# 3 Defining targets and scope of analysis for the green transition

Approaches to measure skill changes linked to the greening of the economy differ in scope and the targets they apply. This chapter reviews different targets, for instance, ‘clean economy’, ‘decarbonisation’, or ‘renewable energy’. It distinguishes approaches based on their unit of analysis (industries, occupations, or skills), their focus on current and future skills, and coverage of national or regional labour markets. The chapter also presents different types of governance models of skills assessment and anticipation exercises.

## Introduction

In the context of SAA exercises for the green transition, definitions of green policy targets and relevant skills, jobs and sectors are often crucial to qualify the scope of analysis and the results. The previous chapter discusses these definitions more broadly, while this chapter maps out how they are used in SAA exercises run by the countries covered in the report.

Table 3.1 summarises the use of green targets in SAA exercises and national green strategies. Many of these concepts are closely related – for example, countries that define decarbonisation also explicitly define renewable energy. With the exception of the O*NET green economy developed by the US Department of Labor and adopted by Australia, the definitions provided in Table 3.1 are those put forward by international co-operation institutions – such as the United Nations Climate Change Conference and European Union – and adopted, to different extents, in the SAA exercises reviewed in this report. There is no one green target that is dominant in the exercises reviewed.

### Table 3.1. Green targets adopted by SAA exercises

| | Australia | Austria | France | Norway | Sweden |
|---|---|---|---|---|---|
| Circular Economy<br>*Definition: An economic model that incentivises reusing existing products and materials in favour of extracting new resources* | | | | | ✓ |
| Clean economy<br>*Definition: Similar to net zero economy, but typically used for the energy sector* | ✓ | | | | |
| Decarbonisation<br>*Definition: Removal or reduction of carbon dioxide ($CO_2$) output in the atmosphere* | ✓ | | ✓ | | ✓ |
| Low-carbon economy<br>*Definition: Economy based on energy sources that produce low levels of greenhouse gas emissions* | | | ✓ | | |
| Net zero economy<br>*Definition: Close to zero balance between amount of greenhouse gas produced and amount removed from the atmosphere* | ✓ | | ✓ | | ✓ |
| O*NET green economy<br>*Definition: the economic activity related to reducing the use of fossil fuels, decreasing pollution and greenhouse gas emissions, increasing the efficiency of energy usage, recycling materials, and developing and adopting renewable sources of energy* | ✓ | | | | |
| Renewable energy<br>*Definition: Energy from a source that is not depleted when used, such as wind or solar power* | ✓ | ✓ | ✓ | | ✓ |
| Green transition<br>*Definition: Activities that contribute to reducing the climate and environmental footprint of individuals, business and the society as a whole, to achieve a low-emission society while maintaining biodiversity* | | | | ✓ | |

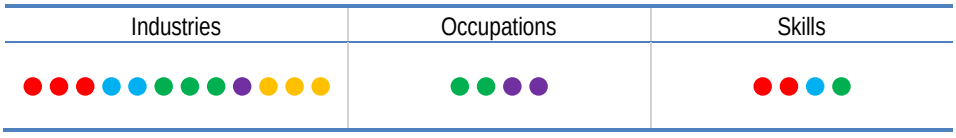
Note: The O*NET green economy definition was used by Australia for research purposes only, and it has not been officially adopted by the Australian Government.
Source: Authors' elaboration based on desk research and policy questionnaires.

## The importance of definitions

The results of the SAA exercises are often reported in terms of industries, and less often quantified in terms of occupations or skills (Table 3.2). SAA exercises that focus on industry, such as Infrastructure Australia or the EDEC in France, still report the results in either net employment, an overview of key occupations or identify a few key skills within the industries reviewed. Other SAA exercises, such as those conducted by the ADEME in France report findings in terms of occupations, regardless of industry, identifying direct green jobs as "jobs with direct production activities to the green economy", indirect jobs as "the activities of suppliers of goods and services linked to the direct production activities", and induced jobs as "job relating to the interactions of the green sector with the rest of the economy" (Ecological Transition Agency (ADEME), 2018[1]). In the analysis on job vacancy data, the Norwegian Committee on Skill Needs identifies green jobs through a big data approach – i.e. identifies green-related keywords (such as "sustainable", "climate", or "renewable") and calculates the share of these postings with green words by industries, occupations, sectors, and counties (Kompetansebehovsutvalget, 2023[2]).

Only four of the SAA exercises reviewed focused mainly on skills. Of those, two SAA exercises identified key skills for the green transition through qualitative methods, while Jobs and Skills Australia and the National Observatory for Jobs and Occupations in the Green Economy use quantitative methods to create a taxonomy of skills for the green transition. There is an additional challenge in defining skills, particularly skills for the green transition, as there is no one commonly accepted taxonomy. It should be noted, however, that most SAA exercises covered feature a discussion of the crossover between skill demands and the green transition, and thereby include an effort to disentangle the understanding of what is a green skill, without necessarily using skills as a unit of measurement. In fact, most SAA exercises feature an analysis at an industry or occupational level with an adjacent qualitative discussion on the skills needs emerging from the green transition.

### Table 3.2. Unit of analysis in skills assessment and anticipation exercises




Note: Circles represent individual skills assessment and anticipation exercises. Australia, Austria, France, Norway, Sweden.
Source: Authors' elaboration based on desk research and policy questionnaires.

In most SAA exercises that use skills as the main unit of analysis, skills for the green transition are identified only once the analysis defines green and green adjacent occupations, after which a skills taxonomy is applied to identify which skills are present in green jobs (Table 3.3). It is through this analysis that the SAA exercises are able to make inference on which skills are necessary to boost the green transition. Jobs and Skills Australia apply a country-specific skills taxonomy to data on green jobs to define green skills, while Deloitte makes use of the O*NET taxonomy. The Austrian Energy Agency defined skills through occupations by identifying skills within green occupations and defining skills as key abilities that fit into one of three categories: technical knowledge, know-how, and system knowledge. Some SAA exercises that have a unit of analysis other than skills still have attempted to define them in order to make general statements about the skills needs for the green transition. In one of the SAA exercises conducted by Virke on the circular economy in Norway, green skills are not only knowledge of environmentally friendly materials or recycling, but also transversal skills such as change management, strategic planning, flexibility, system and risk analysis and innovation. The Victorian Skills Authority in Australia defines green skills as "skills needed to support clean economy ambitions, including for new roles expected to support adaption and mitigation", while the Austrian Just Transition Action Plan defines green skills as "skills necessary to i) facilitate a shift from fossil energy sources to renewable energy and more energy efficiency, and ii) install renewable and efficiency equipment".

