



Chapter 6

Towards an inclusive transition

The significant structural change implied by the transition of whole economies to balance greenhouse gas emissions and carbon sinks will inevitably create tensions among those affected – from central and local governments, to the private sector, the labour force and citizens. This chapter examines the social and economic factors that affect the ability of governments to envision and implement the long-term policy choices needed to stabilise the global climate. It considers how governments might draw on experience with industrial restructuring; the potential impacts of climate policy on households; and case studies that illustrate the need for a just transition for workers and communities. The chapter concludes by exploring how best to take political economy dimensions into account in preparing robust, long-term, low-emission development strategies.

G20 countries vary widely in the speed of change they pledged under the Paris Agreement, reflecting their differing perceptions of the challenges and opportunities presented by the global response to climate change. Transforming whole economies to balance greenhouse gas (GHG) emissions and carbon sinks will inevitably create tensions among those affected by the required changes, from central and local governments, to the private sector, the labour force and citizens.

Regardless of each country's starting point, significant structural change will be necessary. Activities with high GHG emissions need to change technologies or business models, or face decline. Some assets will be stranded. Jobs will be lost, even if the shift to low-emission, climate-resilient economies could result in net job creation. So a “just transition” is needed (as recognised in the Paris Agreement) that creates jobs in low-emission sectors, anticipates changes in employment patterns and fosters business plans that help workers find new jobs and opportunities.

Since climate change emerged as a planetary problem three decades ago, vested interests and incumbent actors in the high-emission economy have made it hard for governments to implement the long-sighted policy choices needed to stabilise the global climate. Policy-makers must take these circumstances into account early on to facilitate the transition while meeting other pressing policy agendas, such as poverty alleviation, job creation, ageing and inclusiveness.

This chapter examines the social and economic factors that make it easier or harder for governments to envision and implement an effective climate response. It draws on current observations and experience with industrial restructuring, analyses the impact of climate mitigation policy on household income, and considers case studies that reflect the need to ensure a just transition for workers and communities. The chapter concludes by exploring how best to take political economy dimensions into account in preparing robust, long-term, low-emission development strategies.

The political economy dimensions of the transition

Setting the scene

Political economy can be defined as the interaction of political and economic processes in a society, including the distribution of power and wealth among groups and individuals, and the processes that create, sustain and transform these relationships (OECD-DAC, 2005). Taking a political economy approach can answer the basic questions of who wins, who loses, how and why (Newell, Phillips and Mulvaney, 2011).

A number of political economy dimensions of climate policy arise at the **macro-economic** level:

- As indicated in Chapter 4, low-emission, climate-resilient policies will have various effects on the economy, welfare, and jobs. This will also have repercussions for inclusiveness.
- Such policies will also impact royalties or tax revenues from fossil-fuel production and consumption, and hence government revenue streams.
- A country's innovation and technological capability, its position as leader or follower, will affect how readily its economic and industrial strategy can adjust to and support its climate policies.
- A country's exposure to immediate and future climate risk, and the vulnerability of its assets and infrastructure, can be powerful drivers of action at national and international level.

A number of **sector-specific** aspects and stakeholders will also influence the politics of climate policies:

- High- and low-emission industries have different weights in a country's economy and trade balance; the share of GHG-intensive activities in total employment is another important factor.
- The marked impact of the transition on fossil-fuel demand has clear implications for dependency on fossil-fuel exports and imports and hence the energy security of countries. The other visible dimension of energy security is the reliability of the electricity system as low-carbon variable renewable energy sources challenge the flexibility of electricity grids.
- Existing infrastructure (electricity networks, pipelines, roads, railways, ports, city plans and buildings) has locked countries into development paths that could be difficult to change. Such change will be influenced by the balance of ownership of key infrastructure between private and public sectors.
- As governments introduce regulatory changes for the transition, incumbent players are likely to try to influence them in order to seek new rents. This will matter especially when critical technology choices require regulatory foresight and intervention – for example, whether electricity or gas infrastructures should be prioritised for the transition.

Local factors can also be critical for the success of climate policy efforts:

- As policy incentives favour low-emission choices, communities specialised in high-emission activities will be affected, as local jobs may decline or be eliminated.
- When assets are stranded or divested, the impact will be felt mostly locally. Bankruptcy law and vulture funds may prolong the lifetime of assets, undermining climate mitigation policy.
- Climate-friendly policy measures may produce other benefits, such as reducing local pollution or energy poverty.

Overall, the effectiveness of climate policy also hinges on a country's **general political conditions**:

- Political accountability and stability of the executive and of key supporting institutions, such as the civil service and the judiciary, are crucial.
- Institutions are necessary that enable consultation in public policy settings and in driving investment strategies with key stakeholders, including social dialogue between governments, business and trade unions.
- Civil society groups have a key role in influencing the debate and holding governments and other interests to account.
- The nature and role of the news media, and its positioning on climate change, can also shape the debate.
- Public voice, awareness and perceptions of climate change play a vital role.
- Business leaders, vested interests and lobby groups can wield significant influence.
- The balance of power between national and local authorities needs to be taken into account.

As shown above, numerous stakeholders, interests, capabilities and interactions come into play when countries design and implement low-emission, climate-resilient policies. The rest of this chapter provides examples of just how important these political economy dimensions can be.

The public sector can be entangled in the high-emission economy

Government budgets, which hinge on the health of economic activity, may rely on fossil fuels and GHG-intensive sectors, for example by collecting royalties on the extraction of oil, natural gas and coal. The share of such revenue in government revenues is typically below 5%, although it is above two-thirds in most countries that belong to the Organization of the Petroleum-Exporting Countries (OPEC) and some fossil-resource-rich countries (Table 6.1). The same considerations are likely to apply, but at a far smaller scale relative to GDP, to the production of palm oil (it is Indonesia's second export in value and contributes significantly to deforestation), and to other GHG-intensive facilities that generate income and tax revenues at local and national level.

Table 6.1. Estimated rents from extraction of oil, natural gas and coal resources

Period average	Billion USD			% GDP			% Total government revenue		
	2001-05	2006-10	2011-15	2001-05	2006-10	2011-15	2001-05	2006-10	2011-14
G20 (excl. EU)	485	1 020	1 130	1.5	2.2	2.0	4.7	6.8	6.8
Argentina	6	12	12	3.8	3.7	2.3	17.5	14.4	8.2
Australia	8	25	26	1.6	2.6	1.8	4.3	7.5	6.2
Brazil	11	29	41	1.7	1.9	1.7	4.8	5.2	5.4
Canada	35	46	27	3.7	3.1	1.5	9.1	8.0	4.7
China	51	180	207	2.7	4.1	2.4	16.7	19.6	10.1
France	<1	<1	<1	<1	<1	<1	<1	<1	<1
Germany	2	5	3	<1	<1	<1	<1	<1	<1
India	14	37	44	2.0	2.9	2.3	11.2	14.8	13.4
Indonesia	12	29	34	5.2	5.7	3.7	29.8	32.2	25.3
Italy	1	2	3	<1	<1	<1	<1	<1	<1
Japan	<1	<1	<1	<1	<1	<1	<1	<1	<1
Korea	<1	<1	<1	<1	<1	<1	<1	<1	<1
Mexico	27	49	52	3.4	4.8	4.3	17.1	20.9	20.9
Russia	82	194	249	16.9	14.6	12.5	45.1	38.6	35.6
Saudi Arabia	94	213	293	38.3	46.8	41.0	>90	>90	>90
South Africa	5	12	10	2.7	4.0	2.5	11.0	14.3	10.3
Turkey	<1	2	1	<1	<1	<1	<1	<1	<1
United Kingdom	17	26	20	<1	<1	<1	2.3	2.6	2.3
United States	119	162	106	1.0	1.1	<1	3.3	3.7	2.5
Rest of the World	453	950	1 000	2.2	3.2	2.9	16.3	20.0	20.5
OPEC (excl. Saudi Arabia)	133	336	363	26.6	29.8	20.8	80.9	85.9	81.1
World	938	1 970	2 130	1.8	2.6	2.3	7.1	10.0	9.9

Notes: Estimated oil, natural gas and coal rents are the difference between the production value at world prices and total costs of production, based on national sources and methods described in “The Changing Wealth of Nations: Measuring Sustainable Development in the New Millennium” (World Bank, 2011). Mexico indicated that less than 20% of government revenues were oil-related in 2016 (16.3%).

