

# A landscaping review of approaches used to develop national plans to implement climate mitigation commitments

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## Executive summary

### Aims

On behalf of the Scottish Government ClimateXChange commissioned Ricardo Energy and Environment to carry out a study of how jurisdictions develop and monitor their strategic plans for achieving greenhouse gas (GHG) emission reductions. The purpose was to compare and contrast international approaches and draw out insights that may help the Scottish Government meet the requirement under the Climate Change (Scotland) Act 2009 (and the Climate Change (Emissions Reduction Targets) (Scotland) Act 2019) to develop future climate change plans, as well as providing information that may support engagement with international partners.

The study initially looked at 16 jurisdictions (12 national and four sub-national). Of these, eight national and sub-national jurisdictions – Belgium (including Flanders and Wallonia), Germany (including Baden Württemberg), Netherlands, New Zealand and Sweden – were then reviewed in more detail. These were selected based on various criteria, including the level of ambition in their climate plans, the modelling approach used, sub-national links and innovative approaches taken.

### Summary of main observations

In summary, from across the eight national and sub-national jurisdictions, the main observations of how these jurisdictions have developed and monitored their strategic plans for achieving GHG emissions reductions are as follows:

- a. The level of ambition within the GHG emissions reduction target varies between jurisdictions. Only two of the eight jurisdictions have either legislated, or are legislating for, a net zero target, with Sweden setting targets to achieve this by 2045, and New Zealand by 2050.
- b. The emissions that are within the scope of the targets also vary between jurisdictions. Some have expressed their GHG emission reduction targets as an absolute economy-wide percentage reduction of all GHGs compared to a 1990 baseline. However, there are cases where jurisdictions have chosen to exclude certain sectors from the economy-wide targets being set. Germany, for example, excludes the forestry and land use sectors. There are also cases where other exclusions have been made, such as in New Zealand's Climate Change Response (Zero Carbon) Amendment Act 2019, where methane emissions produced by living organisms (biogenic methane) are excluded from the proposed net zero by 2050 target.

ClimateXChange is Scotland's Centre of Expertise on Climate Change, providing independent advice, research and analysis to support the Scottish Government as it develops and implements policies on adapting to the changing climate and the transition to a low carbon society.

- c. When setting a 2050 GHG emissions reduction target, most jurisdictions have set a 2030 target to act as a stepping stone along the way. For jurisdictions that are Member States of the European Union (EU) binding targets for emissions in 2030 from certain sectors are set as part of EU legislation, but this does not restrict Member States from setting a more ambitious target. Germany, for example, has set a target to reduce GHG emissions by 55% by 2030.
- d. The approach to target setting used by all jurisdictions includes several common elements. This includes the quantitative assessment of emission reduction potential and the associated costs. It also involves a political decision-making process and culminates in the development of legally binding targets or a climate plan.
- e. Following these assessments, jurisdictions would typically enter into political decision-making process which involves engagement with their political parties, key industry players, civil society and academia. An observation from reviewing these approaches is that whilst there are commonalities as described above, there are differences between the jurisdictions in the degree to which they focus on either of the above steps.
- f. Regarding the implementation and monitoring of a climate plan, jurisdictions identified the importance of a clear governance and institutional set-up to ensure implementation and regular review of the climate plan. For most jurisdictions, the implementation was led by the Environment Ministry, with support from several other ministries. In Baden-Württemberg, this was supported by sectoral ministries, whereas in Wallonia, the climate plans implementation was split between the Walloon Agencies for Air and Climate, and for Energy. For monitoring the climate plan and tracking its progress, Sweden and New Zealand expressed the importance of having an independent organisation, such as the UK's Committee on Climate Change, to ensure stability of the climate plans objectives between political cycles, and also to hold the government to account on delivering its targets.

## Glossary

Acronym	Description
7NC	7 <sup>th</sup> National Communication
CH <sub>4</sub>	Methane
CGE model	Computerised General Equilibrium model
CO <sub>2</sub>	Carbon dioxide
EPA	Environment Protection Authority
ETS	Emissions Trading System
GEF	Global Environment Facility
GHG	Greenhouse gas
HFC	Hydrofluorocarbons
IPCC	Intergovernmental Panel on Climate Change

LEAP model	Long-range Energy Alternatives Planning model
MACCs	Marginal Abatement Cost Curves
N <sub>2</sub> O	Nitrous oxide
NDC	Nationally Determined Contributions
NECP	National Energy and Climate Plan
NGO	Non-Governmental Organisation
PFC	Perfluorocarbons
SF <sub>6</sub>	Sulphur hexafluoride
UNDP	United Nations Development Programme
UNFCCC	United Nations Framework Convention on Climate Change
WRI CAIT	World Resources Institute's Climate Data Explorer

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# 1 Introduction

Tackling climate change is a key priority for the Scottish Government. Scotland has consistently shown leadership on reducing greenhouse gas (GHG) emissions. It introduced the Climate Change (Scotland) Act in 2009 – making Scotland the first country in the world to introduce legally binding annual targets – and has reduced GHG emissions by 47% since 1990<sup>1</sup>. In May 2019 the Scottish Government outlined its response to the global climate emergency, and amended the Climate Change (Emissions Reduction Targets) (Scotland) Bill, to include a target for net zero GHG emissions by 2045. The Bill has subsequently been agreed by the Scottish Parliament and received Royal Assent in October 2019.

The Climate Change (Emissions Reduction Targets) (Scotland) Act 2019 maintains a requirement for the Scottish Government to prepare a report every five years setting out how the targets will be achieved. In 2018, the Scottish Government published its third ‘report on proposals and policies’ (the ‘Climate Change Plan’), building on the previous two publications in 2011 and 2013, to set out an ambitious decarbonisation pathway to 2032. The Scottish Government has committed to providing an update to the current Climate Change Plan by the end of April 2020, six months from the Climate Change Bill receiving Royal Assent.

The reports on progress have evolved over time, with the latest (2018) climate change plan using economy-wide modelling to demonstrate ‘what might be possible’, as opposed to a more bottom-up approach of identifying policies and projects and the savings that can be achieved. This study has been designed so that it aims to support the Scottish Government in their approach to further develop its climate change plans in the future, as well as in its efforts to monitor its progress towards the implementation of those plans.

For this purpose, this report explores how other jurisdictions develop and monitor their strategic plans for achieving GHG emission reductions. The observations and reflections from this report could help inform decisions on how future reports on progress might be developed and tracked.

## 1.1 Objective of the study

The research explores best practices, alternative approaches, and key lessons learned in the development of strategic climate change plans and their monitoring and reporting plans, at national and sub-national levels. Specifically, the scope of the research aimed to address the following:

1. Understanding the details of what climate plans<sup>2</sup> in other jurisdictions cover: this component focused on assessing the content and scope of climate plans in other jurisdictions, in order to identify where they are ambitious, innovative, or utilise an alternative approach to Scotland. This included consideration of:
  - Level of ambition;
  - Nature of the targets;
  - Sectors and gases covered;
  - Role of institutions in delivering the plan;
  - Environmental/social/economic co-benefits;
  - Time period of the plan;
  - Approach to setting out the plan (e.g. sectoral, by technology etc.); and

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<sup>1</sup> Scottish Government, 2018. Scottish Greenhouse Gas Emissions 2017. Agriculture, Environment and Marine. Available from:

<https://www.gov.scot/binaries/content/documents/govscot/publications/statistics/2019/06/scottish-greenhouse-gas-emissions-2017/documents/scottish-greenhouse-gas-emissions-2017/scottish-greenhouse-gas-emissions-2017/govscot%3Adocument/scottish-greenhouse-gas-emissions-2017.pdf>

<sup>2</sup> The focus for this report is on plans for climate change mitigation, and not adaptation to climate change.

- Types of mitigation policies/commitments.
2. The key similarities and differences between these plans and the Scottish Government's 2018 Climate Change Plan. This component was concerned with understanding how other jurisdictions' plans align or diverge with Scotland, with the aim of identifying where key lessons can be transferred and the plan for Scotland potentially enhanced. This included assessment of:
    - Plan content (including the above);
    - The approach to developing the plan;
    - Methods, models and technical approaches;
    - Implementation approach;
    - Degree of climate mainstreaming, i.e. degree to which the objectives of the climate change plan are integrated and prioritized in all other plans developed, implemented and monitored by the relevant government;
    - Processes for monitoring implementation and impacts;
    - Financial support for development and implementation of the plan; and
    - Engagement and communication strategies.
  3. The internal and external processes used to develop climate plans in other jurisdictions. This component, undertaken in large part through stakeholder interviews, explored the practical steps undertaken to develop and monitor plans, considering:
    - Legal processes and frameworks;
    - Procedural processes undertaken or established; and
    - Institutional processes, structures and capacity.

In order to address the above objectives, an analytical framework was developed to systematically review climate plans (including that of Scotland). More detail on this process can be found in Appendix 1. Initially, an assessment was made for a long-list of 16 jurisdictions (12 national and four sub-national) based on information identified from a literature review process. A summary of the results of this process can be found in the research notes in Appendix 2. The results from the assessment were then used to develop a shortlist of eight national and sub-national jurisdictions (Belgium (including Flanders and Wallonia), Germany (including Baden Württemberg), Netherlands, New Zealand and Sweden) that were studied in more detail. The research notes for these shortlisted jurisdictions can be found in an accompanying report (Appendix 3 – published separately). This involved further research through stakeholder interviews to add depth, insights and to unpick the experiences of key individuals involved in the process of developing the plan. Figure 1 shows the long-listed and shortlisted jurisdictions.

This report compiles the outcomes of these research activities, enabling the identification of key strategic insights to help inform the development of Scottish Government's future climate plans and contributions to wider understanding of climate planning, particularly at state and regional level.

The report is grouped by topic, as listed below:

1. Setting an ambitious GHG emissions reduction target, including types of targets, approaches to target setting, updating of targets, and sub-national targets, the legal basis for targets and stakeholder consultation on target setting.
2. Development of the climate plan, including scope and structure of the plan, the process of developing and updating the plan and integration of the plan with other national priorities.
3. Implementation of the climate plan, including institutional set-up and financing of plans.
4. Monitoring the climate plan.

The level of detail in the sections outlined above varies according to the amount of information that was found during the literature review and provided in the interviews, and does not reflect the importance, or any other significance, of the topic in question.