### Table 3.3. Selected definition of skills for the green transition

For countries with a skill-unit analysis

| Country | Institution | Source |
|---|---|---|
| Australia | Jobs and Skills Australia (JSA) | Define skills for the green transition by identifying the skills associated with clean energy through the Australian Skills Classification (ASC).<br>Clean energy workforce defined as: *"…workers involved in developing, generating, storing, transmitting and distributing energy generated from renewable, net-zero emission sources "clean energy supply"; and installing and maintaining the technology that uses clean energy rather than fuels "clean energy use"".* |
| | Deloitte | O*NET green categories of skills used. Coupled with data on jobs affected by decarbonisation to define three key concepts:<br>i) Induced demand clean economy jobs (decarbonisation affects demand but not skill requirements).<br>ii) Evolving clean economy jobs (decarbonisation affects the demand and the skills of existing occupations.<br>iii) Emerging clean jobs (jobs that will emerge out of decarbonisation activity). |
| Austria | Austrian Energy Agency | No general definition of green skills used. Examines the future skills needed in 10 qualifications with high relevance for the green transition in the areas of construction, renovation, and renewable energy (Tretter et al., 2022[3]). |
| France | National Observatory for Jobs and Occupations in the Green Economy | Green skills are identified and defined through the ROME 4.0 model of the public employment service. The ROME model identifies green skills through measuring of skills in vacancies and job applications based on the following definition of green jobs:<br>i) Green jobs: Occupations whose purpose and/or skills implemented contribute to measuring, preventing, controlling, and correcting negative impacts and damage to the environment.<br>ii) Greening jobs: Occupations whose purpose is not environmental but which integrates new fields of green competencies and use eco-gesture in a significant and quantifiable way. |

Source: Authors' elaboration based on policy questionnaires.

## Global insights

### Green jobs and green skills definition in other SAA exercises

*Canada*

In order to define green jobs and skills, Canada's Future Skills Centre (FSC) first established which industries can be considered green (and are therefore part of the "clean economy"). The FSC's definition of green industries aims to capture the majority of clean economic activities – i.e. clean energy production, energy efficiency, and environmental management. Within these clean economy sectors, FCS identified the relative importance of any given occupation to each sector compared with the overall economy exploiting the so-called concentration quotient (CQ) method.[1] The occupations with CQ values greater than 1 – i.e. occupations that account for a larger employment share in green industries than in the economy overall – are considered green. Green skills are the set of skills used in these green occupations (Conference Board of Canada; Future Skills Centre, 2022[4]).

*United Kingdom*

The Green Jobs Taskforce (GJT) of the United Kingdom identified green jobs as employment in an activity that directly contributes to – or indirectly supports – the achievement of net zero emissions targets and other environmental goals. To support the practical task of reviewing evidence, and developing recommendations, the GJT initially focused only on jobs in specific green sectors where change will be crucial to meet the net zero target (power, business and industry, homes and buildings,

transport, natural resources, enabling decarbonisation, climate adaptation). Then, it identified the most affected occupations and the required skills according to net zero policy and investment within these sectors. According to Office for National Statistics (ONS) (2021[5]), the advantage of a sectoral approach is that, if necessary, the definition can be made very simple (like "all jobs in the renewable energy sector") as well as it can be easier to find the data required.

*United States*

Green jobs are defined by the Bureau of Labor and Statistics (BLS) as either: 1) jobs in businesses that produce goods or provide services that benefit the environment or conserve natural resources; 2) jobs in which workers' duties involve making their establishment's production processes more environmentally friendly or use fewer natural resources. BLS undertook separate data collection activities for each component. Firstly, they conducted a "Green Goods and Services survey" to identify whether firms produce green goods and services. They also measured the number of associated jobs in each enterprise, and estimate the occupational employment and wages for those firms identified as producing green goods and services. Secondly, BLS developed a special employer survey on jobs associated with the use of environmentally friendly production processes. Results of their analysis show that green jobs are mostly found in the following sectors: energy from renewable sources, energy efficiency, pollution reduction and removal, greenhouse gas reduction, recycling and reuse, and natural resources conservation (Bureau of Labor Statistics, 2022[6]).

O*NET – an occupational classification database developed under the sponsorship of the Department of Labor in the United States – provides an alternative definition to identify green jobs. O*NET includes three occupational categories, which are expected to change or emerge in each green economy sector: (1) *Green Increased Demand*: the impact of green economy activities and technologies is an increase in the employment demand for an existing occupation, although this impact does not entail significant changes in the work and worker requirements of the occupation; (2) *Green Enhanced Skills*: the impact of green economy activities and technologies results in a significant change to the work and worker requirements of an existing occupation; the essential purposes of the occupation remain the same, but tasks, skills, knowledge, and external elements, such as credentials, have been altered; (3) *Green New and Emerging*: the impact of green economy activities and technologies is sufficient to create the need for unique work and worker requirements, which results in the generation of a new occupation relative to the O*NET taxonomy. Consequently, 215 'Green occupations' has been identified from 12 'Green Sectors', corresponding to these 3 categories, and 1 369 green tasks were identified within green occupations (National Center for O*NET Development, 2022[7]).

*European Union*

The European Centre for the Development of Vocational Training (Cedefop) defined green skills as the knowledge, abilities, values and attitudes needed to live in, develop and support a society which reduces the impact of human activity on the environment, and classified skills and knowledge concepts as three groups, brown, white, and green jobs (Cedefop, 2012[8]), The definition is applied to big data on job vacancies to separate green skills and knowledge.

## Different scope for different initiatives

The scope of the exercises covered in this report varies both within and across countries, thereby leading to very different methods, data, and techniques utilised. In particular, the scope of the SAA exercise is influenced by the issue the exercise seeks to address. For example, the approach to SAA by the Confederation of Swedish Enterprises aims to examine how skill needs are affected by the adjustments that businesses are forced to make due to the green transition, and therefore focuses only on a specific sector and on anticipating future skills needs rather than estimating current ones. The following section highlights the different scope of the exercises covered and discusses: (1) whether SAA exercises for the green transition aim at assessing current skill needs, anticipating future ones, or a combination of both; (2) whether the SAA results, data and background material are publicly disseminated or are kept confidential for governmental purposes only; and (3) whether the exercises focus on a single economic sector/industry or on the whole labour market.