Sources: IMF (2017) and World Bank (2017).

The decisive transition outlined in Chapter 4 shows the importance of fossil-fuel exports in some countries' ability to navigate the transition. Other countries may be subject to similar situations due to the importance of land-use activities or GHG-intensive industrial sectors, whose evolution in a low-emission, climate-resilient scenario is much harder to project. The consumption of fossil fuels also generates tax revenues, mostly from transport. The prospect of the market for fossil fuels progressively declining as low-emission technologies and practices are deployed is therefore a significant structural issue for governments, asset owners and the workforces involved and may prompt resistance to policies that seek to constrain emissions. This situation presents two important issues for the transition:

- It may be difficult to initiate a constructive domestic dialogue on climate policy when immediate budgetary, economic and financial interests work against decisive climate change action that will drive investment away from GHG-intensive activities.

- Economies that rely on GHG-intensive exports are exposed to an external risk of declining demand and prices as the rest of the world embarks resolutely on emissions reductions, and have therefore limited, if any, control over the pace and moment of a decrease in revenues. Reliance on depleting fossil-fuel resources and the volatility of international market prices is already a major concern in fossil resource-rich countries¹. External factors may in this way force more proactive domestic change in fossil-fuel exporters, despite entrenched interests.

As the International Energy Agency (IEA) shows in its scenario consistent with a 66% likelihood of keeping the global average surface temperature increase to below 2°C throughout the century (IEA 66% 2°C scenario, IEA 2017), the world will still need coal, oil and gas for some time. As such, a progressive yet timely exit and diversification strategy is feasible if it is well planned. The challenge for economies rich in fossil fuels is how to best build on today's revenues, workforce skills, education and training institutions, infrastructure and other capacities to engage in diversification.² Saudi Arabia, for example, has identified such risks and opportunities in its Saudi Vision 2030 transition plan to a less oil-dependent economy (see Box 5.4 in Chapter 5). Diversifying government income through energy price reforms and other public revenue measures can help to align diversification goals with GHG mitigation. Such policies are always best undertaken from a position of strength, when international energy prices are high. However, most often, the fiscal pressures that drive structural reforms come only when commodity prices fall. Indonesia and Russia, for example, were also set for austerity with public spending cuts following the recent decline in global oil prices, although some cuts have been held back by a more recent upswing in oil prices.³ Countries with fewer reserves will need to get fossil-fuel subsidy removal and economic reforms under way even more quickly.

The policy and social challenge facing countries rich in fossil fuels is multi-dimensional, hinging on elements such as their ability to spur new activities and innovate; the education levels of their workforces; and their financial infrastructure. Norway, for example, manages its oil wealth effectively through a sovereign wealth fund, of which the government is allowed to spend no more than 4% a year.⁴ This has helped to achieve high living standards while reducing exposure to risks related to the oil price.

The fossil-fuel industry also matters for public and broader institutions in other economies, through its footprint in financial markets and pension funds (Box 6.1).

Box 6.1. Pension funds rely on energy companies' stocks

Stranded assets will sooner or later affect the capital value of energy companies. Chapter 3 provides latest estimates of stranded assets under the IEA 66% 2°C scenario, assuming an orderly energy transition (IEA, 2017).

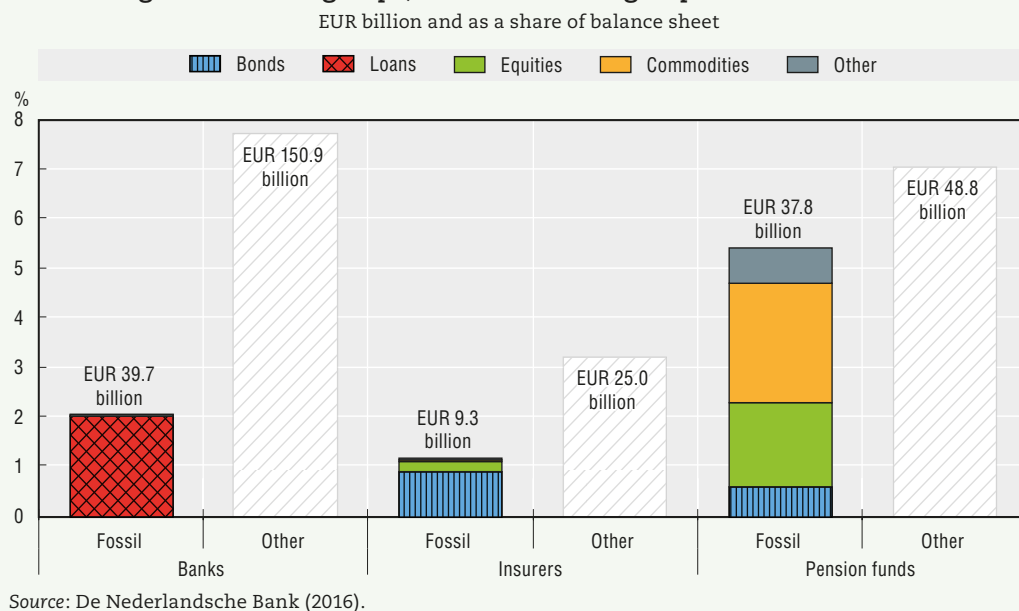
Energy companies can be an important share of a stock market's capital value or of the indices that it proposes to fund managers. Pension funds need to be aware of the possible risk caused by policies that directly target the revenues of companies that rely on fossil fuels. For that reason, France introduced legislation requiring institutional investors to evaluate and report on their exposure to risks related to climate change, including the effect of climate change policies on their portfolios (Journal Officiel, 2015; see also Chapter 7).

In 2014, the total of equity, bond and credit exposures of EU financial institutions to the fossil-fuel industry were EUR 260-330 billion for EU pension funds, EUR 460-480 billion for banks and EUR 300-400 billion for insurance companies (Weyzig et al., 2014). This represents approximately 5% of total assets for pension funds, 4% for insurance companies and 1.4% for banks.

Box 6.1. Pension funds rely on energy companies' stocks (cont.)

De Nederlandsche Bank (2016) has analysed the exposure of Dutch financial institutions to commodity price risks and loans to carbon-intensive producers (Figure 6.1). Dutch banks have EUR 38 billion in outstanding loans to emerging economies that are vulnerable to falling commodity prices. Their largest exposure is to Brazil and Russia. Pension funds' exposure to these countries amounts to EUR 30 billion. Dutch financial institutions' exposure to producers of fossil fuels, including oil and gas companies, amount to EUR 40 billion for the three largest Dutch banks, EUR 38 billion for the three largest pension funds, and EUR 9 billion for the three largest insurance groups. Overall, the Dutch bank association concludes that the costs of a gradual transition will probably be manageable, but a rapid shift could see carbon-intensive companies written off abruptly. A bursting "carbon bubble" may damage not only producers of fossil fuels, but also other GHG-intensive sectors, such as energy generation, transport and agriculture. Exposure to these sectors accounts for a large part of the balance sheets of Dutch financial institutions.

