductions must be achieved within the first year. If reductions do not occur, the budget deficit will have to be compensated through overachievement in later years during the budget period. Greenhouse gas emission budgets therefore help secure immediate action in the green transition. Another benefit of greenhouse gas emission budgets is the ability to cap total emissions, which is what in the end affects temperatures.

However, experiences with greenhouse gas emission budgets from the United Kingdom and the EU have not been convincing. In principle, the EU ETS and non-ETS are defined as greenhouse gas emission budgets, and at the moment, both systems are facing difficulties in connection with large surpluses of emissions allowances. Random factors have contributed to the United Kingdom remaining within its budget without experiencing any significant forward movement in the green transition.[16] On the other hand, the budgets can complicate how efforts are handled. A specific system must be established and a number of challenges arise at the end of each budget period that could result in sub-optimisation or diminution of efforts (e.g. the transfer of emissions rights between periods). Based partially on this, the Committee on Climate Change in the United Kingdom, has assessed in a report on Scottish climate efforts that greenhouse gas emission budgets are not well suited to drive decarbonisation.[17]

Single year targets have different dynamics. This approach does not preclude how the target is achieved and this allows for greater flexibility. On the other hand, the initiatives selected to achieve a target can theoretically result in a last-minute reduction of emissions, which risks a strategy in which efforts are postponed to the end of the period. This is one of the objections with regard to standard targets, as climate change depends on total emissions. In a framework that only sets single year targets every ten years, targets can create problems in relation to ensuring the stability and credibility of the green transition, as the risk of postponing the transition is relatively high.

The Danish Council on Climate Change recommends a framework with single year targets set every five years. This could solve the majority of issues concerning the incentive to postpone the transition, since a five-year period is relatively short in terms of climate policy, and it does not leave any room to delay efforts. There are very few climate initiatives with immediate effect that can be implemented at the last minute. There is therefore little risk of postponement and unnecessarily high emissions at the start of the period.

Using greenhouse gas emission budgets in a climate act is an option. However, The Danish Council on Climate Change considers that the increased complexity of these budgets and the mixed experience from other countries outweigh the benefits.

**Targets for individual sectors should not be written into the climate act**

Only general greenhouse gas reduction targets should be written into the climate act. Recently, there have been discussions in Germany, the Netherlands and within the Swedish transport sector on whether reduction targets should be set for individual sectors.

One of the disadvantages of including sector specific targets in the climate act is the risk of sub-optimisation. Sector specific targets would define effort sharing ahead of time, which could turn out to be both undesirable and unnecessarily expensive. For example, during the 2020s it may turn out that reducing emissions in a certain sector is much cheaper than originally expected. The government could then implement additional initiatives to reduce emissions in that sector and thereby postpone implementing more costly initiatives in other sectors.

These adjustments of the climate policy should be implemented in a manner that does not compromise investor security, as this would increase the cost of the transition. If sector specific targets are written into the act, any restructuring of efforts will require an amendment to the act. The Danish Council on Climate Change considers that this would be an unnecessarily burdensome process, and potentially uncertain.

Another disadvantage of sector specific targets is that they increase the risk of silo mentality and make it difficult to exploit the synergy between sectors. For example, electricity-driven heat pumps can reduce emissions from oil-fired boilers in the heating sector. However, emissions might increase slightly in the electricity sector if electricity is needed for a heat pump during a period with no wind. This small increase in emissions by the electricity sector will be significantly smaller than the reduction of emissions in the heating sector. However, if sector targets are in place, this will put a strain on electricity sector targets and this in turn would be an incentive for the electricity sector to prevent the deployment of heat pumps. A more flexible approach will make it easier to avoid these types of conflict. For these reasons, sector specific targets should not be included in the climate act.

However, one of the advantages of sector specific targets is the guarantee of immediate action towards the green transition by all sectors. This will prevent a specific sector from delaying transition until after 2030. In the long term, late development of new solutions can prove costly, and an increasingly ambitious climate target after 2030 will require accelerated implementation of sub-optimal solutions. In all likelihood, it would be cheaper to develop and implement technologies on an ongoing basis, which would require the transition not to be postponed unnecessarily.

The climate act should therefore include a requirement that climate plans include a strategy for reducing greenhouse gas emissions for each sector. These strategies are described in section 2.2.

#### Target definition should generally follow the UN methods of calculation

A climate act can contribute towards improved clarity and transparency with regard to climate policy. This requires clearly defined targets that unequivocally define what is included and not included in calculations. This would help create a broadly accepted view of whether targets will be met with the current plans.

In principle, a climate target should be defined so only actual greenhouse gas emission reductions are included in calculating target achievement. In order to do so, calculating target achievement should primarily follow the UN national inventory report mehtod. This contributes towards greater transparency and familiarity. Using the UN method will have the following effect:

- Using territorial emissions from Denmark as the basis of calculation, i.e. only including emissions that occur on Danish territory.
- Including all anthropogenic greenhouse gas emissions included in the UN's calculation method.
- That all sectors are included in the calculation of emissions, including emissions and uptake from land use and forests, the so-called LULUCF sector.
- That calculation methods follow UN emission factors and the global warming potential of gases.
- That climate targets are based on the Danish baseline year, 1990, as defined by the United Nations Framework Convention on Climate Change. However, the baseline year should include emissions from the LULUCF sector.

Using the international method ensures that parallel systems are not established and ensures that Danish efforts can easily be understood and compared with efforts in other countries, which is essential in connection with using high Danish ambitions to encourage higher ambitions during international negotiations in the EU and the UN.