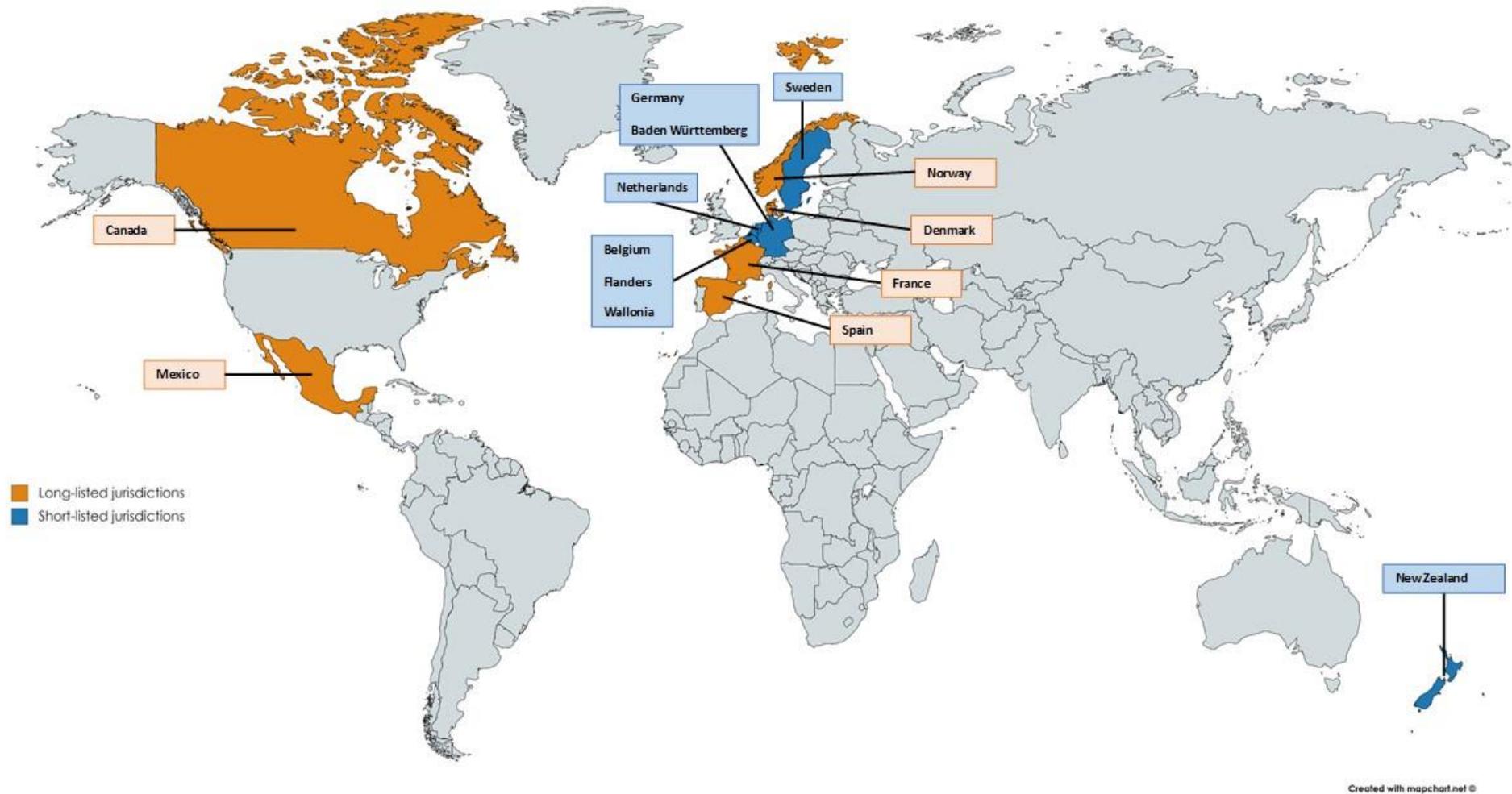


Figure 1 Overview of long-listed and short-listed jurisdictions and their long-term climate targets

## 2 Setting an ambitious GHG emissions reduction target

This chapter provides an assessment of emission reduction targets that have been established by the selected jurisdictions. It describes the targets themselves and the process by which the targets have been developed including the determination of any shares of emission reductions from different sectors, regions or time periods.

### 2.1 Overview of targets

The Paris Agreement outlines that signatories to the agreement will aim to be net zero in terms of GHGs by the middle of the 21<sup>st</sup> century<sup>3</sup>. Most of the jurisdictions considered in this study fall just short of this objective, as they have set long-term targets to reduce GHG emissions by 80-95% by 2050 compared to 1990 levels. One jurisdiction, namely Sweden, made an even more ambitious commitment compared to the Paris agreement, by aiming to be a net sink for GHG emissions after 2045. At the time of writing (August 2019), the UK (not one of the countries studied in this report) is the only country to set a net zero GHG target for 2050 in legislation, with Scotland currently legislating for net zero GHG target by 2045.

Alongside their 2050 targets, several jurisdictions have also set a 2030 target which acts as a stepping stone within their trajectories to their 2050 targets (which is to be expected, as most Nationally Determined Contributions (NDCs)<sup>4</sup> under the Paris Agreement set 2030 targets).

**Table 1: Summary of 2030, 2040 and 2050 targets in short-listed jurisdictions**

Jurisdiction	2030 target	2040 target	2050 target
Belgium*	Belgium has set regional targets only as specified below		
Flanders (Belgium)*			80-95% below 1990 levels
Wallonia (Belgium)*			80-95% below 1990 levels
Germany*	55% below 1990 levels	70% below 1990 levels	80-95% below 1990 levels
Baden Württemberg (Germany)			90% below 1990 levels
Netherlands*	49% below 1990 levels		95% below 1990 levels
New Zealand	30% below 2005 levels		Zero carbon
Sweden*		Net zero by 2045	

\* In this table we only include 2030 targets for EU Member States where they have specifically committed to them themselves. All of the Member States will contribute to the overall EU target of reducing GHG emissions by 40% below 1990 levels by 2030, and each has a binding target to limit

<sup>3</sup> Paris Agreement. 2015. "Parties aim to [...] achieve a balance between anthropogenic emissions by sources and removals by sinks of greenhouse gases in the second half of this century" ([Paris Agreement](#), Article 4).

<sup>4</sup> Nationally Determined Contributions (NDCs) are plans submitted by each Party signed up to the Paris Agreement. NDCs outline each country's commitment to reduce national emissions and adapt to the impacts of climate change. The Paris Agreement requires each Party to "prepare, communicate and maintain successive NDCs that the Party intends to achieve" ([Paris Agreement](#), Article 4).

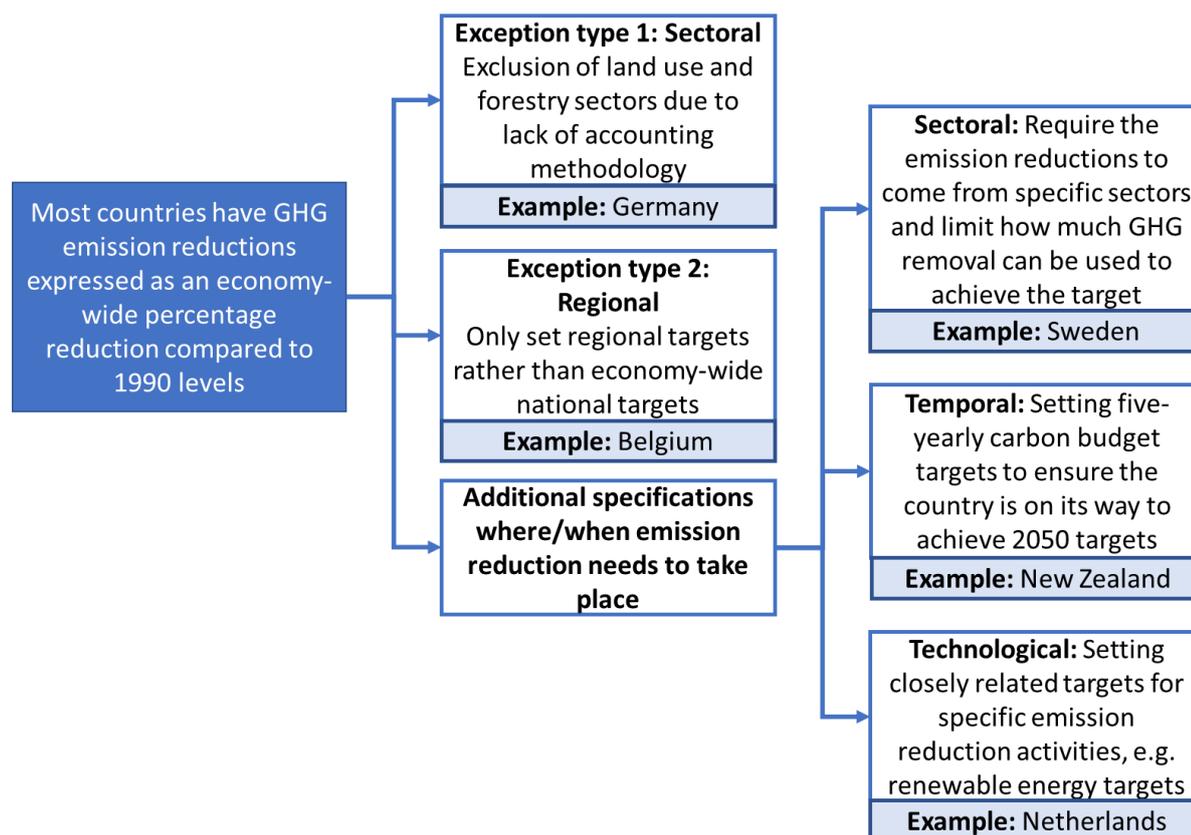
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emissions from sectors that are outside of the scope of the EU Emission Trading System (ETS) under EU legislation.

## 2.2 Type of targets

Most jurisdictions have expressed their GHG emission reduction targets as an absolute economy-wide percentage reduction of all GHGs compared to a 1990 baseline. However, in some cases emissions from certain sectors may be excluded from the target. Some targets also specify where and when the emission reductions are required to be realised. Figure 2 illustrates the type of targets set by the jurisdictions studied here.

Figure 2: Overview of type of targets set by jurisdictions studied here



For example, Germany has not included the forestry and land use sectors in their overall target. It cites the lack of a well-defined accounting methodology for emissions from these sectors as a reason for this. This lack of a clear accounting methodology could potentially cause issues in determining if the overall target has been achieved. Germany therefore decided not to include these sectors in its economy-wide target<sup>5</sup>.

Belgium forms another exception to setting an economy-wide target for all sectors compared to a 1990 baseline, as it has set regional rather than economy-wide national targets. Due to its political situation, Belgium has decided to establish a system for ‘intra-Belgian burden sharing’ whereby Brussels, Flanders and Wallonia regions have all established independent emission reduction targets. Taken together, these regional targets satisfy Belgium’s commitments both under the Paris Agreement and EU regulations, even though no separate national targets have been set.

Furthermore, while most jurisdictions have set economy-wide targets, some have added additional specifications for where these emissions are expected to come from or when reductions need to take place. For example, Sweden has specified a minimum reduction target for the transport

<sup>5</sup> In practice, Germany still has to address emissions from forestry and land use as part of its implementation of EU regulations through the ‘no debit rule’. This rule requires EU Member States to ensure that greenhouse gas emissions from land use, land use change or forestry are offset by at least an equivalent removal of CO<sub>2</sub> from the atmosphere in the period 2021 to 2030.

sector for 2030 to ensure that this high emitting sector (50% of all GHG emissions) is on track to meet the national 2045 net zero target. In addition, Sweden intends to concentrate on activities that reduce GHG emissions rather than on removing GHGs once they have been released. The country has therefore adopted a maximum limit to how much GHG removal can be used to achieve their overall GHG emission target.