Figure 6.1. Fossil fuels on the balance sheet of the three largest Dutch banks, the five largest insurance groups, and the three largest pension fund administrators



Revenues from taxes on fossil-fuel use will also be eroded. If a carbon tax were the only instrument for the transition, estimates of demand-price elasticities indicate that carbon tax revenues would rise faster, given constraints on emissions, than energy tax revenues would if no further policies on climate were implemented. In fact, however, several other instruments have already been mobilised to reduce GHGs, including support schemes for low-carbon alternatives, performance standards and other regulations, representing tax expenditures rather than revenues through a carbon tax. The rising constraints on emissions are also being anticipated by energy-using equipment manufacturers, which are rapidly introducing low-carbon technology such as electric vehicles.

As a result, new tax revenues will need to be mobilised as fossil-fuel consumption drops. In Portugal, for example, the Green Tax Reform led to an increase in the vehicle tax of around 3%. The scope for broadening the base and for increasing rates is considerable,

so revenue erosion is not an immediate concern.⁵ While abrupt changes are unlikely in this area, detailed country-level modelling could help to anticipate when revenue erosion may arise and what alternatives should be envisioned. These could include taxation of transport and other energy services. In the United Kingdom, for instance, GBP 28 billion per annum of tax income comes from fuel duty, which is tied to the use of combustion engines in the transport sector (Office for National Statistics, 2017).

The scale of the fiscal challenge underlines the fact that moving to a clean economy concerns not just environment, energy or transport ministries. Long-term planning also needs to involve finance ministries to ensure a successful and fiscally sustainable transition. In particular, there is a tension between setting taxation levels that maximise revenue while minimising deadweight loss (the principle of fiscal efficiency), and the use of tax policy to change behaviour. For some countries with high energy consumption taxes, CO₂ reduction policies will impose fiscal policy shifts towards other steady bases for taxation.

Why political economy matters in climate policy: lessons from technology deployment and industrial transitions

Technological change vs. stakeholder interests: carbon capture and storage in the EU

From the early 2000s, it was recognised that any credible 2°C pathway had to deal with the scale of coal use in power generation. Carbon capture and storage (CCS) was seen as offering a way to do so while meeting climate and energy security requirements simultaneously. Global emission scenarios consistent with the Paris Agreement objective of well below 2°C also assume an important role for CCS (Chapter 3). Experience in Europe shows how important it is to ensure that different interests align in this area.

Between 2005 and 2009, Europe led global efforts to avoid dangerous climate change and advance CCS. In 2007, a programme was launched that aimed to develop 12 CCS projects by 2015. The programme was supported by a funding mechanism (NER300) that was linked to auction revenues from the EU Emissions Trading System (ETS) and economic stimulus support for six leading projects.

This political impulse clashed with underlying political economy interests at the sectoral level, however. Policy makers had assumed that incumbent players would want to deploy CCS as a means of protecting high-carbon assets and business models. In reality, utility companies and the coal sector perceived CCS as a threat to their assets and in conflict with their lobbying positions: the coal sector remained reticent about strong climate action for coal, and utilities favoured a single policy instrument, the emissions trading scheme. Meanwhile, the economic crisis combined with the spread of renewables was challenging their business models. Their response was to prioritise the pursuit of capacity payments for existing power plants, and to call for a stronger carbon price under the EU ETS.

At the same time, policy makers charged with advancing CCS focused on coal rather than on climate change. They paid insufficient attention to the application of CCS to energy-intensive industries, even though two of the most advanced CCS projects in Europe were proposed for steel and hydrogen production. By tying CCS to coal power, policy makers failed to provide a clear public interest case for deploying CCS to clean up and modernise “old” industries that are under continuous pressure to restructure.

What could have been done differently? Engaging the gas sector and industrial emitters from the cement, steel, biofuels and chemicals sectors earlier would have been more productive, as their long-term interests and skill sets are more closely aligned with the deployment of CCS. More emphasis should also have been given to developing new business models that provided CO₂ transport and storage infrastructure alongside targeted deployment incentives.

Such an approach requires greater government willingness to create “market maker” infrastructure providers, as has often been done to accelerate the deployment of public interest infrastructure as diverse as sewerage systems and gas pipelines. This is not a question of “picking technology winners”, but does mean identifying key geographies and geologies where CCS can be deployed. The broad alignment of interests and incentives for CCS require careful attention by all stakeholders if this option is to deliver the sizeable emission reductions projected by long-term scenarios to stay well below 2°C.

Divestment: the need for exit strategies

Several financial actors, companies and individuals are lowering the carbon footprints of assets as policy interventions start to reduce profits and market shares, and increase the economic and reputation risks these assets carry. Some are also acting on ethical grounds (Baron and Fischer, 2015).

Vattenfall, a Swedish energy company owned by the Swedish government, announced its intention to divest its lignite mines and associated power plants in eastern Germany in October 2014. During the sales process, prospective buyers lost interest as market conditions for lignite power deteriorated and political pressure to reduce German power sector emissions grew. The portfolio, initially valued at EUR 2-3 billion, was eventually sold for a “symbolic price” to the Czech power producer Energetický a průmyslový holding (EPH), with Vattenfall additionally having to make a cash transfer of EUR 1.7 billion to EPH to cover high expected land reclamation costs (Reuters, 2016). EPH expects that rising European power prices can restore the profitability of these assets.⁶ The company also indicated its interest in assets that can benefit from capacity payments, as found in the company’s 2015 annual report (EPH, 2016) although this was not mentioned in the course of the transaction. Two of the acquired units are in fact part of the German electricity system’s emergency reserve and will generate revenues outside the energy market as a result.

When it seemed that Vattenfall might not find a buyer, several proposals for a managed closure of the plants through the creation of a charitable foundation were discussed. These became irrelevant when the Swedish government approved the sale in July 2016, despite widespread concerns about the sustainability and environmental responsibility of the buyer.

The possibility of closure raised social concerns as the lignite industry provides around 15 000 direct jobs – 3.7% of local employment – in Lusatia, where the plants are located (Schwarzkopff and Schulz, 2015). The social implications of such job losses cannot be ignored. The sale created serious difficulties for the German federal government and for the state governments of Brandenburg and Saxony, which wanted to keep the lignite assets open, whether this meant selling or having Vattenfall maintain ownership.

While Vattenfall reduced its carbon footprint, the mid-term impact may be a net increase in GHG emissions, as EPH will seek to maximise revenues from the newly acquired assets. The mines and power plants could have been wound down in a way that helped the region’s workers – including economic diversification, pension bridging, reskilling and redeployment of workers – but this option was not considered given the sale.

This case illustrates several pitfalls that may arise during the transition, as governments need to make politically unpopular but necessary decisions to facilitate the exit of carbon-intensive activities. It also demonstrates the need for a comprehensive climate mitigation policy package: a stronger price on CO₂ emissions through the EU ETS would have clarified the not-so-favourable economics of lignite-based power and probably facilitated the elaboration of an exit strategy.

Governments that want to avoid the social fallout of mining closures will have to either stop such sales or create an enabling environment for buyers. They should take a more active approach in negotiating divestment deals with companies or in managing future phase-outs. In Germany, the Climate Action Plan 2050 finalised in November 2016 has opened discussions on coal phase-out, and options should be presented in 2018 (Weiss, 2017). If a political solution is needed, it should be elaborated sooner rather than later. The following section covers some of the policy instruments and approaches that can be used to handle these situations.