### *The time horizon of SAA exercises*

Whether SAA for the green transition focuses on assessing current skill needs, anticipating future ones or a combination of both depends on the objective of the exercise (Table 3.4). Current skills assessments are aimed at identifying existing mismatches and shortages in the labour market. Vinnova assesses current skill needs without including an analysis of potential future developments. This is because, the objective set for Vinnova by the Swedish Government is to measure skill shortages of relevance to the green transition (Vinnova, 2022[9]). The SAA exercise carried out by the National Observatory for Jobs and Occupations in the Green Economy in France also aims at identifying only current mismatches and labour market needs (Ministry of Ecology, Energy and Territories, 2021[10]).

Forecasts and foresight exercises covering future employment and skill needs are made to produce, respectively precise or broad indications of future trends. Most of the selected SAA exercises in Australia focus on future skill needs (Deloitte Access Economics, 2021[11]; Centre for Policy Development, 2022[12]; RACE for 2030, 2021[13]; Victorian State Government, 2022[14]; Victorian State Government, 2022[15]) but some assess a mix of current and future skill needs. Anticipation exercises can be further categorised based on their time horizon. Broadly speaking, there are short- (six months-two years), medium- (two to five years), and long-term (more than five years) anticipation exercises (OECD, 2016[16]). Among the exercises covered by this study, short-term anticipations are less common compared to medium- and long-term ones. Occupational forecasts made by the Swedish PES anticipate labour demand within specific occupations with a timeframe of one to five years. In Australia, both Deloitte and Race for 2030 anticipate future skill needs over the next five years, with additional forecasts until 2030 or even 2050 (Deloitte Access Economics, 2021[11]; RACE for 2030, 2021[13]). Jobs and Skills Australia's Clean Energy Capacity Study will also produce supply and demand estimates over 10, 20 and 30 years. All other quantitative and qualitative anticipation exercises in Australia have a long-run horizon, focusing on the next 10 to 30 years. This is related to the fact that these exercises are linked to Australia's climate goals of reaching an emission reduction of 45% by 2030 and Net Zero by 2050. GWS and WIFO in Austria also anticipate future skill needs until 2030, linked to climate goals (Großmann et al., 2020[17]; Meinhart et al., 2022[18]).

The advantage of conducting anticipation exercises with shorter time horizons is that they provide more accurate results than longer term exercises. On the downside, the short time span means that they can only provide insights to short-term policy making, e.g. they can inform training provision for those currently unemployed but they are not useful to provide directions for initial education that only fosters skill development for several years down the line. Furthermore, the short- and medium-term anticipation exercises might not differ significantly from the those focusing on assessing current needs. Long-term anticipation exercises, on the other hand, have the advantage that they are useful for longer-term planning and can guide countries when making more structural planning for the labour market and education and training systems. However, longer term forecasts tend to be sensitive to unforeseen structural changes. They also require up-to-date inputs to remain relevant, but they are often updated less often than medium-

term exercises (OECD, 2016[16]). One way to take into account uncertainty is to use scenarios and identify a number of possible outlooks (see the following section).

Combining the approaches of assessing current and future skill needs can be seen in the exercise conducted by NHO in Norway, which asks member companies to estimate how their skill needs will change due to the green transition compared to their current skill needs. The estimations are made according to educational level and subject domains. JSA in Australia is also undertaking a Clean Energy Capacity Study that will include forecasts of future supply and demand for clean energy related roles. The study will provide critical evidence and insights to support workforce planning, policy development and programme design needed to build a strong and vibrant clean energy sector. The Australian New Energy Skills Program is also likely to combine assessing and anticipating current and future skill needs. The programme focuses on increasing the supply of skills that are included in the National Skills Commission's Skills Priority List, which provides a rating of both current and future skill demand in the labour market (National Skills Commission, 2022[19]). The Australian New Energy Apprenticeships Program seeks to encourage apprentices to train in clean energy occupations and qualifications through direct incentive payments to assist with the cost of living. Jobs and Skills Australia's analysis of Australia's clean energy workforce needs will inform the development of refinements to the New Energy Apprenticeships Program, as necessary. Another Australian SAA exercise included in this study that combine current and future skill needs is the one conducted by Infrastructure Australia (Infrastructure Australia, 2021[20]).

### Table 3.4. Analysis timeframe in SAA exercises covered by the study

| Country | Institution | Current Skills | Future Skills | Current & Future Skills |
|---|---|---|---|---|
| Australia | Federal Government | | | |
| | *Jobs and Skills Australia (JSA)* | | | ● |
| | *Infrastructure Australia* | | | ● |
| | *Department of Employment and Workplace Relations (DEWR)* | | | ● |
| | State Government | | | |
| | *Victorian State Government* | | ● | |
| | Independent | | | |
| | *Deloitte* | | ● | |
| | *RACE for 2030* | | ● | |
| Austria | GWS | | ● | |
| | Just Transition Action Plan | | | |
| | *Austrian Energy Agency* | | ● | |
| | *WIFO* | | ● | |
| France | National Observatory for Jobs and Occupations in the Green Economy | ● | | |
| | Skill Forecast: Occupations in 2030 | | | ● |
| | EDEC | | | ● |
| | ADEME | | | ● |
| | The Shift Project | | | ● |
| | Scénario négeWatt | | | ● |
| Norway | Norwegian Committee on Skill Needs | | | ● |
| | Virke – Circular Economy | | ● | |
| | Virke – Virkebarometer | | | ● |
| | NHO – Skill barometer | | | ● |
| Sweden | Public Employment Service | | ● | |
| | Vinnova | ● | | |
| | Confederation of Swedish Enterprises | | ● | |

Source: Authors' elaboration based on policy questionnaires.

### *Public availability of SAA material*

Sharing findings and data from the SAA exercises with the wider public can be beneficial to all: to the institutions carrying out the SAA exercises (direct impact), because sharing facilitates new strategic partnerships and build synergies between institutions who develop similar or complementary exercises; for the data users (indirect impact), who can access data more easily; and for the broader economy (induced impact), since the findings can be used to implement evidence based policy-decisions that go beyond the initial intended use.

