

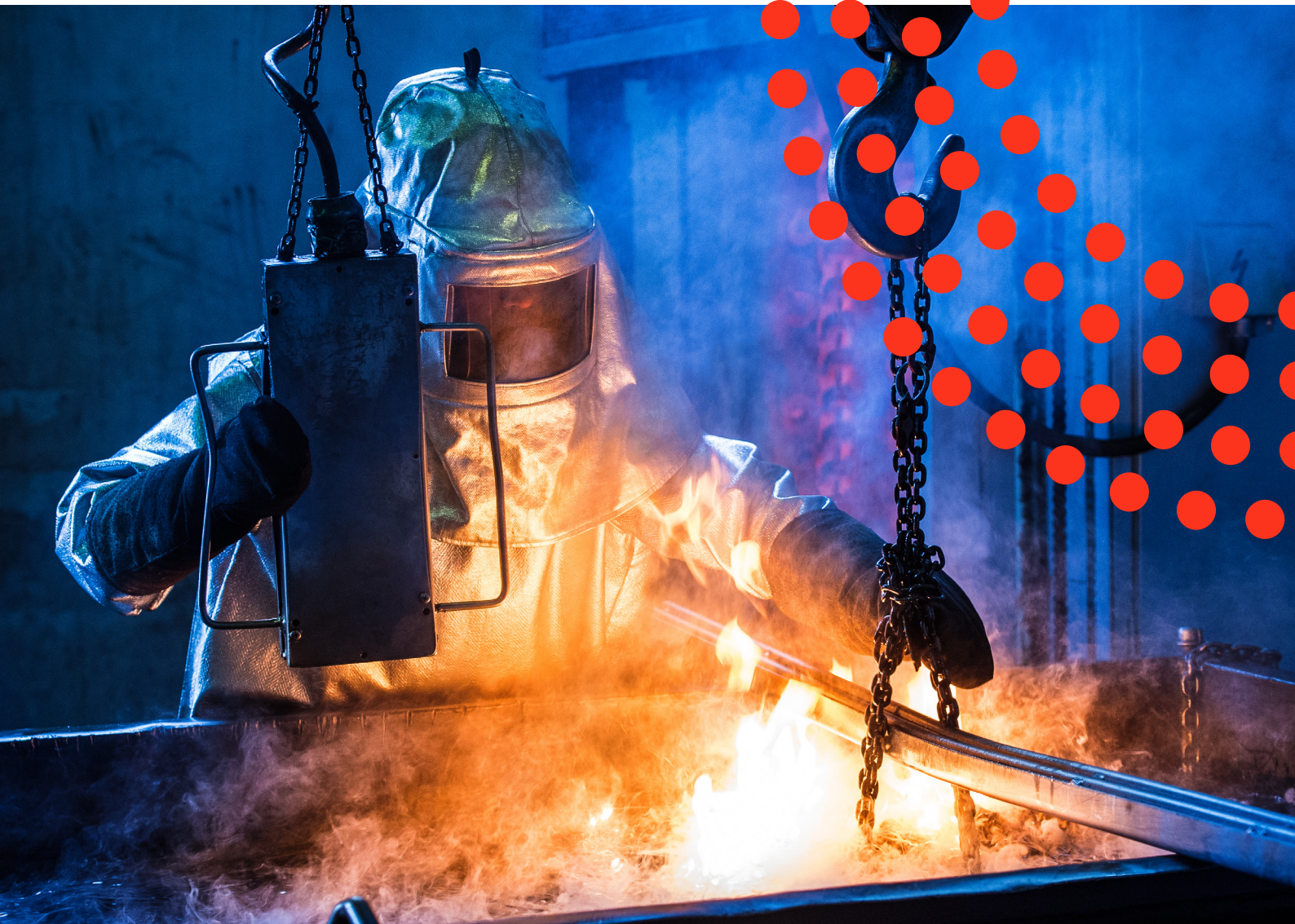


Secretariat
CLIMATE GROUP

elementenergy
an ERM Group company

Activating states and regions for a green recovery of heavy industry

August 2021





A green recovery for heavy industry is a transformation that will bring economic recovery alongside carbon emissions reduction.



Executive summary

Background

Heavy industry has faced several challenges during the COVID-19 pandemic. Climate Group, and the Under2 Coalition, recognise the time-bound opportunities presented to build back greener and stronger in the economic recovery phase. Key aims of this study are to share advice on policy that can promote an industrial green recovery and a just transition within

subnational jurisdictions, as well as to understand the power of subnational governments and their opportunities to influence strategies to build back greener by using the Global Framework Principles formulated by Climate Group and other mechanisms.

A green recovery for heavy industry

The impact of COVID-19 was hard felt by economies across the globe, and this was especially true for heavy industries including chemicals, cement, iron and steel production, facing significant challenges even before the pandemic hit, exposing the industrial sectors to the risk of 'carbon leakage' (the risk that carbon intensive industries facing environmental regulations stronger than those borne by their international competitors may relocate to less regulated regions).

Supply chain disruption, workers' health and safety, reduced demand and long-term uncertainty are some of the key challenges that heavy industry has faced due to the COVID-19 pandemic and related heightened regulations, including trade

restrictions and closed borders. A prompt recovery is therefore an imperative to ensure the survival of these industries and enable them to prepare for the monumental task at hand: to aim for net zero emissions while establishing a financially sustainable business in a rapidly evolving market environment.

A green recovery for heavy industry is here intended as a transformation that will bring economic recovery alongside carbon emissions reduction from the industry, but also a set of additional benefits, such as reduction of waste and pollution, job creation and safeguarding, education and skills development, a just transition and improved global health.



Six potential key benefits of a green recovery for heavy industries that address both the social and ecological dimensions.



Options for a green recovery

The study initially looked back on approaches used by governments to overcome previous economy-wide or industry-specific crises caused by financial, social or environmental triggers or events. The approaches investigated included a wide range of supranational, national and subnational measures. Eleven relevant approaches were shortlisted as measures with relevant learnings and options that could be implemented for a green recovery of heavy industry. Key approaches include, for example, direct industry bailouts, eased accessibility to finance, and investment in new and green infrastructure.

Additionally, the analysis evaluated technology options available for the decarbonisation of heavy industry, the promotion of which could favour a green recovery, including energy efficiency, fuel switching, CCUS and systemic efficiency & circularity.

Finally, the study considered alternative creative solutions that can enable the desired additional benefits of a green recovery. These approaches include investment in decarbonisation and R&D, sharing and repurposing secondary resources and by-products, and encouraging shorter work weeks.



Overview of approaches implemented in the past to overcome economic crises.

Policy options for a green recovery



Overview of policy options to support a green recovery.

The powers of subnational governments and policy options to promote a green recovery

Subnational governments considered in this study refer to provincial, regional, intermediary or municipal governments in both unitary and federal systems, and state governments. Their powers vary widely from case to case, depending on the governance structure of their country. A federal or unitary governance will determine the administrative, political and fiscal powers attributed to a subnational government, which will impact their ability to implement certain policies on a regional scale.

Eight policy options were identified as key opportunities to provide a green recovery to heavy industry. These options were shortlisted by considering the available options for a green recovery and also the powers available to subnational governments to implement these. These policy options target a short-term green recovery, imperative to ensure the survival of heavy industries, which were already facing significant challenges even before the pandemic hit, with strong competition on cost and limited market growth

prospects. Additionally, the design of these policies is aligned with, and can set the foundations for, longer-term industrial decarbonisation needs.

Based on information collected during the literature review and on feedback provided by regions during roundtables and interviews, each policy was evaluated against two relevant parameters: their potential effectiveness in enabling a green recovery in heavy industry and the powers

that subnational governments have to implement them without the involvement of their national government. Policy 3 - Investment in New and Green Infrastructure, Policy 4 - R&D Support and Grants, and Policy 8 - Innovative Regulations, emerged to be particularly effective in enabling a green recovery, as well as attainable for implementation by many regional governments.



Global Framework Principles in the context of a green recovery

Climate Group, alongside Mighty Earth and industry experts, developed a list of Global Framework Principles to accelerate and scale-up the decarbonisation of heavy industry to align with a 1.5°C trajectory. Each principle presents an essential lever that policymakers can use to decarbonise heavy industry.

The Global Framework Principles can and should be used by subnational governments to increase, accelerate and guide state action in the process of bringing about a green recovery for heavy industry. The policies identified by this study can be implemented within the Global Framework Principles.

By understanding subnational government powers and by evaluating which policy options link best with each Global Framework Principle, it can be concluded that states can use the framework to increase, guide and accelerate state action on decarbonisation of heavy industry. However, the level of action will vary between subnational governments according to their political, administrative and fiscal powers.

Many of the Global Framework Principles are already being implemented by some subnational governments, in particular principle #1, principle #2, principle #4 and principle #5. However, principle #5 is considered to be the most effective for the creation of policies that will enable a green recovery in heavy industry.



Principle #1

Secure a truly green recovery by tying public financing for heavy industry to key measures aligned with corporate GHG emissions reduction commitments and plans calibrated to a 1.5°C trajectory.



Policy 1: Eased Accessibility to Finance



Policy 5: Reduction of Fiscal Responsibilities

Principle #2

Establish and strengthen policies and investments to ensure that industrial transformation protects biodiversity and human health and leads to a just transition.



Policy 2: Labour Markets and Education



Policy 3: Investment in New & Green Infrastructure

Principle #3

Institute policies to create demand for low-carbon, circular and resource efficient basic material products, supported by the use of standardised lifecycle carbon footprint labelling and performance incentives for end products (e.g. buildings) to engage the entire value chain.



Policy 6: Reduced Burdens for Investment and Project Development

Principle #4

Develop and deploy at scale, financing policies and tools to incentivise and reward heavy industry companies that set science-based, time-bound, public climate targets calibrated to 1.5°C.



Policy 1: Eased Accessibility to Finance



Policy 5: Reduction of Fiscal Responsibilities

Principle #5

Prioritise funding and investment for enhanced development and deployment of low, zero carbon technologies, including breakthrough technologies like hydrogen for industrial production and near-term carbon capture, to help phase out fossil fuel use.



Policy 3: Investment in New & Green Infrastructure



Policy 4: R&D Supports and Grants

Principle #6

Ensure effective coordination and accounting between countries and regions, including the sharing of new impactful technologies, viable circular economy pathways, sunsets of the highest polluting technologies, and implementation of responsive trade policies to reduce emissions leakage between economies.

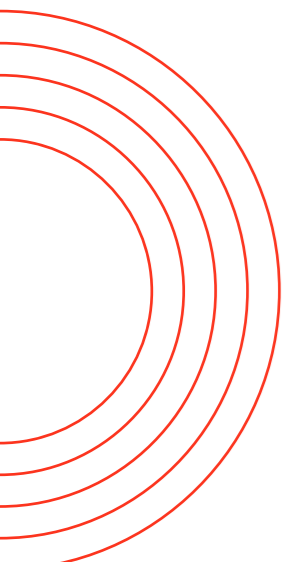


Policy 7: Support to Regional Industrial Capabilities



Policy 8: Innovative Regulations

The policies identified in the previous chapter can be implemented within the Global Framework Principles



Conclusions

It is important that subnational governments provide actions swiftly to minimise the impacts of the current pandemic crisis on heavy industry.

Policy action for a green recovery in heavy industry can be guided by ecological and social dimensions. Each one of these dimensions can bring in a set of benefits, such as carbon emissions reduction, waste and pollution reduction, jobs creation and safeguarding, just transition, education and skills development and improved global health.

The eight policy options identified vary in scope and design, and the potential for implementation will depend on the governance structure of different subnational governments, broadly depending on their federal or unitary governance structure.

The policy options perceived to be most effective are R&D Support and Grants, Investment in New and Green Infrastructure and Innovative Regulations.

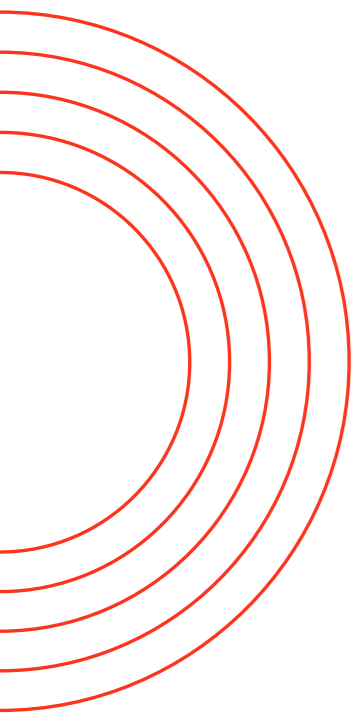
Even in those regions with most limited subnational government powers, there is still room for subnational government action, for example through influence and vertical collaboration with their national government as well as through promoting regional knowledge exchange in industry.

The Global Framework Principles are primarily targeted towards achieving long-term decarbonisation. However, certain foundations of the Principles can already begin to be incorporated in the policy options so that the short-term recovery response is aligned with long-term decarbonisation objectives.

It is important that subnational governments provide actions swiftly to minimise the impacts of the current pandemic crisis on heavy industry.



Contents



Executive summary	02
Acronyms	15
01 Introduction	17
1.1 Context	17
1.2 Objectives	18
1.3 Scope of work and analysis	19
1.4 Report structure	19
02 A green recovery for heavy industry	20
2.1 Why a recovery is needed	20
2.2 Our definition of a green recovery	24



03 Options for a green recovery	31
3.1 Options from the past: review of approaches to overcoming previous economic crises	33
3.2 Technology options to decarbonise heavy industry	42
3.3 Other creative options with broad system benefits	46
04 The powers of subnational governments and policy options to promote a green recovery	50
4.1 Types of subnational governments powers in states	54
4.2 Policy options for a green recovery	56
4.3 Evaluation of policy options for a green recovery	66
05 Global Framework Principles in the context of a green recovery	69
5.1 Global Framework Principles for the Decarbonisation of Heavy Industry	70
5.2 Using the Global Framework Principles to accelerate state government action	72
5.3 Evaluation of the Global Framework Principles	80
06 Conclusions	82

Acronyms

- CCS**
Carbon Capture and Storage
- CCU**
Carbon Capture and Utilisation
- CCUS**
Carbon Capture, Utilisation and Storage
- COVID-19**
Coronavirus disease identified in December 2019
- GFP**
Global Framework Principles
- H&S**
Health and Safety
- PPE**
Personal Protective Equipment
- R&D**
Research & Development
- SME**
Small and Medium-sized Enterprises
- TRL**
Technology Readiness Level

Technology Readiness Levels (TRL) are a type of measurement system used to assess the maturity level of a particular technology. Each technology project is evaluated against the parameters for each technology level and is then assigned a TRL rating based on the projects progress. There are nine technology readiness levels. TRL 1 is the lowest and TRL 9 is the highest.¹

¹ NASA 2012 [Technology Readiness Level](#)



The Under2 Coalition
is a global community
of state and
regional governments
committed to ambitious
climate action.

01

Introduction

1.1 Context

The **Under2 Coalition** is a global community of state and regional governments committed to ambitious climate action in line with the Paris Agreement. The Coalition supports state and regional governments around the world to develop and implement climate policies that are consistent with keeping global average temperature increase well below 2°C. **Climate Group** is the Secretariat to the Under2 Coalition and is an international non-profit organisation working to drive climate action while bringing greater prosperity for all.

The Under2 Coalition works with governments to accelerate climate action through providing technical support, sharing policy knowledge and increasing transparency around climate targets and progress. Recognising the challenges heavy industry have faced through the COVID-19 pandemic, but also the time-bound opportunities presented to build back greener and stronger in the economic recovery phase.

Therefore, Climate Group has taken interest in understanding the powers of subnational governments in addressing the impact of COVID-19 on local heavy industries and their opportunities and mechanisms to create and influence strategies to build back better. Upon initiative of the Under2 Coalition, Element Energy was appointed to carry out the study 'Activating states and regions for a green recovery of heavy industry.'

Climate Group recently developed The Global Framework Principles for the Decarbonisation of Heavy Industry, providing a set of six core principles representing essential levers that policymakers can use to ensure the successful decarbonisation of steel, cement, chemicals and other heavy industries. The aim of the Framework is to reduce emissions in heavy industries across the world, to both strengthen economies and help limit global warming to 1.5°C.²

² Climate Group Global Framework Principles for Decarbonising Heavy Industry Accessed: 11/06/2021

1.2 Objectives

The desired outcome and long-term impact of this project is to drive policy action for the decarbonisation of the global heavy industrial sector at the rate needed to maintain safe levels of carbon emissions, and to do so now as part of the global response to COVID-19.

The objectives of this study are to:

- Share advice on integrating policy into industrial green recovery mechanisms, to achieve a just transition within subnational jurisdictions, based on in-depth research, lessons learned from past economic crises, and up-to-date experiences of heavily industrialised states and regions in the current COVID-19 crisis and recovery.
- Understand the power of subnational governments to address the impact of COVID-19 on their heavy industries, and their opportunities and mechanisms to influence strategies to build back greener by using the Global Framework Principles and other mechanisms.
- Provide opportunities for heavily industrialised states and regions to shape the Global Framework Principles, with a focus on achieving a just transition in the heavy industry sector.
- Communicate ambition and achievements of Under2 Coalition members for a green recovery of their industries; thereby demonstrating leadership and inspiring similar action.