The target should include LULUCF emissions because the target should denote the total territorial emissions and uptake generated by Denmark. However, there is a high degree of uncertainty connected with calculating LULUCF emissions. This large degree of uncertainty could suggest that these emissions be contained in a separate inventory with a separate target. On the other hand, to achieve cost-effectiveness all emissions must be included in the target, because this allows the target to be met using the cheapest reductions possible.

Emission calculations from LULUCF should, as a general rule, follow current methods as defined by the UNFCCC. However, it might be preferable with an alternative accounting of LULUCF emissions in order to account for the uncertainty in this sector. This could be accomplished for example by as using five-year average of emissions. The Danish Council on Climate Change recommends that Denmark work towards establishing climate targets and climate regulation that encourages countries to increase carbon reservoirs in forests beyond the levels reached without climate initiatives which is also mentioned in a previous report.[18] The UN calculation methods need to reflect these factors. For example, the latest report from the UN IPCC shows that temperature increases and the increased concentration of $CO_2$ in the atmosphere may have contributed to an increased $CO_2$ uptake by the world's forests.[19] Whether this natural uptake should be included when calculating overall emissions should be considered. Overall, The Danish Council on Climate Change assesses that the target should include LULUCF emissions, with due consideration to the associated uncertainty of accounting for LULUCF-emissions.

When the target is defined as Danish territorial emissions and calculated based on UN methods, it is clear that a number of "flexibilities and trading options" can no longer be used to comply with the target. For example, this applies to cancelling allowances and using foreign project credits similar to those in the Kyoto Protocol. This also applies to recognising "reductions" from exports of green energy, reductions of emissions from international shipping and air transport and other initiatives that are not included in emissions using UN calculation methods. These mechanisms should not be included in target achievement because they do not significantly contribute to actual greenhouse gas emission reductions in Denmark.

An alternative to the UN approach would be to use consumption-based emissions as the outset and try to reduce these. Consumption-based emissions are emissions generated by Danish consumers irrespective of where emissions actually takes place. This means adding the total climate footprint of imported goods to Danish emissions, and subtracting emissions related exported goods. There are two main practical reasons for not applying this approach. Firstly, there are a number of challenges connected to calculating consumption-based emissions. The climate footprint of each individual product would need to be calculated by following the product across national borders and examining the size of greenhouse gas emissions at the different stages of production. There are significant challenges in gathering data of sufficient quality. Secondly, Danish political instruments can only to a limited extent influence how goods are produced or transported by other countries. However, this does not mean that Denmark should not take consumption-based emissions into account. Denmark can launch initiatives that help shift demand away from products with a large climate footprint, thereby reducing global emissions. This will be presented in more detail in section 2.4.

**The UN calculation method does not always ensure actual greenhouse gas emission reductions**

The objective of a Danish climate act is to reduce greenhouse gas emissions. This principle means that the calculation method may need to be adjusted if there is a lack of consistency between calculations and actual greenhouse gas emissions.

An important example of the inaccuracy of the UN calculation method is the combustion of biomass. The UN calculation method considers the combustion of biomass as carbon-neutral. However, this is not always the case under current regulations. In the report *"The role of biomass in the green transition*", The Danish Council on Climate Change described the differences between biomass with a low climate footprint and biomass that emits $CO_2$ at the same level as burning coal. The former can be considered climate friendly biomass. The Danish Council

on Climate Change has recommended developing criteria to make it possible to distinguish between climate friendly biomass and non-climate friendly biomass.

Only climate friendly biomass should be included in Denmark's efforts to become carbon-neutral. A certain level of $CO_2$ emissions should be attributed to non-climate friendly biomass. Depending on the level of complexity of a system, different fractions of biomass can have different levels of $CO_2$ attributed to them. If a simpler system is desired, non-climate friendly biomass can be attributed the $CO_2$ emissions generated during combustion. A more detailed description of how to regulate biomass is described in *"The role of biomass in the green transition"*.

Table 2 shows an overview of what should be included and excluded from the definition of the target.

| Element | Should/should not be included? |
|---|---|
| Greenhouse gases | All anthropogenic emissions and uptake of greenhouse gases should be included. This means anthropogenic uptakes, e.g. as a consequence of afforestation, can be included in meeting the target. |
| Sectors | All sectors, including LULUCF, should be included as far as possible. However, international shipping and aviation should not be included in the target. |
| Biomass | Only climate friendly biomass should be categorized as carbon-neutral in meeting the target. |
| International credits | International credits should not be used in meeting the target. They do not contribute towards the Danish green transition, either in the long or short term. |
| Cancellation of allowances (EUAs) | Cancellation of allowances should not be used in meeting the target as it does not contribute towards the Danish green transition, neither in the long nor short term. |
| Consumption-based emissions | Policy initiatives can contribute to reducing the total climate footprint of imported goods, thereby reducing global emissions. However, the consumption footprint should not be included in meeting the target. |
| Exports of green electricity or fuels | Exports of energy should not be included in meeting the target, as they do not contribute to Denmark's green transition. However, exports can contribute to emission reductions abroad. |
| Research and development | Research and development have no direct correlation with $CO_2$ reductions and should therefore not be included in the target. However, research and development are essential in reaching climate targets. |

Table 2 Overview of what should or should not be included in the definition of the target and meeting the target.

## 2.2 Preparing climate plans

Climate targets is not sufficient by themselves. A plan is necessary to ensure that you reach the targets set out. The climate act should therefore require the government to present climate plans to help reach the targets. This section takes a closer look at the council's proposed process for preparing climate plans and what these climate plans should contain.