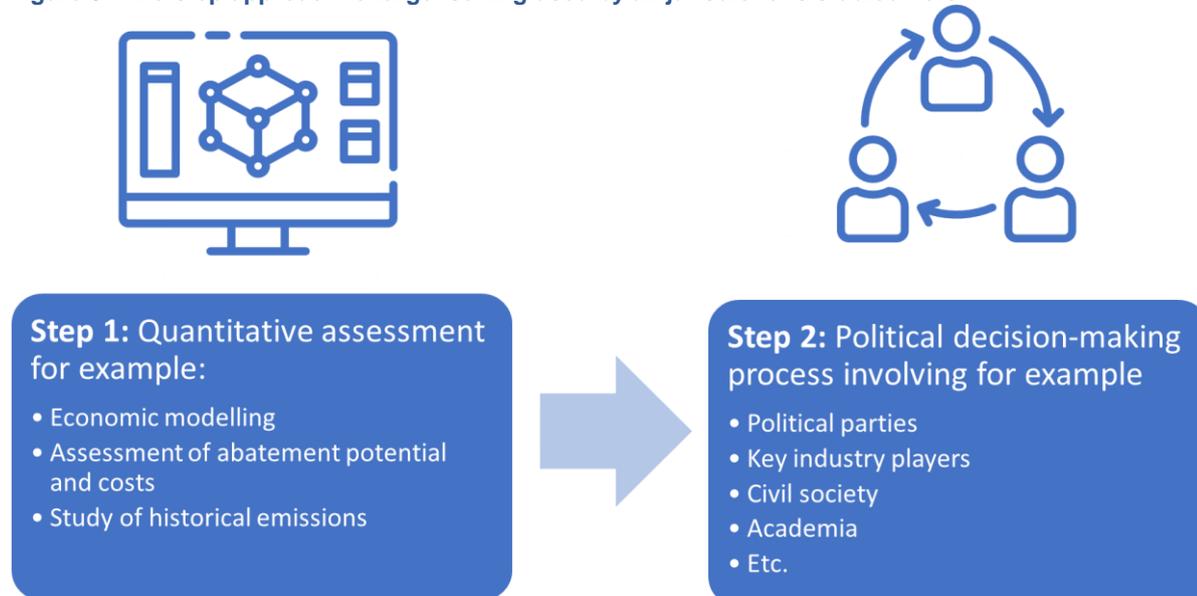
Other countries, such as the Netherlands, have implemented targets which are linked to emission reductions and thereby help the achievement of climate targets, outlining where emission reductions need to take place. For example, the Dutch government is committed to ensuring that by 2050, close to 100% of all energy used in the country comes from renewable sources.

Other jurisdictions, such as New Zealand and Wallonia, have instead used carbon budgets as an approach to break their long-term targets down into interim targets. In 2015, the Wallonia Government adopted two carbon budgets, set for the time periods 2015-2017 and 2018-2022. Subsequent budgets are being developed for the time periods 2023-2027 and 2028-2032, yet to be approved by the new Wallonia Government elected May 2019. In New Zealand, in May 2019, the Government proposed to amend the Climate Change Response Act of 2002, with legislation originally designed to be for a separate Zero Carbon Bill. The resulting proposed legislation, titled the Climate Change Response (Zero Carbon) Amendment Bill, outlines a series of 5-yearly emissions budgets, with the first likely to start from 2022, to act as stepping stones to reduce all GHG (except biogenic methane) to net zero by 2050. For biogenic methane emissions, a separate set of targets are proposed, to reduce these emissions by 24–47% below 2017 levels by 2050, including to 10% below 2017 levels by 2030. Their proposals to adopt this build on their experience with a provisional carbon budget for 2013-2020, of 509.8 million tonnes of carbon dioxide equivalent (Mt CO<sub>2</sub>-eq), equivalent to a 5% reduction on 1990 emissions by 2020.

### 2.3 Approach to target setting

In all jurisdictions studied here, targets have been set by drawing upon the results of quantitative assessments of reduction potentials and their costs. These results then feed into a political decision-making process which then culminates in the development of legally binding targets or climate plans.

Figure 3: Two-step approach to target setting used by all jurisdictions studied here



In the first step, jurisdictions have drawn on quantitative assessments of the potential emissions reductions. Sources of evidence include economic modelling of emissions reduction potentials and assessments of historical GHG emissions, although alternative methodologies have also been used. For example, Sweden also used information from climate pledges made by the private sector to estimate what emission reduction potentials were possible.

As a second step, the quantitative assessments have been used by the jurisdiction in a political decision-making process involving the negotiation of the targets. This negotiation is heavily dependent on the outcomes of the quantitative assessment (including costs), and is aimed at building trust between the government and other key stakeholder groups such as the private sector or civil society or among political parties as in the case of Sweden. Most jurisdictions made use of a comprehensive stakeholder consultation process during this second step to ensure sufficient buy-in from key stakeholders into the target and its achievability, thereby making the eventual political negotiation and agreement easier.

The emphasis placed on either of the steps outlined here (i.e. quantitative assessment and the political process to create buy-in) varies considerably between jurisdictions. Both Sweden and the Netherlands have put more emphasis on a political process to create buy-in and engage the private sector at an early stage. On the other hand, other countries such as Belgium and New Zealand have focused more on quantitative assessments to analyse the level of emission reductions feasible in their jurisdiction. This suggests that the balance needs to be tailored to the country in question and the political and cultural context therein.

### 2.3.1 Updating of targets

All jurisdictions that have set targets so far have also clearly prescribed regular frequencies for reviewing their targets, to assess progress and thereby whether they need updating. In some cases, such as in Germany, the update frequency is aligned with the Nationally Determined Contribution (NDC) cycle under the Paris Agreement, where an update is required every five years. For others, including Flanders and Wallonia, a shorter period of two years is used in line with the EU regulation for Governance of the Energy Union and Climate Action. However, even when a different updating period is used, all countries still need to report on progress made to achieve their targets and update them every five years for the NDC process under the UNFCCC. Furthermore, the Netherlands has opted to comply with both cycles and has committed to update and review its targets every two years in accordance with EU regulation, as well as carry out five yearly reviews aligned with the NDC cycles under the Paris Agreement. Sweden aims to update its climate plan for achieving the target every four years, and provide an annual report to parliament in the budget. Sweden has not explicitly aligned its national climate planning cycle with the NDC update cycle, but notes that as part of the EU-28, has taken on a quantified economy-wide emission reduction target jointly with all other Member States and is compliant with UNFCCC processes as part of the EU NDC.

Figure 4 Frequency of updates to targets by various jurisdictions

Two-yearly updates of target in line with EU Regulation	Five-yearly updates of target in line with NDC cycles and the Paris Agreement
Flanders	Germany
Wallonia	New Zealand
Netherlands	

## 2.4 Sub-national targets

All of the sub-national jurisdictions studied here have developed their emission reduction targets by considering either the national level targets or commitments made by the national government under international agreements, e.g. the Paris Agreement or EU regulation. In all of the cases where the national jurisdiction is an EU Member State, the national targets have subsequently been developed in alignment with EU-wide targets. This consequently creates a cascade of targets.

A key issue to consider in this cascade, is the sharing and assigning of responsibility over emission reduction activities at each governance level. For some emissions occurring at the regional level the main levers to control emissions might only be available at national level, e.g. in the case

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where regulations affecting power plants are determined by a national government. It therefore raises a question about the extent that regional targets are attainable if not enough action is taken at the national level. At present, the sub-national jurisdictions considered here seem to suggest that this issue is generally not very well-defined.

For example, Belgium has binding sub-national targets in place, while there is no overarching national target<sup>6</sup>. In this case, the achievement of the national commitment under the Paris Agreement is entirely dependent on the achievement of the regional targets.

On the other hand, Germany is not planning to break down federal targets into state targets. Instead, decisions on the establishment of sub-national targets sits with States themselves and the level of ambition they choose does not necessarily directly correlate with national-level ambition. This raises an interesting question about the degree of vertical integration in a country and how it impacts on that country's understanding of whether it is on track to meet its targets. In the situation outlined above, whilst the targets are not directly linked we can expect that if sub-national targets are not met then it will impact on the ability of the country to meet its national-level target. But much will depend on how the national-level target was formulated and what assumptions sit behind it (e.g. whether it depends on action entirely at the national level, or also on action that can only be taken at sub-national level). This suggests a greater degree of vertical integration between targets at national and sub-national level which can only improve transparency on whether the jurisdictions are on track.

Lastly, Canada offers an alternative example as it has created a backstop option<sup>7</sup>. In 2016, Canada published its Vancouver Declaration on Clean Growth and Climate Change, which led to the adoption of the Pan-Canadian Framework (PCF) on Clean Growth and Climate Change later that year. The PCF outlines that all provinces and territories in Canada have the autonomy to establish their own climate targets and measures to achieve these targets. Simultaneously, at the federal level, Canada has established a climate target of 30% reduction by 2030 compared to 2005 levels. Based on this target, the government has created a benchmark for a minimum level of carbon pricing that a province or territory needs to implement in order to achieve this target. In case a province or territory fails to establish an adequately stringent system to cut emissions, as measured by the benchmark, the federal government will take over and implement a backstop carbon price instead<sup>8</sup>. This has created a real incentive for provinces and territories to implement their own targets and measures, as the backstop can take away some of the autonomy of the province or territory, including a say in what happens with the revenues raised from the carbon pricing policy.

Figure 5 below shows the varying cascades of targets in the context of Germany, Belgium and Canada. It illustrates that it is crucial to clarify responsibilities at each governance level to ensure that emission reduction targets at all levels are achieved.

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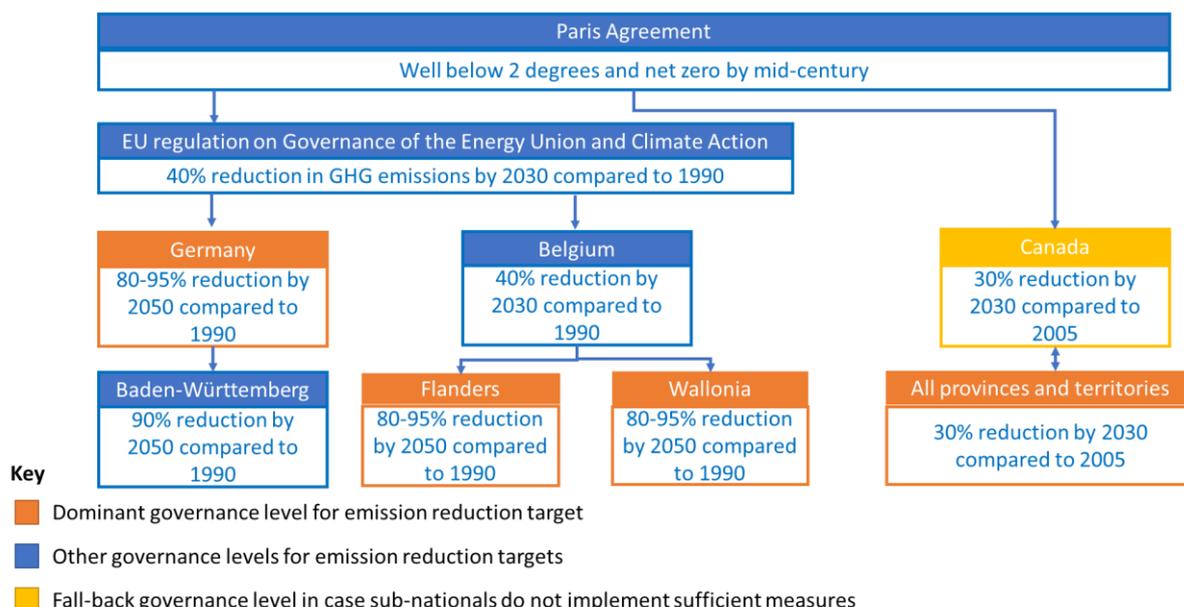
<sup>6</sup> For the whole economy. There is a target for sectors outside of the EU ETS.