1.3 Scope of work and analysis

This work focuses on policies capable of enabling a green recovery in heavy industry that can be undertaken by regional governments around the world.

The study was structured and carried out in the following stages:

- 1. Desktop research on lessons learned from previous economic crises**, the tactics subnational governments have used to overcome them, and the powers they currently have to build back greener from the global COVID-19 pandemic; addressing a green recovery for heavy industry, health and economic protections for workers, as well as a just transition to low-carbon careers.
- 2. Stakeholder engagement** with subnational government delegates to discuss challenges and opportunities for green recovery and a just transition in the current economic environment, discuss preliminary findings of the study and evaluate the applicability of the Global Framework Principles.
- 3. Roundtable** with a wider group of subnational government delegates, to share the views and experience of regional governments about industrial decarbonisation, discuss the study's emerging results and facilitate connections and networking between regional members of the Under2 Coalition.
- 4. Evaluation of the Global Framework Principles** and their effectiveness in increasing, accelerating and guiding state action and decision making on policies, in particular for the promotion of a green recovery in heavy industry.
- 5. Dissemination of the findings** through a project report incorporating desktop research, interviews, and roundtable findings.

1.4 Report structure

The following part of this report is structured into 6 chapters.

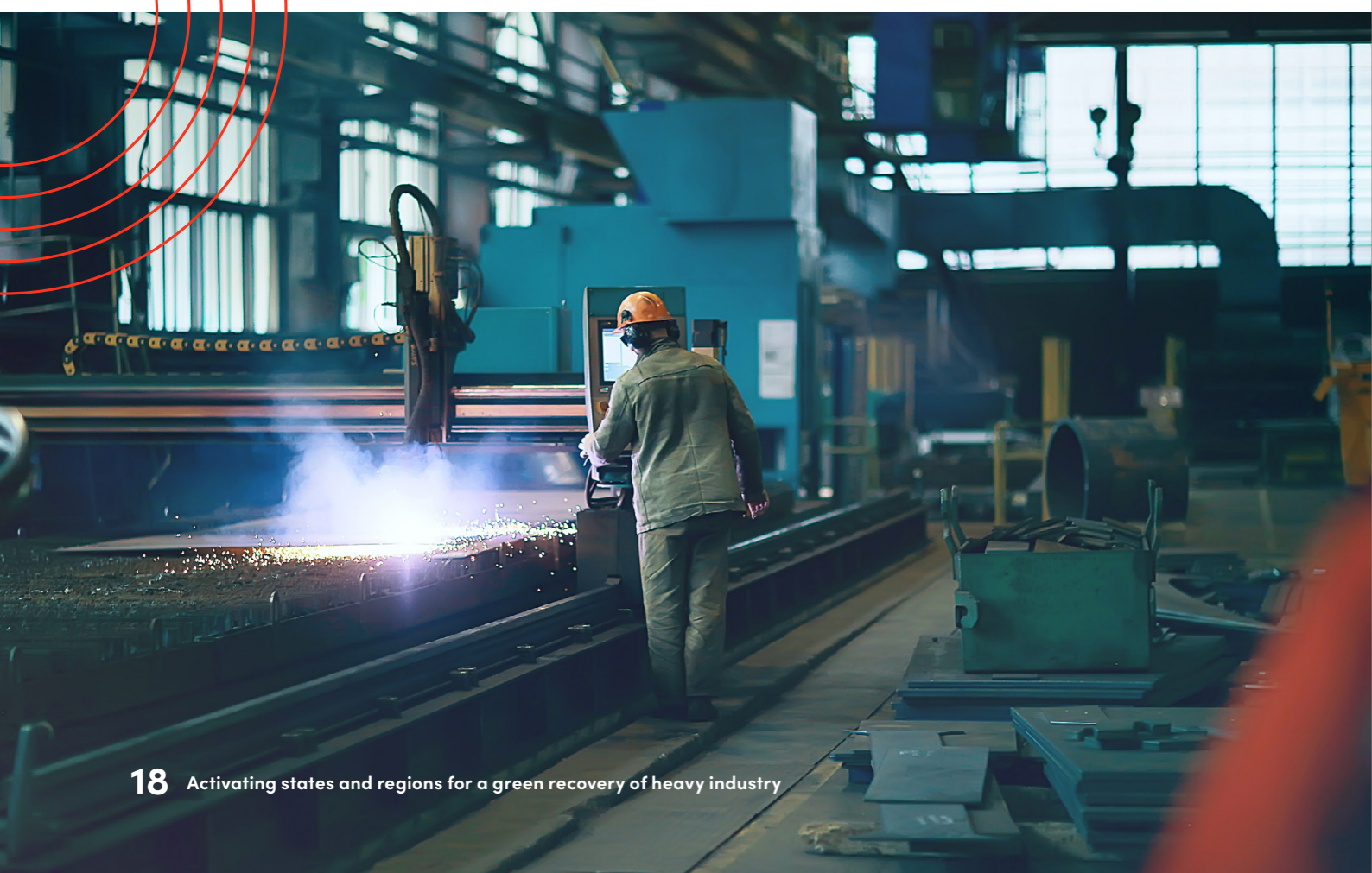
Chapter 2 sets out our definition of a green recovery and provides an overview of the reasons that make a green recovery for heavy industry around the world urgently needed.

Chapter 3 presents the currently available options for enabling a green recovery, looking at options utilised in the past, technology innovation and creative solutions.

Chapter 4 evaluates the powers of subnational governments around the world to enact policies to foster a green recovery, both looking at different government types and at the policy options that would fit best for them.

Chapter 5 discusses the merits of the Global Framework Principles in guiding legislation that promotes decarbonisation in heavy industry and their applicability to a green recovery.

Finally, **Chapter 6** reports the conclusions from the study.





02

A green recovery for heavy industry

2.1 Why a recovery is needed

The impact of COVID-19 was hard felt by economies across the globe, and this was especially true for heavy industries including chemicals, cement, iron and steel production. In fact, these sectors were already facing significant challenges even before the pandemic hit. Heavy industries that operated in mature markets, facing strong competition on cost and limited market growth prospects, already struggled to access the financial resources necessary to achieve national decarbonisation targets.

While carbon policies adopted by many countries provided an incentive to decarbonise, these have generally been an

insufficient driver to invest in the technologies necessary to achieve deep emissions cuts, as illustrated in Section 3.2. Instead, the increasing financial pressure resulting from increasing carbon prices (or equivalent carbon policies such as emissions trading schemes) exposed industrial sectors to the risk of 'carbon leakage'.³ Carbon leakage refers here to the risk that industries facing environmental regulations stronger than those borne by their international competitors may relocate to less regulated regions. If they were to do so, their carbon emissions would also relocate, or 'leak', with them, rather than being abated.

³ Cambridge Econometrics (2017) [Competitiveness impacts of carbon policies on UK energy-intensive industrial sectors to 2030](#)



Against this challenging backdrop, COVID-19 introduced a diverse set of challenges that threatened the multiple industries across the globe. A set of concurring challenges emerged from the research and was confirmed through interviews and roundtables with regional government delegates and are summarised in Figure 1.

1. **Supply chain disruption** resulted from wide-spread quarantines and heightened regulations including trade restrictions and closed borders.⁴ This in turn hindered the delivery of key components which, combined with just-in-time production strategies, eventually caused production stoppages.⁵
2. **Workers' health and safety** (H&S) came under threat. Limited remote work possibilities for staff working in heavy industries combined with the obstacles faced by many employers in providing adequate personal protective equipment (PPE)⁶ implied greater exposure to virus among this category of workers.⁷ Besides the concerning health impact, workforce morale and productivity were also impacted, posing additional burdens and costs to struggling firms also needing to quickly devise and implement new H&S protocols.
3. **Reduced demand.** Uncertainty and government restrictions limiting economic activity caused a rapid shift in consumer demand, with ripple effects felt along the supply chains and hence affecting demand for outputs from heavy industries.⁸ This in turn meant companies faced a situation of oversupply, forcing them to stop production to cut costs.
4. **Long-term uncertainty** about what the post COVID-19 world will look like remains, constraining investments and hindering the recovery. While some countries are close to reopening their economies in full or have already done so, for many this may still be months away. Longer-term impacts of COVID-19 on consumer behaviour, working practices and travel are also not yet clear.⁹
5. **Weakened cash reserves** pose an existential risk to the continued operation of many industrial sites. Even before COVID-19 hit, heavy industries often operated with cash reserves only sufficient to cover 2-3 months' worth of operations.¹⁰ And while larger companies may be more easily able to access financial markets to meet their working capital requirements, even these were threatened by failures of smaller, critical partners within their supply chains. Furthermore, the increase in corporate debt resulting from the need to open new credit lines to mitigate the short-term liquidity risk may add fragility against future shocks.

Considering the above, it is evident that many heavy industries are now in a as challenging position as ever position. A prompt recovery is therefore an imperative to ensure the survival of these industries and enable them to prepare for the monumental task at hand: to aim for net zero emissions while establishing a financially sustainable business in a rapidly evolving market environment.

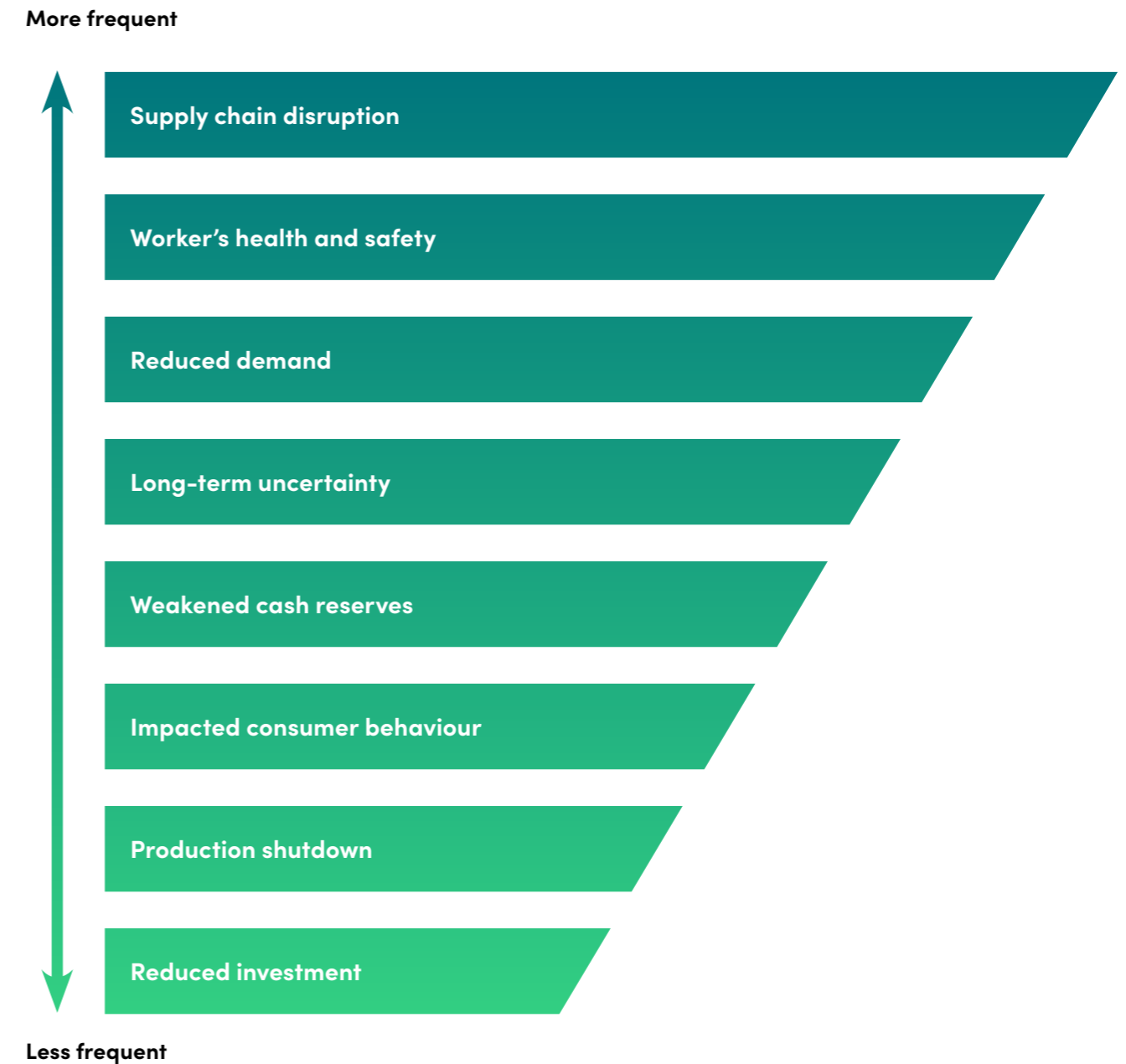


Figure 1: Key issues experienced by heavy industry around the world, in order of relevance.

4 A survey by the US National Association of Manufacturers for instance found that over a third of their member companies reported facing supply chain disruptions.

5 See for instance Accenture's [report](#) on COVID 19's impact on the automotive industry.

6 Jimmy O'Donnell (2020) [Essential workers during COVID-19: At risk and lacking union representation](#), The Brookings Institution, accessed: 8 June 2021

7 UK Office for National Statistics (2021) [Coronavirus \(COVID-19\) related deaths by occupation, England and Wales: deaths registered between 9 March and 28 December 2020](#)

8 Examples of this are provided by the double-digit contraction in the global automotive industry [estimated](#) by Accenture, and the smaller yet significant reduction in demand for cement [reported](#) by IFC.

9 See for instance the preliminary outputs from Accenture's [research](#) on COVID 19 permanent impact on consumer behaviour.

10 See Accenture's [article](#), From survival to revival – Industrial post COVID-19 (2020).

2.2 Our definition of a green recovery

While causing extensive disruption to our normal way of life, the COVID-19 pandemic also contributed to raising awareness around the entangled relationship between public health, the health of global ecosystems and that of our economies. It is therefore unsurprising that many countries identified a “green recovery” as necessary and pledged to pursue to “build back better”. An overview of approaches already being implemented in early recovery packages is shown in ‘Approaches being implemented in early recovery packages’

on pages 26–27. While it is intuitively clear that policies in support of a green recovery should seek to enable more than climate change mitigation – for instance focusing on the creation and safeguarding of jobs, skills development, promoting global health, as well as addressing a just transition – no universally accepted definition of these concepts exists.

This study investigated how states and regions could support a green recovery by employing the framework of “the Doughnut of social and planetary boundaries”, developed by Kate Raworth in 2012 and elaborated in the box to the right.¹¹

The doughnut is a conceptual tool that enables holistic consideration of the social and ecological dimensions relevant to sustainable development, each of which could potentially be impacted within a green recovery.¹¹ The framework was popularised via Kate Raworth’s “Doughnut Economics: Seven Ways to Think like a 21st Century Economist” book.

“The Doughnut consists of two concentric rings: a social foundation, to ensure that no one is left falling short on life’s essentials, and an ecological ceiling, to ensure that humanity does not collectively overshoot the planetary boundaries that protect Earth’s life-supporting systems. Between these two sets of boundaries lies a doughnut-shaped space that is both ecologically safe and socially just: a space in which humanity can thrive.”¹¹

¹¹ doughnuteconomics.org/.

Credit: Kate Raworth, doughnuteconomics.org

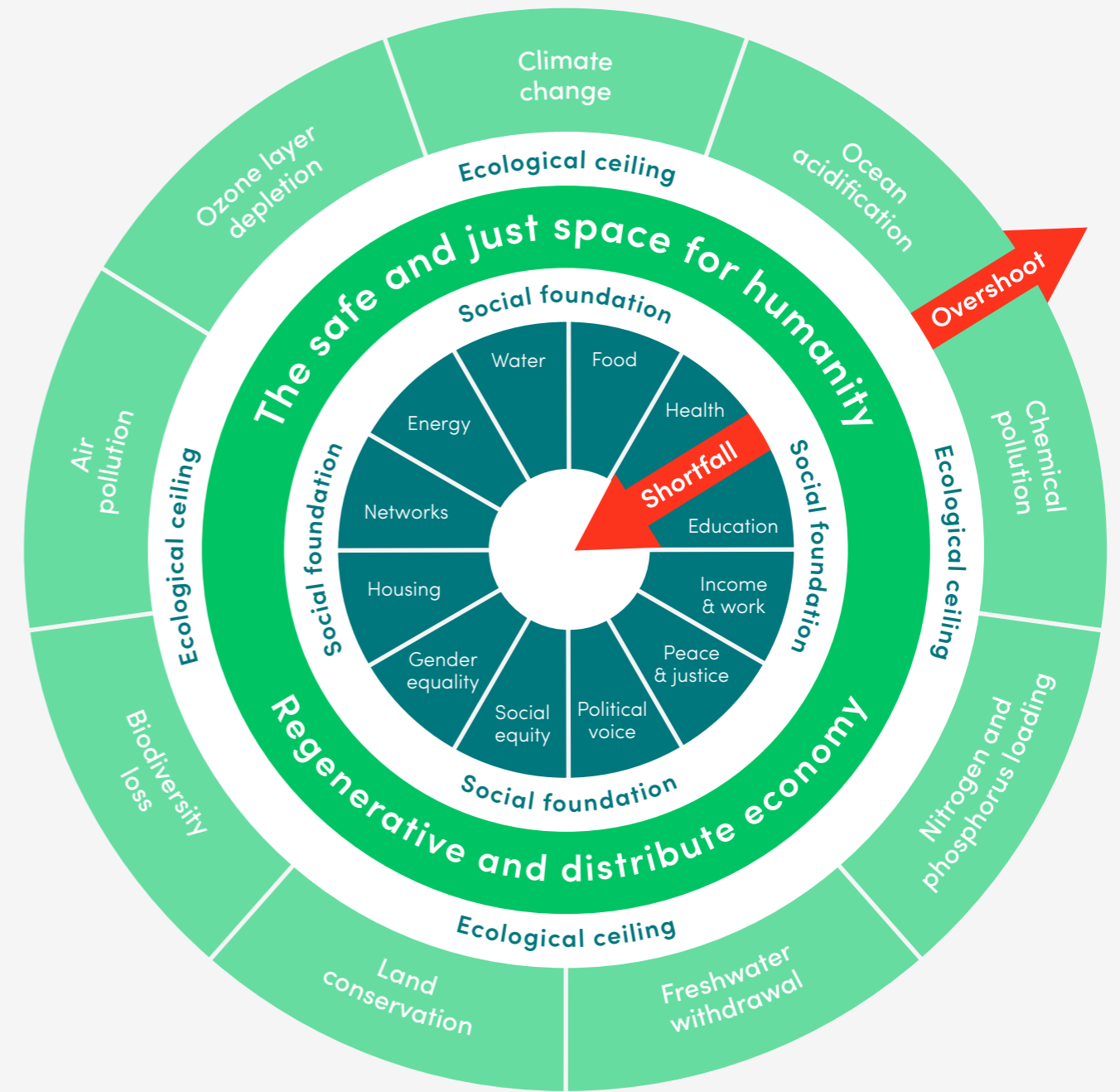


Figure 2: The doughnut of social and planetary boundaries.