**Climate plans should be obligatory for governments**

Setting targets is not enough to secure action. Targets themselves are rarely credible and they rarely drive development unless they are accompanied by a plan and initiatives that ensure targets are met. A central element of a climate act should therefore be a requirement that the government prepare a climate plan, thus providing credibility with regard to meeting the target. The current Climate Act does not include a requirement for climate plans. However, this requirement exists in, or has been proposed for, the climate acts in four countries which this report analyses in appendix A; the United Kingdom, Germany, the Netherlands and Sweden.

A climate plan should include initiatives and instruments that ensures that the ten-year climate target will be met. Climate plans should include a timeframe for implementation. There may be situations where the instruments required to reach the target are unknown. A climate plan should therefore include both specific policies and a plan for achieving additional reductions through development of new technologies or policies. Figure 6 shows an example of how a climate plan with specific policies contributes the majority of efforts to reach the 2030 target while simultaneously containing additional options for reductions through development of new approaches.

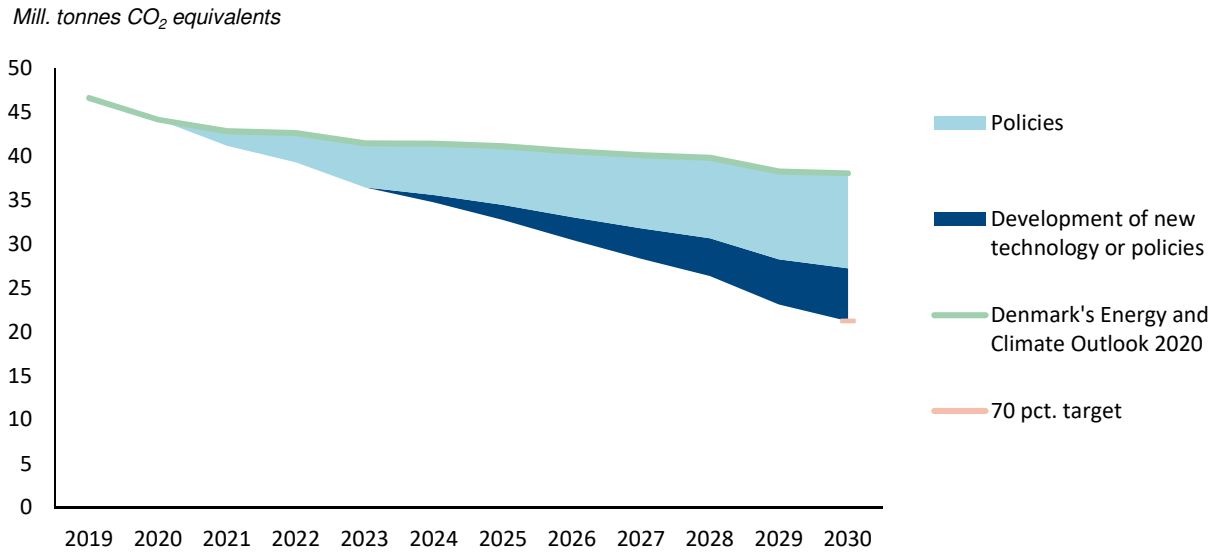


Figure 6 Illustration depicting how policies and development of new technology or policies can reach a 2030 target.

Note 1: Denmark's Energy and climate outlook 2020 shows the expected emissions of greenhouse gasses if no new policies are enacted.

**Sector specific strategies are the main components of a climate plan**

Climate plans should contain more than just a list of initiatives. It is important that a climate plan ensures that all parts of society actively contribute to the green transition. Some sectors will reduce emissions faster than other sectors, depending on how advanced various green technologies are and what it costs to implement the different mitigation initiatives. In sectors with only a small number of mature mitigation options, efforts must still be made because waiting is no longer an option. If a sector delays its transition and the development of new technologies and solutions until after 2030, then the transition after 2030 will need to be accelerated and any lack of efforts will only result in delaying the development of the needed solutions. All else being equal, this will make the transition more expensive for the sector in question. A climate plan should therefore include a strategy to reduce emissions from different sectors and to support the development of new technologies and initiatives that can contribute towards greenhouse gas emission reductions.

Sector specific strategies should describe the challenges faced by the sector in question, policies aimed at resolving these challenges and it should establish a number of indicators to make it easier to monitor whether the necessary and sufficient progress occurs. The transport sector is a good example. Electric cars have an important role in reducing emissions but getting more of them on the roads depends on different policy initiatives. Electric vehicles need to be cheaper for the consumer but the required charging structure needs to be in place as well, e.g. quick-charging stations on motorways and charging options in cities. A sector specific strategy for transport should contain policies that solve these two challenges while simultaneously identifying a number of indicators e.g. the percentage of zero emission vehicles in car sales and the number of charging stations in Denmark.

Furthermore, sector specific strategies should include the government's estimate of what they expect to achieve with the initiatives in question within the framework of the indicators described. Every year, when assessing

progress towards the climate targets, an assessment should also be made of progress within the selected indicators (for more information see section 2.3 on monitoring). If the anticipated progress does not occur which the indicators will reveal, this could be a sign that additional policies and measures are necessary, or that new initiatives are required in other sectors in order to reach the target.

The choice of indicator must be directly related to the initiatives being introduced. For example, if the sector specific strategy aims at promoting electric vehicles, an obvious indicator would be how many electric vehicle are sold. Indicators can be designed in different ways. An indicator can be absolute e.g. the number of electric vehicles in a given year. An indicator can also be relative e.g. the percentage of electric vehicles (and other zero-emission vehicles) in new sales in a given year. Absolute indicators can be useful in areas with clear targets for 2050, such as the phasing-out of fossil energy sources within transport and production. Relative indicators can be used in areas where this is not the case, for example within industry where an indicator might be emissions per produced tonne of cement (or other products).