Lessons from earlier industrial transitions

The pathways described in Chapter 2 show that a significant shift in the global energy profile is necessary to mitigate climate change, with a decline in the use of coal, oil and gas, in that order. In the power generation sector, decarbonisation implies the stranding of production assets. The best way to avoid massive stranding is to align energy infrastructure decisions with the Paris Agreement climate objective (Chapter 3), but some of the productive capacity that exists today will not recoup its investment cost in a low-carbon scenario.

Beyond fossil fuels, other activities that are very GHG-intensive, such as cement, steel, chemicals, paper and pulp, and glass – face similar risks, until technological change makes their decarbonisation possible.⁷ They will also be challenged by alternative solutions, improved resource efficiency or recycling of their outputs. New business models could emerge, undermining or reinforcing incumbent companies. Today's GHG-intensive companies also have considerable human capital that will be essential for successful shifts in technology and business models. Some sectors have already shown that they can undergo rapid changes as new technologies appear. The steel sector, for example, adopted electric arc furnaces that enabled scrap to account for 25% of global crude steel output.

The policy challenge is to manage the reduction of emissions from today's GHG-intensive sectors while minimising the destruction of assets' value. This first requires sending clear signals to investors and decision-makers in companies, starting with coherent climate policy instruments, including public procurement that spurs innovation in the right direction (see Chapter 5). It also requires corporate disclosures that reflect firms' positions in the face of climate risks (see Chapter 7).

It is impossible to predict how efficient these heavy industries will be in their shift to a low-emission, climate-resilient economy; although policy makers should aim for an orderly evolution, disruptive changes may happen. Disruptions can also be exacerbated by business cycles and other factors, such as the global excess capacity of the iron and steel industry, or the current pressure on government budgets in oil-rich economies. These challenging times for every industry also open a window of opportunity for governments to prepare industry for competition in a world consistent with the objectives of the Paris Agreement. Failure to do so is likely to result in further carbon lock-in or stranded assets down the line.

Governments sometimes intervene to facilitate large-scale industrial restructuring, with mixed results. Numerous firms also enter and exit markets without government intervention. Within any given economy and any given sector, managers of incumbent companies will adopt different strategies and new entrants may drive incumbents out, so an overall picture of stranded assets and new opportunities cannot be obtained. Divergent corporate strategies are already visible in the oil and gas sector: some multinationals are expanding renewable energy activities while others remain focused on conventional activities.

Overall, it is unlikely that all high-emission companies will manage to re-allocate capital (financial and human) without problems. Governments should start thinking about policy packages to facilitate and not prolong the exit of less successful plants.

During recent sectoral crises, G20 governments have intervened to facilitate restructuring. Their policy approaches, particularly in the shipbuilding and the iron and steel sectors, offer examples for the low-emission transition.

- Investment aid, strictly related to restructuring: loan guarantees to support companies closing facilities (in the EU and Japan) have been effective when accompanied by commitments to reduce capacity, e.g. in Japan's shipbuilding industry in the 1980s (OECD, 2005).
- Closure aid, to cover social costs (severance pay-outs, counselling services, vocational training), which are addressed below.
- Diversification and modernisation: financing instruments and other measures to promote energy efficiency, process improvements, and environmental protection in the Japanese steel industry in the 1970s (Tamura, 2015); public support to promote job creation in depressed areas (Europe, steel) (Davignon, 2016); site transformation, from shipbuilding to ship-repair and offshore wind (Denmark), or in Gdansk, from container ship-building to specialised hulls and industrial steel structure (Mazurkiewicz-Gorgol and Bomhoff, 2009).

Governments freed up considerable resources to facilitate the restructuring of these sectors. In the 1980-85 restructuring of European steel, for example, EU producers received ECU 38 billion of state aid (23 to support continued operations, 12 to improve operations, 2 for closure and one to support R&D) (Davignon, 2016).

In China, Liu and Xu (2015) consider overcapacity in coal and heavy industry and advocate for a "Fund for output reduction and transition of industries with excess overcapacity" to finance special bonds used by local governments, with penalties for non-compliance with output reduction plans. In early 2016, China established a Special Fund for Excess Capacity Reduction to finance lay-offs and reemployment in the coal and steel industry.⁸ Funds will be raised mainly from power grid enterprises and the amounts will be based on the energy generation of these enterprises. The special fund will co-finance worker layoff and re-employment, alongside local funds.

Box 6.2. Barriers to "green" restructuring

Several problems may hamper industrial restructuring, including the exit of inefficient plants and firms:

- General conditions may sometimes create inadvertent barriers to exit, including the administrative costs of closing plants, such as the costs incurred by companies when going through bankruptcy procedures, the cost of decommissioning and rehabilitating industrial sites, or severance payments and relocation of workers.
- Industries with high capital and sunk costs and low salvage values may be able to run relatively unproductive (and polluting) plants for a long time.
- The financial sector may discourage exit as the sudden closure of firms facing overcapacity could create market risks.
- Some heavy and fossil-fuel industries are geographically concentrated and account for an important share of local economic activity and jobs. Local governments have a direct interest in sustaining economic activity and may offer support to firms that should otherwise exit the market.
- In certain G20 economies, state-owned enterprises are often active in heavy and fossil-fuel industries, which may have financial and social implications for structural change.

A rational approach for government interventions is to first facilitate the exit of less profitable, less energy- and resource-efficient firms. Support for the modernisation of the industry should be targeted to the remaining companies, subject of course to the country's state aid rules. If broad subsidies to upgrade the sector are introduced first, they risk being wasted on companies that are likely to shut down; they also undermine the main effort to cut capacity, essential to restore the viability of remaining companies. Box 6.2 highlights some challenges with industrial restructuring.

Addressing the impacts of mitigation-related policies on household income

The success of the transition, and public support for it, depends on equitable and transparent distribution of its costs and benefits across society. Energy and transport affordability is central to the discussion on how changes in energy prices would affect development and welfare of households in different income groups (Box 6.3). Equity outcomes and public support could be undermined by concerns that instruments such as carbon pricing and reform of fossil-fuel subsidies may lead to energy price increases that disproportionately affect poorer households. Economic simulations and policy observations demonstrate, however, that adverse impacts of energy prices on the affordability of energy and on inter-household equity can be alleviated without harming the environmental effectiveness of policies. The following sections give examples of measures to that effect, in the context of carbon and energy taxes and fossil-fuel subsidies.

Solving distributive impacts of carbon pricing

To ensure that public debate is well informed and that effective policies are designed, it is vital to gauge how the transition affects societies and economies. It is also crucial to understand how to prevent or reduce impacts that are regressive – i.e. that fall disproportionately on the poor. Despite a common perception, climate policy instruments are not always regressive. In a sample of 21 mainly European OECD economies, taxes on transport fuels were often proportional to income in high-income countries and progressive in middle-income countries, with limited regressive effects for heating fuels and stronger regressive effects for electricity (Flues and Thomas, 2015). Analysis for low-income countries also shows progressive effects of taxes on transport fuels (Sterner, 2012). A review of relevant work from over two dozen countries concludes that while environmental taxes can be regressive in some high-income countries, transport-fuel taxation is generally progressive, particularly in low-income countries (Kosonen, 2012). In low-income countries, such as India, taxes on transport fuels are generally considered to be highly progressive in both urban and rural areas (Datta, 2008).