In particular, data sharing between private and public actors has several potential benefits, including: i) enhanced transparency, accountability, and empowerment of users, ii) increased business opportunities, iii) user-driven innovation and crowdsourcing, iv) improved co-operation and competition both within and across sectors, and v) increased efficiency (OECD, 2019[21]). Moreover, sharing data can also yield beneficial spill-overs effects, insights, and new areas of use that could not be foreseen by those developing the initial data plan design.

Most of the SAA exercises examined by this study are publicly available, with only a few exceptions. In France, for example, all exercises are publicly available. The results of the EDEC are published as studies by the organisations conducting them and can be found through the EDCD's data base. The National Observatory for Jobs and Occupations in the Green Economy publishes their key figures on employment and green economy on their webpage but the results for the list of green skills and continuing education are not available yet. Furthermore, the results of the exercise conducted by France Stratégie and Dares are also published online. In Norway, the studies by the Norwegian Committee on Skill Needs, NHO, and Virke are publicly available. Both of Virke's reports covered in this Note are free upon request on the employer organisation's webpage but there are other reports that are regulated by a paywall. NHO publishes their survey's yearly results in extensive reports produced by the Nordic Institute for Studies in Innovation, Research and Education which are all available on their webpage. The Committee on Skill Needs has a designated webpage where they continuously publish their work. In Sweden, all material produced by a governmental body is regulated under the principle of public access to information. This means that all official documents produced by the PES and Vinnova must be available to the public. Reports as well as materials that are used to conduct the SAA exercises can be accessed digitally and manually through the various governmental channels. The PES also shares their progress orally with stakeholders by participating in workshops (Swedish Public Employment Service, 2022[22]).

The only exercise that is not (or will not be) publicly available is the New Energy Skills and Training Gap Analysis in Australia (Victorian State Government, 2022[14]). The findings of this exercise remain fully internal and no part of the report can be accessed by the public. On the other hand, the remaining SAA exercises from Australia are available to the public or will be when they are finalised.

### *The coverage of SAA exercises*

SAA exercises can differ in their geographical coverage which can be either national or regional.[2] National exercises use aggregated data to assess and anticipate skill needs and are used to guide broad policy decisions that span over multiple sectors and labour markets. By contrast, the regional coverage uses a more disaggregated level of data and can identify within-country variation. National and regional approaches are not mutually exclusive and can be used in the same SAA study.

Furthermore, the national and regional coverage can be divided into either a whole-of-economy approach or a sectoral approach. Sectoral approaches focus on skills that are needed in a specific industry while the whole-of-economy approaches are conducted across industries. The Skills Committee of Norway is an example of an SAA exercise that has a national coverage and a whole-of-economy approach. As part of the Just Transition Action Plan in Austria, WIFO conducted an SAA exercise that combines the national, regional and sectoral approach. WIFO analysed the impact of CO2 reduction policies on employment at the national level, and break this down by 20 sectors and 19 regions (Meinhart et al., 2022[18]). In Sweden there are two exercises that have overlapping approaches: the exercise by Vinnova and the PES. Both

exercises focus on skill needs within the industry sector but the SAA exercise by PES is regional while the approach by Vinnova is national. Most of Australia's exercises included in this report are conducted at the national level, the state level and/or regions within one particular state (e.g. (Deloitte Access Economics, 2021[11]; Victorian State Government, 2022[14]; Victorian State Government, 2022[15])). All the SAA exercises covered in this study have been compiled in Table 3.5 to get a better overview of their coverage.

Table 3.5. The coverage of the SAA exercises in the study

| | National | Regional | National & Regional |
|---|---|---|---|
| Whole-of-Economy | | ● ● | ● |
| Industry/Sector | ● ● ● ● ● ● ● ● ● | ● ● ● | ● ● ● ● ● |
| Whole-of-Economy & Industry/sector | ● ● | | ● ● ● ● ● ● |

Note: Circles represent individual skills assessment and anticipation exercises. ● Australia, ● Austria, ● France, ● Norway, ● Sweden.
Source: Authors' elaboration based on policy questionnaires.

## Global insights

### Whole-of-Economy & Sectoral approach: FSC (Canada)

In 2022, the Future Skills Centre in Canada (FSC) conducted an SAA exercise looking at how labour and skills demands would be affected if Canada was to meet a decarbonisation target. The focus was on both whole-of economy implications and impacts by sector. In particular, using a macroeconomic analysis model called *gTech,*[3] the FSC anticipated changes in employment and wage rates in all sectors of the Canadian economy according to three different decarbonisation scenarios.[4] Assuming stable employment shares of occupational groups by sector, based on data from the 2019 Labour Force Survey, the changes in employment by sector were then converted into changes in employment by occupation. Subsequently, skills with high importance and frequency in those occupations were identified and scored by linking the information with the O*NET database. Through this scoring work, the skill needs for each green occupation were identified.

Another notable feature of the Canadian example is that, in parallel to a nation-wide analysis, FSC also developed a more disaggregated, regional study, concentrating on the four provinces with the largest labour markets in Canada, namely, Ontario, Alberta, British Columbia, and Quebec. This regional investigation assessed which sectors in each region would be impacted more than others and offered recommendations on local-level efforts to prepare their respective workforces to the green transition (Future Skills Centre, 2022[23]).

### Sectoral approach: UWV (The Netherlands)

In the Netherlands, the *Uitvoeringsinstituut Werknemersverzekeringen* (UWV) – the public employment agency – in co-operation with *Sociaal Economische Raad* (SER) – an advising body for the Dutch Government and Parliament on social and economic policy – conducts an SAA exercise focusing specifically on the construction and building fields in order to help the sector smoothly adapt to the green transition. In particular, the exercise forecasts the occupations and skills in the construction industry that are expected to expand and contract following a net-zero policy. Unlike most SAA exercises focusing on the whole economy, the UWV project has the advantage of providing more detailed estimates, such as the jobs that are needed compared to the number of current vacancies in the sector (Employment Insurance Agency (UWV), 2022[24]).