Indicators can be formulated positively e.g. the number of electric vehicles if the aim is to promote their use, or negatively e.g. the number of petrol and diesel vehicles if the aim to phase-out their use. In many cases, defining indicators negatively is the better option since the aim is to remove greenhouse gas emissions. For example, reducing the number of petrol and diesel vehicles will thereby reduce the consumption of petrol and diesel, while electric vehicles are a technology that can replace petrol and diesel vehicles. However, in some situations, indicators can be formulated positively if the intention of the initiatives in a sector specific strategy is to promote certain technology/solutions.

Indicators can also be set when focusing on developing new technologies, for example by setting indicators for resources allocated to research and development. See box 3 for more examples of indicators.

**Box 3: Examples of indicators**

Indicators are part of making the green transition more tangible, and they ensure progress in the green transition and that greenhouse gas emission reductions are not merely due to economic recession or the relocation of production to other countries, for example. This box presents a number of examples of indicators that could be part of a climate plan. This list is not exhaustive or complete, and the final indicators should be devised with reference to the instruments included in the climate plan. The following are examples of indicators for something to be promoted or restricted.

Transportation
- Percentage of electric vehicles/zero emission vehicles in new car sales/on the roads
- Number of cars running on fossil fuels
- Consumption of fossil fuels

Agriculture and land use (LULUCF)
- Share of untreated slurry
- Number of hectares of cultivated organic soil
- Number of hectares of forest
- Emissions of greenhouse gases per liter of milk produced

Electricity and district heating
- Consumption of coal and natural gas
- Share of renewable energy in electricity production
- Share of renewable energy in district heating

Individual heating
- Number of oil furnaces
- Consumption of oil used for heating
- Number of gas-fired boilers
- Consumption of gas used for heating

Industry

- Emission intensity in the industrial sector as a whole or specific sections of the industrial sector (e.g. domestic value added per unit of greenhouse gas emissions or amount produced per unit of emissions)
- Share of electricity consumption by the industrial sector as a whole or specific sections of the industrial sector
- Share of renewable energy consumption by the industrial sector as a whole or specific sections of the industrial sector.

Waste

- Share of renewable waste incinerated
- Share of renewable waste gasified
- Share of plastics recycled.

**Sector specific strategies should be coordinated and integrated**

Sector specific strategies should be integrated into an overall climate plan. Sector specific strategies risk causing a silo mentality where each sector only focuses on how to reduce their own emissions. However, opportunities to reduce greenhouse gas emissions can be found across different sectors. For example, energy savings make it easier to incorporate heat pumps in the district heating system and electric vehicles can reduce carbon emissions generated by transport, however, electric vehicles needs green electricity from the electricity sector in order to eliminate emissions. In the report *"Udfordringer og muligheder på vej mod et klimaneutralt samfund"* (Challenges and opportunities on the road to a carbon-neutral society), The Danish Council on Climate Change presented many different examples of cross-sector relations. Similarly, the options available to some sectors are limited by what others do. For example, there is a limited amount of biomethane and it would be unfortunate if the transport sector, the industrial sector, the electricity sector and the heating sector combined wanted to use more biomethane than is available. Coordinating sector specific strategies can rectify this issue by prioritising biomethane for sectors with few mitigation alternatives. This is why sector specific strategies should be integrated and coordinated across the different sectors.[20]

Coordination across different ministries is a good way to improve coordination and integration of sector specific strategies. If each ministry prepares its own independent sector specific strategy, then coordination will become difficult. It may be necessary to establish a body where strategies can be discussed and where various ministries can contribute towards the preparation of the sector specific strategies. It would also be beneficial if a sector specific strategy received input from other sectors in addition to input from enterprises and players within the sector itself.

Sector specific strategies should not focus solely on greenhouse gas effects. The challenge of climate change is one among many, as exemplified by the UN Sustainable Development Goals. It is therefore important to think across challenges when choosing instruments and policies for a sector specific strategy, and it is important to assess how a given strategy may effect a number of other challenges, such as increasing biodiversity, improving animal welfare, protecting groundwater or similar. Land use is a good example of sector where many perspectives need to be integrated. Denmark has limited area and therefore land use has to be prioritised between a range of uses e.g. wind turbines, solar panels, agricultural production, forest and much more. If different sectors do not work together to solve the different challenges, we risk choosing solutions to the climate challenge that exacerbate other issues. We also risk overlooking initiatives that can contribute to solving several challenges simultaneously.[21]

**New climate plans should be prepared periodically**

As previously mentioned, new climate targets should be set every five years with a ten-year horizon. Therefore, a new climate plan with a ten-year horizon should be prepared every five years. Climate targets become more credible when a plan for reaching the targets is presented shortly after the targets are adopted.

The first climate plan should be prepared in 2020. This climate plan should focus on the 2030 target and also set an indicative target for 2025. Following this, a new climate plan should be prepared every fifth year. This means that the next climate plan should be prepared in 2025 with the aim of reaching the 2030 and 2035 targets which will also be set in 2025.

Having new climate plans, every fifth year can contribute towards a stable climate policy and provide ample time for new policies to have an effect. However, five years is too long to wait if it becomes apparent that a climate plan will not reach its target. It is necessary to complete annual follow-ups on whether the climate plan will reach the climate target and whether the indicators set are developing as expected. If this is not the case, then the climate act should require the government to update the climate plan with new initiatives that make achieving the target more probable. Section 2.3 goes into more detail on assessing climate plans.