Approaches being implemented in early recovery packages¹²



Europe

EU's Recovery Plan¹³

€1.8tn in short-to-long-term support through the MFF & Next Generation EU. Plan will integrate EU Green Deal objectives by directing 37% of Next Generation EU funds to meet Green Deal goals. An updated EU Industrial Strategy¹⁴.

Approaches

Reduced Burdens for Investment and Project Development, Innovative Regulations, R&D Support and Grants, Eased Accessibility to Finance, Investment in New and Green Infrastructure, Support to Labour Markets and Education.



British Columbia (Canada)

British Columbia's COVID-19 Action Plan

Income supports, tax relief and funding for people, businesses and services. New support to help businesses reopen, adapt, hire, rehire, and grow: SME grants, tax credit, rebate to buy select machines and equipment, and fast-track skills training programs.

Approaches

Fiscal Policy, Eased Accessibility to Finance, Support to Labour Markets and Education, R&D Support and Grants.



Republic of Korea

Korea's Financial Stimuli

Korea's Financial Stimuli for internal and local tax and financial support. **Supplementary Budgets** for spending on green and digital markets and additional financial support. **New Deal** to strengthen employment, renovation of buildings, production of EVs and to rebalance territorial development. Projects included will be developed by local governments. Projects can include disaster management systems. **Industry Stabilisation Fund** to support seven key industries¹⁵.

Approaches

Reduction of Fiscal Responsibilities, Innovative Regulations, Investment in New and Green Infrastructure, Support to Regional Industrial Capabilities, Responses to Natural Disasters and Long-Term Resiliency.



North Rhine-Westphalia (Germany)

North Rhine-Westphalia Action Plan

The region has assembled a €3.6 bn recovery package which seeks to provide short-term response and stimulation through investments in green infrastructure, amongst others. The programme is also centered around providing sustainable growth in the long term¹⁶. Alongside this package, NRW.BANK launched a package to assist businesses and entrepreneurs with a range of equity and debt capital solutions to invest in growth¹⁷.

Approaches

Eased Accessibility to Finance, Investment in New and Green Infrastructure.



Lombardy (Italy)

Lombardy's Investment Plan

Three-year investment plan worth €3bn to support local economy. Investment for public works, energy efficiency, renewable energy, urban re-development and sustainable development, sustainable mobility.

Approaches

Investment in New and Green Infrastructure.



Brazil

Brazil's Package Measures

Relaxed rules for entering contracts with states and municipalities and loosens rules around processes for payment of such contracts. Direct transfers, suspension of debts with the federal government for six months and suspension of payment of debts with public banks in 2020.

Approaches

Reduced Burdens for Investment, Reduction of Fiscal Responsibilities, Eased Accessibility to Finance.



- 12 Allain-Dupré, Dorothee, et al. "The territorial impact of COVID-19: Managing the crisis across levels of government." *OECD* (2020).
- 13 European Commission: Recovery Plan for Europe
- 14 European Commission: Updating the 2020 New Industrial Strategy: Building a stronger Single Market for Europe's Recovery (2020)
- 15 UNESCAP, Republic of Korea: Policy Responses (2021)
- 16 The Climate Group, Building Back Greener: Regional Plans [project](#) (2020)
- 17 European Association of Public Banks [article](#) (2020)



Figure 3: Six potential key benefits of a green recovery for heavy industries that address both the social and ecological dimensions.

By applying the doughnut framework, **six potential benefits of a green recovery for heavy industries were identified covering both the ecological and the social dimensions**, as shown in **Figure 3**. These benefits, listed below, relate to specific ecological and social dimensions portrayed in the doughnut framework, indicated within parenthesis:

- **Carbon emissions reduction (climate change, ocean acidification).**
- **Waste and pollution reduction (air pollution, chemical pollution).**
- **Job creation and safeguarding (income and work).**
- **Education and skills development (education).**
- **Just transition (social equity).**
- **Improved global health (health).**

While the above benefits do not represent the only potential benefits from policies in support of the green recovery, it is useful to reflect how past and proposed policy initiatives address any of the above, as it will aid policy makers across the globe to identify ways to address multiple policy priorities while supporting a green recovery.





Global or local economic crises can often abruptly impact all industries and economic sectors across the world.



03

Options for a green recovery

To study and formulate the set of policy options to enable a green recovery in heavy industry described in Chapter 4, a preliminary investigation through desk-based research and stakeholder engagement was carried out. The outcomes of this investigation are presented in this chapter.

The first section provides an overview of policy options implemented in the past by national or regional governments to enable a recovery from crises that affected the

heavy industry sector. The following section evaluates the technology options available for the decarbonisation of heavy industry, the promotion of which could favour a green recovery. Finally, the last section investigates alternative creative solutions.



Figure 4: Overview of approaches implemented in the past to overcome economic crises.

3.1 Options from the past: review of approaches to overcoming previous economic crises

Global or local economic crises can often abruptly impact all industries and economic sectors across the world. Furthermore, heavy industry in certain regions can also be exposed to sector-specific crises, such as persistent decline in industrial activity resulting from relocation of sites, foreign competition or reduction in the demand for products. Both forms of economic downturn are undesirable, commonly resulting in a reduction in industrial activity and socioeconomic benefits.

This section looks back on approaches used by governments to overcome previous economy-wide or industry-specific crises caused by financial, social or environmental triggers or events. To provide a full picture, a wide range of supranational, national and subnational measures previously implemented are identified and depicted in the map. These measures have been grouped into a total of eleven approaches depending on their nature.

Direct Industry Bailouts

Direct Industry Bailouts refers to the provision of money and/or resources to industries which are at risk of bankruptcy when the failure of one or more companies would result in an adverse impact reverberating to the wider economy. Examples of Direct Industry Bailout measures include government emergency

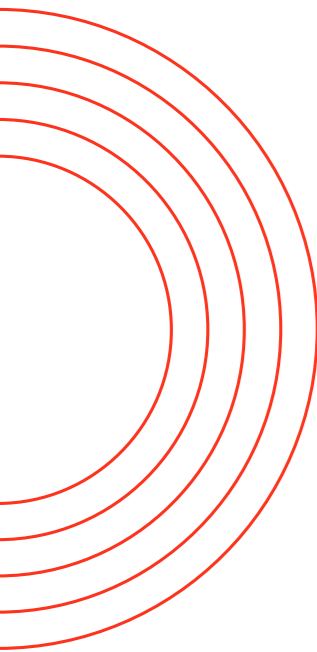
loans, direct government payments to industry workers, redundancy payments and government purchase of stock ownership.

A key policy example of Direct Industry Bailout is the **United States' 2008 to 2014 bailout to the automotive sector**¹⁸. This measure saw the lending of \$80bn and the purchase of stock ownership by the Treasury Department to Detroit's Big Three automakers (General Motors, Ford and Fiat Chrysler). To increase industry competitiveness against foreign automakers, the Obama administration used the move to set new auto efficiency standards and increase air quality¹⁹. According to literature, the outcomes of the measure were ambivalent. The companies returned to profitability within three years and remain at present more financially viable. However, the bailout came at a total cost to taxpayers of around \$10bn, and this form of protectionism led to a high cost per job saved²⁰.

Eased Accessibility to Finance

This approach refers to facilitation from the government for industries to access financial services and/or credit from financial institutions. These institutions can be varied, such as regional public banks or private institutions working closely with regional governments.

18 Warwick, K. and A. Nolan (2014-07-03), "Evaluation of Industrial Policy: Methodological Issues and Policy Lessons", OECD Science, Technology and Industry Policy Papers, No. 16, OECD Publishing, Paris;
 19 What Happened During the Auto Industry Bailout?, *The Balance* (2020)
 20 Spilimbergo, Antonio., et al. "Fiscal policy for the crisis." (2008).
 21 O'Sullivan, Eoin, et al. "What is new in the new industrial policy? A manufacturing systems perspective." *Oxford Review of Economic Policy* 29.2 (2013): 432-462.



A key policy example within this approach is **Germany's ongoing 2008 Central Innovation Programme for SMEs**.

Following the global financial crisis, this policy streamlined four existing innovation programmes into one, raising funds to a total of €1.5bn under Germany's Second Stimulus Package. The outcomes of this policy were broadly favourable, both for the beneficiaries and for the linked supply chains. The programme helped SMEs maintain their long-term strategy and resulted in high multipliers by stimulating production, new research & development (R&D) projects and employment benefits^{18,21}

Other examples of previous use of this approach include North East England's Northern Powerhouse Strategy, EU's SME credit guarantees under the Competitiveness and Innovation Programme and multi annual programme and France's National Territorial Renewal Fund^{22,23,24}.

Support to Labour Markets and Education

Support to Labour Markets and Education refers to employment-related policies which aim at safeguarding existing employment, investing in education and accelerating employment transition following major industrial closures.

A key policy example is **England's 2015 SSI Task Force Jobs and Skills Investment Funds**, a suite of measures adopted when three thousand jobs were lost after the closure of SSI UK Steelworks facility in Tees Valley²⁵. A Task Force provided tailored

support to affected communities and affected businesses, whilst the Skills and Investment Fund was run by the local authority. The measures were successful at mitigating the impacts of the closure. Within a year, over 15,000 training courses had been approved, 800 jobs were created and 400 safeguarded, whilst around 170 new businesses were started²⁶.

Other Support to Labour Markets and Education measures include the US' National Industrial Recovery Act of 1933²⁷, Germany's vocational training programme, Norway's support for restructuring areas, Finland's Proactive Framework for Sudden Structural Changes and Netherlands' Action Plans²¹.

Investment in New and Green Infrastructure

This approach refers to the public procurement of, and expenditure in, public goods and services which can enhance the efficiency of industrial activity and facilitate industrial emissions reduction pathways via private sector investment.

This policy can help re-invigorate regions that are experiencing an industrial decline, and governments can use public procurement policies to ensure that investments into public infrastructure are well aligned with decarbonisation goals.

A policy within this approach which is widely reported in literature is the **EU's €200bn 2008 European Economic Recovery Plan**²⁸. The policy saw extensive action being taken at all governmental levels of the EU to help industry, among



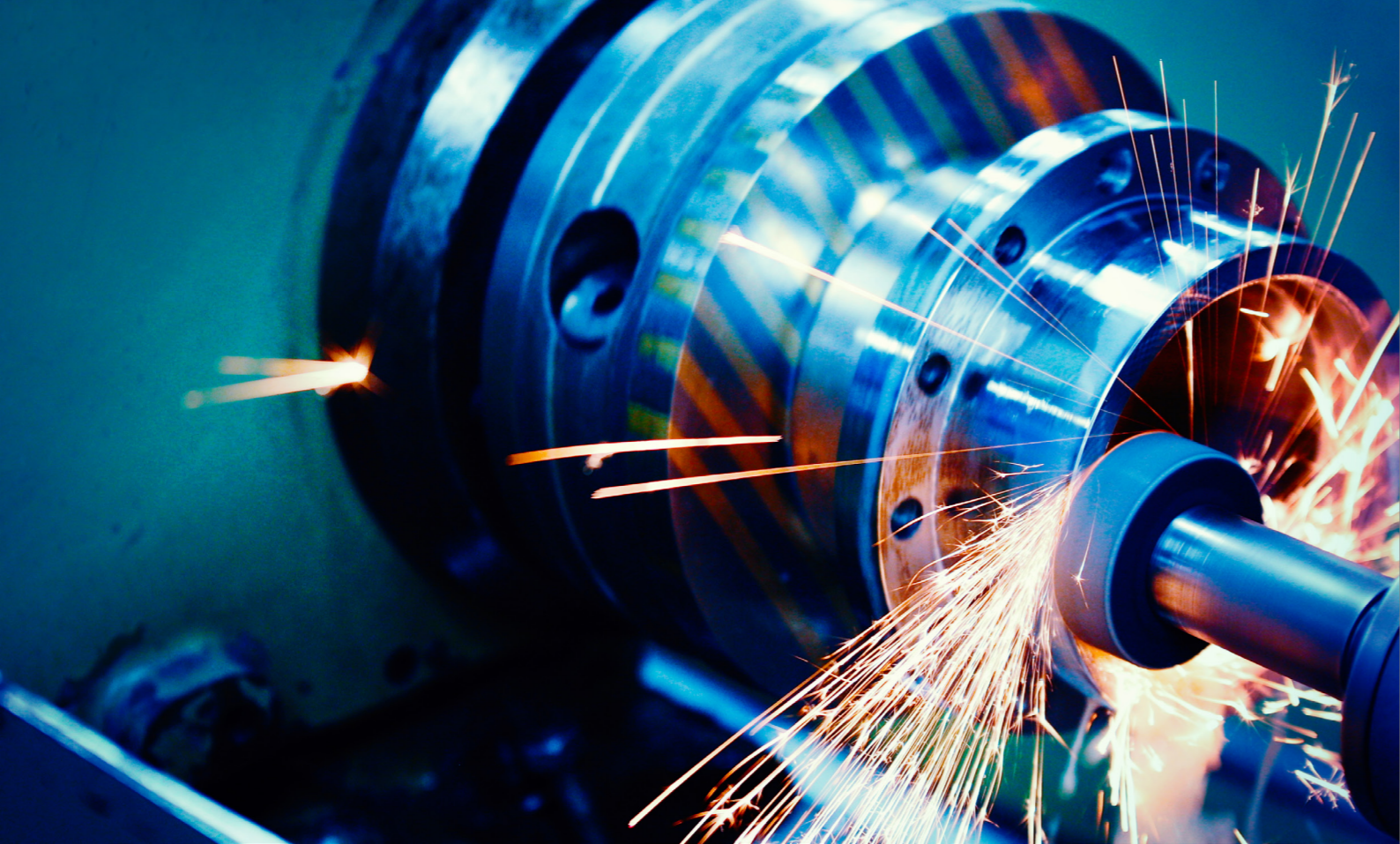
other sectors. The recovery plan focused on "smart investments", aimed at modernising infrastructure and inter-connection to promote energy efficiency, productivity and innovation²⁹. Outcomes of the policy were mixed. The construction and automobile sectors were notable beneficiaries of the policy. Effects of the recovery plan were short-lived, leading to a rise in GDP in numerous countries during 2010-11, followed by a fall in 2012 and a rise in unemployment³⁰. However, policy effects are challenging to isolate, as the policy was

implemented when the sovereign debt crisis hit in many Member States. In addition, a survey concluded that implementation of the Plan was slowed down due to a lack of coordination between organisations at the EU, national and subnational government level³¹.

Additional examples within this approach include Denmark's Renewal Fund, Italy's support to complex industrial crisis areas, the EU's approach to industrial policy and China's Strategic Energy Industry^{21,32,33}.

22 HM Government [Report](#), Northern Powerhouse Strategy (2016)
 23 Brault, Julien, and Simone Signore. The real effects of EU loan guarantee schemes for SMEs: A pan-European assessment. No. 2019/56. EIF Working Paper, 2019.
 24 Tetyana Korneyeva, The Response of France in Light of the Global Economic Crisis – the Case of Paris. Seminar. (2011)
 25 University of Strathclyde Glasgow: Regional Policy Intervention for Industrial Areas in Crisis (2017)
 26 SSI Task Force publishes "One Year On" Report. SSI Press release (2016)
 27 Weinstein, Michael M. "Some macroeconomic impacts of the national industrial recovery act, 1933-1935." *The great depression revisited*. Springer, Dordrecht, 1981. 262-281.