<sup>7</sup> Please note that Canada was not short-listed for this study and therefore no interview has been carried out to gather information on its climate change plans. However, it has been included in the literature review as part of the long-listing exercise of this study. This has identified the relevance of the Canadian approach to the implementation of sub-national targets as explained in this chapter.

<sup>8</sup> UNFCCC. 2017. Canada's 2017 Nationally Determined Contribution Submission to the UNFCCC. Available from:

<https://www4.unfccc.int/sites/ndcstaging/PublishedDocuments/Canada%20First/Canada%20First%20NDC-Revised%20submission%202017-05-11.pdf>

Figure 5: Schematic overview of cascade of targets in Germany, Belgium and Canada



## 2.5 Legal basis of targets

The case studies considered here demonstrate that the main reason jurisdictions lay down their target as a law or act is to ensure that the target is sustainable despite any changes in government that may occur.

The two main examples from the case studies where a legal basis for the emission reduction target has been established (or is still being discussed) come from Sweden and New Zealand. In both of these cases, the legal basis for the targets has been developed following the approach of the UK.

In the case of Sweden, the emission reduction targets are set out in the Climate Act (in force since 1<sup>st</sup> of January 2018). The Swedish Climate Act stipulates that it is the government’s responsibility to aim to work towards the targets set by the Parliament. This ensures that regardless of what government is in place, the targets will remain in place. In addition, it also ensures the existence of the Climate Expert Policy Council, which is a committee responsible for evaluating the Swedish government’s climate policy and whether it is compatible with its climate goals.

Likewise, in New Zealand the Climate Change Response Act of 2002 is being amended to include legislation initially proposed to form a separate piece of legislation, designed as the Zero Carbon Bill. The resulting proposed legislation is titled the Climate Change Response (Zero Carbon) Amendment Bill, which has been developed by the Government to ensure that all key climate legislation is kept within one Act.

Interviewees highlight that the UK’s example of the Climate Change Act and the Committee on Climate Change has been crucial to create a similar strong mandate for climate action in Sweden and New Zealand.

In some cases, a two-step process may help with the process of gaining political agreement to targets in climate legislation. As highlighted in section 2.2, Germany first set out its targets in a climate action plan in 2016. As a subsequent step, the government is now negotiating a climate law that can form the legal basis for the German emission reduction targets and ensure that these endure during various political cycles.

## 2.6 Stakeholder consultation

Most jurisdictions use some sort of stakeholder consultation when establishing emission reduction targets. This usually is a one- to two-year process involving various sectoral ministries, academia, industry players, the general public and political parties (as in the case of Sweden). Below we have

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identified three different methods for stakeholder consultation in the establishment of targets used. These include

1. A political working group process as used in Sweden (with stakeholder consultation),
2. A process of meeting rounds for collection of ideas and discussion of drafts as used in Germany and Baden-Wuerttemberg, and
3. An online public consultation process as used in New Zealand.

Such methods are not necessarily mutually exclusive, and a country may choose to adopt two or more of such approaches in parallel, for example carrying out a wider public consultation whilst also running a working group process to get targeted inputs and feedback from key experts.

In the case of Sweden and the Netherlands, stakeholder consultation took the form of a political working group process whereby key players from industry, civil society and academia were invited in iterative rounds of conversations to establish the target. The main aim for these conversations was to establish targets that were in line with what is possible in the country and collect ideas for concrete mitigation measures (highlighting the important link between target setting and policy planning). As a consequence, strong buy-in was created from industry, as they had been part of the process to establish the targets. The Swedish process is outlined in more detail in Box 2 below.

**Box 2: Sweden's consultation process to establish its emission reduction target**

In 2014, the Swedish government set up a cross-parliamentary committee with the task to develop a Climate Policy Framework. Seven political parties (all but one who was unwilling to participate) were represented in this committee. The members of this committee were politicians, but also experts from the academic world, NGOs, trade unions and industry. The committee consisted of a mix of people who worked closely together in a step-by-step process of two years to establish Swedish climate targets.

The process they used for this was by asking themselves the following questions:

- What is possible in terms of emission reductions in each sector from a bottom-up perspective?
- What does the IPCC tell us in terms of what is needed and what is possible?
- What is Sweden's fair share under the Paris Agreement, i.e. what is the level that Sweden needs to contribute to in order to align with the Paris Agreement and IPCC reports?

No advanced modelling tool was used, but instead a scenario analysis approach was used whereby experts looked at each sector to assess what mitigation actions were possible there. These experts tried to consider what is realistic in terms of mitigation actions that could be carried out in each sector and assessing their technical feasibility using a bottom-up approach. This process built mutual trust between those involved and helped support greater ambition for stringent climate targets over time. After the two years necessary to agree on targets with the committee, one additional year was used for government to review these decisions and establish the Climate Policy Framework.

The buy-in from all different stakeholders involved in the process for the ambitious climate targets in Sweden are seen as the critical element for its success.

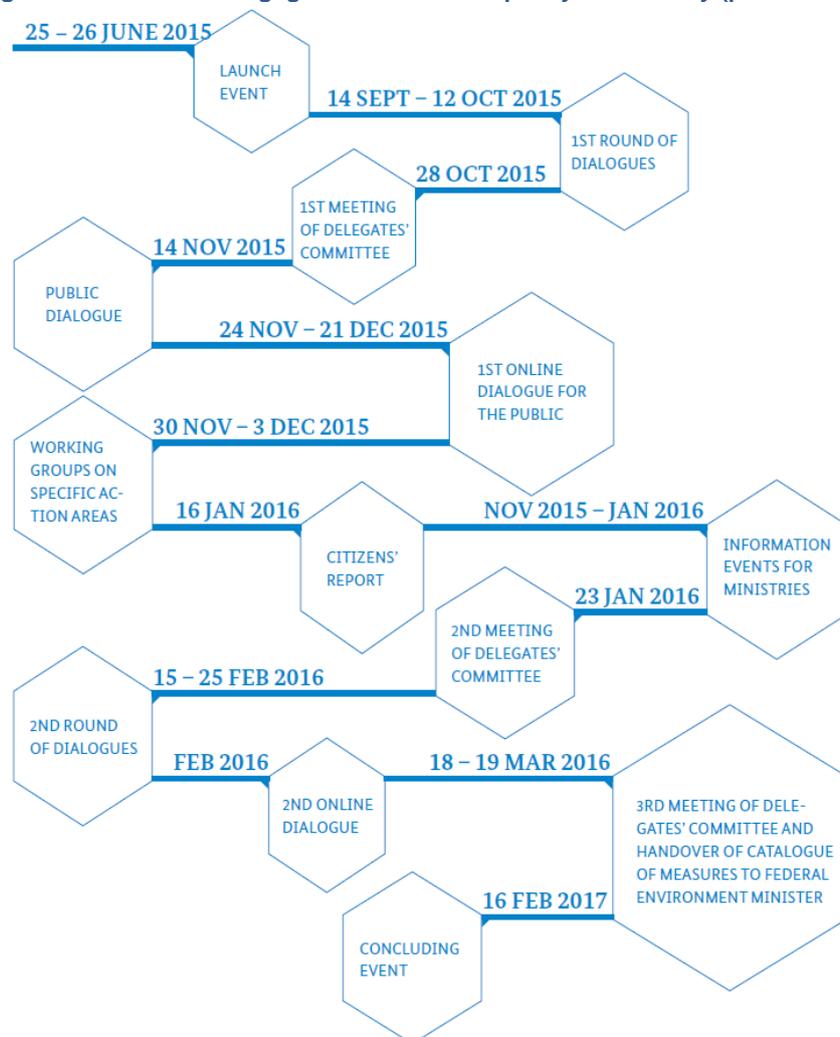
Baden-Württemberg and Germany took a different approach by organising a large number of meetings with mostly representatives from sector associations to collect ideas for concrete mitigation measures. Other groups that were engaged in the process include business communities, academia such as the Center for Solar Energy and Hydrogen Research Baden-Württemberg, German Environment Agency and Ecologic Institute, civil society such as churches and environmental NGOs, municipalities, and citizens. In the case of Germany, this process started in June 2015 and ended in February 2017. The figure below presents the steps of the process, which included:

- target-group-specific formats;
- arrangement of meetings of a committee of delegates;

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- ministry information events;
- sector-specific working groups;
- a launch event and a closing event to frame the process;
- a relevant website.

Figure 6: stakeholder engagement on climate policy in Germany (provided by interviewee)



In New Zealand, a stakeholder consultation process was undertaken by the Productivity Commission (an independent Crown entity which completes in-depth reports on topics selected by the Government) as part of an inquiry into how New Zealand can transition to a low-emission economy to 2050. To do so, between May 2017 and August 2018, over 120 engagement meetings (including overseas) were held, 34 conference/seminars arranged, and a discussion document titled “Our Climate, Your Say!” launched online for the general public to comment on. The discussion document was linked to a submission form on the Ministry of Environment’s website, and the general public were encouraged to answer 16 questions on what they thought should be considered within the Zero Carbon Bill. This submission form was kept open until June 2018, with a summary findings report released in August 2018. Overall, over 400 submissions were received from the general public as well as from other organisations.

### 3 Development of the climate plan

In most of the jurisdictions considered in this study, the government has started to develop a climate plan after the establishment of GHG emission reduction targets. Such a climate plan

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typically lays down the practical approach, i.e. strategies and measures, necessary to achieve the emission reduction targets.

Within this chapter the findings of the case studies outline how jurisdictions have developed their climate plans and what these typically entail. It should be noted, however, that most of the jurisdictions analysed here, including New Zealand, Netherlands and Sweden, are still in the process of developing their climate plans. As these documents have not been published yet, limited information was available on the content of the climate plans as well as the process used to develop these.

### 3.1 Scope and structure of the plan

The level of detail used in climate plans varies substantially between jurisdictions. For example, some jurisdictions including Germany, have developed their climate plan as a strategic document. In these cases, the plan outlines the long-term targets at the national and sectoral level as well as strategies / mitigation pathways for each of the sectors, while concrete policies and measures to be implemented will be outlined in a separate or additional document (in the case of Germany a 'programme of measures', which is under negotiation).