**Inclusiveness of citizens, the business community and other organisations can increase support for the climate plans**

In general, there is broad support for an ambitious climate policy in Denmark, and this support must be sustained in order for Denmark to continue to achieve significant greenhouse gas emission reductions. This is why a climate plan should be prepared in collaboration with citizens, the business community and other organisations. This can help generate support for climate plans and help uncover new options and potentials for greenhouse gas emission reductions. For example, by taking advantage of the knowledge that exists in enterprises, the government can prepare a climate plan that more precisely assesses what can be done to reduce emissions as well as identify innovation needs. However, it is also important that stakeholder involvement does not lead to lack of action or lower ambitions. Ultimately, it is the government's responsibility to prepare a climate plan that can meet the climate targets.

There are many different ways to incorporate citizens, enterprises and other organisations, and Denmark can draw on inspiration from Sweden, Germany and the Netherlands, to name a few examples.[1] For example, stakeholder engagement can be initiated from below (bottom-up) by trade associations taking steps to launch specific initiatives that contribute to reaching overall national targets, as can be seen by the Swedish initiative "Fossil-Free Sweden". Stakeholder engagement can also apply a top-down approach where the government launches a process for the structured incorporation of partners in order to encourage innovation, ownership and support to implement initiatives, as can be seen in the Dutch process. Two-way communication is important. Ideas and concerns put forward by citizens and the business community must be included in the process going forward. At the same time it is just as important that the decision makers conveys its reasoning for choosing different solutions, and describes who will be effected by them, and how. It is also important to ensure that engagement does not lead to a silo mentality within certain sectors.

## 2.3 Monitoring climate efforts

Effective monitoring of efforts is crucial to detect if the current trajectory does not follow the intended plan to reach the target, and in this way, monitoring provides an opportunity to adjust efforts to get back on the right trajectory. Monitoring thus adds to the credibility of targets and plans, as it very quickly becomes apparent if a climate plan is failing to meet targets. The climate act should therefore include rules for monitoring climate policy. As the effects of climate policies tend to be gradual, and since emissions inventories are two years behind due to the statistical methodology, the forward-looking aspect of monitoring that is projections should be the primary tool.

**Projections should identify inadequate climate plans**

At present, baseline projections are completed approximately once a year by the Danish Energy Agency. Baseline projections are based on the latest historical year includes only adopted policy. Baseline projections in their current form do therefore not include policy targets or specific legislation that has not be enacted. This means that baseline projections only show the expected development insofar as no additional policy initiatives are adopted. The projections therefore show the action deficit (or surplus) with regard to reaching a specific target and they can be used to identify and quantify the need for additional policy measures.

Going forward, the annual baseline projection should be expanded with a separate climate plan projection. This projection should assess the overall effect of planned, but not implemented, policies in the climate plan. The

[1] The analysis of these cases can be found in appendix A in the Danish version.

climate plan projection should be updated annually in connection with the baseline projection. Regularly comparing intermediate targets and the projection, including the climate plan projection, will make it possible to determine whether we are on the right track in order to meet the targets. If it becomes apparent that the initiatives in the climate plan will not reduce emissions sufficiently to reach the intended target, then the reasons for this must be analysed and the climate plan re-opened and updated quickly so that it once again is probable that the targets is met. Figure 7 shows an example of how the baseline projection and the climate-plan projection can identify a need to update the climate plan. In the example, the 2020 plan is expected to meet the greenhouse gas emissions target for 2030. A number of policies will be implemented by the following year, and the baseline projection will be reduced as the effect of the adopted initiatives is included in the baseline projection itself. However, in this scenario the updated climate-plan projection means that the remaining measures in the climate plan no longer is no sufficient to reach the 2030 target. It is therefore necessary to update the climate plan in order to stay on track towards the 2030 target.