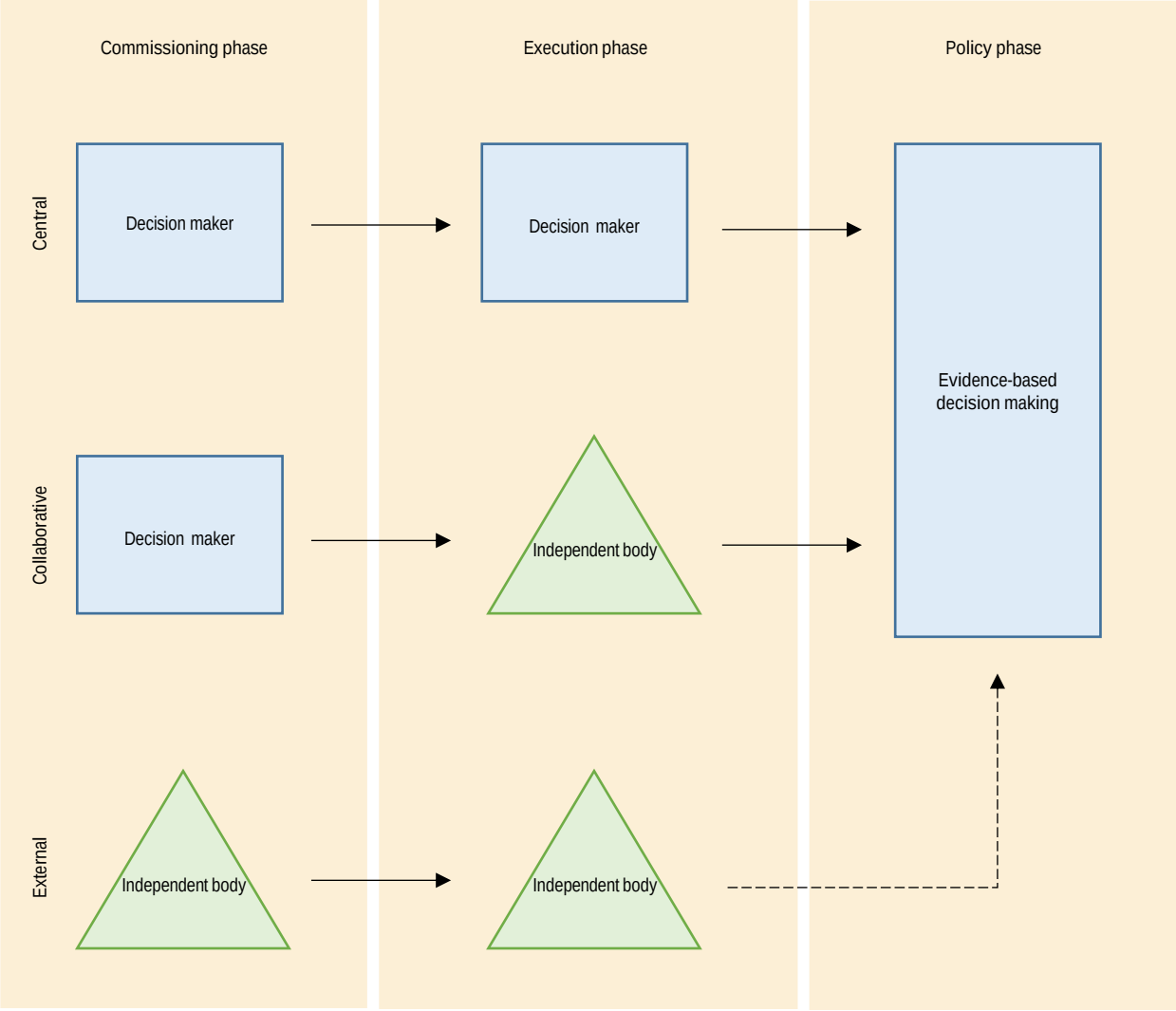
## The diverse landscape of governance structures

Governance frameworks of SAA systems for the green transition are widely heterogeneous across OECD countries. This is largely motivated by the complexity of policy making that involves such exercises, as it lies in the intersection of various policy domains, such as labour, education, environment, industry, etc.

Building on governance principles for SAA exercises mapped out by the OECD (OECD, 2016[16]), this report proposes three models for understanding the governance structures of green SAA exercises: the central model, the collaborative model or the external model (Figure 3.1). Each of these governance models is divided into three phases: (1) the commissioning phase, during which the decision is made to conceptualise and carry out a green SAA exercise; (2) the execution phase, where the SAA exercise is carried out; and (3) a policy phase, when the results of the SAA exercise are integrated into a policy-oriented decision-making process. Incorporating the results in the policy phase is not limited to governmental and public bodies, but also refers to policy undertaken by industry organisations, trade unions, training providers, employer organisations and other organisations and institutions of a similar nature.

What differentiates the three models is the main actor involved in each phase. There are two types of actors in the SAA process: decision makers and independent bodies. A decision maker is any public, private or hybrid organisation or institution that has the power to implement policies based on the results of the SAA exercises. For the public sector, this includes ministries and governmental agencies that will ultimately use the results of the SAA exercise to create policies or adjust their public services. Private decision-making actors include trade unions, industry organisations, or private training providers that can change their industry-wide policy based on results, or where the results inform the way the private institution operates, such as private training providers or industry organisations that can adjust which training they provide based on skills needs found in the SAA exercise. In addition, collaborative initiatives – such as public-private task forces that combine both public and private decision-making bodies also fit into this category of actor. By contrast, an independent body is an actor in the SAA ecosystem that does not create policies itself but can affect policy making through the execution of SAA exercises, making them independent of the decision-making process. Independent bodies are typically research institutions, universities or consulting firms that produce content for the end-user (decision-making body) but are not influenced by the policy agenda surrounding the approach to SAA.

Figure 3.1. Governance models for skills assessment and anticipation




Source: Author's elaboration based on OECD (2016[25]), *Getting Skills Right: Assessing and Anticipating Changing Skills Needs*, https://doi.org/10.1787/9789264252073-en.

The SAA exercises covered in this study all fall into one of the three governance models outlined in Table 3.6.

- In the central model, every governance phase is executed by a decision maker, and the results directly feed into the policy-making process, which is also executed by a decision maker. An example of this would be when a national ministry commissions an SAA exercise in-house, executes the exercise and creates a new policy based on the results. The central model is, for instance, used in the Swedish SAA exercise conducted by the PES which is motivated by the policy agenda to transform the mining industry and meet the climate goal of net-zero emissions by 2045 (Swedish Public Employment Service, 2022[22]). However, there is room for several different decision makers to be a part of the SAA process in the central model. This is for instance when a national ministry commissions an agency or industry body to carry out an SAA exercise, and the results feed into the work of both the ministry and the agency/industry body in the policy phase. Furthermore, a decision-making body can also be a non-governmental institution such as an employer organisation. The institution's aim is to adopt

internal policy-decisions based on the results of SAA which makes them a decision-maker. This does not exclude the results from also feeding into external policy processes as well. Virke's SAA exercise covering the circular economy is an example of this approach, where results are used in both internal and external policy processes.