28 European Commission: Communication from The Commission To The European Council A European Economic Recovery Plan (2008)
 29 The Commission launches a major Recovery Plan for growth and jobs, to boost demand and restore confidence in the European economy, [European Commission](#) (2008)
 30 How Europe Revived the Economy through Green Spending in 2008, [Energy Tracker Asia](#) (2020)
 31 Committee of the Regions, Survey on European Economic Recovery Plan in Regions and Cities: One Year On (2010)
 32 European Commission, A Stronger European Industry for Growth and Economic Recovery (2012)
 33 Naughton, Barry. "The Rise of China's Industrial Policy 1978 to 2020." (2021).



R&D Support and Grants

In this approach, governments can support R&D activities in industry and academia (or joint ventures) to advance maturity of technologies which can raise industrial productivity and address industry challenges. Due to their public nature, these funds can be used to support R&D activities not otherwise targeted by the risk-averse private sector. Support can be provided in the form of direct subsidies and tax incentives but also in the form of reduced fees for patent application.

The US's 2009 Advanced Research Programme Agency – Energy (ARPA – E), a strand of the American Recovery and Reinvestment Act's is a key example of policies focusing on R&D activities. Over

\$1.5bn was used to accelerate the implementation of transformative energy technologies for the heavy industry. The focus of the Act was on technologies that can meet long-term energy challenges, including power generation, CCUS, energy storage and efficiency, and electric vehicle batteries³⁴. The impact of the Act has been reported to be primarily positive, with 45 projects having sparked follow-on investments totalling \$1.25bn from the private sector and industry as of 2017. Over 35 projects produced 100 new patents and led to the creation of new companies³⁵.

The EU's public-private partnerships and R&S tax credits and Germany's Energy and Climate Fund are additional R&D Support and Grants example measures previously implemented.^{21,36}

34 Zandi, Mark. "The economic impact of the American Recovery and Reinvestment Act." Report. January 21 (2009)

35 ARPA-E: Accelerating U.S. Energy Innovation, ARPA-E (2017)

36 Guellec, Dominique, and Sacha Wunsch-Vincent. "Policy responses to the economic crisis: Investing in innovation for long-term growth." (2009).

Reduction of Fiscal Responsibilities

This approach entails the temporary or permanent reduction or elimination of certain tax responsibilities for industries, that allow companies to increase spending in internal areas of growth. Multiple measures can be used within this approach, such as Value Added Tax (VAT) reductions, tax rebates and reliefs, discounts on business tax rates, increased ceilings on tax brackets or exemptions.

A good example of Reduction of Fiscal Responsibilities are the **UK's Enterprise Zones**. Enterprise zones are restricted geographical areas in which businesses and industry are offered either discounts on tax rates or tax reliefs in the form of tax increment financing, among other measures³⁷. The Zones are selected by the central government, but implementation of measures occurs at the local level. The aim of these Enterprise Zones is to support development in selected sectors facing structural barriers to achieve long-term growth²⁵. Outcomes of this policy have been mixed and regionally different. Overall, only 25% of jobs forecast were delivered, mostly in the form of low-skills requirement jobs. In some cases, the added jobs resulted from employment relocation rather than from new employment creation³⁸.

Reduced Burdens for Investment and Project Development

This approach includes measures to reduce some regulatory burdens that may hamper new private investment into growing the industrial base. Examples of this approach are the reduction of bureaucracy and administrative burdens and costs, simplification of planning and permitting, relaxation of investment regulations, direct investment deregulation and more administrative measures such as ensuring public authorities pay invoices to the private sector.

A comprehensive policy example is **EU's 2007 Action Programme**, implemented during the global financial crisis. The European Commission targeted a reduction of 25% by 2012 of the over €120bn administrative costs imposed on businesses by EU legislation and its transpositions by national and subnational governments³⁹.

The outcomes of the policy – which simplified and codified legislation in 13 priority areas – have been overwhelmingly positive. Over €30bn in annual savings for businesses have been materialised, and the Action Programme has now brought a priority focus seeking to implement new policies in the least burdensome manner for businesses.

37 Tax increment financing is a public subsidy targeting redevelopment of infrastructure financed through future tax revenues.

38 In the zone? Have enterprise zones delivered the jobs they promised? Centre for Cities (2019)

39 European Commission, Action Programme for Reducing Administrative Burdens in the EU Final Report (2012)

40 Sporek, T. "The Prospect and Role of Katowice Special Economic Zone in Poland /The EU Government Point of View for SEZ." (2004)

41 Okazaki, Tetsuji, Ken Onishi, and Naoki Wakamori. Excess Capacity and Effectiveness of Policy Interventions: Evidence from the cement industry. RIETI, 2018.



Support to Regional Industrial Capabilities

This approach seeks to promote collaboration and cooperation activities between stakeholders of regional industry: private industry, policymakers, trade associations and other public organisations in order to build regional industrial strengths.

A lasting example of Support to Regional Industrial Capabilities is **Silesia's 1995 Regional Contract** in Poland. In this contract, regional authorities took forward a 20-year "social contract" with the central government in order to address the production and employment decline of the region's heavy industrial base. Regional government, trade unions, local community

and entrepreneurs worked together with the central government to stipulate the contract⁴⁰. The contract introduced multiple measures, such as local training, grant provisions and company aid, eased access to finance and establishment of a Special Economic Zone with tax privileges²⁵. The outcomes of the contract have been positive, but progress has been hindered by legal barriers as well as political influences.

Other measures implemented in past crises include Austria's *Förderungsaktion für Eigenständige Regionalentwicklung*, Germany's Experimentation Clause in Lausitz and Japan's Temporary Law for Structural Improvement of the Special Industries for the cement sector^{21,41}.

Adjusting Industrial Trade with External Regions

This approach refers to the use of trade policy and trade channels to regulate trade export and import intensity, either as a form of protectionism or to strengthen endogenous industry competitiveness through increased international competition. This approach can be implemented by directly supporting exports, trade reforms, internationalisation of industry, imposing tariff ceilings, foreign direct control investment or through more innovative measures such as border carbon adjustment.

An example of this approach was **Indonesia's 1967-97 trade reform for the manufacturing sector**. Indonesia expanded its economy to external markets to combat a persistent internal economic crisis and to comply with international commitments. The trade reform was a multi-measure package which reduced tariff levels and non-tariff barriers, relaxed regulations for international direct investment, among other measures⁴². Outcomes of the policy were very positive, as the Indonesian manufacturing industry managed to increase technical efficiency, especially in the chemicals industry.

Another example within this approach is India's Industrial Reforms of 1991 for New Economic Policy⁴³.

Innovative Regulations

Innovative Regulations include all measures intended to better understand the relationship between industry and industrial policy, and the effects that the latter has on industrial long-term competitiveness.

A well-documented policy example is the **EU's 2010 Smart Regulation Strategy**, which saw the introduction of Fitness Checks to evaluate the regulatory framework around policy areas⁴⁴. Fitness Checks were used to identify regulatory gaps, overlaps, inconsistencies and burdens, and the impact of these on specific industry sectors, such as the aluminium and refining sectors. Policy evaluation can indirectly lead to positive outcomes, as it provides a quantitative evaluation of industry margins and changes in competitiveness against foreign counterparts. Subnational governments play a role of consultation through the Committee of the Regions. As a result, improved understanding of industry characteristics and cause-effect between policy and industry performance can lead to better future policy design.



42 Suatmi, Bernadetta Dwi, Harry Bloch, and Ruhul Salim. "Trade liberalization and technical efficiency in the Indonesian chemicals industry." *Applied Economics* 49.44 (2017): 4428-4439.

43 Burange, G., and Shruti Yamini. "A Review of India's Industrial Policy and Performance." *eSocialSciences Working Papers* id: 3964 (2011).

44 European Commission, *Smart Regulation in the European Union* (2010)

45 World Bank. 2020. "Resilient Industries in Japan: Lessons Learned in Japan on Enhancing Competitive Industries in the Face of Disasters Caused by Natural Hazards." World Bank, Washington, D.C.

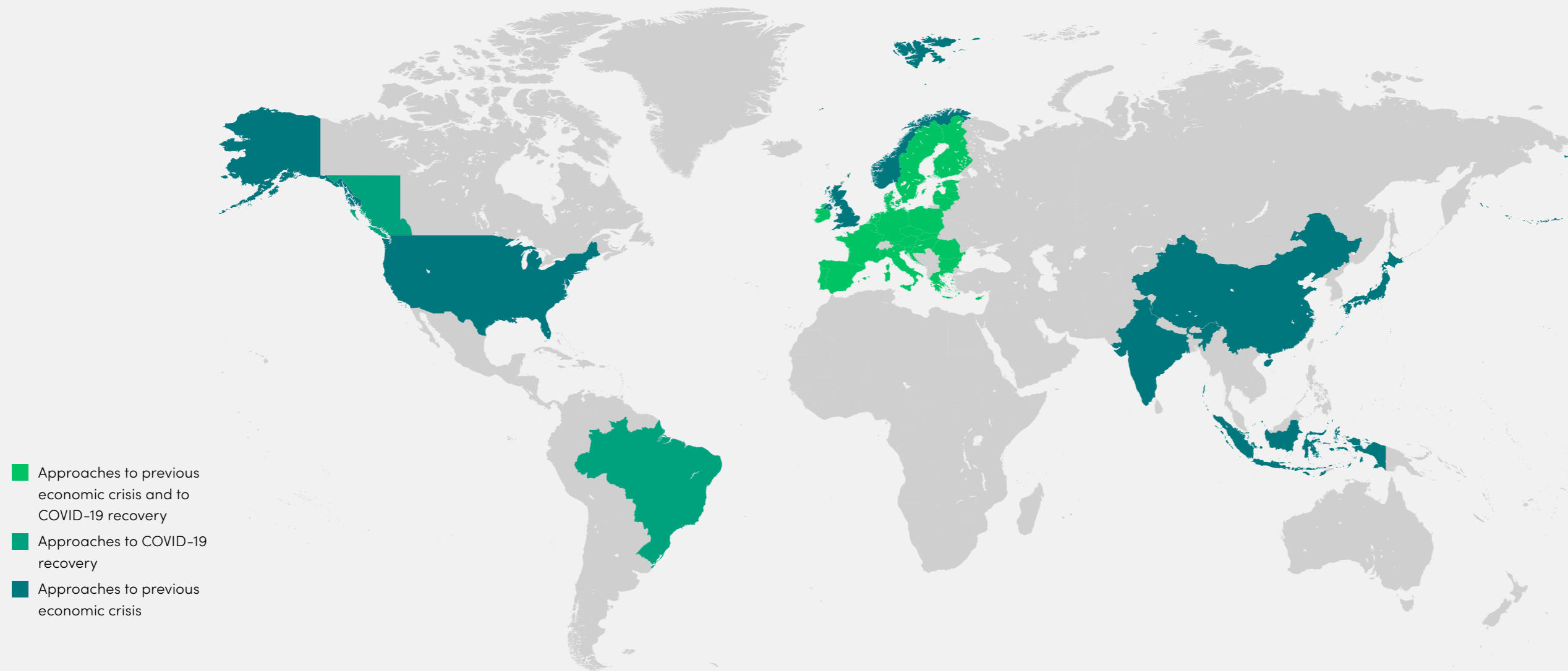


Figure 5: Countries in which the investigated policy examples were applied to overcome economic crises.

Natural Disasters Response and Long-Term Resiliency

This approach includes measures responding to large-scale natural disasters, which may abruptly result in the unforeseen interruption of industrial activity, or which can cause an industrial shock to output or employment. The approach can also include responsive measures to increase long-term preparedness. Examples within this approach can be one or a combination of the approaches presented in this chapter, but typically their implementation is accelerated and aimed at providing

short-term response. Measures include clean-up work, environmental reclamation, mediation of disputes for compensation, grants and loans for reconstruction, creation of agencies for multi-level coordination, frameworks for all hazards response, and many others.

A recent policy example was **Japan's 2011-2019 Emergency Guarantee Program for Recovery from the Great East Japan Earthquake**. Credit guarantee corporations around Japan's prefectures jointly launched a guarantee programme for SMEs damaged by the disaster, or SMEs that

suffered sales reductions⁴⁵. These corporations worked closely with regional banks and local credit unions to provide over 130,000 guarantees – with a total credit exposure of over \$24bn – to bring back SME stability and recovery whilst improving their creditworthiness.

Other nNatural Disasters Response and Long-term Resiliency examples include Japan's Financial Corporation and Act on Special Zones or Reconstruction; US' National Response Framework for Hurricanes and New Zealand's Earthquake Support Subsidy for Earthquakes and package for trades training.^{46,47,48}

46 Umeda, Sayuri. "Japan: legal responses to the Great East Japan Earthquake of 2011." *The Law Library of Congress, Global Legal Research Center (September), law@ loc. gov.* 2013.

47 Cheong, So-Min. "From frequent hurricanes to the Deepwater Horizon oil spill in coastal Louisiana: the impact of regulatory change." *Ecology and Society* 19.2 (2014).

48 Stevenson, J. R., et al. "Organizational networks and recovery following the Canterbury earthquakes." *Earthquake Spectra* 30.1 (2014): 555-575.

3.2 Technology options to decarbonise heavy industry

The previous section outlined a broad range of approaches to support the economic recovery following past crises. In the context of supporting a green recovery for heavy industries it must also be considered that policy should simultaneously help industries invest in decarbonisation.

There are four distinct pathways for decarbonising heavy industry. The first three relate to measures that can be implemented by individual sites with minimal impact to their value chains.

The fourth relies on a broader shift in the way industrial products fit within the economy, potentially affecting what feedstocks are used in manufacturing products as well as how products are handled at the end of their useful life. Each site may be able to implement multiple pathways at the same time.

Examples of specific options within each pathway – often applicable to some industrial sectors but not others – are summarised in **Table 1**.



Decarbonisation pathway 1: Energy efficiency

Increasing energy efficiency, which entails implementing ways to better use the electrical power and heat available while minimising energy wastage, thus reducing the amount of energy required to produce a given amount of industrial output.



Decarbonisation pathway 2: Fuel switching

Replacing the fossil fuels used to generate electricity and heat in boilers, furnaces and other industrial processes with electricity or low-carbon hydrogen. This is known as fuel switching.



Decarbonisation pathway 3: CCUS

Carbon capture, utilisation, and storage (CCUS), i.e., capturing the carbon dioxide emitted within industrial processes to then either use it as feedstock for other products or permanently sequester it in geological stores.⁴⁹



Decarbonisation pathway 4: Systemic efficiency & circularity

Improving energy and resource efficiency on a systemic level and promoting a circular economy includes the use of scrap as feedstock instead of virgin materials, which often reduces the process energy requirements (e.g. in the steel industry).

49 It should be noted that the carbon reduction potential of the CO₂ utilisation (CCU) and CO₂ storage (CCS) pathways may significantly differ, especially if the

50 DRI = direct reduced iron; EAF = electric arc furnace. EAF producers use steel scrap or direct reduced iron (DRI) as their main raw material.

51 E.g., kilns using a mix of biomass, hydrogen, and electric plasma gas.

52 BF = blast furnace; BOF = basic oxygen furnace. Integrated BF/BOF is the most common steelmaking route.

Decarbonisation pathways	Examples	Deployment barriers
 Energy efficiency	<ul style="list-style-type: none"> • Waste-heat recovery • Optimised energy use 	<ul style="list-style-type: none"> • Long payback times • Impact on production process • Limited residual potential for improving efficiency
 Fuel switching	<ul style="list-style-type: none"> • Hydrogen-based DRI + EAF for steel production⁵¹ • Mixed-fuel cement kilns⁵¹ • Hydrogen and electric furnaces or boilers 	<ul style="list-style-type: none"> • Higher energy costs • Infrastructure constraints affecting both the electricity grid and hydrogen distribution • Technology maturity often low, especially for hydrogen • Potential impacts to product quality
 CCUS	<ul style="list-style-type: none"> • On integrated BF/BOF⁵² • On clinker calcination process • On olefins steam cracker • On ammonia production 	<ul style="list-style-type: none"> • Lacking business case / clear ownership models • Maturity of capture tech for specific sectors • Availability of infrastructure for CO₂ transport and storage • High energy requirements for capture • Operational challenges such as increased downtime
 Systemic efficiency & circularity	<ul style="list-style-type: none"> • Increasingly circular economy, inc. increased use of scrap, products redesign • Product substitution, e.g., of concrete with timber 	<ul style="list-style-type: none"> • Changes in demand may threaten existing plants • Willingness to pay price premium for 'green' not yet demonstrated in most industrial contexts • Strict regulatory standards, e.g., within construction industry, can be hard to meet for innovative products

Table 1: Decarbonisation options and barriers to their deployment

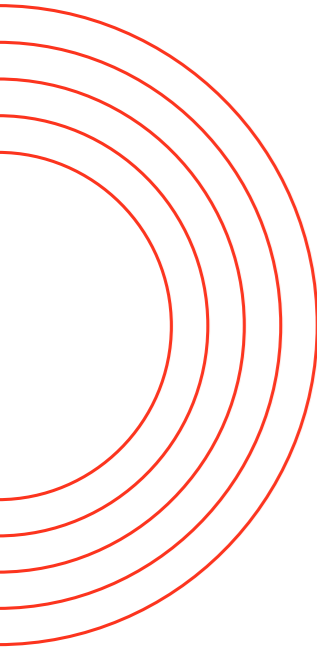


Table 1 also indicates the main barriers hindering deployment of each solution today. These can be broadly categorised into technology-, economics-, and infrastructure-related barriers. The main **technology barriers** relate to the low maturity⁵³ of some of the proposed solutions, which deters potential adopters from investing in first-of-a-kind until the main risks are satisfactorily mitigated and uncertainties are cleared.⁵⁴ Adverse economics, absence of clear market drivers (including supporting policies), and uncertain ownership structures make for a **challenging business case** for most of the decarbonisation options considered.⁵⁵ Even where technologies are mature and a business case could be found, **infrastructure unavailability** risks delaying uptake. Substantial new infrastructure will indeed be required before electrification, hydrogen fuel switching and CCUS can be deployed, including an upgraded electricity grid, hydrogen distribution networks and CO₂ networks.⁵⁶

It therefore appears that governments wanting to support a green recovery for heavy industries could consider ways to accelerate technology development and demonstration, establish a business case through economic incentives or regulations and support the construction of the required enabling infrastructure.