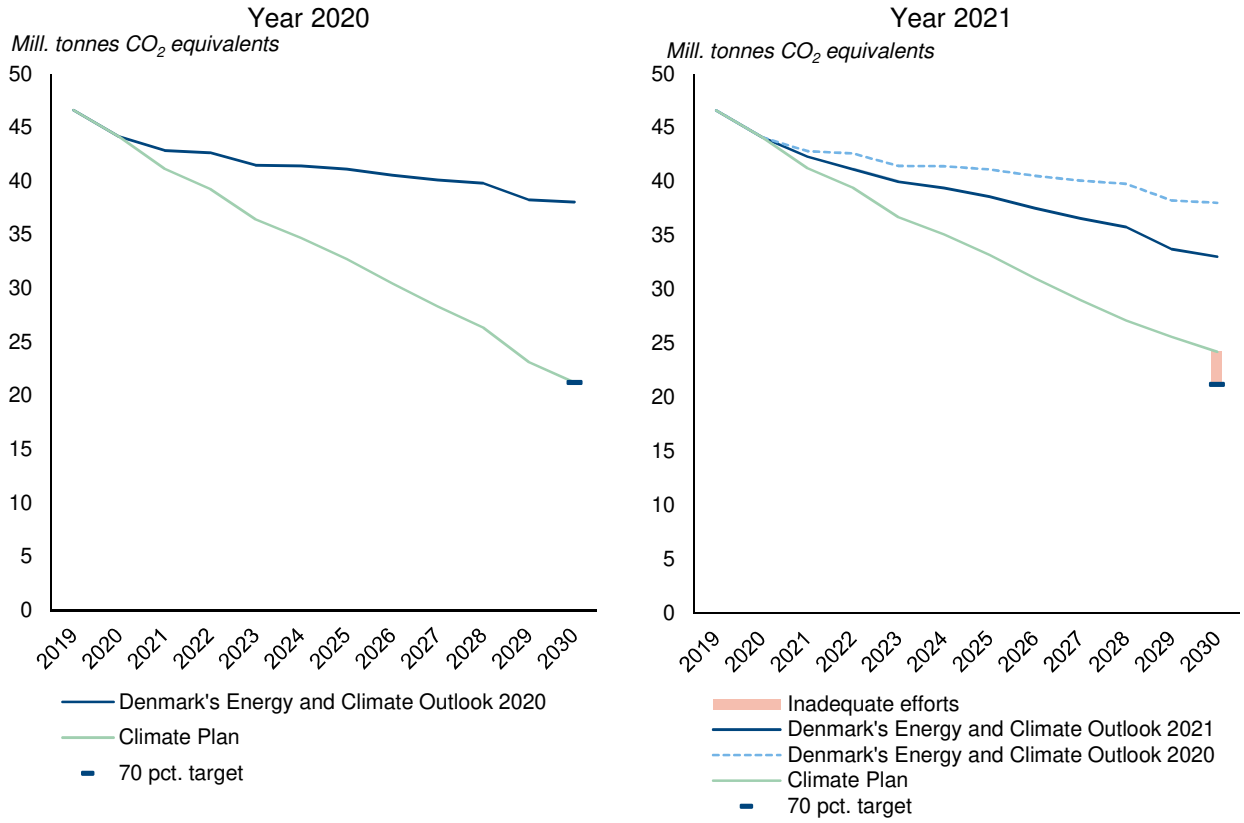


Figure 7 Illustration depicting monitoring program

**Annual baseline projections**

Baseline projections should be prepared annually following a fixed time schedule. This is due to a number of factors:

- Deviations from the adopted course can be discovered quickly.
- Technology develops at a fast pace and assumptions can shift significantly from year to year.
- Annual frequency makes coordination with other fixed parliamentary processes possible.
- Annual frequency generates policy predictability and increases overall transparency.

As the climate plan will include a number of indicators that go beyond emissions, these indicators should be included in the baseline projection model to ensure that the projection of indicators are consistent with projection output. The projected indicators should be compared with the indicators included in the target. This will be crucial in identifying the causes of any possible deviations from the planned course and identifying areas where new

policies must be implemented. Projections should be easy to understand so non-specialists are able to follow the debate that stems from the report.

#### A scientifically based and transparent projection

Projections will play a central role as a policy-management tool and this means there will be certain requirements regarding their format. A projection is based on a number of assumptions regarding how the world will develop in different areas and how enterprises and private individuals will react to the various financial, legal and technical frameworks. Considerable uncertainty is associated with these assumptions, and since policy will be based on the projection, it is important that there is confidence in the projection's ability to deliver as true and fair a presentation as is possible of expected developments under the given framework. This requires involving relevant expert knowledge and transparency in both the assumptions and methodology.

There are no objectively correct assumptions and methodology when it comes to making projections. Openness with regard to assumptions and methodology, and responsiveness to input from relevant expert knowledge and dialogue with partners is therefore vital. There must also be transparency throughout the entire process, from data and assumptions to the preparation of models and presentation and interpretation of the projection's results.

The need for openness with regard to methodology and assumptions is even more pronounced for climate-plan projections. As described in section 2.2, a climate plan will include both specific policies to reduce emissions and policies that seek to develop new technologies or change behaviour but does not in itself provide emissions reduction.

The effect of specific instruments depends on a number of assumptions. For example, the expected change of behaviour in the target group can determine the effect of an instrument. The assessment of behavioural changes will therefore heavily influence the assessment of the overall effect of the initiatives. There will be even more uncertainty in connection with assessing the effect on emissions of components in the climate plan that do not have any well-defined instruments i.e. the extent that it is possible to realise a technical potential. Finally, assessing the effect of unknown technologies and solutions will be particularly difficult. Given that the climate-plan assessment will be the benchmark for government climate efforts, and that the assessment will unavoidably be based on subjective assumptions, transparency is very important in the process and in policy-making.

In order to best ensure a scientifically based and transparent process, and thereby a credible projection, the projection should be validated by an independent expert body. The body in question should, among other things, ensure a qualified discussion about the assumptions and methodology, openness regarding the adopted assumptions and methodology, as well as insight into the technical models used to prepare the projections. The body should also be able to propose the development of models as appropriate.

#### Climate impact assessment of proposed legislation

Monitoring is more than just an annual projection of the climate plan. The transition to net-zero emissions requires a cohesive and coordinated effort across all sectors. It is therefore vital to assess the climate effect of proposed legislation when relevant. This will ensure that the government at all times can implement an informed ranking of any proposed legislation with harmful climate impacts in relation to the green transition. This will contribute to a cost-effective transition by ensuring that the harmful or beneficial climate impacts of proposed legislation are not overlooked. It will also contribute to increased emission reductions, as it will make it possible to prioritise legislation that results in fewer greenhouse gas emissions. The climate act should therefore require that all relevant legislation undergo a climate impact assessment to the same extent that all relevant legislation is currently assessed for impacts on government, household and corporate finances. If a bill is adopted, these assessments can then be included in the baseline projections.

## 2.4 Global climate efforts

A future climate act should focus on reducing national emissions, so that Denmark can achieve its long-term target by 2050, and it should guide the direction of a global effort. By combining the national focus with a strategy on

how Denmark can contribute to reducing emissions outside its borders, Danish climate policy can have a significantly greater positive impact on the global climate.