Where higher energy prices have a regressive effect, well-designed social policies can improve access to energy and reduce energy affordability risks. An appropriate use of revenues, such as income-tested transfers, can ensure that higher carbon prices have progressive impacts (Klenert and Mattauch, 2016). Simulations for 20 high- and middle-income countries show that transferring a third of the additional revenues from higher energy taxes can improve energy affordability (Flues and Van Dender, 2017). A review of more than 120 studies notes that if a sufficient, but small, part of revenues from energy taxes is handed back to households, it is possible to avoid negative distributional effects, and also reduce poverty and deprivation (OECD, 2014). More broadly, concerns about the post-tax distribution of income should be addressed through personal income tax reform rather than through differentiated carbon or energy taxes, which can frustrate or hinder the underlying environmental objective of reform.

Overall, policy makers can take full account of the expected impacts of proposed policies on income distribution and embed solutions that ensure their progressivity. There need not be a trade-off between the effectiveness of a carbon pricing mechanism or other measures to lower emissions and their impact on household equity. There is now much policy experience in this area, which can be replicated as countries decide to introduce mitigation policies targeted to the general public.

Box 6.3. Energy access and affordability within the climate policy context

The success of climate policies partly hinges on how well they guarantee energy access and affordability. Households need access to modern energy services such as lighting, cooking, heating and transport. Lack of energy access is sometimes called energy poverty. Households should not face difficulties in paying for necessary levels of energy use. A lack of such energy affordability is referred to as energy affordability risk, or fuel poverty, and may compromise health and participation in society.

In the case of energy access, energy use remains flat for the lowest income groups until the household is well clear of the poverty line. This means that even though a household may be earning more, it will not spend the additional income on energy at first: there are therefore many more households that lack access to energy than there are households below the poverty line. In the case of energy affordability, there is a clear link between energy affordability risk and low disposable income.

For G20 countries, lack of energy access is largely a rural problem in emerging economies, notably in India where 44% of households lack access to electricity (IEA, 2016). The use of traditional fuels is widespread in Indonesia (72% of the population) and Brazil (13%), and just under half of Chinese households use solid fuels for cooking (and often for heating as well) (Tang and Liao, 2014). Energy affordability risk can be high in both rural and urban areas, including in advanced economies where it affects 2% to 30% of the population, depending on the indicator used (Flues and Van Dender, 2017). These are important considerations when thinking about policy instruments that aim to transform energy use, including by phasing out fossil fuels (see below).

It is more important to address the causes of insufficient access to energy and energy affordability risks (through access to cleaner and more efficient fuels, new and more targeted social transfers, more efficient electric appliances and housing, and improved public transport) than the symptoms (such as increased costs and health problems). Energy efficiency measures can help deliver similar or higher end-use service at lower overall cost. Rather than increasing product prices, for example, energy efficiency labelling schemes significantly lower lifecycle costs.

Such energy efficiency measures can produce a “triple dividend”. A positive environmental effect from reduced emissions is accompanied by a positive economic impact: large-scale energy efficiency policies can boost annual economic growth by 0.25% to 1.1% (IEA, 2014). In addition, re-investing carbon revenues in energy efficiency programmes aimed at low-income households would also yield an equity dividend. Low-income households may not always fully benefit, however, because they often use older or second-hand appliances, so energy efficiency programmes specifically targeting the poor tend to be most effective. Through Brazil’s Electricity Public Benefit Fund, for example, utilities are required to invest 0.5% of their revenues in energy efficiency programmes, of which 50% must be devoted to low-income households.

Sources: Flues and Van Dender (2017, forthcoming); Tang and Liao (2014); IEA (2016); IEA (2014).

Lessons from fossil-fuel subsidy reforms

When governments start to appreciate the environmental, financial or opportunity costs of fossil-fuel subsidies, and attempt to reform them, they typically face a difficult, politically risky task. Subsidies benefitting consumers of fuels or electricity are usually widely available, and may be regarded by citizens as their rightful share of their nation's natural wealth. Raising the price of a basic commodity is rarely popular. Subsidies benefitting fossil-fuel production flow to powerful companies with considerable resources to defend the status quo.

Resources freed up by reducing fossil-fuel subsidies can also be used to alleviate energy affordability pressures on poorer households. Analysis before subsidy reforms in Indonesia showed that removing fossil-fuel and electricity consumption subsidies would result in real GDP gains of 0.4% to 0.7% and aggregate welfare gains for consumers ranging from 0.8% to 1.6% in 2020 (Durand-Lasserve et al., 2015). Such findings suggest that the choice of redistribution system may determine the impacts on different income groups. Cash transfers, and to lesser extent food subsidies, tend to reduce poverty and hence appeal more to poorer households. Compensation mechanisms proportional to labour income tend to benefit higher-income households and increase poverty, as informal employment is higher among poorer households, which renders them ineligible to receive these payments.

An increasing number of countries have overcome the political obstacles to subsidy reform. Successful reforms generally have several features in common. First, the government will have gathered data on the monetary value of the subsidies, their distribution across beneficiaries, and how energy-related services — and, usually, air quality — could be improved when prices better reflect costs. As countries are also committed to reducing national GHG emissions, they would have looked at the cost per tonne of carbon emissions reduced through fossil-fuel subsidy reform and compared that with alternative policies.

Surprisingly, at the start of reform, governments often have poor information even on how much money they are spending, or losing, and how the subsidies have grown through time. The actual distribution of subsidies across income classes can also come as a surprise to policy makers. Price subsidies may have even been conceived initially as a way of reducing poverty. Yet untargeted subsidies that simply reduce the price of fuel or electricity for everyone are by their nature regressive: the richer the household, the higher their energy consumption, the more they benefit from the subsidy.

An IMF review of fossil-fuel subsidies in 32 developing countries found that for every USD 100 spent on subsidising fuels, only USD 18 goes to the bottom 40% of households. In other words, for each USD of benefit provided to the poorest 40% of households in each country using energy subsidies, governments spend on average USD 5.6 (Coady et al., 2015). In Mexico, for example, 40% of the subsidies for gasoline between 2006 and 2014 went to the top 10% of its population. In India, 87% of electricity consumed by domestic consumers is subsidised, based on 2010 estimates, of which more than half goes to the richest 40% of households, while 25% of households do not even have access to electricity (Pargal and Banerjee, 2014).

These figures compare unfavourably to the cost of direct cash transfer programmes, recognised as one of the most efficient ways to deliver social assistance to poor households. In Bolivia, 58% of the Juancito Pinto cash transfer programme goes to the poorest 40% (Arauco et al., 2014). In Peru, 71% of the Juntos cash transfer programme goes to households below the international poverty line (Jaramillo, 2014). In Brazil, it is estimated that 80% of the Bolsa Familia programme goes to the poorest 32% (Soares et al., 2006).

Communicating information on subsidies is essential in the reform process. In Egypt, 70% of the population did not know the scale of energy subsidies in 2014 (Fay et al., 2015); in Morocco, a 2010 survey found 70% unaware that energy was subsidised at all.

The governments' strategies included explaining that the subsidy absorbed a huge part of government revenues (39% in Egypt and 17% in Morocco) and that the compensation package would address citizens' concerns about "what's in it for me?"