In other cases, the plan itself already includes a detailed description of the measures to be taken to achieve the targets. In the case of Sweden, the Climate Act states that the government must present a Climate Action Plan every four years to ensure there is a clear framework for how the targets will be met. This year (2019) is the first year the government will develop such a plan. The Swedish Environment Protection Authority (EPA) have developed a report to support the government to develop this first action plan. The official government action plan will be presented in the autumn. The Swedish Climate Act also outlines in detail the eight elements that will have to be included in the plan, as follows:

1. Sweden's commitments in the EU and internationally;
2. Sweden's historical greenhouse gas emissions data, including the most recent emissions inventory;
3. Emissions reduction projections;
4. The outcome of any emissions reduction measures taken;
5. Planned emissions reduction measures, including an approximate indication of when these measures may come into force;
6. The extent to which adopted and planned emissions reduction measures can be expected to contribute to the achievement of the national and global climate change targets;
7. The extent to which adopted and planned measures in different expenditure areas affect the ability to achieve the national and global climate change targets;
8. Any further measures or decisions that may be needed to achieve the national and global climate change targets.

Other jurisdictions have used the EU regulation on Governance of the Energy Union and Climate Action as a basis for the development of their climate plans. Under this regulation, Member States are required to develop National Energy and Climate Plans (NECPs) based on a common template to outline how they will meet the EU climate targets over the period 2021-2030. Both Flanders and Wallonia have therefore developed their climate plan as part of the process to prepare the Belgian NECP for submission to the European Commission.

Lastly, the interview template included questions around how behaviour change and co-benefits of policies and measures were considered in the climate plan, but none of the interviewees provided information on this for their jurisdictions. In addition, none of the NDCs of the jurisdictions studied in this report included references to the role of behaviour change or co-benefits. This seems to imply that these aspects have received less attention in climate plans to date.

### 3.2 The process of developing the plan

In almost all jurisdictions, stakeholder consultation is or has been a key element for the development of the climate plan. Interviewees mentioned that stakeholder consultation does not only ensure input is provided into the concrete measures proposed in the climate plan, but it can

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also help to build buy-in among stakeholders for acceptance of the policies and measures to be introduced.

Input for the climate plan can also come from approaches to model emissions. While most jurisdictions used a modelling approach to set targets, modelling is also widely used to assess what policies and measures could be used to achieve the emission reduction targets. The outputs of these models therefore form a useful basis for the development of the climate plan.

In addition, the jurisdictions studied here demonstrate that involving sectoral ministries in the development of the plan helps to integrate measures and their implementation into the overall sectoral strategies. This can, at a later stage, also facilitate implementation of the climate plan to be delegated to the relevant sectoral ministries.

The process of developing the plan in Baden-Württemberg is outlined in more detail in Box 3 below.

#### Box 3: Baden-Württemberg's development of a climate plan

A first draft of the IEKK (Integrated concept for energy and climate protection) was developed by the sectoral ministries led by the ministry of environment. The aim of the IEKK is to present the sectoral action necessary to reach the regional targets set for 2020 and 2050 in the Climate Law. The draft IEKK underwent public consultation, where it was discussed in various fora, e.g. in round tables involving citizens (with each round table addressing a specific issue, e.g. power generation, transport, private households) as well as sectoral round tables. The general public could also comment on the draft online. All suggestions received were considered and transparently categorised into categories indicating whether they are or are not included, or under which conditions and when a suggestion could be included. Suggestions considered to be feasible were included. Later on, stakeholder events were held to allow comments on the revised draft.

### 3.2.1 Updating of climate plans

Similar to the updating of emission reduction targets, the updating of climate plans is aimed to align with the requirements under the Paris Agreements or EU Regulations. For example, both Flanders and Wallonia aim to update their climate plan every two years in line with the EU requirements for NECPs. Sweden forms an exception as they intend to review and update their climate plans every four years, in line with political cycles.

### 3.3 Integration of plan with national priorities

The case studies demonstrate that jurisdictions have taken different approaches to ensure that their climate plans align with other national plans and priorities. Doing this can help mainstream climate action across all aspects of government and wider society, which is likely to lead to a more effective response than just driving climate action from the climate plan.

This does not necessarily need to be done for all sectors but could be focused on priority sectors. For example, in the case of New Zealand, its agriculture sector received a high level of attention as part of the climate plan development, as this sector is responsible for almost half of the country's GHG emissions, as well as 5% of its GDP. In order to integrate the Zero Carbon Bill (Climate Change Response (Zero Carbon) Amendment Bill) with such national priorities, a specific sectoral target was developed for biogenic methane emissions. This target is separate to the overarching target aiming to reduce all GHGs (except biogenic methane) to net zero by 2050 and aims to reduce biogenic emissions within the range of 24–47% below 2017 levels by 2050, and to 10% below 2017 levels by 2030. This separate target takes into consideration the importance of the sector to the national economy, whilst also striving to remain aligned with New Zealand's position as a signatory to the Paris Agreement. Regarding this national priority to remain aligned to the Paris Agreement, its biogenic methane target is based on the findings of an IPCC special report which showed that in scenarios that limit warming to within 1.5 degrees, the reductions in global agricultural methane emissions by mid-century should be between 24-47% below 2010 levels.

In the case of Sweden, the Climate Act requires reporting on the extent to which adopted and planned measures in different expenditure areas affect the ability to achieve the national and

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global targets. This element of the climate plan ensures that the emission reduction targets are mainstreamed across all sectors in Sweden and no plans can be implemented that compromise the achievement of the emission reduction targets.

Taking a sectoral approach to implementation of the climate plan can also help mainstream climate action more widely. Developing sectoral implementation plans, and clearly setting out the responsibilities for climate action that sit with sectoral ministries, can be an important way of embedding climate action within other policies. For example, Baden Württemberg indicated that the responsibilities of the sectoral ministries to implement the climate plan automatically leads to an integration with their other policies.

## 4 Implementation of the climate plan

The jurisdictions that have been studied in this project have had limited experience with the implementation of their climate plans, as plans have either not been published yet or have been developed recently. However, interviewees have identified two key aspects that need to be established before entering the implementation phase, which include:

- Establishment of a clear governance and institutional set-up to ensure the implementation and regular review of the climate plan, and;
- Establishment of a mechanism by which the climate plan can be financed.

### 4.1 Institutional set-up

In most of the jurisdictions studied for this report, implementation is led out of the Environment Ministry. But this is usually done with the cooperation of other sectoral ministries as appropriate. In Baden-Württemberg, implementation of the climate plan is the responsibility of sectoral ministries. In some cases, coordination and implementation of the plan was led by a multi-stakeholder group, for example by a steering group of representatives of all energy and climate administrations in Belgium. In one case, in Wallonia, the responsibility was split between the Walloon Agencies for Air and Climate and for Energy. This shows that there are various models for the institutional set-up for implementing the climate plan and the one that works best is likely to depend on national circumstances and on the desired degree of mainstreaming of climate action into wider policy, versus the political appetite for climate action. For example, even if climate mainstreaming is seen as a desired objective, if political support for climate action is not strong outside of the environment ministry then it may be more important that implementation is driven centrally from the ministry.

In New Zealand, under the Proposed Climate Change Response (Zero Carbon) Amendment Bill, the bill commits the Government to establish a new, independent Climate Change Commission to provide expert advice and monitoring to help keep successive governments on track to meeting long-term goals. This is modelled on the approach adopted in the UK.

### 4.2 Financing of plans

Most jurisdictions considered here did not mention a specific budget for the development of the climate plan. In terms of the financing of the implementation of the plan itself, several governments rely on the establishment of various revenue raising mechanisms to finance other more subsidy-based instruments. For example, in Sweden a carbon tax has been in place for years which raises revenue which can be used for subsidising low emission activities. Likewise, the Dutch government is also considering the implementation of a carbon price in the form of a floor price to fund other low emission activities.

## 5 Monitoring the climate plan

All jurisdictions studied here have laid down some form of monitoring process for the implementation of their climate plans and achievement of emission reduction targets. However, these monitoring plans vary in terms of how well-defined they are and whether they have already been implemented. In the case of Sweden and New Zealand, the monitoring process has been laid

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down in a Climate Act or Law, while Germany has specified the requirements for monitoring in its Climate Action Plan where its targets are also set out.

The majority of jurisdictions monitor their climate plan on an annual basis. For example, the Swedish government is obliged under its Climate Act to provide a report as part of the government's annual budget Bill, which outlines the progress of the country towards its climate plan and targets.

Monitoring reports generally are required to contain historical emission development as well as projections of emissions up to the target year. In addition, most monitoring plans also require reporting on progress made with the implementation of measures and less often also a general assessment of progress.

Baden-Württemberg has a two-step approach to monitoring. Firstly, each year the state is to produce a brief report outlining historical emissions, projections up to the target year and an update on the implementation of measures. In addition to that, every three years the state is to produce a larger report including an assessment of the overall progress and any need for additional or improved action.

In some cases, jurisdictions have introduced committees which are responsible for scrutinising climate relevant information. This assessment is used to help judge progress towards achieving climate targets and to make recommendations about how mitigation actions and plans need to be improved. This is the case for Sweden, Germany, Baden-Württemberg and New Zealand. As indicated before, Sweden and New Zealand have modelled these committees on the UK Committee for Climate Change. In the UK, the Committee on Climate Change (CCC) provides independent advice to government on building a low-carbon economy and preparing for climate change. The remit of the UK CCC goes beyond a simple oversight of progress towards delivering strategic plans for achieving GHG emission reductions. The committees in Sweden and New Zealand intend to publish focused monitoring reports on progress and recommendations in relation to the climate plan regularly. Germany has also considered using the UK approach as a model, but as targets have not been laid down in a climate law yet, no legal basis for the committee exists yet. In all cases the committee scrutinising the monitoring report creates a feedback loop for updating the climate plans.

The process of monitoring generally uses existing processes and data, including:

- GHG inventory data to understand progress made towards the target. This information is always in the past and usually shows developments with a two-year delay, e.g. GHG emissions in the year 2017 will only be available in 2019.
- In order to gain a better understanding of how GHG emissions will develop in the future, GHG projections are developed taking the most recent GHG inventory data as well as current trends into consideration. EU Member States are required to submit GHG projections every two years against which they can measure their progress at later stages.
- Existing processes to monitor the implementation of mitigation measures.

## 6 Conclusion

The eight jurisdictions studied here demonstrate that the way in which countries or sub-national entities set their GHG emission reduction targets varies considerably. For example, only two of the eight jurisdictions have either legislated, or are legislating for, a net zero GHG target, with Sweden setting targets to achieve this by 2045, and New Zealand by 2050. The emissions that are within the scope of the targets also vary between jurisdictions. Some have expressed their GHG emission reduction targets as an absolute economy-wide percentage reduction of all GHGs compared to a 1990 baseline. However, there are cases where jurisdictions have chosen to exclude certain sectors from the economy-wide targets being set, such as Germany excluding the forestry and land use sectors. There are also cases where other exclusions have been made, such as in New Zealand's Climate Change Response (Zero Carbon) Amendment Act 2019, where biogenic methane emissions are excluded from the net zero by 2050 target.

When setting a 2050 GHG emissions reduction target, most jurisdictions have set a 2030 target to act as a stepping stone along the way. For jurisdictions that are Member States of the European

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Union (EU) binding targets for emissions in 2030 from certain sectors are set as part of EU legislation, but this does not restrict Member States from setting a more ambitious target, such as Germany, which has set a target to reduce GHG emissions by 55% by 2030.