A climate act could include a requirement to prepare a strategy for how Denmark will work towards reducing emissions outside Denmark. Such a strategy would leverage the effect of Denmark's green transition if, for example, the high ambitions of Denmark could inspire or pressure other countries to increase their climate goals. Another way to leverage emissions reduction is if technological development in Denmark makes it easier and cheaper for other countries to implement the same technology and thereby reduce their greenhouse gas emissions. This would result in increased cost-effectiveness, as money already invested in the Danish green transition would lead to further greenhouse gas emission reductions globally. A strategy for Danish efforts can be used to put the globally focused efforts into a cohesive framework instead of having a range of different policies that are not integrated. This allows for synergy between different efforts, which otherwise would be difficult to identify if policies were solely viewed individually.

A globally focused strategy can be used as an increased contribution by Denmark towards the 1.5-degreee temperature target. As presented in chapter 1, there is good reason for Denmark to contribute with more than the planned domestic greenhouse gas emission reductions resulting from current targets. The principles of right to development, historical responsibility and capacity warrant additional contribution from Denmark and this could be done by working towards reducing emissions outside its borders.

Denmark can contribute to reducing emissions outside its borders in many ways:

- International diplomacy: Work towards increased emissions reduction targets and joint solutions to common issues via the EU and UN.
- Reduce consumption of goods with a large climate footprint
- Reduce emissions in sectors not included in target achievement (international shipping and aviation)
- Develop green technologies and deploy them in other countries
- Increase international climate support
- Support green projects and investments in other countries
- Export green energy

Box 4 includes a brief analysis of a number of elements to help reduce emissions outside Danish borders, but that do not contribute to reducing Danish territorial emissions and that are therefore not included in the 2030 and 2050 target achievement. It would make sense to include these elements in a globally focused strategy. The list is not comprehensive and additional elements may prove to be relevant.

A globally focused climate strategy should include a clear follow-up process to ensure that Danish efforts have the intended effect. To establish clarity and credibility with regard to the strategy, a number of indicators can be set, as suggested for climate plans in section 2.2. For example, an indicator could be consumption of a certain type of good with a large climate footprint or consumption of fossil fuels by aircrafts departing from Danish airports.

Indicators, their targets and an ongoing follow-up will make it easier to identify projects or efforts with the greatest effect. This can contribute to more cost-effective Danish efforts to reduce global emissions. Follow-up and evaluation of global efforts can e.g. be included in a separate section of the annual climate-policy report.

**Box 4: Elements suitable for inclusion in a globally focused climate strategy**

**International diplomacy**
Denmark can advocate increased climate ambitions in other countries, for example via the EU and UN. More ambitious regulation within the EU would also make it easier and cheaper for Denmark to live up to its climate targets. A good example of this is the EU requirement for the production of more energy-efficient products; something that Denmark would have trouble accomplishing on its own. EU regulation can also reduce the risk of carbon leakage, such as moving production to other EU countries. Increased climate ambitions can also be

achieved in other fora, for example within the UN, where there is a need to adjust regulations concerning LULUCF -emissions, as was previously recommended by the council's report "*Biomassens betydning for grøn omstilling*" (*The role of biomass in the green transition*). A strategy could include initiatives the Danish government will try to implement within the EU, the UN or other international organizations.

**Support for green projects and investments in other countries**
Private funds and pension companies (and their customers), for example, often have an ambition to contribute towards a global green transition, and it is possible to do so commercially. Danish initiatives in the form of e.g. conditions for categorizing green investments can help guide private investments towards projects that contribute to the green transition.

**Reduce consumption of goods with a large climate footprint abroad**
Denmark consumes many goods produced abroad and which have caused greenhouse gas emissions in other countries. For example, food, cars, clothes and electronic equipment are often produced abroad, resulting in significant emissions. These emissions are not included in Danish emission calculations. However, a climate strategy could include initiatives to reduce the consumption of emission-heavy goods, for example by encouraging the use of second-hand clothing and electronics or by reducing the consumption of meat via campaigns, taxes or other initiatives. Meat, for example, is produced locally in Denmark and is imported from other countries. This means that initiatives could result in greenhouse gas emission reductions both outside and inside Denmark. In the report "Udfordringer og muligheder på vej mod et klimaneutralt samfund" (Challenges and opportunities on the road to a carbon-neutral society), The Danish Council on Climate Change provides further discussion on the issue of consumption-based emissions.

**Develop green technologies and deploy them in other countries**
Through research, development and market maturation of green technologies, Denmark can contribute towards green technologies becoming even cheaper and more readily available sooner, which would contribute to reducing emissions abroad. Denmark has already made a significant and global impact on technological development, for example in sustainable energy and energy efficiency. Strategic efforts and political support for offshore wind is an example of how Denmark can actively contribute to technological development and thereby accelerate the deployment of green technology and phase out the use of fossil fuels. A climate strategy can contain initiatives to promote research and development of new strategies, as well as initiatives such as regulatory cooperation between authorities and export promotion to help deploy green solutions in other countries.

**Reduce emissions in sectors not included in target achievement (international shipping and aviation)**
International shipping and aviation are a significant source of emissions worldwide. As these are international sectors, emissions occur outside the borders of a country and are therefore not included in its climate targets. Because of this, there is a risk that these emissions will not be considered when formulating a country's climate policy. However, Denmark has several instruments that could potentially address emissions by these sectors, for example via different types of taxes on air travel or support towards technological development and/or the production of green fuel for aircrafts and ships. Danish efforts in this area should be integrated with international regulation. Generally, however, not enough has been done internationally to implement the necessary instruments and a number of EU countries have begun to implement national initiatives.

**Consider the effect of fossil-fuel production in the North Sea**
Denmark produces oil and gas. However, only emissions connected with extracting oil and gas from the North Sea are included in Danish emissions. Emissions generated by the combustion of oil and gas for energy purposes are included in the emissions of the country that uses the oil and/or gas. A globally focused climate strategy should include considerations on how Denmark intends to continue this production of oil and gas.