- Under the collaborative governance model, the SAA exercise is commissioned by a decision maker and executed by an independent body, while the results are fed back into the policy area of the decision maker who commissioned the exercise. This is seen for example when national ministries or governmental agencies commission universities, independent research institutions or consulting firms to carry out an SAA exercise. These results will then inform the ministry/agency's policy-making process. In this model, the work of the body carrying out the SAA exercise is independent from the policy agenda of the commissioning body, and can therefore explore the benefits and drawbacks of government policy in a wider context. Two examples of the collaborative model are found in Norway, where NHO commissioned the execution phase of their SAA exercise to an independent research institute called the Nordic Institute for Studies in Innovation, Research and Education (NIFU) (Rørstad, Børing and Solberg, 2023[26]), and the Ministry of Education commissioned a green SAA study to the Norwegian Committee on Skill Needs (Kompetansebehovsutvalget, 2023[2]).
- An external governance model occurs when an SAA exercise is both commissioned and executed by an independent body. In this case, the results of this approach to SAA do not always reach policy makers, unless the findings gather media attention or if the government has a system for tracking SAA exercises entirely run by independent bodies. This happens, for instance, when universities carry out skills-related research projects that are not commissioned by the government. In such cases, the decision-making bodies need to have a good overview of the SAA ecosystem to track new findings and integrate the results in the policy-making process. An example of an external governance model is the work carried out by Deloitte on behalf of the Climate Council in Australia. The Climate Council is an independent and community-funded organisation for climate change communications, made up by climate scientists, health and renewable energy experts. The Climate Council commissioned a report by Deloitte – a consulting firm – and used the results to get climate stories into the media and promote climate solutions (Deloitte Access Economics, 2021[11]).

Within the selection of SAA exercises covered by this report, there is a high representation of the central governance model (Table 3.6). This should come as no surprise given that the stakeholders contributing to the report's research are governmental decision-making bodies, and whose work would automatically fall under the category of central or collaborative governance model. The benefit of a central governance model is that the results are directly integrated in the policy process, and the scope of SAA exercises can be designed to better fit the purpose of the policy. For example, the SAA exercise commissioned by the National Observatory for Jobs and Occupations in the Green Economy in France is designed to answer specific questions about green jobs and skills for the Ministry of Ecological Transition to carry out policies for the green transition (Ministry of Ecology, Energy and Territories, 2021[10]).

The benefits of the collaborative governance model are that the independent bodies that execute the SAA exercise can bring new ideas and perspectives to the policy issue through influence on scope and execution of the exercise. This allows for a new layer of validation, as the results by the independent body can be compared to results gathered through the central governance model. Certain actors in collaborative SAA exercises are considered independent bodies even if they are governmentally funded, because of the level of independence in research and removal from decision-making abilities in the policy phase. The independent body can also be a private actor such as in the case of the Virkebarometer in Norway, where Virke is commissioning the execution phase to the private analysis bureau Opinion (Virke, 2021[27]).

The external governance model is the least common among the SAA exercises reviewed for this study. One of the reasons may be that SAA exercises may be costly to execute. Another reason could be a selection bias, as the exercises covered in this report have been mainly identified through public stakeholders. Indeed, as previously discussed, there is limited government overview of SAA exercises that are conducted by independent bodies. Mapping existing independent SAA exercises is beneficial, as it allows the decision makers to tap into a wider source of information and prevent duplication of efforts between the decision makers and independent bodies.

### Table 3.6. Governance structures applying for the SAA exercises

| Country | Institution | Central | Collaborative | External |
|---|---|---|---|---|
| Australia | Federal Government | | | |
| | *Jobs and Skills Australia (JSA)* | | ● | |
| | *Infrastructure Australia* | ● | | |
| | *Department of Employment and Workplace Relations (DEWR)* | ● | | |
| | State Government | | | |
| | *Victorian State Government* | ● | | |
| | Independent | | | |
| | *Deloitte* | | | ● |
| | *RACE for 2030* | ● | | |
| Austria | GWS | | ● | |
| | Just Transition Action Plan | | | |
| | *Austrian Energy Agency* | ● | | |
| | *WIFO* | | ● | |
| France | National Observatory for Jobs and Occupations in the Green Economy | ● | | |
| | Skill Forecast: Occupations in 2030 | ● | | |
| | EDEC | ● | | |
| | ADEME | ● | | |
| | The Shift Project | | | ● |
| Norway | Norwegian Committee on Skill Needs | | ● | |
| | Virke - Circular Economy | ● | | |
| | Virke - Virkebarometer | | ● | |
| | NHO - Skill barometer | | ● | |
| Sweden | Public Employment Service | ● | | |
| | Vinnova | ● | | |
| | Confederation of Swedish Enterprises | | ● | |

Source: Authors' elaboration based on policy questionnaires.

## Global insights

Central Model: Future Skills Centre (Canada)

With funding by the government of Canada's future skills programme, the Future Skills Centre (FSC) has been undertaking SAA for the green transition since 2021. With the goal to support Canada's green transition and share knowledge and insights on the creation of new and sustainable jobs with workers and employers, FSC conducts research on green SAA exercises through a consortium partnership with various public and private research institute, including the Smart Prosperity Institute (SPI), the Diversity Institute and the Conference Board of Canada (Future Skills Centre, 2023[28]).

Collaborative Model: Green Jobs Taskforce (United Kingdom)

The United Kingdom has formed the Green Jobs Taskforce to foster the transition towards a high-skill, low carbon economy. The Department for Business, Energy and Industrial Strategy, and the Department for Education convened this Taskforce of 17 individuals from diverse backgrounds in industry, academia, unions, industry, education and skills sector. All the members of the task force directly participate in research and report publication, and the results are publicly announced and proposed to the government after intensive internal deliberation (Green Jobs Taskforce, 2021[29]).

External Model: Basel University (Switzerland)

Basel University in Switzerland undertook a vast research programme on green SAA exercises in 2020, thanks to funding by the Swiss National Science Foundation. The researchers' aim was to estimate the green potential of 322 ISCO occupations through machine learning algorithms. By comparing the occupations with high green potential with the current state of labour shortage among European countries, they provided the information not only on promising green occupations but also on the preparedness of the European workforce to move toward a green economy (Niggli and Rutzer, 2020[30]).