To target energy subsidies better, countries such as India and Egypt have experimented with voucher systems. The United States, which deregulated its petroleum and natural gas markets in the 1970s and 1980s, also targets its energy-related assistance to poorer households through its Low Income Household Energy Program (LIHEAP). Iran introduced the Targeted Subsidy Reform Act, replacing some fossil-fuel subsidies with targeted cash transfers to households (Guillaume, Zytek and Farzin, 2011). Similar targeted assistance to help with heating bills was introduced in 2015 by Ukraine in connection with its subsidy reforms (Ogarenko and Gerasimchuk, 2016). India transfers subsidies directly into the bank accounts of means-tested consumers of liquid petroleum gas (LPG) and kerosene. When the informal economy is large, it can be difficult to target assistance for energy fuels to lower income households. In such situations, electricity subsidies can be targeted to specific households, to a specific amount of energy (e.g. the first 80 kilowatt-hours every month), or both.

Numerous other countries have shifted assistance from fuel or electricity consumption to cash transfers. In 2015, for example, the Kingdom of Saudi Arabia raised retail gasoline prices by about 50% as part of a plan to restructure energy subsidies, pushing down oil consumption by 2% in the first 11 months of 2016 compared with the corresponding period in 2015; it raised prices again at the end of 2016. Families affected by the measures could register for cash transfers from 1 February 2017; the payments are expected to start in June 2017 (Mahdi, Carey and Nereim, 2016; Lee, 2017).

Overall, effective reform of fossil-fuel subsidies requires an accurate understanding of its primary impact on budgets and on targeted consumers. Alternative methods, such as cash transfers, are needed to correct the social distortions that subsidies were intended to rectify in the first place. Governments that need to undergo this delicate process now have much experience to build on.

Towards a "just transition"

"Taking into account the imperatives of a just transition of the workforce and the creation of decent work and quality jobs in accordance with nationally defined development priorities [...]"

– UNFCCC, 2015, preamble to the Paris Agreement.

Alongside households, the other critical group affected is the workforce of companies that are likely to be restructured or closed. Trade unions are fully aware of these challenges and have publicly advocated for a role as active players in a "just transition". For climate action to be successful, workers should have a say in their company's strategy to respond to the climate challenge; and when restructuring and closures are anticipated, proper social measures should be planned.⁹

The UNFCCC estimates that there are nearly 1.5 billion jobs in sectors critical to climate stability (Table 6.2). This is probably more an indication of the magnitude of economic activities that will contribute to mitigation and the need to adapt to ongoing climate changes, than an estimate of total jobs at stake in the transition. For instance, the IEA's 66% 2°C scenario indicates that around 1 million direct jobs would be "lost due to the premature closure of assets, around 20% of current coal mining employment", to be put in perspective with the current 30 million jobs in the energy sector (IEA, 2017).

Although the aggregate effect on jobs may be modest (see Chapter 4), the net number hides significant job losses at local level, with potential for geographical dislocation of affected communities, as well as creation of new jobs, some of which require new skills.

Workers who lack mobility or means to acquire new jobs in different industries and regions may find themselves with skills and expertise no one wants, leaving whole communities vulnerable (Caldecott et al., 2016). Upgrading and diversifying workers' skills is vital to strengthen their resilience to risks and shocks, particularly where access to education is limited and incomes are low, limiting the opportunities to re-skill and relocate.

Table 6.2. Global direct employment in sectors critical to climate stability

Sector	Employment (millions of people)
Agriculture	1 000
Forestry	44
Energy	30
Manufacturing (resource-intensive)	200
Buildings	110
Transport	88
TOTAL	1 472

Source: UNFCCC, 2016.

Historically, the term “just transition” was used by North American trade unionists to describe a programme of support for workers who lost their jobs due to environmental protection policies. It is now used globally and understood by trade unions and their partners as an effort to plan and invest in a shift to environmentally and socially sustainable jobs, sectors and economies.

Trade unions have recognised the urgency of acting to mitigate climate change. They point out the need to open negotiations with companies on how to best move to a low-emission economy. The International Trade Union Confederation has set out several demands, including recognising workers in the fossil-fuel industry; supporting innovation in the manufacturing sector; investing in community renewal; guaranteeing social protection and human rights; establishing just transition funds; and pursuing social dialogue backed by collective bargaining (ITUC, 2010). In 2015, the International Labour Organization established *Guidelines for a just transition towards environmentally sustainable economies and for all* (ILO, 2015), which rests on the following principles:

- a. Strong social consensus on the goal and pathways to sustainability.
- b. Policies that respect rights at work.
- c. The recognition of the strong gender dimension of environmental challenges and opportunities, and the consideration of policies to promote equitable outcomes.
- d. Policy coherence across economic, environmental, social, education, training and labour portfolios to generate an enabling environment for the transition.
- e. The anticipation of impacts on employment, social protection for job losses and displacement, skills development and social dialogue – including the right to organise and bargain collectively.
- f. The need to take into account the specific conditions of countries, including their level of development, economic sectors and sizes of enterprises – no “one size fits all” solutions.
- g. The importance of fostering international co-operation among countries.

Even if there is a high-level consensus among trade unions on sustainable development and climate protection, however, those whose jobs are directly at stake sometimes oppose climate policies (ETUC, 2016). This reinforces the case for engagement with workers and unions to ensure community ownership.

In the wake of the financial and the economic recessions, it is not enough just to mitigate the effects of climate policy on the workforce: climate policy also has to help to create new jobs, for example in renewable energy and energy efficiency measures.¹⁰ The urgency to act on climate could be challenged by a workforce that does not see new jobs and livelihoods arising in parallel with abrupt industrial and economic changes. Chapter 4 stresses the importance of active labour market policies to guide employment towards new, low-GHG activities or other growth sectors.

The following case studies show how labour force aspects are playing out, positively or negatively, in recent transition processes.

Just transition at the enterprise level: Enel in Italy and Latrobe Valley in Australia

Enel, an Italian electricity multinational, is committed to renewable energy and to researching and developing environmentally friendly technologies. In 2015, approximately half of the group's electricity was from non-fossil sources. Enel has committed to decarbonize its energy mix by 2050.

As part of its decarbonisation plan, Enel will close 13 GW of thermal power stations in Italy, while expanding renewable energy, demand management and other measures. It has entered into social dialogue and a framework agreement with its Italian union partners. The framework covers retention, redeployment, reskilling and early retirement. It is a good example of a just transition agreement for this sector as it envisions the workforce evolving hand in hand with the structural change of the sector from a small number of large plants to a more decentralised model. The employability problem was managed by Enel together with trade unions, using opportunities provided by recent Italian legislation.¹¹

The closure of the Latrobe Valley Hazelwood coal power plant in Victoria, Australia, provides another example of worker transition measures. Its owner, the French energy multinational Engie, decided to close the plant on 31 March 2017, a decade after the end of its envisioned technical life. The Victoria government signed an agreement with Engie to transfer some workers to the AGL Loy Yang B station, also operated by Engie. Vacancies at this station will be created through early retirement packages. A funding scheme of AUD 20 million was put in place to support the workers, part of a AUD 266 million package for the Latrobe Valley, AUD 50 million of which is to support business growth in this community (Victoria Government, 2017).

Community level: perspectives for social and ecological industrial policy

Schweinfurt, Germany, has 50 000 inhabitants and a strong automotive industry, so decarbonisation will bring structural changes that affect lives and working conditions. The Bavarian metalworkers' union IG Metall and Friends of the Earth in Bavaria (BUND) are collaborating on a project that aims to identify how to create a social and ecological transition in the area. The project will consider the consequences of climate change and demographic trends on employment as well as on private lives. During the project, the partners will tackle challenges like increasing energy efficiency and reparability of products, as well as the energy and resource efficiency of plant processes. The provision of regional mobility options is another strong focus. Improving quality of life and protecting the environment are held equally important. The organisers also seek to answer the following questions, putting people first: How should the region's industries develop their products, processes and employees' skills? How can new jobs be created at the same time? How can the interests of employees and the environment be brought in line?

