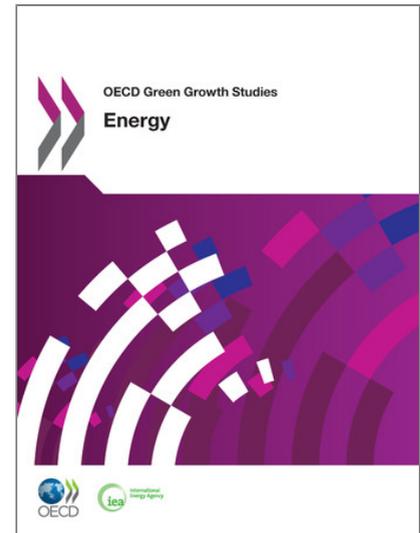


OECD *Multilingual Summaries*

OECD Green Growth Studies. Energy

Summary in English



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- The OECD Green Growth Strategy aims to provide concrete recommendations and measurement tools, including indicators, to support countries' efforts to achieve economic growth and development, while ensuring that natural assets continue to provide the resources and environmental services on which well-being relies. The strategy proposes a flexible policy framework that can be tailored to different country circumstances and stages of development.
- This report was coordinated with the International Energy Agency (IEA).

Introduction

Energy is a fundamental input to economic activity. Modern energy services light up our homes and schools, fuel economic activity to produce and consume, provide comfort and mobility, pump water and contribute to health and well-being. Harnessing energy sources to replace manual and animal labour was the platform of the Industrial Revolution: a period of unprecedented economic and social development.

The 20th century witnessed large increases in the global population, economic output and fossil fuel consumption. The gains from growth have been impressive for many. Yet these gains have taken a toll on a range of environmental systems where unsustainable practices have dominated. Continuing deterioration of natural resources could stress the ability to meet the needs of a growing population and undermine economic activity. Green growth could meet this challenge. Green growth is about fostering economic growth and development while ensuring that natural assets continue to provide the ecosystem services on which our well-being relies. To do this it must catalyse investment and innovation which will underpin sustained growth and give rise to new economic opportunities.

The energy sector poses a particular challenge in the context of green growth due to its size, complexity, path dependency and reliance on long-lived assets. The current energy system is highly dependent on fossil fuels, whose combustion accounted for 84% of global greenhouse gas emissions in 2009. Global demand for energy is rapidly increasing, due to population and economic growth, especially in large emerging countries, which will account for 90% of energy demand growth to 2035. At the same time, nearly 20% of the global population lack access to electricity. A major transformation is required in the way we produce, deliver and consume energy.

A large-scale transformation of the global energy sector is possible, though it will require significant investment. Global emissions could be halved by 2050, using existing and emerging technologies at an additional cumulative investment of USD 46 trillion. It is vital for governments to create the enabling policy framework to catalyse private-sector investment in the transition to a low-carbon energy sector. It is cheaper in the long-term to act now, as every USD 1 of energy sector investment not spent before 2020 will require an additional USD 4.3 to be spent after 2020 to compensate for increased greenhouse gas emissions by building zero-carbon plants and infrastructure by 2035.

Benefits and opportunities

Moving economies in a greener direction will foster broad benefits. High levels of resource productivity and the efficient use of energy can lead to more dynamic and competitive economies which are, in turn, better able to respond to the scale of the transition that is required. Countries can gain an advantage by being the first ones to take action and realising the benefits related to competition in widening international markets for green energy goods and services. Green growth can reduce the burden on land, air and water resources while creating expanded opportunities for gains in productivity, quality of life and social equity.

The environmental imperative to reduce carbon dioxide (CO₂) emissions and ensure sustainable growth in the energy sector coincides with a looming new investment cycle in power generation in most OECD countries. In non-OECD countries, many power generation facilities are quite young, but more will be built in the coming years to meet growing energy demand. There is a window of opportunity to establish the policy framework to enable transformational change in the energy sector, including facilitating technological innovation and the creation of new markets and industries, to reduce the sector's carbon-intensity, and improve energy efficiency.

Overall, there are four key elements that provide the economic rationale for applying green growth strategies to the energy sector:

- *Economic costs of environmental damage and poorly managed natural resources:* Failing to address environmental concerns and not managing natural resources effectively poses risks to long-term economic growth, for example, via the growing scarcity and rising price costs of increased environmental damage of conventional fossil fuels and to well-being through the impairment of human health caused by pollution, for example.
- *Innovation to achieve environmental and economic objectives:* Innovation is fundamental to the objectives of green growth in that it can help to decouple environmental damage from economic growth. It is also at the core of economic objectives such as productivity growth and job creation. Innovation is particularly important in the energy industry, as we search for forms of energy that impose fewer environmental costs and for ways of improving efficiency in use as prices rise.

- *Synergies between environmental and productivity growth objectives*: Improved resource productivity and energy efficiency, through innovation or deployment of energy technology or processes, supports decoupling between economic growth, environmental damage and resource degradation.
- *Opportunities for new markets and industries*: Shifting toward green growth in the energy sector will require new technologies, fuel sources, processes and services that can spur new markets and new industries. Firms that are proactive in the face of these changes will be well-positioned to both contribute to and benefit from them.

Policies for green growth in the energy sector

Aligning the energy sector with a green growth framework requires a clear understanding of national priorities. While fostering greener growth will require international co-operation, it is largely a national matter and the policy mix will therefore differ across countries, according to local environmental and economic conditions, institutional settings and stages of development.