It is also useful to consider that investment in the decarbonisation of heavy industries could unlock **potential opportunities and broader benefits**, some of which are summarised in **Table 2**, which may justify the effort required to overcome the significant challenges presented above.

For instance, investment in forms of energy efficiency that are not already economical for individual sites could make economic sense when a broader perspective is considered, for instance when using excess industrial heat for district heating.

As for hydrogen fuel switching and CCUS, their uptake could help transition workers within carbon-intensive sectors to new low-carbon sectors, thus aiding in the

delivery of a just transition. In addition to leveraging existing skills, both hydrogen and CCUS may furthermore help make use of existing assets and safeguard existing jobs. This would for instance be the case when carbon capture is retrofitted to existing plants and natural gas appliances are converted to use hydrogen.

Instead, the diffusion of circular economy practices could simultaneously reduce the amount of waste heading to landfill – hence reducing the related environmental hazards – and increase security of supply for valuable materials.

It is worth noting that industrial decarbonisation can open new opportunities for local economies. Indeed, decarbonised industries could expect to be better able to compete in a decarbonising world where low-carbon products can claim a price premium. Early movers within emerging markets for low-carbon products may find it easier to establish themselves as long-term leaders, supporting local ‘clean’ growth and unlocking novel exports markets from industrial regions. Regions that move early in developing low-carbon hubs may also find it easier to attract inward investments from developers seeking to build new low-carbon enterprises. This would simply require that the enabling infrastructure is developed from an early stage with the potential of future expansion in mind.

Finally, improved working environments and cleaner air quality resulting from certain decarbonisation pathways may make industrial jobs and their neighbourhoods more appealing, thus unlocking a broader range of social benefits across the local communities. When considering this broad range of potential co-benefits of investing in decarbonisation, governments may find it more acceptable – politically as well as economically – to support such investments.

Decarbonisation pathways

Potential opportunities

Broader benefits



Energy efficiency

- Operational cost reductions and increased competitiveness

- Cross-sectoral synergies (e.g., with district heating)



Fuel switching

- Possibility of installing new hydrogen-ready appliances or retrofit old gas appliances to run with hydrogen

- Valorising existing assets (e.g., industrial appliances, gas grid)



CCUS

- Access shared infrastructure from emerging cluster projects to
- Low-regret action where CCUS is the only option

- Leveraging skills of carbon intensive industries



Systemic efficiency & circularity

- Valorising waste
- Reducing operating costs

- Lower reliance on raw materials imports, enhanced security of supply & trade balance
- Reduced waste disposal and related environmental impacts

Table 2: Opportunities and broader benefits of the different decarbonisation options

⁵³ Even when a solution can be considered technologically mature, it is often not commercial mature.

⁵⁴ For instance, the potential impacts on industrial processes and final product quality must be fully understood before investment can take place.

⁵⁵ An exception is energy efficiency, which can deliver economic benefits as well as carbon reduction, especially for energy-intensive industries where energy constitutes a significant share of the operating cost.

⁵⁶ These networks may be based on pipelines or on e.g. shipping, trucking, and rail transport.

In addition to investing in decarbonisation, subnational governments may leverage creative approaches to steer the recovery towards a greener, healthier, economy

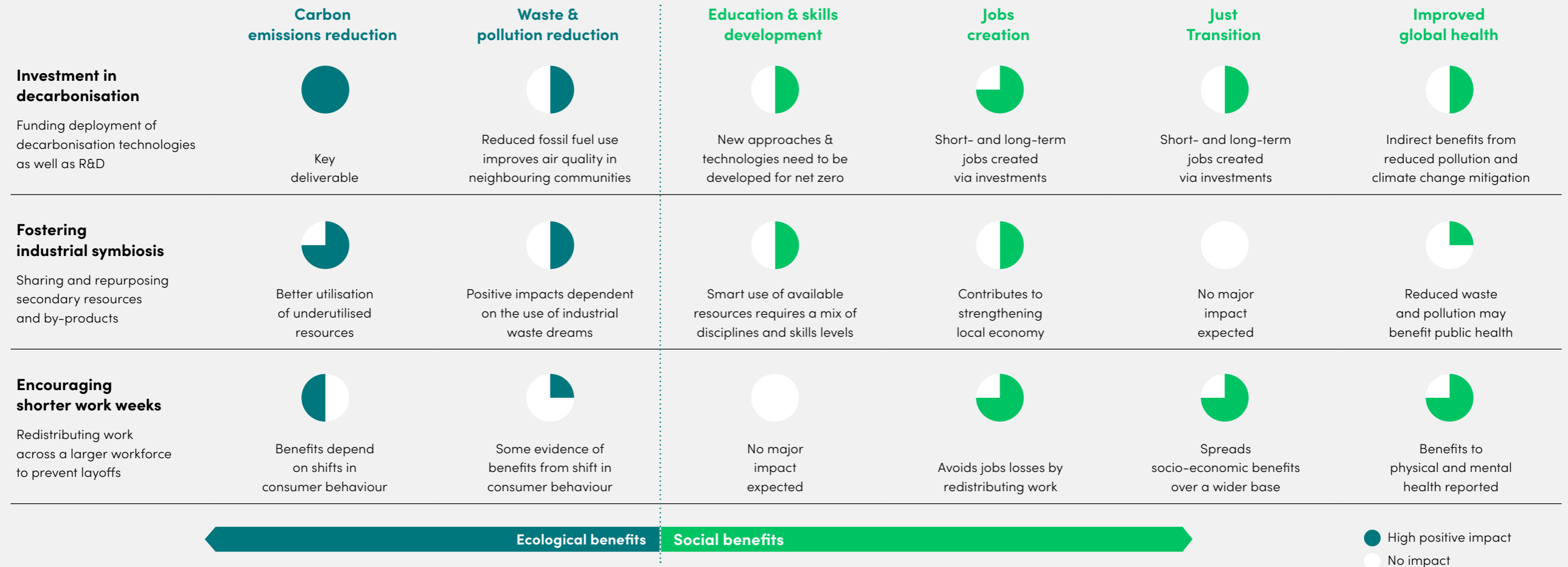


Figure 6: Creative approaches to stimulating a green recovery

3.3 Other creative options with broad system benefits

National and subnational governments may also consider other approaches to steer the recovery towards a greener, healthier economy; shorter work weeks and fostering industrial symbiosis are two of these. While neither of these approaches directly relate or are exclusively aimed at the decarbonisation of heavy industries, both stood out for their ability to offer a

broad range of the ecological and social benefits that could contribute to a green recovery, as summarised in **Figure 6**. The idea that **shorter work weeks** could contribute to environmental and social progress had been gathering momentum even before COVID-19.⁵⁷ According to Autonomy, shorter work weeks can induce

a change in consumer behaviour towards “low-carbon ‘soft’ activities” and “low-carbon alternatives for daily activities such as eating and commuting”. In turn, these shifts could result in reduced carbon footprint and increased air quality. While

these environmental benefits would not directly arise from changes within heavy industries, the diffusion of shorter work weeks could help support a just industrial transition. As reported by the New Economics Foundation “reductions in

57 Autonomy report, The Shorter Working Week: A Radical and Pragmatic Proposal (2019).



working hours, accompanied by the offer of skills retraining and significant levels of support for local, regional and national industrial strategy, could be a central part of an agreed 'just transition' deal between Government, industry and trade unions to support workers in declining high-carbon industry.⁵⁸ This is partly because the redistribution of working hours across a larger number of people could reduce job losses, which explains why multiple organisations including the German union IG Metall has backed proposals for shorter work weeks.⁵⁹

As a further potential benefit, research highlighted the potential mental and physical health benefits arising enabled by more regular free time and reduced levels of overwork and stress. Considering that one in four of all sick days lost in the UK is thought to be a direct result of excessive workload,⁶⁰ there are reasons to expect that a shorten working week could also deliver productivity gains.

A radically different yet similarly creative approach to supporting a green recovery for heavy industries could be to **foster symbiosis within industrial clusters**, "a systems thinking approach [...] to enable process integration and demand pooling across the companies in a cluster".⁶¹ This approach entails promoting the sharing and repurposing of secondary resources and by-products between neighbouring sites. Carbon emissions reductions could result from the sharing of carbon-intensive assets, either by reducing the need to purchase new assets⁶² or by enhancing efficiency in their utilisation, and also from the reduced production of waste. If waste streams from an industrial site are turned into feedstock for neighbouring industrial processes, carbon emissions from waste treatment (e.g. incineration) can be avoided, and additional environmental benefits can materialise via the reduced volumes of industrial waste heading to landfills.

Considering that one in four of all sick days lost in the UK is thought to be a direct result of excessive workload, there are reasons to expect that a shorten working week could also deliver productivity gains.

58 New Economics Foundation report, *Achieving a Shorter Working Week in the UK* (2018).

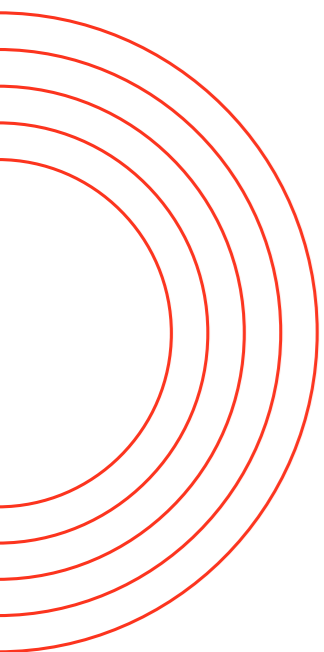
59 Reuters, "German union IG Metall backs four-day week to save jobs". Available at: www.reuters.com/article/us-germany-labour-idUSKCN25B0FG

60 Health and Safety Executive, *Work related stress, anxiety and depression statistics in Great Britain* (2017). Available at: www.hse.gov.uk/statistics/causdis/stress.pdf.

61 Accenture in collaboration with the World Economic Forum, *Industrial Clusters: Working Together to Achieve Net Zero*

62 If so, the emissions from the asset production processes (i.e., "embedded emissions") could be averted.





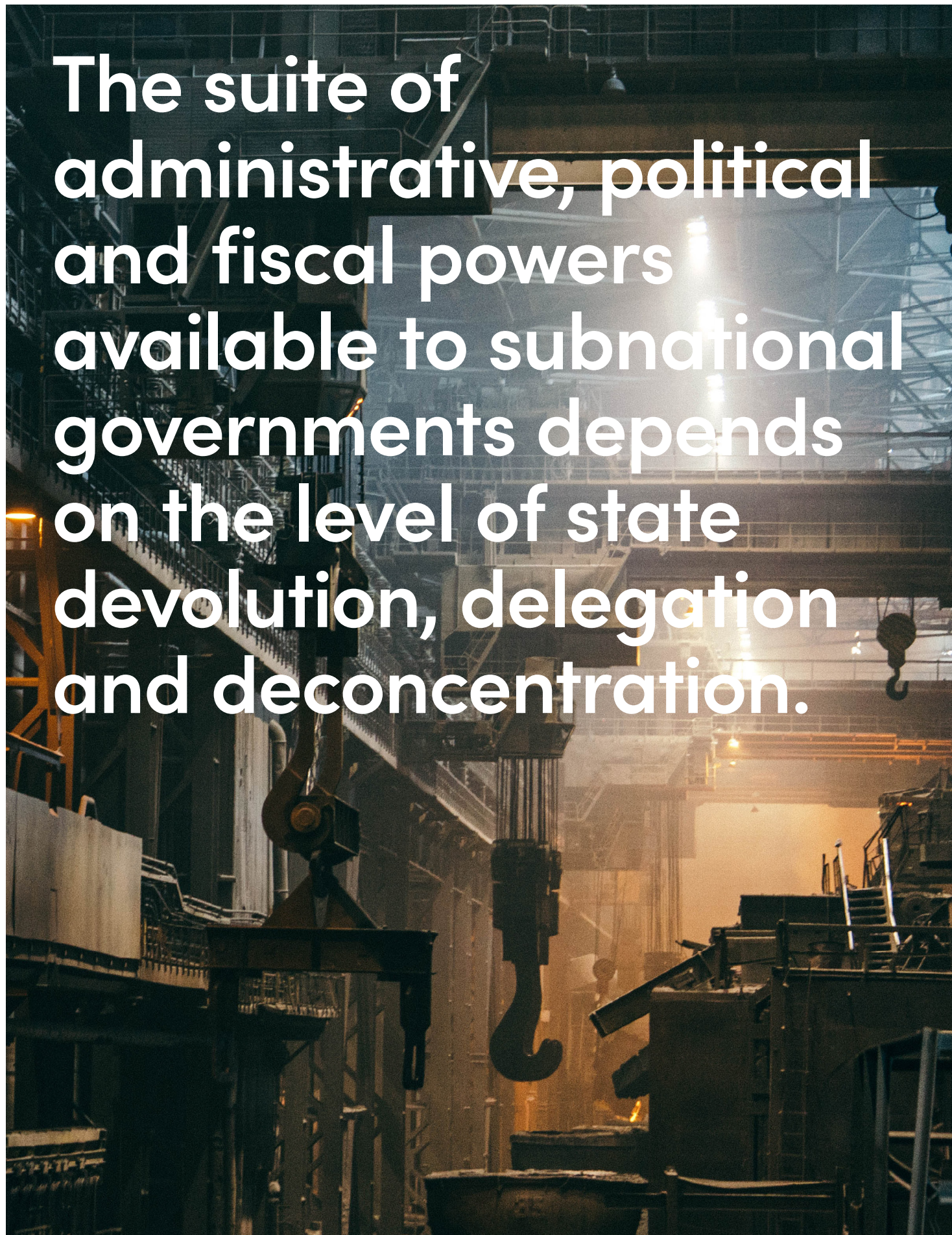
04

The powers of subnational governments and policy options to promote a green recovery

There are various forms of subnational government depending on the governance structure of a country, which can be divided into federal and unitary. In federal states, the sovereignty is shared between the federal government and federal states, whereas in unitary systems the state is governed as a single power, where the national government is supreme. Quasi-federal states are unitary countries with some federal characteristics. Examples of federal states include Australia, United

States, Germany and Canada. Examples of unitary states include the UK, Korea, New Zealand, Italy and Japan.

Subnational governments discussed in this chapter may refer to provincial, regional, intermediary, or municipal governments in both unitary and federal systems, and state governments. In federal systems, the subnational government powers are demarcated by state laws. In unitary states, subnational government powers are



The suite of administrative, political and fiscal powers available to subnational governments depends on the level of state devolution, delegation and deconcentration.



defined in national laws⁶³. In both systems, these laws specify whether a responsibility is a reserved function, whether it is shared with the subnational government or whether a function is an exclusive or delegated power of subnational governments. Subnational government powers vary widely across regions. To better understand this division, this study divides subnational government powers of federal and unitary states into administrative and political powers and fiscal powers:

- **Administrative and Political Powers** refer to the distribution of administration powers as well as political and decision-making authority between different government tiers. It allocates tasks and

functions, including planning, financing, social services and management decisions of public functions such as management of their administrative structure and resources.

- **Fiscal Powers** refer to the distribution of tax and spending allocation responsibilities between different government tiers. Autonomy depends on amount of resource delegation and space for independent fiscal resource management. Revenues may be raised locally or through transfers from national government.

An overview of the powers of federal and unitary states is provided in **Table 3** (summary of Section 4.1)⁶⁴.

63 Allain-Dupré, Dorothée. "Assigning responsibilities across levels of government: Trends, challenges and guidelines for policy-makers." (2018).

64 OECD, "Responsibilities across levels of government", in OECD Regions at a Glance (2016)

	Unitary States	Federal States
Administrative and Political Powers	<ul style="list-style-type: none"> • Level of decentralisation depends on the level of state devolution and delegation. • National government reserves most political matters, giving selected legislative and administrative authority to subnational governments in certain areas. • Subnational governments can have secondary legislative powers, to change certain details of country-wide laws. • Commonly devolved matters can include implementation of welfare and labor market policies, planning and economic development. 	<ul style="list-style-type: none"> • Powers of federal states can vary considerably between subnational governments, but administrative and political powers are distinctly divided between the federal and state governments. • Subnational governments can have their own competences, and these can be exercised separate from, or shared with, the federal government. • Exclusive powers such as foreign or monetary policy continue to rest with the federal government.
Fiscal Powers	<ul style="list-style-type: none"> • Subnational governments are granted lower spending powers than in federal systems, and fiscal rules are imposed by the national government. • National governments retain a higher share of total public investment as well as resulting revenues. • Higher level of fiscal discipline. Direct fiscal controls by the national government are common. • National governments may control regional delegations so as to ensure the fiscal and budgetary responsibilities are fulfilled. 	<ul style="list-style-type: none"> • Allocation of fiscal resources varies between federal systems, but subnational governments have higher fiscal resources, which usually leads to higher regional expenditures. • Subnational governments are endowed with wide fiscal autonomy and so they can implement fiscal policies to levy certain taxes independently. • Central states can still place fiscal rules and constraints on certain areas of fiscal policy such as revenue and spending. Subnational governments may also have to negotiate fiscal targets with national governments.