Many jurisdictions draw on modelling approaches to support the determination of GHG emissions reduction targets and following these assessments, jurisdictions would typically enter into political decision-making process which involves engagement with their political parties, key industry players, civil society and academia. An observation from reviewing these approaches is that there are significant differences between the jurisdictions in the degree to which they focus on either of the above steps.

In most of the jurisdictions considered in this study, the government has started to develop a climate plan after the establishment of GHG emission reduction targets. Such a climate plan typically lays down the practical approach, i.e. strategies and measures, necessary to achieve the emission reduction targets. It should be noted, however, that most of the jurisdictions analysed here, including New Zealand, Netherlands and Sweden, are still in the process of developing their climate plans. This means limited information was available to draw conclusions on the content of these climate plans as well as the process used to develop these.

However, none of the interviewees approached as part of this study nor any of the climate plans have referred to elements around the role of behaviour change as well as co-benefits of specific policies and measures. This seems to imply that these two aspects have received less attention in climate plans to date. Once more jurisdictions have published their climate plans in the coming years, further research may therefore need to be carried out to identify lessons learned around the focus given in these plans to different types of policies and strategies.

Regarding the implementation and monitoring of a climate plan, jurisdictions identified the importance of a clear governance and institutional set-up to ensure implementation and regular review of the climate plan. For most jurisdictions, the implementation was led by the Environment Ministry, with support from several other ministries. In Baden-Württemberg, this was supported by sectoral ministries, whereas in Wallonia, the climate plan implementation was split between the Walloon Agencies for Air and Climate, and for Energy. For monitoring the climate plan and tracking its progress, Sweden and New Zealand expressed the importance of having an independent organisation, such as the UK's Committee on Climate Change, to ensure stability of the climate plans objectives between political cycles, and also to hold the government to account on delivering its targets.

## Appendix 1: Methodology

### Overview

This report aims to explore how jurisdictions develop and monitor strategic plans for achieving ambitious GHG emission reductions. As a first step, this study therefore identified a long-list of jurisdictions – both national and sub-national – that could be relevant for Scotland to learn lessons from. The long-list can be found below Table 4 on page 26. These were selected based on their likelihood to provide insights into a range of different approaches to development of climate change plans.

Secondly, a data capture template was developed for consistency. Using this template, data was collected on the 16 long-listed jurisdictions.

To ensure this study carries out a focused review of the jurisdictions most relevant to Scotland, a sub-set of case studies was shortlisted from the long-list for further review. The short-listing approach used a set of five criteria developed in coordination with the Scottish Government. By assessing these key criteria, a short-list of nine national and sub-national jurisdictions were selected for further review and case study development. This further review included a detailed desk review as well as interviews with key stakeholders.

The interviews with key stakeholders were designed to last one hour and the key stakeholders were provided with the interview questions in advance of the interview. This was done to prompt their awareness of the subject matter, but also to allow for them to complete sections of the questionnaire by hand ahead of the interview and return these to the interviewers.

### Approach to long-listing

To assess the long-listed jurisdictions, a matrix was developed to capture key information on the domestic climate plans and sub-national plans of the identified jurisdictions, obtained direct from country websites or in some cases third-party sites (e.g. National Communications under the UNFCCC, LSE Grantham Institute, World Resources Institute, Climate Action Tracker and others).

The matrix was developed in agreement with ClimateXChange, and used 11 question headings consistent with the overarching research questions.

Figure 7: overview of project methodology

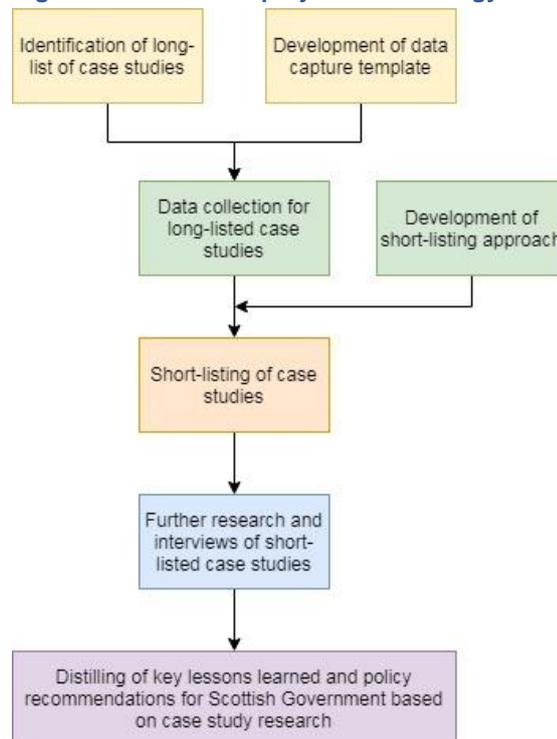


Table 2: Initial matrix template to collect data on key research questions for long-listed jurisdictions

Data point	Description	Example of possible response
Date of publication	This shows how recently the plans have been published	2015 for NDCs submitted under the Paris Agreement
Level of ambition	This includes targets for 2020, 2030 and 2050 as well as the type of target, e.g. intensity or absolute	30% reduction by 2020 compared to 2005 levels as well as 40% reduction by 2030 and 95% reduction by 2050
Legal basis	This might include a climate change act or law or alternatively a mandate for climate change action in other legislation	UK Climate Change Act, Germany's Energiewende, France's Finance Law.

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Transparency of plans	Indicates the extent to which the climate plans assessed can provide the information needed to undertake further assessment, add value to the research, and enable analysis at both country and regional level.	High level of transparency if all plans (and supporting documents) are published online.
Stakeholder engagement	This can be indicated by choosing one of the three categories below: <ul style="list-style-type: none"> <li>No engagement (outside of government) in the development of the plan.</li> <li>Passive engagement (stakeholders were kept informed, but not actively involved in development of the plan).</li> <li>Active engagement (stakeholders were actively involved in development of the plan).</li> </ul>	Active engagement
Coverage	Sectoral coverage and coverage of various greenhouse gases	Economy-wide and all GHGs
Modelling approach	This indicates how the plans have been developed. Types of modelling approaches that are referenced range from cost optimisation (e.g. TIMES), LEAP, MACCs, 'non-modelled' (e.g. equal allocation of effort, grandfathering, extrapolation etc) or 'other' with specifications such as GCE models.	TIMES modelling for the energy sector plans.
Support for plan development	This indicates where support came from and who carried out the work e.g. consulting firm or academics.	Support from university in modelling tasks.
Sub-national links	This indicates if there is a strong mandate for sub-national entities in the climate plans.	E.g. attribution of targets and carbon budgets to sub-national level, regional sub-plans or reporting and tracking systems at sub-national level.
Monitoring	This indicates whether systems are in place for monitoring implementation of the plan and progress in achieving the objectives.	Requirement for annual reporting and independent committee responsible for regular reviews.
Innovation	This indicates if the climate plan has made use of notable innovative approaches.	<ul style="list-style-type: none"> <li>Setting sectoral targets.</li> <li>Taking a non-sectoral approach to its climate plan (e.g. a thematic approach, looking at 'heat' or 'electricity').</li> <li>Leadership of the climate plan is done by another entity than the Environment Ministry.</li> </ul>

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		<ul style="list-style-type: none"><li>• Taking a novel approach to public engagement.</li><li>• Taking an innovative approach to monitoring progress.</li></ul>
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**Table 3: Final matrix used to collect data on key research questions for long-listed jurisdictions**

	Date of publication <sup>1</sup>	Level of ambition <sup>2</sup> (L, M, H)	Legal basis <sup>3</sup>	Transparent plan <sup>4</sup>	Stakeholders <sup>5</sup>	Coverage <sup>6</sup>		Modelling approach <sup>7</sup>	Support for plan development <sup>8</sup>	Sub-national links <sup>9</sup>	Monitoring <sup>10</sup>	Innovation <sup>1</sup>
						Sectors	Gases					
Country X	2014	High – zero emissions by 2050	Yes – Climate Change Act	Yes	Active engagement	Economy-wide	Just CO <sub>2</sub>	LEAP		N		Yes – also has renewable targets
Country Y	2017	2020 – medium (20% from 2005 levels) 2050 – high (90% from 2005 levels)	No	Yes	No engagement	Energy, transport and agriculture	CO <sub>2</sub> , CH <sub>4</sub> and N <sub>2</sub> O	Cost optimisation – TIMES		Y		No

The long-listed jurisdictions included:

- France
- Germany
- Baden-Württemberg (Germany)
- Sweden
- Canada
- New Zealand
- Spain
- China (China)
- Jiangsu
- Netherlands
- Denmark
- Mexico
- Norway
- Belgium
- Flanders (Belgium)
- Wallonia (Belgium)

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### **Approach for shortlisting:**

Four of the 11 data points outlined in the section above were selected as the key criteria for shortlisting:

- ‘Level of ambition’ – The Paris Agreement and subsequent scientific reports have increasingly made it clear that there is an urgent need for ambitious action, with net zero emissions a goal now increasingly highlighted as necessary. As such, the research specifically looked to shortlist those jurisdictions setting the most ambitious targets, as these plans aim to identify how to achieve such ambitions.
- ‘Modelling approach’ –the research sought to shortlist jurisdictions that exhibit a variety of modelling approaches, and approaches to apportionment of effort (e.g. between sectors, or between sub-national jurisdictions).
- ‘Sub-national links’ –the research sought to capture countries that have a strong level of sub-national action and autonomy, and ambitious sub-national plans.
- ‘Innovation’ – the case studies sought to reflect innovative approaches to climate plans.

All the other criteria in the matrix provide useful information on the climate plans in these jurisdictions, but are less relevant to the shortlisting. Colour shading in Table 5 reflects the following approach:

- Level of ambition – those jurisdictions showing the greatest level of ambition were shaded green.
- Sub-national links – those jurisdictions showing the greatest level of sub-national action were shaded green.
- Innovation – those jurisdictions showing specific innovations were shaded green, and the innovations described.

Jurisdictions were shaded green under the modelling approach category if they exhibited a particularly interesting approach to the modelling, for example using a range of different modelling approaches in parallel.