### *Stakeholder involvement in SAA exercises*

The intersectional approach of SAA exercises implies that there are potentially a multitude of stakeholders present throughout the process. Stakeholders can be engaged both horizontally and vertically. Horizontal engagement is achieved through direct collaboration across governmental departments, such as the Ministry of Labour, the Ministry of Education or the Ministry of Economy. For example, in France the "Skills Forecast: Occupations in 2030" is co-conducted by France Stratégie, an institution attached to the Prime Minister's Office, and Dares, a team located under the Ministry of Employment (France Stratégie, 2022[31]). By contrast, the vertical dimension of engagement applies to different levels of government which include regional, sub-regional, and non-state actors, such as the private sector (OECD, 2019[32]).

In particular, collaborations between the public and the private sectors are often sought after. Indeed, it can be challenging to get an accurate snapshot of the skill landscape if the particular approach to SAA is not conducted with the help of key players "on the ground". Social partners have unique knowledge on these matters: employers have an idea about what skills they need in order to develop their business, and trade unions have information about the skills and training needs of their members. Inclusion of social partners can be vital for the successful execution of SAA exercises, but also for dissemination of findings and implementation of evidence-based policies and actions. This point is not lost in the field of anticipating training needs. In fact, according to a recent OECD survey, employers and employer organisations are involved in SAA exercises in 7 out of 10 participating countries, while trade unions are involved in 6 out of 10 cases (OECD, 2019[33]). Governments can organise the voices of social partners through skills councils

(also called sectoral councils and sector skills councils), and use these councils to anticipate skill needs and plan adult learning programmes and training programmes to address these needs (OECD, 2016[25]).

In the countries under analysis in the present report, public-private partnerships usually focus on a specific sector, such as the renewable energy sector in Australia or the mining industry in Sweden, although innovative practices are gradually emerging. For example, in Norway the Committee on Skill Needs brings together a wide range of stakeholders – 4 representatives of employer organisations, 4 representatives of trade unions, 9 independent researchers, and 1 representative of the county councils – with the goal of creating a common knowledge base that all members of the Committee can adhere to. Similarly, in Sweden providers offering Higher Vocational Education (*Yrkeshögskolan*) – such as universities, local authorities or private training companies – collaborate with employers and industry representatives to understand how the labour market needs are changing and design relevant education programmes (so-called YH-model).

Yet, while engaging stakeholders is essential to pursue shared policy objectives, it comes with distinct challenges. In Sweden the private actors of the mining industry are providing information on future skill requirements that will be needed to meet the demand of the green transition. The PES then co-ordinates the actors of Vocational Education and Training (VET), universities, and other parts of the educational system, on a local and regional level, to ensure that information is received and that relevant actions are taken in to consideration (Swedish Public Employment Service, 2022[22]). The involvement of multiple stakeholders requires a governance system that helps co-ordinate the contribution of each stakeholder to the SAA process as well as mitigate gridlocks that may arise from conflicting interests. Conflicting interest may result in disagreements about appropriate policy actions affecting the efficiency of the outcomes. Co-ordination among stakeholders is also one of the main obstacles to information being used in making informed policy decisions (OECD, 2016[16]; OECD, 2019[32]). Moreover, data on skills are often fragmented and collected by many different stakeholders. For example, in Australia's SAA exercise RACE for 2030 there are nine different stakeholders involved in data collection and research. In order to oversee the process, maintain consistency and co-ordinate information flows, the project is managed by the Energy Efficiency Council and the Australian Power Institute.

### *Funding of SAA exercises*

Most SAA exercises are funded either publicly or privately, but a few less frequent financing schemes are based on a combination of public and private funds. The rationale behind this cost sharing is that skill forecasts and investments benefit both private and public domains, and hence the funding should be distributed accordingly. There is no blueprint on how this is achieved but it should rather be based on the domestic prerequisites within a country and guided by the balance between equity and efficiency (OECD, 2019[32]). The EDEC SAA exercises in France are financed jointly by the Ministry of Labour and the institutions that carry out the exercise (which in some cases are private organisations). There is only one exercise in this study that is funded through crowdfunding which is the "People Powering the Future" produced by Deloitte and commissioned by the Climate Council in Australia. Accordingly, the funding is dependent on private donations and philanthropy.

## References


Bureau of Labor Statistics (2022), *Measuring Green Jobs*, https://bls.gov/green/home.htm (accessed on 10 September 2022). [6]

Cedefop (2012), *Green skills and environmental awareness in vocational education and training*, https://cedefop.europa.eu/files/5524_en.pdf. [8]

Centre for Policy Development (2022), *Who's Buying?*, CPD discussion paper, https://cpd.org.au/wp-content/uploads/2022/01/Whos-Buying-Report.pdf (accessed on 31 August 2022). [12]

Conference Board of Canada; Future Skills Centre (2022), *Green occupation pathways*, https://fsc-ccf.ca/wp-content/uploads/2022/02/FSC_green-occupation-pathways.pdf. [4]

Deloitte Access Economics (2021), *People powering the future: Skilling Queenslanders for the clean transformation*, https://www2.deloitte.com/au/en/pages/economics/articles/people-powering-future.html (accessed on 31 August 2022). [11]

Ecological Transition Agency (ADEME) (2018), *La transition énergetique*, https://presse.ademe.fr/wp-content/uploads/2018/08/ademe_lalettre_strategie_56_finale.pdf. [1]

Employment Insurance Agency (UWV) (2022), *Klimaatbanen in de gebouwde omgeving*, https://www.werk.nl/imagesdxa/publicatie_klimaatbanen_in_de_gebouwde_omgeving_tcm95-435269.pdf. [24]

France Stratégie (2022), *Les Métiers en 2030. Prospective des métiers et qualifications*, https://www.strategie.gouv.fr/sites/strategie.gouv.fr/files/atoms/files/fs-2022-pmq-rapport-mars_4.pdf. [31]

Future Skills Centre (2023), *Skills and Sustainability: FSC gets ahead of the shift to support decarbonization*, https://fsc-ccf.ca/engage/skills-and-sustainability/ (accessed on 31 July 2023). [28]

Future Skills Centre (2022), *Jobs and Skills in the Transition to a Net-Zero Economy*, https://fsc-ccf.ca/research/jobs-and-skills-transition-to-a-net-zero-economy/ (accessed on 15 September 2022). [23]