Port Augusta, South Australia, hosted coal mining and coal-based power plants for more than six decades until its plants, among Australia's oldest, closed in 2016. A local initiative bringing together citizens, workers and trade unions elaborated a plan to replace coal-based

activities with renewable power generation plants (6 concentrated solar plants and 95 wind turbines; Repower Port Augusta, 2017). The first plant was completed in October 2016.¹² The initiative attracted interest from three potential employers and received funding from the Clean Energy Finance Corporation (a Commonwealth entity) and the South Australian government, an example of how central and local governments can collaborate to help communities move away from CO₂-intensive activities. The Port Augusta example shows how important investment can be for community transitions. Low-carbon infrastructure can help communities to avoid stranding but may require public support.

The transition of workers during Canada's phase-out of coal power generation

In 2016, the government of Canada announced plans to phase out coal-fired electricity by 2030, by which time 90% of Canada's electricity will be non-emitting. Coal-fired power produces 8% of Canada's total emissions and almost three-quarters of emissions from its power sector. To support an overall transformation of the economy, the government intends to use CAD 21.9 billion over 11 years for low-carbon infrastructure and commercially viable clean energy, including funds flowing through the Canadian Infrastructure Bank.

The government has also committed to working with provincial governments and organised labour to “ensure workers affected by the accelerated phase-out of traditional coal power are involved in a successful transition to the low-carbon economy of the future” (Government of Canada, 2016). This includes a national Just Transition task force, including organised labour, to guide and support the shift away from coal.

Social dialogue: the closure plan of the Diablo Canyon facility

Diablo Canyon is the last remaining commercial nuclear power plant in California, meeting 8.6% of California's power consumption. Although its low-carbon technology does not make it an obvious case study for this report, its closure plan offers a useful example of a just transition process.

Diablo Canyon has been targeted by environmental groups from its construction onward, because of general opposition to nuclear power and because of concerns about its safety in an area prone to earthquakes. It has been the target of numerous protests and legal challenges. Pacific Gas and Electric (PG&E), one of California's three investor-owned utilities and the largest utility in the United States, owns and operates the facility. As of 2011, PG&E employed 1 200 workers at Diablo Canyon, and 200 workers were employed by subcontractors.

In 2016, the plant faced uncertainty about whether its lease and permits would be renewed. If the state had not extended the lease, the plant would have had to close down as early as 2018. The local trade union (IBEW local 1245) worked to ensure that the plant would stay open to preserve employment, while Friends of the Earth US was campaigning for the plant to phase out and for PG&E to invest instead in renewable energy, energy efficiency and energy storage (Moglen and Peek, 2016). PG&E informed the trade union that it would not seek relicensing of the plant after 2024, based on market conditions, but was seeking a coalition to stave off an abrupt shutdown. The trade union started working on a retention package. The final deal was to operate the plant for eight to nine more years, combined with a package including annual bonuses, severance allowances, and retraining – a positive outcome from the union's perspective. Under the agreement, PG&E will also compensate the community for its loss of property tax revenues with USD 85 million, and will reserve up to USD 62.5 million for plant decommissioning.

Both unions and civil society groups describe the Diablo Canyon closure plan as a good example of a just transition process. It was based on effective social dialogue involving strong unions and a large and well-funded employer who recognises and supports

rights at work. For workers, the long lead time to closure (eight years), good retraining and redeployment provisions, and generous retrenchment packages were key. PG&E's ability to offer a Just Transition Fund, compensate the community for lost tax revenues and create new jobs in renewable energy and energy efficiency were also important (see PG&E et al. 2016).

It will nonetheless take several years to see how many workers at the plant are able to retrain and redeploy within the company. Similarly, the surrounding community now needs to try to diversify its economy and attract a broader tax base. The real results of the agreement may not be apparent for a decade after closure.

Retraining and skills development: examples from Belgium, France, Germany and Saudi Arabia

Stronger energy efficiency standards in the EU and Belgium have driven an increase in jobs retrofitting buildings as well as building new structures to a higher standard of energy efficiency. These standards, along with technological innovation in the building sector, have developed so quickly that it is challenging for workers to keep up to date (see also OECD/IEA/NEA/ITF, 2015).

To address this issue, the three main trade unions in **Belgium** and sector employers have collaborated on developing courses for construction workers linked to green buildings and energy efficiency measures. Workers and employers assess the need for skills training together and develop proposals, which lead to very concrete training programmes executed by the government organisations.

Saudi Arabia started the development of its energy efficiency policy in 2010, leading to the Saudi Energy Efficiency Program (SEEP) in 2012, focusing on three sectors (buildings, transport and industry) totalling 90% of the country's energy consumption. The programme contains standards, labels and regulations covering a range of equipment (vehicles, white goods, building codes, etc.) and accompanying measures (e.g. a national energy-service company). Human capital development is an important component, with the development of energy efficiency curricula in five engineering schools, the development of an energy efficiency technician degree, and professional training for energy managers, based on the ISO 50001 energy management certification system (Alabbadi, 2016). Energy efficiency retrofit programmes could generate up to 247,000 jobs in Saudi Arabia over 10 years depending on the ambition of implementation (Dubey, Howarth and Krarti, 2016).

In **France**, workers from a car factory in Le Mans that was closing were retrained in mechanics and electromechanics to work in the new wind turbine industry, which helped to maintain jobs and create a new local activity. In Bielefeld, **Germany**, the project "Meine Energie hat Zukunft" (My Energy has a Future) brought together the public employment services, 120 companies, higher education institutions and vocational training providers, among others, to attract students to renewable energy-related activities (ILO, 2016).

Informal workers in the transition: Bus Rapid Transit in Bogotá, Colombia

Transmilenio, the bus rapid transit (BRT) system of Bogotá, Colombia, is the most used BRT system in the world, with 1.6 million passengers a day. Before BRT, informal workers driving minibuses provided the bulk of Bogotá's transport. Their work involved long days, leading to health problems and insecure conditions; these workers also had little ability to organise themselves.

BRT has been praised as a sustainable transport solution, reducing pollution and congestion. In theory, BRT should also be good for workers, replacing insecure informal jobs with formal work with better conditions. But each newly created formal job in BRT

replaces seven jobs driving minibuses, according to some estimates. Despite this, there has been no effort by the government, the donors (the World Bank) or the bus company to assess the impact of this restructuring on the existing workforce, and to ensure that affected workers are supported to gain employment in the new system, to retrain in order to find alternative work, or to take early retirement. “The experience suggests that even a progressive restructuring programme that results in the creation of formal jobs can have significant negative labour impacts, and exclusion of workers and their representatives from dialogue about the reforms undermines the possibility of tackling those problems fairly” (Porter, 2010).

Such examples support the case for prior assessment of social impacts. ILO argues that “mitigation actions with potential social impacts, should only be taken once the potential affected population are protected and compensation measures through adequate social protection measures are in place” (ILO, 2016).

The above case studies illustrate several points that echo the ILO’s just transition guidelines:

- Local communities and unions have a key role to play in the shift to a low-emission, climate-resilient economy, including identifying activities that can substitute the declining high-carbon ones.
- An active social dialogue is necessary between unions, employers, and local or central government.
- The transition needs to be anticipated years in advance in order to facilitate retraining and mobility plans.
- High-level policy and corporate commitments are vital, including funding commitments.
- Overall coordination, co-operation and trust among stakeholders is crucial.