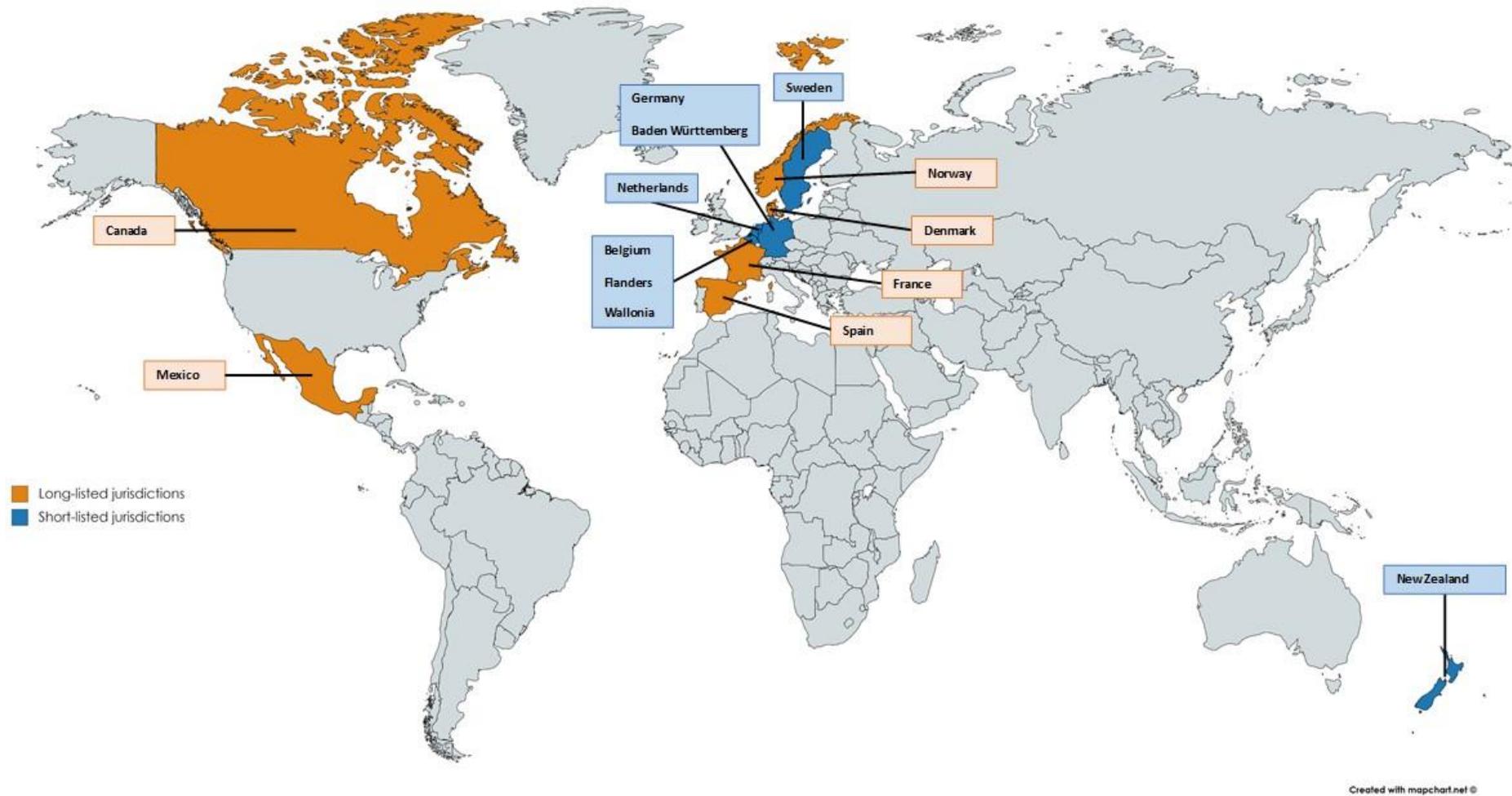
The countries then showing the highest number of highlighted criteria have been selected. These are shown in Table 5 below.

On this basis, the shortlisted countries were as follows, and as highlighted in 7:

- Germany (incl. Baden-Württemberg)
- Sweden
- New Zealand
- Belgium (incl. Flanders and Wallonia)
- The Netherlands.

These jurisdictions do indeed cover all the key modelling approaches (with the exception of the Dutch Energy Transition Tool, which it is understood is effectively an accounting tool comparable to the LEAP model).

Figure 8: short-listed and long-listed jurisdictions



**Table 4: Overview of key research questions for short-listed jurisdictions**

	Modelling approach	Level of ambition*	Sub-national links	Innovation	
France	Unknown	Medium – 40% by 2030 from 1990, 75% by 2050	No – no information found to suggest particularly strong sub-national action		0
Germany	Unknown	55% reduction by 2030, 70% reduction by 2040; 80-95% reduction by 2050.	Yes		2
Baden Württemberg	Unknown	High – 90% by 2050 from 1990 levels.	Yes	Financing tools for renewable energies & energy efficiency.	3
Sweden	Cost optimisation (TIMES) for stationary energy sources	High – net zero emissions by 2045.	No	Monitoring – done by independent committee annually.	2
Canada	Macro-economic (E3ME)	Low - by 30 percent below 2005 levels by 2030 (absolute).	Yes – strong level of Provincial action.	Governance – pan-Canadian framework, with backstop.	2
New Zealand	CGE modelling + excel-based tool for policy impacts	Net zero by 2050.	No	Looked to include all sectors in ETS (but in the end, didn't include agriculture due to lobbying). Also, climate committee and stakeholder engagement.	2
Spain	Cost optimisation (TIMES)	90% by 2050, with zero carbon “soon after”. Also, 100% renewable energy by 2050.	Sub-national action on adaptation but not so much found on mitigation.		1

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China	CGE (EPPA)	40-45% reduction of CO2 emissions per unit of GDP by 2020, and 60-65% reduction by 2030 compared to 2005.	Yes – strong level of action in the Provinces.	Funding into low carbon development.	1
Jiangsu	Unknown	Unclear	Yes		1
Netherlands	Accounting tool (Energy Transition Model).	High – 95% reduction by 2050 (plus required by law to meet nearer term targets).	No	Ambitious and specific targets driving action – pledge for every house to not use gas by 2050.	2
Denmark	CGE + technical energy system model (IntERACT), cost optimisation (TIMES-DK), plus range of sectoral models (e.g. RAMSES, EMMA, COMPARE etc).	High – 50% of energy consumption from renewables by 2030. 2050 – low emission society and independent of fossil fuels. Plus 2030 targets on low carbon transport.	Yes		3
Mexico	CGE (EPPA) and partial equilibrium model (Balmorel).	Low - 30% cut in GHG emissions against baseline by 2020 and 50% cut in GHG emissions compared to 2000 in 2050.	Yes – significant levels of autonomy at State level.		1
Norway	Unknown	40% by 2030 from 1990, 80-95% by 2050.	No information found to suggest strong levels of sub-national action.		1
Belgium	Macro-economic (HERMES), plus bottom-up.	Medium - 40% reduction by 2030 compared to 1990.	Yes		2

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	OFFREM model for energy system.				
Flanders	Flemish energy and GHG simulation model, plus bottom-up. OFFREM model for energy system.	Medium - 40% by 2030 compared to 2015. High – 80-95% by 2050 compared to 1990.	Yes		3
Wallonia	EPM (energy/emissions projection model, plus bottom-up). OFFREM model for energy system.	Low - 30% by 2030 compared to 2005. High – 80-95% by 2050 compared to 1990.	Yes		3

\*The targets listed here include all targets set, including those set by the European Union rather than by the country itself. Instead, Table 1 in the main report only includes targets set by individual countries.

### Approach for interviews

The interviews were developed on a semi-structured basis, meaning that a set of questions were developed in advance, but that discussion was allowed to deviate from this as appropriate depending on the course of the conversation. The interview questions were sent to the participants in advance and where possible, participants were encouraged to submit initial written responses in advance of the interviews. In one case (Belgium), the appropriate people were not available for an interview but they did submit a written response.

The interview questions were as follows:

Section 1: Ambition		
1	What are the key targets for climate change mitigation in your jurisdiction?	
2	Where are these targets set out? Do they have a clear mandate, e.g. a legal basis, a clear political commitment etc?	
3	How were these targets developed? Are they reviewed, if so, how often and by who?	
4	What type of targets are they - GHG or non-GHG? If GHG, are they absolute, intensity, or business as usual? If intensity, confirm if target is per	

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	unit of GDP (tonnes GHG/ unit of GDP) or otherwise. What is the base year for the target? Which GHGs and sectors does the mitigation target(s) cover?	
5	<p>Does the overall economy-wide target filter down into any sectoral mitigation target(s) or sub-national mitigation targets?</p> <p>If yes,</p> <ul style="list-style-type: none"> <li>• For which future years?</li> <li>• For which GHGs? Sectors?</li> <li>• How was the allocation of effort between sectors and/or sub-national regions decided? For example, was it based on expected abatement costs, capacity of the sector/region, historical emissions etc?</li> <li>• Is this sectoral or sub-national ambition somehow codified?</li> </ul>	

Section 2: overview of the climate plan (focused on the issue of how the targets will be met)		
6	Is there a climate plan or similar document/approach that sets out how these targets will be met?	
7	What is the scope of the plan? Does it cover all sectors, and all gases?	
8	What time period does the plan cover? Up to the target year(s)? Or up to an earlier year?	
9	How is the plan structured – by sector? By technology? By ‘thematic area’ (e.g. heat, electricity etc)? By policy type (e.g. traded vs non-traded)?	
10	Does this plan link to any other government plans, including non-climate ones? If so, which ones and how is the link made?	
11	What is the mandate for the plan? Is it a political commitment? Is there a legal basis? If so, what is it and how it is structured? If not, are there other ways the plan can ensure during different political cycles?	

Section 3: Development of the plan		
12	When was the plan developed?	
13	Who led the coordination and development of the plan?	
14	<p>Who else was involved in its development:</p> <ul style="list-style-type: none"> <li>• Government ministries? If so which?</li> <li>• Business community? If so which?</li> <li>• Academia and research institutions? If so which? How/if was any research commissioned?</li> <li>• Civil society and NGOs? If so, which?</li> <li>• Technical consultants? If so, which?</li> <li>• Others? If so, which? (If country) Do you have an equivalent independent body to the <a href="#">UK Committee on Climate Change</a>?</li> </ul>	
15	What were the roles of the stakeholders mentioned above? For example, where did technical expertise come from? How was public consultation on the plan carried out?	
16	How were all the key stakeholders involved? How long did the process of development take?	
17	Was the development of the plan based on best practices from elsewhere?	
18	How were links made between the climate plan for your jurisdiction and any [ <i>national/sub-national</i> ] plans?	
19	Were there any difficulties passing the plan or policies through parliament? If so, which ones, and why/how were they overcome?	
20	What are the key mitigation policies/actions/measures in the plan?	
21	How was it decided which policies/actions/measures would help deliver the plan? How are the policies agreed and signed off?	
22	How was behaviour change and public engagement, and their role in the delivering the plan, considered in the plan?	

23	<p>Was any modelling undertaken in the development of the plan? If yes:</p> <ul style="list-style-type: none"> <li>• What models were used?</li> <li>• Were models developed for any policies that support the plan in particular?</li> <li>• Were several models used to inform the plan? If so, how were the outputs brought together?</li> </ul>	
24	Does the plan show the combined effect of all the policies/actions/measures and whether or not they will deliver the target(s)?	
25	How frequently is the plan updated or revised?	
26	What financial or other support was available for the development of the plan?	

Section 4: climate plan implementation		
27	Who has lead responsibility for implementing the plan? How many people are there in the team that has this responsibility, and what is the specific role of the team?	
28	Which other institutions are involved in the delivery of the plan and how is responsibility assigned?	
29	<p>Is the implementation of the plan monitored? If so:</p> <ul style="list-style-type: none"> <li>• How is this done?</li> <li>• How often it is done?</li> <li>• Who is responsible for monitoring progress?</li> <li>• Is progress reported in a regular monitoring/progress report? How often is this done? How much detail is given? Are progress reports publicly available?</li> <li>• How are the results used, are they fed back into the policy-making process?</li> </ul>	
30	Is the plan being mainstreamed across other policy areas? If so, how?	