Green Jobs Taskforce (2021), *Green Jobs Taskforce report*, https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1003570/gjtf-report.pdf (accessed on 31 July 2023). [29]

Großmann, A. et al. (2020), *Die Auswirkungen von klimapolitischen Maßnahmen auf den österreichischen Arbeitsmarkt*, https://downloads.gws-os.com/Gro%c3%9fmannEtAl2020_ExpertInnenbericht.pdf. [17]

Infrastructure Australia (2021), *Market Capacity for electricity generation and transmission projects: A report from Infrastructure Australia's Market Capacity Program*, https://www.infrastructureaustralia.gov.au/sites/default/files/2021-10/Market%20Capacity%20for%20Electricity%20Infrastructure%20211013.pdf (accessed on 5 September 2022). [20]

Kompetansebehovsutvalget (2023), *Fremtidens kompetansebehov: Utfordringer for grønn omstilling i arbeidslivet*. [2]

Meinhart, B. et al. (2022), *Transformation und "Just Transition" in Österreich*, WIFO, https://www.wifo.ac.at/jart/prj3/wifo/resources/person_dokument/person_dokument.jart?publikationsid=68029&mime_type=application/pdf (accessed on 5 September 2022). [18]

Ministry of Ecology, Energy and Territories (2021), *L'observatoire national des emplois et métiers de l'économie verte*, https://www.ecologie.gouv.fr/lobservatoire-national-des-emplois-et-metiers-leconomie-verte#scroll-nav__3 (accessed on 6 September 2022). [10]

National Center for O*NET Development (2022), *O*NET RESEARCH CENTER*, https://www.onetcenter.org/reports/GreenTask.html (accessed on 6 September 2022). [7]

National Skills Commission (2022), *Skills Priority List | National Skills Commission*, https://www.nationalskillscommission.gov.au/topics/skills-priority-list (accessed on 8 September 2022). [19]

Niggli, M. and C. Rutzer (2020), *Greening and the Labour Market*, https://cieb.shinyapps.io/nrp_73_green_potential/ (accessed on 31 July 2023). [30]

OECD (2019), *Enhancing Access to and Sharing of Data: Reconciling Risks and Benefits for Data Re-use across Societies*, https://doi.org/10.1787/276aaca8-en. [21]

OECD (2019), *Getting Skills Right: Making adult learning work in social partnership*, OECD Publishing, Paris, https://www.oecd.org/employment/emp/adult-learning-work-in-social-partnership-2019.pdf. [33]

OECD (2019), "Strengthening the governance of skills systems", in *OECD Skills Strategy 2019: Skills to Shape a Better Future*, OECD Publishing, Paris, https://doi.org/10.1787/2a40e30e-en. [32]

OECD (2016), *Getting Skills Right: Assessing and Anticipating Changing Skill Needs*, OECD Publishing, Paris, https://doi.org/10.1787/9789264252073-en. [16]

OECD (2016), *Getting Skills Right: Assessing and Anticipating Changing Skills Needs*, OECD Publishing, Paris, https://doi.org/10.1787/9789264252073-en. [25]

Office for National Statistics (2021), *The challenges of defining a "green job"*, https://www.ons.gov.uk/economy/environmentalaccounts/methodologies/thechallengesofdefiningagreenjob (accessed on 10 November 2022). [5]

RACE for 2030 (2021), *E3 Opportunity Assessment: Developing the future energy workforce*, https://www.racefor2030.com.au/wp-content/uploads/2021/10/RACE-E3-Opportunity-Assessment-FINAL-REPORT-October-2021.pdf. [13]

Rørstad, K., P. Børing and E. Solberg (2023), *NHOs kompetansebarometer 2022: En kartlegging av NHOs medlemsbedrifters kompetansebehov i 2022*, NIFU. [26]

Swedish Public Employment Service (2022), *Kompetensförsörjning vid stora företagsetableringar och företagsexpansioner Slutredovisning 1 juni 2022*, https://arbetsformedlingen.se/download/18.e4c7c0717f2869663d11a92/1654071410486/uppdrag-om-kompetensforsorjning-vid-stora-foretagsetableringar.pdf. [22]

Tretter, H. et al. (2022), *Kompetenzen für die klimaneutrale Zukunft*, https://erasmusplus.at/fileadmin/Dokumente/erasmusplus.at/Aktuelles/2022/BB/Bildungsdialog_Endbericht_final_barrierfrei_2022-05-03.pdf (accessed on 18 April 2023). [3]

Victorian State Government (2022), *OECD Questionnaire Green SAA : Victorian State Gov Dept. Environment, land, water and planing - DELWP feedback*. [14]

Victorian State Government (2022), "OECD Questionnaire Green SAA: Victorian State Government Victorian Skills Authority". [15]

Vinnova (2022), *Uppdrag genomförandet av ett kompetenslyft för klimatomställningen*, https://www.vinnova.se/contentassets/c0040f5b5def43239f203b83b1a716d2/2022-01006-delrapport---kompetenslyft-for-klimatomstallningen.pdf. [9]

Virke (2021), *Handels- og tjenestenæringen – jobbene vi skal leve av*, https://www.virke.no/analyse/statistikk-rapporter/rapport-om-handels-og-tjenestenaringen/ (accessed on 9 October 2022). [27]

## Notes

[1] The concentration quotient (CQ) measures the relative importance of any given occupation to each clean economy sector compared with the overall economy. The CQ formula is: Occupation's share of sectoral employment / Occupation's share of national employment. Values greater (lower) than 1 indicate that a given occupation is more (less) important to the clean economy than the overall economy.

[2] Regional, in this context, is taken to mean a national sub-region, such as states, provinces, municipalities or any other geographically defined sub-national area.

[3] The gTech is a computable general equilibrium (CGE) model that represents transactions between all sectors of the economy as measured by Statistics Canada National Accounts. It captures all sectors' activity, gross domestic product, trade of goods and services, transactions, and behavioural aspects, thereby managing to provide a forecast of how government policy affects many different economic indicators.

[4] Scenario 1 (Electrons) is a lower-carbon-intensity future, Scenario 2 (Resources) involves a heavier continued reliance on carbon-intensive activities while achieving net-zero emissions through alternative approaches, such as the use of carbon capture technologies. Scenario 3 (Blended) aims at reducing overall GHG emissions by 75%, with the remaining 25% accounted for through the purchase of carbon offsets implemented in other jurisdictions.