Managing the transition: towards robust, low-emission, climate-resilient, development strategies

The call of the Paris Agreement to formulate and communicate long-term low GHG-emission development strategies offers governments an opportunity to start a discussion among all stakeholders on the key domestic ingredients of a successful shift to a low-carbon, climate-resilient economy. A few countries, including G20 members, have built long-term GHG emission pathways to guide their strategies (see Chapters 2 and 3).

This report’s chapters on pathways (Chapter 2), infrastructure needs (Chapter 3) and financing (Chapter 7) all show how important it is for each country to have a long-term vision of a low-emission economy. Such a vision is necessary to drive a set of near- and medium-term decisions on policies and infrastructure, and generate common expectations among public and private stakeholders.

A purely technical approach that leaves out political economy aspects can miss opportunities and challenges, limiting buy-in for implementation. In countries where they have been developed, 2050 planning processes have initiated debate and deepened understanding. Experience with domestic and international initiatives to design long-term GHG strategies provides the following lessons:¹³

- Long-term strategies help to make it clear to stakeholders that economic and political transformations are necessary. They can offer stakeholders opportunities for competing visions of the low-emission transition, which can expose vested interests and help ensure the robustness of the agreed outcome. In the Netherlands, a detailed Energy Agreement for Sustainable Growth was reached by the government

with employers, trade unions, environmental organisations and others, containing provisions on energy conservation, renewable energy and job creation, and associated policies and funding measures. The involvement of non-governmental stakeholders in the process ensures broad support (Government of the Netherlands, 2017).

- In their long-term economic plans, countries should take into account actions by the rest of the world in the context of the Paris Agreement – especially by export-oriented economies, whether in high- or low-carbon products. Global linkages among economies that are starting to take climate mitigation actions are likely to exacerbate disruptive effects.
- Climate change impacts should be part of the conversation on long-term strategies, informed by the latest available science. Even if projected changes are gradual in the medium term, they can affect the viability of certain technology or infrastructure options.
- The modelling of domestic economic pathways may not reflect the possible emergence of new activities, infrastructure, business models or disruptive technologies. As an example, a cost-based analysis may indicate a growing role for CCS, but will say little about the need to align various stakeholders for the provision of critical infrastructure for CO₂ transport and storage.
- Sectoral change is most effective when aligned with investment cycles and trends. As infrastructure reaches the end of its technical life, windows of opportunity open and close rapidly. In the United Kingdom, for example, the government had recognised by 2009 that there could be no new coal plant without CCS, due to lifetime emissions associated with any new coal power plant. The quantitative tools used for long-term projections sometimes miss this dimension of capital stocks, giving a misleading sense of progressive change when step changes are more probable.
- Sectoral targets help to provide guidance to investors and planners about future trends, supporting a more orderly transition. Transparency is important to avoid capture of sectoral goals by vested interests.
- Low-emission development strategies can be regularly revised – as is the case of the UK carbon budgets and the German 2050 plan. Numerous examples in recent climate policy history show why revisions will be necessary. These include: unexpected levels of effectiveness of policy instruments (EU ETS, renewable support policies); significant cost changes of low-carbon options (onshore and offshore wind, solar, nuclear, hybrid and electric vehicles); technology disruptions (LED, compact fluorescent and incandescent lighting); the emergence of new business models; changes in macro-economic conditions; and new information on climate change impacts and vulnerabilities.
- Strategies need to take into account constraints and opportunities related to the workforce, such as the availability of skills and training needs.

The process of elaborating low-emission development strategies can be critical in a country's response to the climate challenge. Nationally determined contributions pledged under the Paris Agreement are only the first step towards a long-term strategy that brings together various business, public sector and civil society interests. Long-term strategies should create an opportunity to gather the views of different ministries and levels of government. Governments can choose from a number of approaches to organise co-operation across ministries. For instance, there could be a systematic regulatory review of proposed legislative changes, testing their impact on GHG emissions and climate resilience – i.e. an extended climate impact assessment.¹⁴

Notes

1. This is illustrated by some of the main themes of the 2016 Arab Fiscal Forum: “Revenue Diversification in the Arab World: Challenges and Opportunities”; “Macro-Fiscal Challenges – Learning to live with Cheaper Oil”; and “Managing Oil Wealth – A Fiscal Framework for Uncertain Times” (Arab Fiscal Forum, 2016a, 2016b)
2. IMF (2016) underlines the differences across oil-exporting Arab countries and lays out policy recommendations to promote economic diversification contingent on country circumstances and capacities. Macroeconomic stability and supportive institutional and regulatory frameworks are prerequisites to promote diversification of government revenues and unlock the private sector potential in non-oil sectors.
3. See: <https://www.bloomberg.com/news/articles/2016-06-06/saudi-arabia-approves-plan-to-bolster-non-oil-economy>; <https://www.bloomberg.com/news/articles/2016-06-21/for-jokowi-real-test-on-indonesia-fuel-subsidy-may-be-starting>.
4. In February 2017, the Norwegian government announced that it would reduce the cap on spending from 4% to 3%. See <https://www.bloomberg.com/news/articles/2017-02-16/norway-central-bank-chief-warns-of-sharp-drop-in-wealth-fund>
5. If transport became fossil-fuel-free, today’s main source of environmentally related tax revenue in most countries would disappear. However, it is possible to tax other, closer proxies to transport services, for example, the distance driven. The technology for doing so is available and getting cheaper, leading to growing adoption of distance-based charges.
6. “...we are convinced that lignite is in a position to contribute successfully to the rapidly evolving German power mix”. Jan Springl, Board member of EPH, Reuters, 2016.
7. Wyns and Axelson (2016) give an overview of decarbonisation options for these industrial actors, from technology to business models, highlighting also the cross-sectoral linkages that the low-emission transition could generate as industries look for improved resource efficiency.
8. See http://szs.mof.gov.cn/bgtZaiXianFuWu_1_1_11/mlqd/201601/t20160122_1655180.html; http://english.gov.cn/state_council/ministries/2016/05/19/content_281475352712538.htm
9. See Rosemberg (2010) for a history of the emergence of “just transition” in the climate policy context and an early overview of climate and jobs-related issues.
10. The US Energy and Employment Report finds that 6.4 million Americans work in the energy and energy efficiency sector, with a 5% increase in 2016. Some 800 000 individuals work in the low-emission generation industries and 2.2 million “are employed, in whole or in part, in the design, installation and manufacture of Energy Efficiency products and services, adding 133 000 jobs in 2016 [...] Almost 1.4 million Energy Efficiency jobs are in the construction industry” (US DOE, 2017). Other studies try to project the job impacts of the low-emission energy transition; see Saussay et al. (2016), in the case of France, and Bivens (2015) for estimates of employment impacts of the U.S. EPA Clean Power Plan.
11. The measures included: early retirement incentives for older workers; apprenticeships to ensure transfer of knowledge from older to younger workers; company agreements preventing laid-offs through “solidarity agreements”; dedicated training to ensure qualification and employability of resources both during the recruitment phase and in professional mobility, including acquisition of new skills for the development of new businesses.
12. “World-first solar tower powered tomato farm opens in Port Augusta” RenewEconomy.com.au website, accessed on 12 February 2017.
13. These lessons are drawn from national processes for the elaboration of long-term emission pathways in France, Germany, South Africa and the United Kingdom.
14. In the United Kingdom, the Carbon Plan lists contributions of policies towards the overall carbon budget, although these are not legally binding on departments. France established legally binding sectoral carbon budgets aligned with its long-term goal.

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