Policies will need to take into account the inter-relationships between economic sectors, transports, land-use patterns, social welfare and environmental integrity. A range of mutually reinforcing measures is required to address market failures and barriers, and create the enabling policy conditions for largescale private-sector investment. This includes:

- *Rationalising and phasing-out inefficient fossil fuel subsidies* that encourage wasteful consumption, while adequately addressing the needs of low-income households through effectively targeted social policies.
- *Setting a price signal to value externalities* and provide robust signals for longer-term structural changes.
- *Establishing sound market and regulatory frameworks* that remove barriers to green investments and facilitate the move away from existing systems and patterns of fossil fuel energy use.
- *Radically improving energy efficiency* will reduce the need for investment in energy infrastructure, cut fuel costs, increase competitiveness, lessen exposure to fuel price volatility, increase energy affordability for low-income households and cut local and global pollutants improving consumer welfare.
- *Fostering innovation* by creating the enabling environment and regulatory frameworks to foster breakthroughs and overcome the inertia incumbent in today's energy systems, whether institutional or economic. Investment in relevant research and temporary support for the development and commercialisation of green technologies will be needed in certain cases. Intellectual property protection is important to the industry as reflected in the growing numbers of clean technology patent applications. In addition, governments need to implement effective policies for green energy innovation that target the cost competitiveness gap while also fairly reflecting the maturity and competitiveness of individual technologies and markets.

To achieve a green energy revolution and large-scale CO₂ emission reductions, all technology options will be needed. Energy efficiency, many types of renewable energy, carbon capture and storage, nuclear power, smart grids and new transport technologies can all contribute to curtailing greenhouse gas emissions, while promoting energy security and delivering wider environmental and social benefits. Constraining the types of technology that can be used in the energy sector transition will substantially increase costs.

Making green growth strategies work

Policy commitments to green energy growth are essential to providing policy certainty, clear direction for infrastructure investments and addressing structural change. Adoption of comprehensive strategies for energy efficiency, such as the International Energy Agency (IEA) 25 energy efficiency policy recommendations, provides resilient policy platforms for green energy growth.

Tailor-made energy policies for economies at different development stages can constitute the driver for a successful transition to green growth in the energy sector and the wider economy. The challenges to design and implement such a policy package with a consistent framework are considerable. Many energy systems are “locked-in” to high carbon production and consumption patterns that can be difficult to break for reasons that go beyond simple economics. Making reform happen will require attention to some common political economy challenges:

Structural adjustments: structural change involves not only a breakthrough of new technologies, but also corresponding shifts in the broader supporting system of infrastructure, supply chains, institutions, markets and

regulations. Policies should aim to address barriers to change across the entire energy system and accelerate the “creative destruction” process. Specific actions include:

- Carefully designed *electricity market reform* to set incentives for suppliers to invest in efficiency with consumers and “green” capacity as well as environmentally friendly technologies to meet demand.
- *Dedicated supply chains* for efficient and clean energy applications, to combine specialised firms in geographical clustering, attract potential business partners and enhance conditions for local innovation and technology and infrastructure development, as well as to encourage international co-operation.
- *Targeted policy mechanisms* to attract private finance to the renewable energy and energy efficiency sectors.

Stranded capital: Sunk capital that is at risk of being stranded can act as a constraint on the rate of transition towards cleaner energy systems. Addressing the political economy of stranded capital will require:

- Carefully assessing future societal needs, seeking *less capital intensive options and opening up alternative low energy options* such as end use efficiency, distributed systems for services.
- Developing *standards for flexible options* such as carbon capture-ready fossil fuel plants that could retrofit at a later stage.
- *A regulatory framework* that provides a long-term view with clear milestones, to provide robust signals, reduce uncertainty and establish credibility.
- *A significant carbon price or proxy*, which provides a clear expectation of increase over time to create incentives strong enough to encourage sustainable energy solutions.

Distributional effects: Restructuring the energy sector is expected to have (relatively small) direct employment changes and wider equilibrium effects across the economy as well as between countries. Policies should help to ensure that while there will be winners and losers, the adjustment can be achieved in a way that is consistent with appropriate social policies. Specific policies include:

- Carefully designed package of *labour market and skills policies*, to help the labour market be dynamic and inclusive. This includes education policies that enable workers to acquire the training they need to move from contracting to growing industries and firms.
- *Consumer and demand side power in markets*, especially programmes to *expand the supply of safe, efficient and reliable energy* to the poorest sectors of society.
- Combining the *removal of environmentally harmful energy subsidies* with *effectively targeted policies for poverty alleviation* to offset the financial impacts on poor communities, allowing consumers to make more rational choices in their energy use and more efficient uses of government expenditures.

Monitoring progress towards green growth in the energy sector

Government progress on implementing policies that promote green growth in the energy sector can be evaluated using well designed operational sets of indicators, which the IEA and OECD are currently developing in consultation with a broad group of stakeholders.

The OECD has developed a conceptual framework for monitoring progress towards green growth, including a set of indicators. While the set of indicators is still being refined, key indicators pertinent to the energy sector are those that measure the carbon productivity or intensity of energy production and consumption (on various levels, including national and sectoral), energy intensity and efficiency, “clean” energy-related research and development and patents, as well as measures of energy related taxes and subsidies.

This needs to be complemented with (i) energy end-use indicators that help policy makers understand how users will respond to changes in energy prices, income, technology, energy efficiency, production patterns, and lifestyle (ii) additional energy-environment indicators, and with indicators characterizing the level of access to energy.

While energy statistics and balances are generally well established in countries and at international level, measuring energy efficiency and innovation is difficult, and coherent industry level information is scarce. More needs to be done improve data quality, methodologies and definitions, and to link the data to economic information.

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