Table 3: Variations in powers depending on governance structure

4.1 Types of subnational governments powers in states

The suite of administrative, political and fiscal powers available to subnational governments depends on the level of state devolution, delegation and deconcentration^{65,66}. As a result, when it comes to the division of powers between national and subnational governments in unitary and federal states, the distinction is not clear-cut⁶⁷. However, subnational governments in a federal structure tend to be highly decentralised and so federal states generally grant its subnational governments a higher scope of jurisdiction and a higher degree of autonomy to exercise given jurisdiction than in unitary states⁶⁸.

Administrative and Political Powers in Unitary States

In this system, the central government reserves most political matters, only giving selected legislative and administrative authority to subnational governments in certain elements, usually defined in national constitutions. Devolved powers can be substantial in more decentralised states or limited to simple administrative competencies in more centralised others.

National governments may delegate to subnational governments powers, responsibilities or functions on its own accord for convenience. Where this occurs, the legislative competencies granted to subnational governments continue to be

subject to the national legislative framework⁶⁹. Such frameworks may be more or less flexible, thus leading to varying degrees of autonomy regime among countries. Subnational governments can also have secondary legislation powers, granting the opportunity to change certain details of country-wide laws.

Subnational governments can be granted administrative and legislative activities in one certain field – such as implementation of welfare and labour market policies, planning and economic development – or in multiple fields at once, giving the subnational governments traits of a general-purpose government⁷⁰.

Unlike federations, the central government retains the responsibility for all legislative matters, including the jurisdiction assigned to subnational governments. Consequently, the authority of subnational governments in unitary regimes is derived from the central government itself^{71,72}.

Administrative and Political Powers in Federal States

In federal states, administrative and political powers are distinctly divided between the federal and state governments. Political and administrative powers of federal states can vary enormously between subnational governments. Subnational governments

can have their own competences, and these can be exercised separate from, or shared with, the federal government. In the latter case, the subnational government implement legislation which is passed at the national level⁶⁷.

The powers which subnational governments have benefit from a constitutionally guaranteed autonomy. This is because the powers are demarcated in state laws or constitutions, and as a result there can be variations of subnational government authority even within the same country⁷¹.

Even if federal states benefit from more administrative and political powers, exclusive powers such as foreign or monetary policy are a prerogative the federal government and so are shared among constituent subnational governments⁷³.

Fiscal Powers in Unitary States

Subnational governments in unitary states are granted lower spending powers than in federal systems, and fiscal rules are usually imposed by the central government. As a result, the national governments retain a higher share of total public investment⁷⁴. Consequently, subnational governments also have lower access to public revenue from such investments.

In unitary states, there is a higher level of fiscal discipline and so it is common for direct fiscal controls to be established by the national government. These are done to ensure compliance with national fiscal and expenditure targets⁶⁸. Central governments may use and control regional delegations so as to ensure the fiscal and budgetary responsibilities are fulfilled.

Fiscal Powers in Federal States

Allocation of fiscal resources varies considerably between federal systems. However, subnational governments in this system have higher fiscal resources, which usually leads to higher regional expenditures⁷⁵. In federal systems, subnational governments are endowed with wide fiscal autonomy and so they can implement fiscal policies to levy certain taxes independently from the national government⁷⁶.

Institutional arrangements are used to ensure fiscal autonomy between national and subnational governments is consistent and well defined⁶⁸. Even with the higher fiscal autonomy than unitary states, central states can place fiscal rules and constraints on certain areas of fiscal policy such as revenue, spending, borrowing and financing. Federal states may also have to negotiate fiscal targets with central governments, and they usually have margins to ensure compliance with rules set at national level.

65 Saltman, Richard, Reinhard Busse, and Josep Figueras. Decentralization in health care: strategies and outcomes. McGraw-hill education (UK), 2006.

66 Deconcentration occurs when central government control is relocated geographically, shifting responsibilities for policy implementation to its field offices.

67 European Energy Institute. Study on the Division of Powers between the European Union, the Member States and Regional and Local Authorities. Publications Office of the EU. 2010.

68 Cottarelli, Carlo, and Martine Guerguil, eds. Designing a European fiscal union: Lessons from the experience of fiscal federations. Routledge, 2014.

69 European Energy Institute. Study on the Division of Powers between the European Union, the Member States and Regional and Local Authorities. Publications Office of the EU. 2010.

70 OECD/UCLG (2016), Subnational Governments around the world: Structure and finance.

71 Watts, Ronald. "Provinces, States, Länder and Cantons: Content and Variations Among Subnational Constitutions of the World." Subnational Constitutional Governance (1999): 11-22.

72 Responsibilities across levels of government", in OECD Regions at a Glance 2016, OECD Publishing, Paris.

73 OECD/UCLG (2019), 2019 Report of the World Observatory on Subnational Government Finance and Investment – Key Findings

74 Hansjörg Blöchliger, Economics Department and Center for Tax Policy and Administration, O.E.C.D. David King, Stirling University, United Kingdom

75 OECD. COVID-19 and fiscal relations across levels of government, 2020

76 Bahl, Roy. "The pillars of fiscal decentralization." (2008).

Policy options for a green recovery



Figure 7: Overview of policy options to support a green recovery

4.2 Policy options for a green recovery

Chapter 3 looked at the range of approaches which have been previously used to recover from past economic crises. In addition, the chapter characterised the short-term challenges faced by heavy industry for a recovery as well as the technology options needed to support long-term investment in decarbonisation.

Section 4.2 presents a suite of policy options which can be used to provide a green recovery to heavy industry. These policy options emerge from combining Chapter 3 findings with an understanding of powers available to subnational governments. These policy options target a short-term green recovery, and their design

is aligned with, and can set the foundations for, longer-term industrial decarbonisation needs. The policy options presented describe how their use can benefit heavy industry and include some of the ecological and social benefits presented on Chapter 2.

The approaches from Chapter 3 used to provide the suite of policy options presented in this Section 4.2 are presented above. Certain approaches have not been taken forward if subnational governments had severely limited powers to implement an approach or if an approach exhibited significant incapacity to include long-term decarbonisation principles in its core.



Policy 1: Eased Accessibility to Finance

Eased Accessibility to Finance includes measures such as public, low-interest and non-guarantor loans; government-backed credit guarantees, equity finance, direct grant payments and extended grace periods^{77,78}. The higher borrowing capabilities of national governments suggests that these usually provide the funding needed to implement this policy option. Public financing using public development banks, public venture capital fund and guarantee provision are more commonplace at the national level, rather than subnational⁷⁹. In certain cases, some subnational governments in unitary and federal states are given autonomy to fund, design, allocate and distribute support schemes, albeit higher reliance on national-level funds is commonplace⁸⁰.

This policy option can be designed to help companies maintain a healthy level of credit risk. This is especially true for SMEs, which have experienced larger demand and supply impacts during the pandemic⁸¹. Alternatively, financing can be provided to de-mothball production capacity which

may have been idled during demand reduction due to pandemic. In turn, these benefits can help safeguard direct jobs in beneficiary companies as well as indirect and induced jobs through supply chain linkages and regional economy interconnections.

The policy option can also be tailored for organisations to continue with their industrial decarbonisation projects, which could have been postponed due to needs to conserve or relocate capital. Examples are investment reactivation into such “shovel-ready” projects, especially least-cost decarbonisation technology solutions and short-term cost efficiency, such as energy efficiency projects for technologies with high Technology Readiness Levels (TRLs) between 7 and 9, bringing **Carbon Emissions Reduction** benefits. These can result in short-term benefits after completion, such as reduction in operational expenditure or carbon tax savings through reduction of carbon intensity.

77 Equity finance refers to the raising of capital via the sale of company shares, which can be purchased by public organisations.

78 Through its Economic Reactivation Program (in Spanish), The Government of Queretaro in Mexico has provided economic incentives to companies which maintained jobs during the pandemic through its PROFIGE program.

79 OECD, Regions and Innovation Policy, OECD Reviews of Regional Innovation, OECD Publishing. (2011)

80 Tetlow, Gemma, and Grant Dalton. “Support for business during the coronavirus crisis: an international comparison.”

81 OECD, Coronavirus (COVID-19): SME Policy Responses (2020)



Policy 2: Support to Labour Markets and Education

This policy option is aimed at supporting employee retraining or upskilling in those industries facing higher disruption, either from the pandemic or from a transition to decarbonised industrial operations. Within this policy option, measures include vocational programmes, adoption of task forces and connecting educational organisations with industries.

The policy option is concerned with opening existing public education budgets from subnational governments to the industrial employee base as a means to counterbalance potential cut-off in employee-training through private industrial budgets. In both unitary and federal states, subnational governments play a large role in administering and funding education services. In some countries, this policy option can be managed by regional offices of the central government (deconcentration). Enterprise-based education can fall outside the scope of regional educational expenditure in certain states. In such cases, regions with

the needed fiscal and administrative powers can expand the scope of other policy options such as Eased Accessibility to Finance or Reduction of Fiscal Responsibilities to indirectly facilitate - rather than directly provide - education support.

This policy option can help achieve **Just Transition** and **Education and Skills Development** benefits, as the industries within scope have experienced an increased risk on changes to employment due to pandemic effects: digitalisation, changes to supply chains and transfigured business models. As industry seeks to reduce operational costs, there is an additional opportunity to assist industry in this goal by addressing skills gaps. This is because there is an existing skills shortage for some sustainability skills for mature technological processes, such as certain systemic circularity processes like steel reuse⁸². In such instances, this policy option can bring **Waste & Pollution Reduction** benefits.



82 Rakhshan, Kambiz, et al. "Components reuse in the building sector—A systematic review." *Waste Management & Research* 38.4 (2020): 347-370.



Policy 3: Investment in New and Green Infrastructure

New and green infrastructure may refer to public goods which may not be independently provided by the private market, such as energy transport and storage networks, road and maritime transport channels, industrial parks, telecommunications and others.

In unitary states, competences in infrastructure investment usually rest with the national government, although shared competencies with subnational governments are possible in certain areas, especially administrative. As a result, certain subnational governments can administer investments in energy, transport and construction projects via use of national government funds and contracts. In federal states, subnational governments usually represent a higher share of the total national expenditure in infrastructure. Subnational federal governments can usually invest in larger projects as well as benefit from additional autonomy to administer infrastructure funds.

The social and ecological benefits from investment in new and green infrastructure

include short and long-term **Job Creation and Safeguarding** and indirect **Carbon Emissions Reduction**. Through new construction projects, this policy option can help raise industrial demand from the cement and steel sectors, especially if products are sourced regionally. In addition, government investment decisions on infrastructure signal confidence (e.g., reinforcement of electricity networks) and help industries take forward their short-term decarbonisation investments decisions more confidently. Subsequently, this helps industries strengthen their employment needs.

Subnational governments can materialise green recovery benefits if investment in regional infrastructure uses indicators to target projects maximising regional content and socioeconomic multipliers: use of local skills, domestic supply of goods rather than imported, creation of long-term jobs for operation and maintenance and maximise the labour intensiveness relative to expenditure. Social benefits, such as fair work, social inclusion, adjusting equity and transition work can be included too.



Policy 4: R&D Support and Grants

By advancing technology readiness levels and supporting demonstration and validation projects, this policy option can target technologies leading to emissions reductions, raising industrial productivity and addressing novel industrial challenges.

The role of subnational governments in providing instruments for this policy can be broadly differentiated between R&D Support and Grants for public and private sectors. Subnational governments are usually more involved in supporting R&D in the public sector, through ongoing institutional, seed funding and competitive R&D funding support for public research centres and higher education institutions. On the contrary, it is more commonplace for national governments to provide public subsidies and tax credits for private R&D activities⁸³. However, in some states (especially federal), subnational governments support the private sector too⁸³. Lastly, national governments can sometimes delegate administrative competencies to subnational governments⁸⁴.

This policy option can bring **Carbon Emissions and Waste and Pollution Reduction** benefits. It promotes industry participation and activity, especially in demonstration and testbed projects, which validate more mature technologies. Successful R&D projects can result in positive multiplier effects through increased productivity and new enterprise creation. R&D Support and Grants is essential to progress technologies with low TRLs (1 to 6) but targeting support for deployment projects of those scalable technologies with higher TRLs can be used to accelerate a green recovery. Some of these technologies include:

- Overcoming remaining technical challenges for alternative binders and constituents in the cement sector.
- Advancing direct reduction of iron with high blends of hydrogen for the steel sector.
- Overcoming renewables integration issues for electrolytic hydrogen-based production of chemicals such as ammonia.

Whilst most R&D programmes at present have an element of decarbonisation, it is important to distinguish those programmes specifically aimed at providing a short-term recovery from those pursuing long-term results. This is because ongoing and open R&D programmes may have a pre-pandemic design, with a mission-orientation divergent from short-term needs. Green recovery-related policies can include, for instance, directing support for R&D projects to low-income and disadvantaged areas or areas where localised pollution is higher (due to higher presence of industry).

83 OECD, *Oecd Time-Series Estimates of Government Tax Relief for Business R&D. Deliverable 2.6: Summary report on Indicators Tax Expenditures (Year 4)*, (2019).

84 Europa, Ismeri. "Distribution of competences in relation to regional development policies in the member states of the European Union." *Final Report for European Commission (Rome/Brussels, Ismeri Europa/Applica Processing)* (2010).



Policy 5: Reduction of Fiscal Responsibilities

Reduction of Fiscal Responsibilities includes the deduction of COVID-related losses from taxable industry income, the deferral of tax payments and the increasing tax rate ceilings. For the purposes of providing a recovery, this policy option should be a temporary response to counteract the effect of the pandemic on industries to prevent impacting long-term budgeting balance of national and subnational governments.

Unitary states have higher shared taxation responsibilities with the national government, relative to federal states. Contrastingly, federal states tend to have a higher fiscal autonomy, allowing subnational governments to have increased flexibility in the form of tax measure (e.g., local taxes and or/ property taxes) to be targeted. It is noteworthy to mention that whilst certain federal states have a high degree of tax autonomy (e.g., Canada), this is reduced in others (e.g., Mexico).

However, both in federal and unitary states, it is possible that responsibilities are shared due to fiscal balancing and thus adjusting

taxes is likely to require negotiation and authorisation⁸⁵. Discretion over key taxes (such as corporation tax) is likely to be reserved, due to budget control requirements. Rather than requesting devolution of certain fiscal powers to allow direct action from subnational governments – which can be a slow process – subnational governments can request fiscal action at the national level.

All heavy industry sectors have been hit by the pandemic, to a varying extent⁸⁵. Whilst this policy option can thus help limit the impacts which could lead to employment and activity losses (**Jobs Creation and Safeguarding**) in industries of all sizes, it can be most effective for SMEs, due to their inherently lower cash reserves and lower borrowing capabilities⁸⁶. For instance, the pandemic has resulted in delays in payments from construction operators to their suppliers and for the given reasons this would affect SMEs more noticeably⁸⁷. Tax deferrals to such suppliers – such as cement and steel providers – to reflect the delay in payments could be an effective way of reducing the balance sheet effects.

85 According to IEA's World Energy Outlook Special Report: Sustainable Recovery (2020), the steel, cement and (petro) chemicals sectors reduced their production in 2020Q1 by 1.5%, 4.5% and 3%.

86 Whilst hard to estimate global data, the EU provides estimates of total SME representation within heavy industry enterprises: over 90% of all companies in the chemicals sector are SMEs, the average number of employees per enterprise in the cement sector falls within SME sizes (below 250) whereas certain iron and steel subsectors, such as foundries, continue to be dominated by SMEs.

87 Alsharaf, Abdullah, et al. "Early impacts of the COVID-19 pandemic on the United States construction industry." *International journal of environmental research and public health* 18.4 (2021): 1559.