**Increase international climate support**
A globally focused climate strategy should consider Danish international climate support as well as Danish support of the UN Sustainable Development Goals, many of which directly or indirectly effect the climate.

Climate change affects developing countries, and there is a great need for climate change adaptation in these countries, as well as protection against natural disasters, in order to provide the growing populations with good life conditions and to minimize migration to Europe. Denmark can also contribute to reducing emissions in developing countries by supporting reduction projects via climate support.

**Export green energy**

There is great potential for green energy production in Denmark, particularly from wind turbines. However, there is a limit to how much $CO_2$ Denmark can displace domestically by constructing more wind turbines. However, Denmark can export green electricity to other countries and thereby displace fossil fuels in the electricity sector of neighboring countries. So even though Denmark cannot reduce more $CO_2$ emissions by producing more electricity from wind turbines, further deployment of wind turbines would still contribute towards reducing emissions outside Denmark's borders. A strategy could include plans for further deployment of e.g. offshore wind (including transmission links), possibly in coordination with countries to which Denmark expects to export.

## Appendix A: Overview of the climate change policy frameworks of other countries

Only the summary table of the appendix have been translated into English. The Danish version of this report contains the full appendix text.

| Elements | United Kingdom | Sweden | Germany | The Netherlands |
|---|---|---|---|---|
| **Climate Act?** | Yes. | Yes. | No.<br>But is being discussed by the government. | Yes |
| **Climate council** | Yes.<br>Since 2008. | Yes.<br>Since 2018. | No.<br>Many different councils, no actual climate council. | Yes.<br>Since 2012. Called the "Council for the Environment and Infrastructure", solely focused on climate. |
| **Long term target for 2050?** | 100 pct. in 2050.<br>Written into the Climate Act. | 100 pct. In 2045.<br>Written into a separate Act. | 80-95 pct. Reduction in 2050.<br>Included in climate plan. | 95 pct. In 2050.<br>Written into the Climate Act. |
| **Intermediate targets? Greenhouse gasemission budgets?** | Five years budgets, recommendation submitted by the Climate Council. | Targets for non-ETS sector of 63 pct. In 2030 and 75 pct. In 2040. | Target of 55 pct. In 2030. | Target of 49 pct. In 2030. |
| **Requirement for government climate plans?** | Yes.<br>Each time a new five-year budget is adopted. | Yes.<br>Every four years. | No.<br>Not at present, but a proposal for a climate act includes a requirement for | Yes.<br>Every five years. |

| | | | | |
|---|---|---|---|---|
| | | | climate plans every five years. | |
| **Status assessment on achieving short-term targets?** | Yes.<br>Annually. | Yes.<br>Annually. | Yes.<br>Annually. | Yes.<br>Annually. |
| **Sector specific targets?** | No. | Yes.<br>Only for the transport sector. | Yes. | Yes. |
| **Involvement of stakeholders?** | Yes.<br>Voluntary agreements between enterprises and authorities. | Yes.<br>Individual sectors prepare voluntary climate plans. | Yes.<br>However, frameworks are/were unclear. | Yes.<br>Well-defined framework and follow-up. |

Table 3 Comparison of climate policy frameworks in the United Kingdom, Sweden, Germany and the Netherlands.

Source: See references in Danish version of this analysis which includes the full appendix.

## References

[1] The Intergovernmental Panel on Climate Change (IPCC), Global Warming of 1.5°C, 2018
[2] UN Environment, Emissions Gap Report, 2018
[3] UNFCCC, Nationally Determined Contributions, 2019 [https://unfccc.int/process-and-meetings/the-paris-agreement/nationallydetermined-contributions-ndcs#eq-2]
[4] Falkner, R., The Paris Agreement and the new logic of international climate politics, 2016
[5] The Intergovernmental Panel on Climate Change (IPCC), Global Warming of 1.5°C, 2018
[6] Steffen, W et al. Trajectories of the Earth System in the Anthropocene, 2018
[7] The Intergovernmental Panel on Climate Change (IPCC), Climate Change 2014 Mitigation of Climate Change, Working Group III Contribution to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change: Chapter 4: Sustainable development and equity, 2014
[8] The Intergovernmental Panel on Climate Change (IPCC), Global Warming of 1.5°C, 2018
[9] Pickering, J. og, Berry, C., On the concept of climate debt: its moral and political value, 2012
[10] Committee on Climate Change, Net Zero: The UK's contribution to stopping global warming, 2019
[11] The Danish Council on Climate Change, Status for Danmarks klimamålsætninger og -forpligtelser 2018, 2018
[12] UN Environment, Emissions Gap Report, 2018
[13] The Danish Council on Climate Change, Omstilling frem mod 2030, 2017
[14] The Danish Council on Climate Change, Status for Danmarks klimamålsætninger og -forpligtelser 2018, 2018
[15] Government Offices of Sweden, Det klimatpolitiska ramverket, 2017 [https://www.regeringen.se/artiklar/2017/06/det-klimatpolitiskaramverket/]
[16] Committee on Climate Change, Carry forward of surplus emissions from Carbon Budget 2, 2019
[17] Committee on Climate Change, Advice on the new Scottish Climate Change Bill, 2017
[18] The Danish Council on Climate Change, Biomassens betydning for grøn omstilling,2018
[19] The Intergovernmental Panel on Climate Change (IPCC), Climate Change and Land, 2019
[20] The Danish Council on Climate Change, Udfordringer og muligheder på vej mod et klimaneutralt samfund, 2019
[21] Misserli, P. et al, Expansion of sustainability science needed for the SDGs, Nature Sustainability, 2019