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31	What financial support is available for the implementation of the plan? Where does this support come from?	
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Section 5: other discussion topics		
32	Are there any unique aspects or approaches associated with your plan and how it was designed or is implemented?	
33	What has been the most challenging part of your plan's implementation? What has worked well?	
34	If you were able to, what would you have done differently?	

## Appendix 2: Completed matrix for long-listed policies

	Date of publication <sup>1</sup>	Level of ambition <sup>2</sup> (L, M, H)	Legal basis <sup>3</sup>	Transparent plan <sup>4</sup>	Stakeholders <sup>5</sup>	Coverage		Modelling approach <sup>7</sup>	Support for plan development <sup>8</sup>	Sub-national links <sup>9</sup>	Monitoring <sup>10</sup>	Innovation <sup>11</sup>
						Sectors	Gases					
France (tier 1)	National Low Carbon Strategy - 2015 NDC – 2015 7NC - 2017	Medium – 40% by <b>2030</b> from 1990, High - 75% by <b>2050</b>	Plan Climate 2017	Yes	Active engagement	Economy wide – Waste processing, Agriculture, Energy industry, Manufacturing industry, Residential-tertiary, Transport.	All (CO <sub>2</sub> , CH <sub>4</sub> , N <sub>2</sub> O, HFC, PFC, SF <sub>6</sub> )	Not specified	Companies, research organisations, higher education and research institutions, collective infrastructures, etc.	Yes	Annual/twice annually. Review cycle every 5 years.	Yes, for example Climate-KIC France - supports a range of innovation activities.
Germany (tier 1)	Climate Action Plan 2020 – 2014 Climate Action Plan 2050 - 2016 7NC - 2017	Medium -40% reduction by <b>2020</b> ; 55% reduction by <b>2030</b> (also the 2016 Paris Agreement NDC);  High - 70% reduction by <b>2040</b> ; 80-95% reduction by <b>2050</b> .	German Climate Action Plan 2050.	Yes	Active engagement	Economy wide - Energy, buildings, transport, trade and industry, agriculture and forestry.	All	Not specified	The Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety (BMUB), under minister Barbara Hendricks.	Yes	Annual climate action report - first submitted in 2015.	Yes, for example Green IT initiative – 40% reduction in energy consumption by IT operations since 2009.

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Baden-Württemberg (tier 1)	Germany's 7NC - 2017	Low - 25% by 2020 from 1990.  High – 90% by 2050 from 1990 levels.	Climate Change Act (Klimaschutzgesetz) (KSG BW) (2013).  Strategy for Adaptation to Climate Change in Baden-Württemberg (2015).	Yes	Not clear	Economy wide	All	Not specified	BW is a 'technology hub' – high density of research institutions & high employment in high-tech and future technologies including green jobs and climate policies.	N/A	Reporting is mandatory under Article 9 Climate Change Act  B-W's Integrated Energy & Climate Strategy (IEKK) is quantitatively and qualitatively monitored.	Financing tools for renewable energies & energy efficiency.
Sweden (tier 1)	2015 (NDC)  2017 (decision for new climate policy framework).  2018 (implementation of climate act).	High – net zero GHG emissions by 2045 (absolute).	Yes – Climate Change Act (2018).	Yes, a lot of documentation.	Active engagement	Economy-wide	All	Cost optimisation - TIMES for stationary energy sources.	Yes, technical support by academics.	No	Independent council.	Yes, targets and monitoring.

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Canada (tier 1)	2016 (PCF development) 2017 (revised NDC) 2018 (ratification of PCF).	Low - by 30% below 2005 levels by 2030 (absolute).	Yes, Vancouver Declaration.	Yes	Active engagement.	Economy-wide	All	Yes (E3ME)	Financial and technical support (modelling).	Yes, federal backstop but province have authority to implement policies.	Annual reports and reviews of PCF in 2020 and 2022.	Yes, governance.
New Zealand (tier 1)	2015 (NDC) Zero Carbon Act proposed in 2017.	Medium as current target is low – 30% below 2005 levels by 2030 (but Zero Carbon Bill planned for 2019 is high).	Yes – Climate Change Response Amendment Act (2008).	Yes, a lot of documentation.	Yes, especially for Zero Carbon Bill proposal.	Economy-wide.	All.	CGE modelling and an Excel-based tool that calculates the impact of various emission reduction opportunities on emissions, demand for fuels, the size of certain industries, and land-use patterns	Consultancy support from Vivid Economics.	No	Independent climate committee, regular reviews of ETS.	Yes, mostly through engagement for Zero Carbon Bill development

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Spain (tier 1)	Feb 2019 (Draft Climate Plan).	High – Reducing emissions of GHGs, renewable energies and energy efficiency of the Spanish economy by 2030 and 2050.	Yes – Climate Change Act (2007) – most recent.  Current climate action plan in draft proposal.	Yes	Active engagement.	“Sectors that participate in the emissions trading scheme, the large industries and the electricity sector and the diffuse sectors: agriculture, forestry, transport, residential, institutional and commercial and fluorinated gases”.	All	Cost optimisation – TIMES.	Government, Academic.	Yes	Not clear	Not clear
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China (tier 1)	NDC – 2016.  13 <sup>th</sup> Five Year Plan 2016.	Low to Medium - 40-45% reduction of CO <sub>2</sub> emissions per unit of GDP by 2020 compared to 2005.  60% to 65% reduction of CO <sub>2</sub> emissions per unit of GDP by 2030 compared to 2005 level	National Plan for Tackling Climate Change 2014.  13 <sup>th</sup> Five Year Plan 2016.	No	Active engagement	Economy wide	CO <sub>2</sub> emissions per unit of GDP – limited information/policies on other gases.	Emissions Prediction and Policy Analysis (EPPA) - a computable general equilibrium (CGE) model of the world economy.	Governmental institutions and Chinese academics/universities.	Yes	Not clear.	Funding into low carbon development.
Jiangsu (tier 1)	China's NDC 2016 and 13 <sup>th</sup> Five Year Plan 2016.	Low – Medium -Follows China's targets of a 40-45% reduction of CO <sub>2</sub> emissions per unit of GDP by 2020 compared to 2005	No jurisdiction-specific legal basis.	No – minimal documentation.	Active engagement with other Chinese cities.	Mostly energy.	CO <sub>2</sub> emissions per unit of GDP – limited information/policies on other gases	Not clear	Political partners NDRC & BMU.  Implementation partners JDRC & GIZ.	N/A	Not clear	Plans to incorporate decentralized and renewable energy sources into the province's energy supply.

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Netherlands (tier 2)	2015 (NDC) 2018 'Klimaatakkoord'.	High – 95% reduction by 2050 (absolute).	Yes – Klimaatwet (2018).	Some documentation, not all plans well-defined yet.	Active engagement	Electricity, Built environment, Industry, Agriculture and land use, Mobility / transport.	All	Use of Energy Transition Model by Kalavasta.  Most estimates are extrapolation of potential in various sectors.	PBL (planbureau voor de leefomgeving).	No	Annual reporting under the KEV.	Yes – also target to delink all houses from gas by 2050.
Denmark (tier 2)	2018 (Draft integrated National Energy and Climate Plan (NECP)).	High – 50% of energy consumption from renewables by 2030.  2050 – low emission society and independent of fossil fuels.	Yes – Climate Change Act.	Yes	Active engagement.	Economy-wide .	CO <sub>2</sub> , CH <sub>4</sub> , N <sub>2</sub> O, F gases.	Cost Optimisation - RAMSES, IntERACT, TIMES, PSO Model, Technology Deployment Models.	Government, Academic.	Yes	Danish Meteorological Institute – ABC4CDE / DECM.	Yes – Energy Ministry – transition from FF to renewables.

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Mexico (tier 2)	2015 (NDC) 2013 (National Climate Change Strategy).	Low - 25% reduction in GHG and SLCP emissions for the year 2030 compared to BAU scenario.  and 30% cut in GHG emissions against baseline by 2020 and 50% cut in GHG emissions compared to 2000 in 2050.	Yes, General Law on Climate Change (2012).	Yes, detailed documentation of main plans include carbon tax, energy reform etc.	Active engagement,  The INDC development included a public participatory process through multiple sectorial meetings and a web based public survey.	Economy-wide	All + focus on black carbon.	Yes, EPPA (a GCE model) and Balmorel model for electricity.	The Strategy has been elaborated by SEMARNAT, with the participation of the INECC. Support from every federal institution within the CICC, every state in Mexico, academics private sector and others.	Yes, States are required to develop and evaluate climate policy. Also emphasis on importance municipal ities.	LSE reports: No independent body is clearly entrusted with accountability and enforcement, and responsibility for monitoring implementation is ambiguous.	Legal basis is often cited as important.
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Norway (tier 2)	INDC - 2016  7NC - 2018	Medium – 30% by <b>2020</b> , 40% by <b>2030</b> from 1990.  High – carbon neutral by <b>2030</b> and low-emission society by <b>2050</b> .	Climate Change Act June 2017.	Yes	Active engagement.	Economy wide-energy, IPPU, agriculture, LULUCF & waste.	All	Not specified.	Not clear	Yes	Norwegian Climate and Environment Ministry is responsible for this.	'Mission Innovation' – includes increased efforts in renewable energy technologies, energy efficiency & CCS.  Increased budget allocation to the Ministry of Climate and Environment of NOK 10.5 billion
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Belgium (tier 2)	Part of EU NDC (2015) Country goal (2015).	Medium – 40% reduction by 2030 compared to 1990 (absolute).	Article 92bis of Special Act on Institutional Reform empowers local authorities.	Yes, although more detail on regional level.	Active engagement, through national debate on carbon pricing in the non-ETS sector.	Economy-wide (but separates targets ETS and non-ETS).	All	Macro-sectoral top-down econometric model (HERMES).  Energy system was modelled bottom-up.  OFFREM model: used by all regions for off-road sectors.	Support by VITO for scenario modelling, especially transport.	Yes, very strong, all authority with Flanders + Wallonia + Brussels.	Annual reporting. New MRV law adopted in 2016.	Yes, high regional responsibility based on GDP and potential for mitigation.
Flanders (tier 2)	1 December 2016 (Flemish Climate and Energy Pact). July 2018 (Flemish Climate Policy Plan).	Medium - 40% by 2030 compared to 2015 and 80 – 95% by 2050 compared to 1990 (absolute).	Flemish Climate and Energy Pact (2016).	Yes, for plans up to 2030.	Active engagement through multi-stakeholder climate summits.	Economy-wide.	All	Flemish energy and GHG simulation model, OFFREM model for off-road sectors.	KU Leuven (Academic) and VITO.	No, Flanders itself is the sub-national link.	As above	No

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Wallonia (tier 2)	20 February 2014 (Walloon Climate Decree).  Draft Walloon Air Climate Energy 2030 plan (19 July 2018).	Low - 30% by 2030 compared to 2005 and 80 – 95% by 2050 compared to 1990 (absolute).	Walloon Climate Decree (2014).	Yes, for plans up to 2030	Passive engagement	Economy-wide	All	EPM (energy/emissions projection model (bottom-up)) as well as OFFREM for off-road sectors.	Not clear	No, Wallonia itself is the sub-national link.	As above	No
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