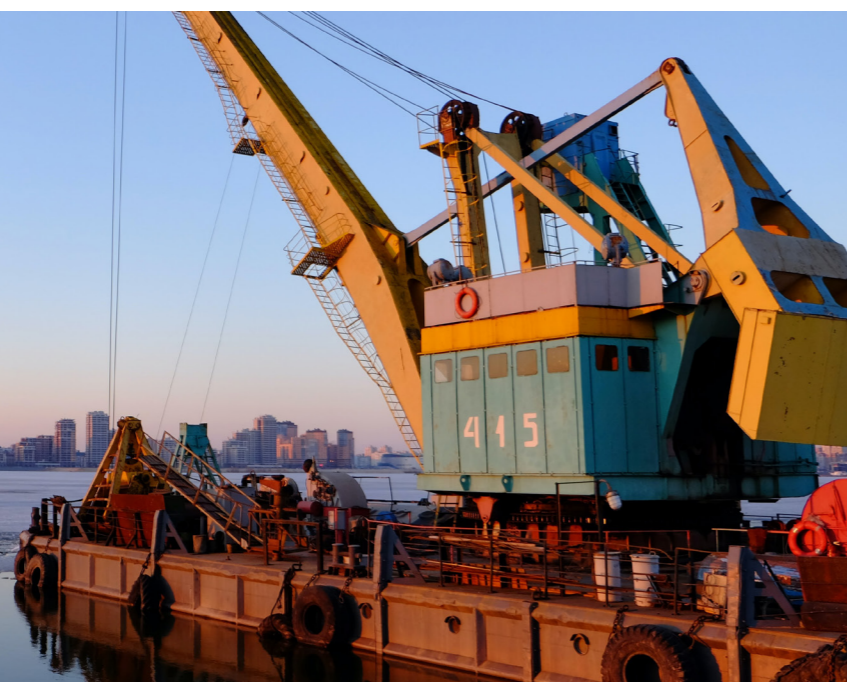
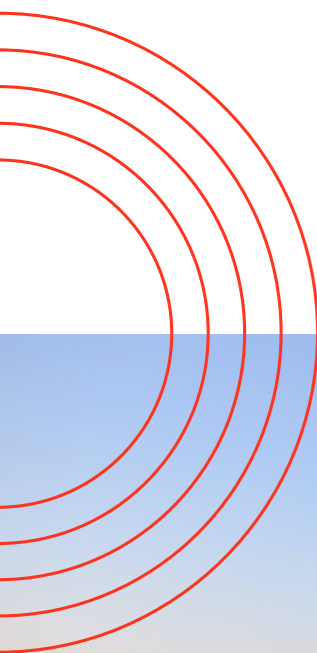
Policy 6: Reduced Burdens for Investment and Project Development

Excessive administrative procedures and red tape has been identified as a major challenge for important policy options such as public investment in infrastructure^{88,89}. Lack of clarity on key applicable policy is also a barrier to private investment. This policy option includes measures such as reduced bureaucracy, reduced administrative burdens and costs as well as simplified planning, such as easing of permits. Use of these measures can fast-track projects and investments which allow industries maintain their existing workforce activities, accelerate **Jobs Creation and Safeguarding** benefits or which reduce their operation costs.

Subnational governments are generally granted powers to administrate and control land use, planning and permitting. In addition, subnational governments may also have direct autonomy over the administrative burdens associated with

subnational level legislation to adapt secondary legislation.

However, due to multi-level distribution of legislative-administrative powers, reduction of certain administrative or legislative burdens is likely to require collaboration with national governments. This is especially the case in unitary states. Federal states with higher political powers generally have higher autonomy to reduce legislative burdens to business investment. However, due to multi-level distribution of legislative-administrative powers, reduction of certain administrative or legislative burdens may require collaboration with national governments. This is especially the case in unitary states. Both unitary and federal subnational governments can work with their central governments to ensure political coherence on industrial policy and a vision for green recovery.



88 OECD, Infrastructure planning and investment across levels of government: current challenges and possible solutions (2020)

89 In California, for instance, a [study](#) suggests that the turnaround time for key authorisations for CCS projects can be over 18 months.



Policy 7: Support to Regional Industrial Capabilities

Support to Regional Industrial Capabilities can be the centre of focus for organisations such as regional strategy and management bodies, public-private partnerships and local enterprise partnerships, multi-level committees, appointments of regional coordinators and task forces.

Even though the degree of autonomy can vary federal and unitary states usually indistinctively have administrative powers to support regional industry, due to their local expertise to directly collaborate with industry. Both federal and unitary subnational governments usually have autonomy to select coordinators and managers of industrial strategy and stakeholder relationships, although in unitary states some subnational governments can see coordinators being appointed at the national level to represent national government interests in regional industrial policy.

The policy option can be designed to drive sector-specific or cluster-specific action. The former would address sector-specific challenges (such as challenges for certain use of low-carbon technologies) whereas the latter would address shared challenges to establish common levels of ambition (such more macroeconomic approaches, e.g., regional industrial decline). Subnational governments can have a higher collaborative role in the latter, due to their regional level expertise.

The platforms which can be used in the short-term to focus on a green recovery can then be used to focus on long-term decarbonisation. But in both instances, activities to support regional industrial capabilities require analogous actions: raising consultations, coordination activities, aligning priorities, sharing of best practices, voicing industrial concerns and priorities to national governments⁹⁰. These activities can bring **Education and Skills Development** and **Just Transition** benefits.

90 Scottish Government published a useful [consultation](#) on perceptions of the Scottish manufacturing industry on actions proposed by the subnational government for a recovery plan for the manufacturing sector.



Policy 8: Innovative Regulations

Innovative Regulations includes the use of novel practices to assess links between industry policy with the goal of increasing long-term competitiveness. Innovative regulations can be tailored to each heavy industry sector, at various geographical levels of policy action and can break down the analysis between industrial subsectors (e.g., cement and lime separately)⁹⁰. This policy options include measures such as:

- **Competitiveness Proofing: Analysis of the ex-ante impact of policies on competitiveness of industry.**
- **Fitness Checks: Evidence based analysis of fulfilment of policy actions.**
- **Cumulative Cost Assessments: Assess cumulative costs of a policy area on an industrial sector.**

The generally higher political powers of federal states - which increases with the level of devolution - indicates that these

may have more autonomy to implement innovative regulations and directly control policy effects on industry. In unitary states, national governments normally have increased control over political powers and so this could limit the role of subnational governments from direct implementation of innovative regulations to collating insights into impact of national-level policies on regional industries.

Innovative regulations can be used to better understand how legislation can bring **Just Transition** benefits. Ahead of new policymaking to provide a green recovery, those subnational governments with sufficient political powers can incorporate innovative ex-ante studies in their industry agenda. Doing so can ensure that short-termed recovery legislation does not compromise the need for longer-term decarbonisation. In regions with reduced political powers, subnational governments can vertically cooperate with policy makers.

Interdependencies of policy options and their effect on available subnational government powers

Whilst subnational governments may have the necessary powers to directly implement the above policy options in certain areas, the scale of the implementation may require collaboration and negotiation with the national government. This has been highlighted in the discussion within the relevant policy options sections where possible. This is because policy options may cross various levels of vertical jurisdiction. For instance, a subnational government may have the autonomy to deploy a large-scale infrastructure project but may require regulatory support at the national level for the investment to be taken forward.

⁹¹ de Vef, Jan-Maarten, et al. "Competitiveness of the European Cement and Lime Sectors." *WIFO Studies* (2018).



4.3 Evaluation of policy options for a green recovery

Based on information collected during the literature review and on feedback provided by regions during the roundtables and interviews, each policy was evaluated against two relevant parameters. The policies were tested on their potential effectiveness in enabling a green recovery in heavy industry and on the powers that subnational governments have to implement them without the involvement of

their national government. **Figure 8** shows how each policy is positioned based on the two key parameters, while **Figure 9** elaborated further on the compatibility of the policies with the powers of subregional governments. Policy 4, policy 3 and policy 8 emerged to be particularly effective in enabling a green recovery, as well as attainable for the implementation by many regional governments.

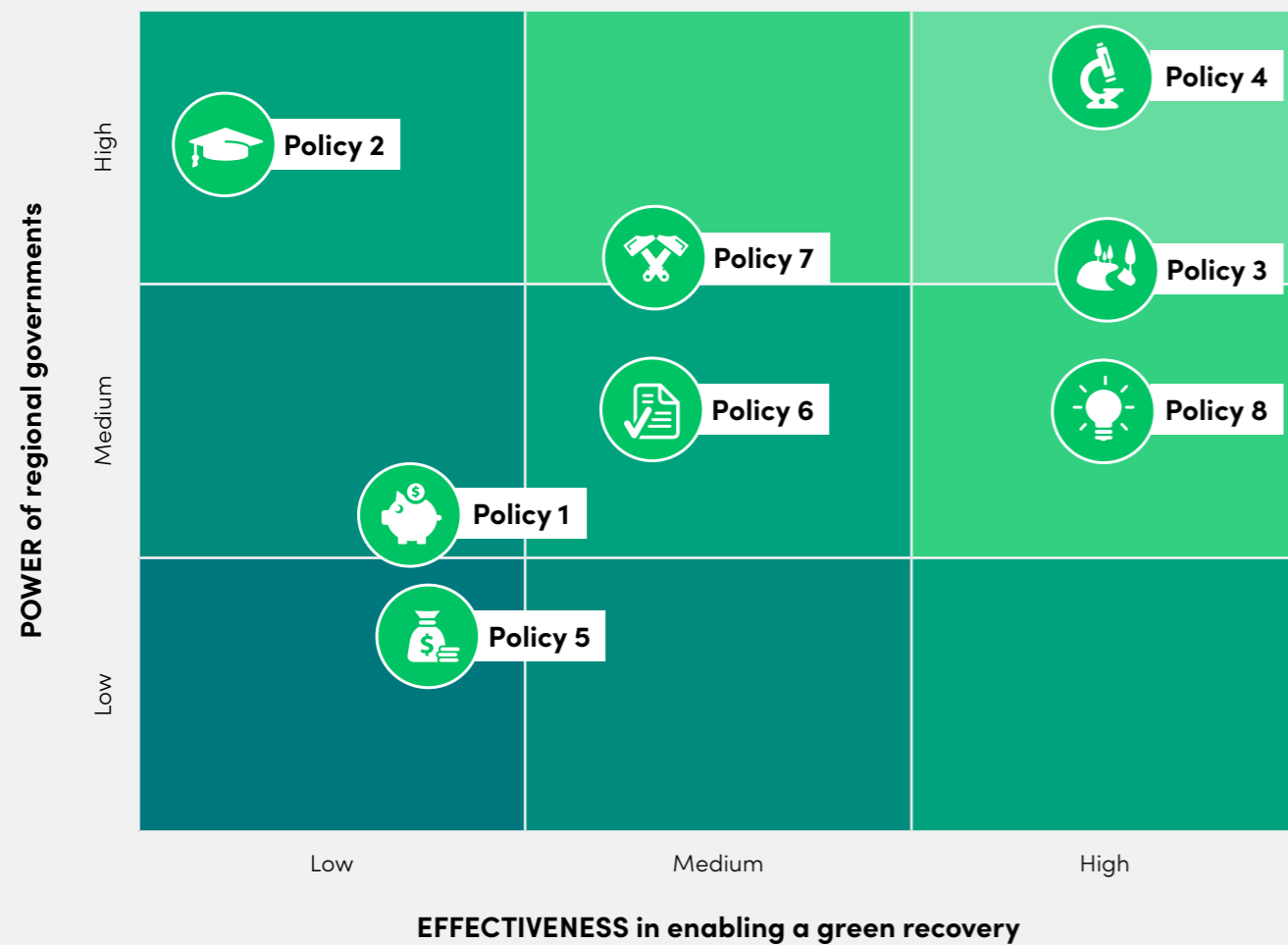


Figure 8: Evaluation of the effectiveness of each policy in enabling a green recovery together with the typical ability of regional governments to implement the policy compatibly with their powers.

Policy Options	Powers available to subnational governments	Unitary government	Federal government
1. Eased Accessibility to Finance	Higher borrowing capabilities of national governments suggests. Public financing through measures presented are more commonplace at the national level.	Partial power of implementation	Partial power of implementation
2. Labor Markets and Education	In both unitary and federal states, subnational governments play a large role in administrating and funding education services.	Higher power of implementation	Higher power of implementation
3. Investment in New and Green Infrastructure	In unitary states, competences usually rests with central government. Federal states higher expenditure of total national investment.	Partial power of implementation	Higher power of implementation
4. R&D Support and Grants	Subnational governments usually more involved in supporting R&D in the public sector (research centres and higher education)	Higher power of implementation	Higher power of implementation
5. Reduction of Fiscal Responsibilities	Responsibilities over many shared due to fiscal balancing and adjusting key taxes for policy likely to require negotiation.	Partial power of implementation	Partial power of implementation
6. Reduced Burdens for Inv. & Project Development	Planning and permitting tend to be devolved, but federal states usually have higher autonomy over legislative burdens.	Partial power of implementation	Higher power of implementation
7. Support to Regional Industrial Capabilities	Both subnational governments can have administrative powers to support industry due to their local expertise.	Higher power of implementation	Higher power of implementation
8. Innovative Regulations	Federal: Higher autonomy to implement innovative regulations Unitary: Reduced legislative powers limit role to collaboration	Partial power of implementation	Higher power of implementation

● Higher power of implementation ● Partial power of implementation

Figure 9: The powers of subnational governments to implement each policy depending on government type.



The Global Framework Principles can be used by subnational governments to increase, accelerate and guide state action in the process of decarbonisation of heavy industry.



05

Global Framework Principles in the context of a green recovery

Climate Group, alongside Mighty Earth and industry experts, developed a list of Global Framework Principles to accelerate and scale-up the decarbonisation of heavy industry to align with a 1.5°C trajectory. Each principle presents an essential lever that policymakers can use to decarbonise

heavy industry⁹². In Chapter 5, we provide commentary on the hypothesis “Can the Global Framework Principles increase state action on the decarbonisation of heavy industry?”

⁹² The Global Framework Principles can be accessed [here](#).



5.1 Global Framework Principles for the Decarbonisation of Heavy Industry

The Global Framework Principles are formulated as such:

Principle #1:

Secure a truly green recovery by tying public financing for heavy industry to key measures aligned with corporate GHG emissions reduction commitments and plans calibrated to a 1.5°C trajectory.

Principle #2:

Establish and strengthen policies and investments to ensure that industrial transformation protects biodiversity and human health and leads to a just transition.

Principle #3:

Institute policies to create demand for low-carbon, circular and resource efficient basic material products, supported by the use of standardised lifecycle carbon footprint labelling and performance incentives for end products (e.g. buildings) to engage the entire value chain.

Principle #4:

Develop and deploy at scale, financing policies and tools to incentivise and reward heavy industry companies that set science-based, time-bound, public climate targets calibrated to 1.5°C.

Principle #5:

Prioritise funding and investment for enhanced development and deployment of low, zero carbon technologies, including breakthrough technologies like hydrogen for industrial production and near-term carbon capture, to help phase out fossil fuel use.

Principle #6:

Ensure effective coordination and accounting between countries and regions, including the sharing of new impactful technologies, viable circular economy pathways, sunsets of the highest polluting technologies, and implementation of responsive trade policies to reduce emissions leakage between economies.

What do we understand for a 1.5°C trajectory?

To put global economy-wide decarbonisation needs into perspective, the IPCC Special Report on Global Warming of 1.5°C states that limiting global warming to 1.5°C will require a reduction of global CO₂ emissions of 45% from 2010 levels by 2030 and net zero CO₂ emissions by 2050. Non-CO₂ emissions (methane, black carbon and nitrous oxide) would also have to be deeply reduced by 2050 (30% to 60% reduction), but do not need to reach net zero⁹³.

According to a similar IPCC study, technology mitigation options potentially consistent with limiting warming to 1.5°C and applicable to heavy industry include⁹⁴:

- i. process and energy efficiency,
- ii. bio-based feedstocks,
- iii. circularity and substitution,
- iv. electrification and hydrogen and,
- v. CCUS



93 IPCC, 2018: Global Warming of 1.5°C. An IPCC Special Report on the impacts of global warming of 1.5°C above pre-industrial levels and related global greenhouse gas emission pathways, in the context of strengthening the global response to the threat of climate change, sustainable development, and efforts to eradicate poverty [Masson-Delmotte, V., P. Zhai, H.-O. Pörtner, D. Roberts, J. Skea, P.R. Shukla, A. Pirani, W. Moufouma-Okia, C. Péan, R. Pidcock, S. Connors, J.B.R. Matthews, Y. Chen, X. Zhou, M.I. Gomis, E. Lonnoy, T. Maycock, M. Tignor, and T. Waterfield (eds.)]. In Press.

94 de Coninck, H., Revi, A., Babiker, M., Bertoldi, P., Buckeridge, M., Cartwright, A., ... & Wollenberg, L. (2018). Strengthening and implementing the global response.

5.2 Using the Global Framework Principles to accelerate state government action

This section discusses how the policy options presented in Chapter 4 can be adapted to include the Global Framework Principles in their design core. By adapting actionable policy options, we describe how

the Global Framework Principles can be used by subnational governments to increase, accelerate and guide state action in the process of decarbonisation of heavy industry.

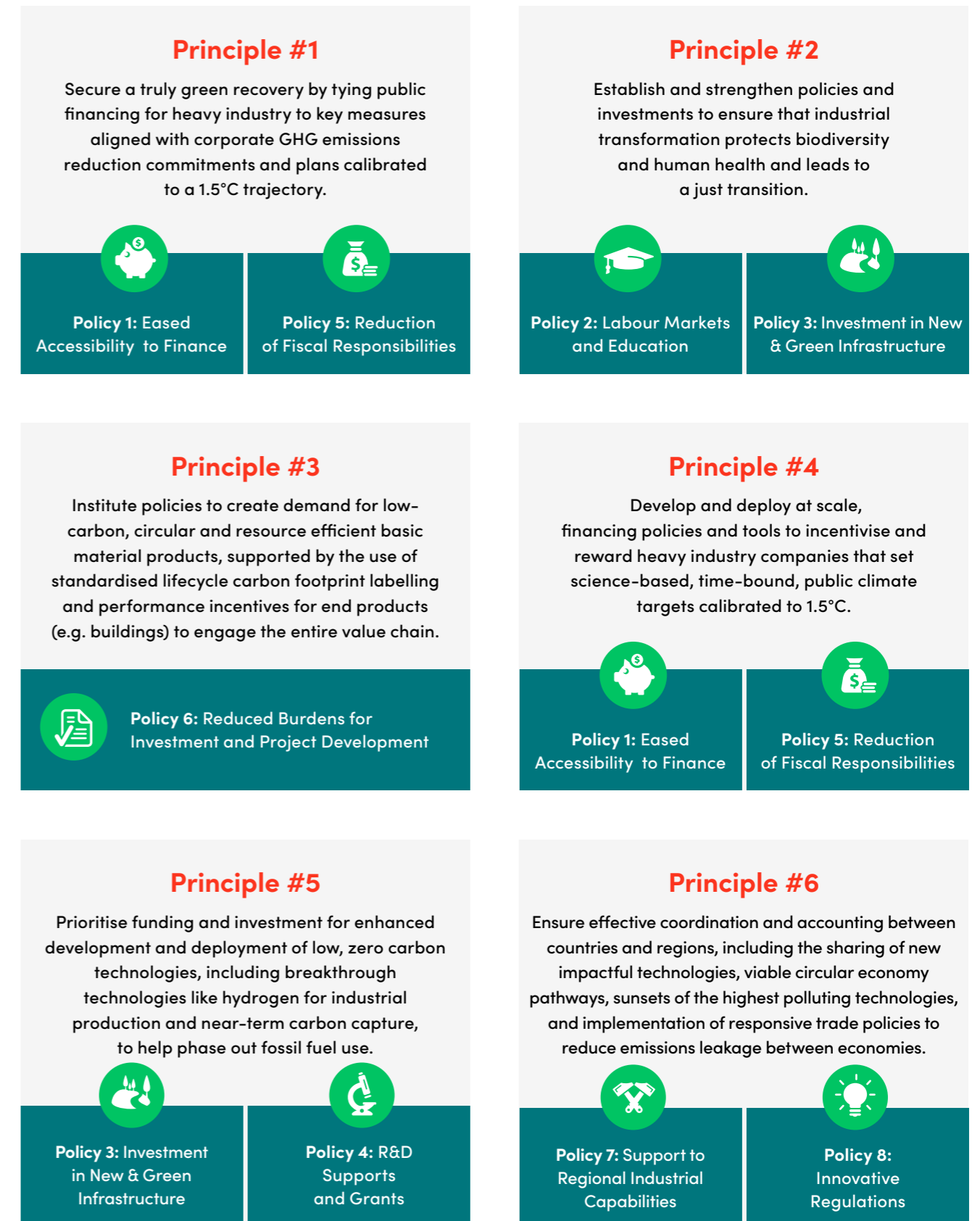


Figure 10: The policies identified in the previous chapter can be implemented within the Global Framework Principles

Global Framework Principle #1

The principle acknowledges that industries having deployed low-carbon technologies in pre-pandemic times can be exposed to increased financial stress due to COVID-19 effects. Subnational governments can support public financing via two policy options: **Policy 1 - Eased Accessibility to Finance** and **Policy 5 - Reduction of Fiscal Responsibilities**. These options can help industries recover from the pandemic shock by increasing access to capital - either internal or external - to support industrial competitiveness and reduce liquidity constraints.

Secure a truly green recovery by tying public financing for heavy industry to key measures aligned with corporate GHG emissions reduction commitments and plans calibrated to a 1.5°C trajectory.

Subnational governments can ensure that recovery support simultaneously supports industrial decarbonisation if:

- The public financing policy options are oriented to support those heavy industry players having implemented specific low-carbon technologies aligned with a 1.5°C trajectory (see page 70 - What do we understand for a 1.5°C trajectory?). This policy option can place green rewarding for industries at the core of the criteria to access finance.
- The public financing policy options are tied to heavy industry with a pre-pandemic record of average GHG emissions intensity or final product carbon intensity below their regional industry averages.
- The public financing policy options is used to support those companies with operational performance management strategies which minimise emissions resulting from operational inefficiencies.



Global Framework Principle #2

This principle seeks to promote social and ecological aspects on top of climate change mitigation priorities in new and revised actions aimed decarbonisation of heavy industry. Within the boundaries of regional powers, subnational governments can put this principle into action mainly through two policy options: **Policy 2 - Support to Labour Markets and Education** and **Policy 3 - Investment in New and Green Infrastructure**. These policy options can be designed to channel public investments into activities which can counteract the potential future loss of jobs due to the transition.

Subnational governments can additionally materialise decarbonisation benefits if:

- Labour and education policies are focused on the most vulnerable industry stakeholders in the transition, both for industrial sites and their supporting value chains. Subnational governments can address the just transition through reskilling and upskilling: enhancing transfer of unavoidable employment loss into new fields and firms but also preparing workforces (through certifications etc.) to forthcoming low-carbon technologies and energy uses as well as circular approaches compliant with decarbonised industrial activities
- Investments are focused into infrastructure which can be employed by heavy industry, but which have long lead times. Such investments can directly support industry to decarbonise. Further, these investments can consider in their design phase how to best protect regional biodiversity to support long-term resiliency of investments as well as the lifecycle GHG emissions of the projects against the expected abatement of GHG from the project.

Establish and strengthen policies and investments to ensure that industrial transformation protects biodiversity and human health and leads to a just transition.





Global Framework Principle #3

This principle aims to create a market for products obtained via low-carbon pathways through “technology push” measures. In the past, implementation of such policies was mostly motivated by a need to address circularity. From the policy options in scope, **Policy 6 – Reduced Burdens for Investment and Project Development** is the most suitable option to supplement this Global Framework Principle. By facilitating investment into circularity projects, this policy option can indirectly materialise benefits, such as new jobs to support novel circularity processes and operational savings due to lower material intensity.

Institute policies to create demand for low-carbon, circular and resource efficient basic material products, supported by the use of standardised lifecycle carbon footprint labelling and performance incentives for end products (e.g. buildings) to engage the entire value chain.

95 Breakthrough Energy, EU Policy Options Website (2021)

Subnational governments can help realise these benefits whilst keeping a focus in decarbonisation by:

- Simplifying bureaucratic processes relying on institutional action – planning approvals, consenting and environmental permitting – for projects promoting circularity, such as capture of CO₂ for on-site CCU processes. The permitting process and its duration have been identified as one of the main barriers to technology scaling.
- Providing clear standard lifecycle analysis criteria which industries can use to readily assess whether candidate projects promoting circularity can benefit from the regional measures for reduced burdens for investment.
- Fast-tracking of low-carbon labelling and quality certificates for products created via novel circular approaches, the lack of which is usually a burden for industries to invest in. For instance, rapid performance testing of green cement to remove barriers of perceived unreliability and risk⁹⁵.

Global Framework Principle #4

This principle is centred around rewarding through financing and other mechanisms for those in heavy industry which commit to decarbonising their activities through credible pathways, in line with 1.5°C trajectories. Subnational governments can best implement this principle via **Policy 1 – Eased Accessibility to Finance** and **Policy 5 – Reduction of Fiscal Responsibilities**. These two policy options require similar subnational government powers – especially fiscal powers – and so certain subnational governments may have more accessible functions to implement the principle independently.

Subnational governments can align the policy options with the framework principle by:

- Focusing the policy options on technologies whose deployment cannot address short-term challenges due to the extended lead times for engineering, procurement and construction phases as well as permitting and consenting, such as CCUS projects or infrastructural hydrogen projects.
- Reserving any form of financial mechanism support to those companies with science-based targets and, within these, conditioning loan interest rates or regional bank backed-up guarantees to projects compliant with said science-based targets⁹⁶.
- Linking future subnational government tax credits to market driven mechanisms and carbon policy, such as emissions trading schemes, tax credits based on performance relative to standards or financial incentives for industries to shift their energy consumption at certain times.

Develop and deploy at scale, financing policies and tools to incentivise and reward heavy industry companies that set science-based, time-bound, public climate targets calibrated to 1.5°C.



96 Shuckburgh, Emily, et al. “A Blueprint for a Green Future-Multidisciplinary report on a green recovery from COVID-19 by the Cambridge Zero Policy Forum.” (2020).



Global Framework Principle #5:

This principle focuses on supporting the scale-up and roll-out of technologies required for a 1.5°C trajectory. Many industrial assets have investment cycles of 20 to 25 years, suggesting the need to accelerate the development and deployment of low-carbon options, ahead of 2050 GHG reduction targets. This principle can be implemented via two policy options: **Policy 3 - Investment in New and Green Infrastructure** and **Policy 4 - R&D Supports and Grants**. These policies are highly complementary and jointly ensure that technologies reaching maturity are deployed.

Prioritise funding and investment for enhanced development and deployment of low, zero carbon technologies, including breakthrough technologies like hydrogen for industrial production and near-term carbon capture, to help phase out fossil fuel use.

The policies can raise activity and demand for heavy-industry products whilst raising action on industrial decarbonisation if:

- When possible, subnational governments focus on providing tax incentives or subsidies in R&D and technology demonstration activities focusing on technologies in Box 2 with lower TRL options (below 6) which exhibit largest cost reduction and breakthrough potential. As part of the conditionality of funding, subnational governments can request R&D projects to explore how advancements in a technology may impact biodiversity and human health.
- In regions with more limited competencies, subnational governments promote collaboration and facilitate joint R&D activities between large industrial players and academia to increase connectivity, transfer of information and commercialisation. In addition, subnational governments can act as intermediaries to assist R&D organisations gain access to grants and subsidies provided at the national level.
- Investments resulting in carbon lock-in are avoided, subnational governments use their administrative powers in hand to direct investments in infrastructure enabling deployment of mature technologies, i.e., which would stimulate industry spending in the short to medium-term and which can crowd-in capacity.

Global Framework Principle #6

This principle entails the use of subnational government powers, their local expertise and relationships with regional heavy industry to socialise transferrable solutions needed for decarbonisation. Commonplace responsibilities and governmental functions given to subnational governments mean that, out of all options, **Policy 7 - Support to Regional Industrial Capabilities** and **Policy 8 - Innovative Regulations** can best support the realisation of this principle.

Many of the decarbonisation challenges are communal throughout industries, so these policy options can help subnational governments raise action in these areas if:

- Support to regional industry focuses on horizontal cross-jurisdiction collaboration, especially between those regions with increase trade and industrial supply chain connections, to align strategies to decarbonisation pathways. Within a region, subnational governments can also foster dialect and help develop trust amongst branches of industry, which can be a lengthy process. Platforms for collaboration activities can be shared with established or existing industrial decarbonisation platforms – such as knowledge centres, regional cluster or industry associations – where dissemination activities for decarbonisation continue to happen. Important activities also include sharing an understanding of what jobs (both in terms of skills but also in terms of volumes) will be needed to tackle the transition.
- Ex-post assessments of newly implemented regional legislation, regional programmes and regional administrative experiences are carried out to understand how short-term policy options used for a green recovery have impacted heavy industry. As a result, most successful policy options can be accordingly adapted to fit the wider context and needs of long-term decarbonisation. Ex post assessments can also include considering how industrial policy affects the regional environment⁹⁷.

Ensure effective coordination and accounting between countries and regions, including the sharing of new impactful technologies, viable circular economy pathways, sunsets of the highest polluting technologies, and implementation of responsive trade policies to reduce emissions leakage between economies.



⁹⁷ Scottish Government published a report trying to understand the environmental impact of manufacturing industry in Scotland.

5.3 Evaluation of the Global Framework Principles

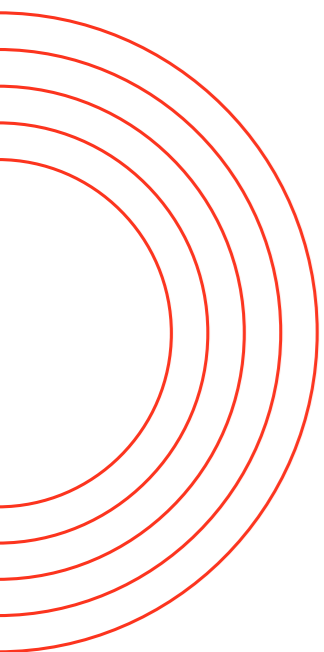
Subnational governments can use the policy options presented for a green recovery to implement the Global Framework Principles (GFPs). By understanding subnational government powers and by evaluating which policy options link best with each GFP, it can be concluded that states can increase state action to increase, guide and accelerate decarbonisation of heavy industry. However, the use of policy options to

implement the GFPs implies that the level of action will vary between subnational governments according to their political, administrative and fiscal powers.

Many of the Global Framework are already being implemented by some subnational government, in particular Principle #1, Principle #2, Principle #4 and Principle #5. However, Principle #5 is seen as the most effective for the creation of policies that will enable a green recovery in heavy industry.

By understanding subnational government powers and by evaluating which policy options link best with each Global Framework Principles, it can be concluded that states can increase state action to increase, guide and accelerate decarbonisation of heavy industry.





06

Conclusions

Advancing from rescue to recovery

- **Subnational governments must provide urgent action to minimise the impacts of the current pandemic crisis on heavy industry.** Rapid response will reduce the repercussions of a lengthy economic crisis and prevent 'carbon leakage' from key sectors. However, emerging policy action needs to acknowledge the interdependencies of short-term

green recovery and long-term industrial decarbonisation to ensure that one need benefits the other. Therefore, subnational governments can exploit synergies between short term and long-term focus by narrowing the scope of actions for green recovery to policies only compatible with 1.5° trajectories.

Learnings from previous crises can be used to face this crisis, but considering industrial decarbonisation is key

- **COVID-19 has added further strain to the challenges already faced by heavy industry.** The sectors operate in heavily commoditised markets, where intense cost competitiveness and varying progress levels on carbon policy lead to reduced profitability margins and carbon leakage risks. According to the consultations carried out in this study, the most frequently felt effects of the pandemic on heavy industry include supply chain disruption, impact on workers' health and safety and reduced demand for products. To address these

challenges, subnational governments can implement policies to enable a quick green recovery of heavy industry.

- **Policy action for a green recovery in heavy industry can be guided by keeping both social and ecological dimensions in focus.** Both dimensions can be addressed by enabling a set of benefits that include carbon emissions reduction, waste and pollution reduction, jobs creation and safeguarding, a just transition, education and skills development and improved global health. Governments



with more advanced recovery plans have already started designing policies in a way that materialises these benefits.

- **Several approaches and a wide range of policy designs have been implemented in the past to recover from economic crises.** Many of these provide useful learnings that can be applied to the current context, as some approaches have previously performed better than others in achieving their intended goals. Most of these policies

can be used now, but their design needs to ensure focus can incorporate both elements of green recovery and industrial decarbonisation. This can be done by ensuring that the policies are designed to encourage investment in technologies which heavy industry needs to decarbonise. A wide range of policy options are available to encourage investment in such technologies and this study materialises this optionality through **eight policies** aimed at supporting a green recovery in heavy industry.



The powers of subnational governments to implement the suggested policies vary between regions

- An important outcome from the engagement with subnational governments is that, out of the policy options presented, the ones perceived to be **most effective are R&D Support and Grants, Investment in New and Green Infrastructure and Innovative Regulations.**
- **The eight policy options identified vary in scope and design, and the potential for their implementation will depend on the governance structure of different subnational governments,** broadly depending on their federal or unitary governance structure. It is challenging to establish clear-cut patterns of central-subnational government distribution of powers for unitary and federal states. However, observed trends for occurrence of certain political, administrative, and fiscal powers allows for a generic split, though exceptions exist.
- Subnational government have different levels of autonomy to implement **the policy options as described in this study, due to the differences between their powers.** Nevertheless, all subnational governments can still use the proposed policy options as guidance for the implementation of policies in a reduced form, as most applicable. Additionally, even regions with most limited subnational government powers, can still take action, for example through influence and vertical collaboration with their national government as well as through promoting regional knowledge exchange in industry.

The Global Framework Principles can be applied by adapting the policy options for long term decarbonisation

- The Global Framework Principles (GFPs) created by Climate Group present a set of foundations for the decarbonisation of heavy industry. To help understand factual opportunities for subnational governments, a section of this study aimed to answer the hypothesis "Can the Global Framework Principles increase state action on the decarbonisation of heavy industry?"
- Chapter 5 detailed how subnational governments can use the policy options presented for a green recovery to implement the GFPs. By understanding subnational government powers and by evaluating which policy options link best with each GFP, it can be concluded that states can use the framework to increase, guide and accelerate state action on decarbonisation of heavy industry. However, the use of policy options to implement the GFPs implies that the level of action will vary between subnational governments according to their political, administrative and fiscal powers.
- The GFPs are primarily targeted towards achieving long-term decarbonisation. However, certain foundations of the Global Framework Principles can already begin to be incorporated in the policy options so that the short-term recovery response is aligned with long-term decarbonisation objectives. The policy options presented for a green recovery thus attempt to include the Global Framework Principles insofar as the policy options continue to focus on a short-term response. As subnational governments leave behind the recovery, the presented policy options can be adapted as described to fully integrate the Global Framework Principles in their design to address long-term decarbonisation.



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