



Green Transitions Guidance Note

Energy Sector

IBC Training Programme on Green Transitions
Proposed Template

*The United Nations Issue-based Coalition (IBC) on Environment and
Climate Change for Europe and Central Asia*

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Executive Summary

In this Guidance Note we present and discuss possibilities for how the energy sector can undergo a green transition to support achieving the Paris Agreement's long-term temperature goal to keep the rise in mean global temperature to well below 2 °C above pre-industrial levels, and preferably limit the increase to 1.5 °C.

The energy sector causes mainly CO₂ emissions resulting from electricity and heat production, transport, heating of buildings and energy use in industries, but also fugitive emissions (methane, CH₄). The World's global greenhouse gas emissions account for 50 billion tons CO₂ equivalent, and two thirds of it can be attributed to the energy sector. So, the energy sector is key in achieving climate neutrality.

Each country is invited to develop low emission development strategies laying down pathways and climate mitigation opportunities to achieve a green transition. The challenge hereby is that there is no one-size- fits-all approach. An additional uncertainty is now introduced by the current energy crisis demanding from governments a quick adaptation to changes in energy availability and energy prices. Therefore, countries first need to understand their national circumstances and analyse their potentials. To do this, several tools and approaches are publicly available, such as the Carbon Neutrality Toolkit by UNECE, Fossil fuel subsidy simulator by UNDP, Country savings analysis by UNEP, Net zero pathway by IEA, De-risking renewable energy investment tool by UNDP.

Strategic and programmatic guidance is provided by the presentation of several interventions leading to decreased use of fossil fuels in our energy system. The interventions best known are an increase of renewable energy and increased energy efficiency, i.e. lower primary and final energy consumption. But these interventions can only unfold their full potential if also actions are undertaken in other areas, such as low carbon mobility, electrification, smart grids, sector coupling, energy storage, interconnection, phase out of fossil fuels, district heating & cooling, new technologies (such as hydrogen), digitalisation and carbon capture and storage.

Summarizing, we cannot shy away from a clean energy transition and that the benefits of acting early are weighting much more than postponing or even ignoring the need for action.

Background and Context for Green Transitions

The green transition is key to safeguarding our planet's future allowing us to turn the fossil-fuel dependent economy to a green economy, in a new sustainable paradigm that drives sustainable development and peace. It is an integral part of the 2030 Agenda and directly contributes to the achievement of most of the SDG targets. The Ukraine crisis has seriously affected the Europe and Central Asia region including exacerbating the energy crisis, increased pollutants, biodiversity loss and climate change. During this time, it is important to support member states of the region to turn environmental and climate challenges into opportunities and to make the Green Transition just and



inclusive for all. The success of this transition depends on strong regional coordination, involving local authorities, state-owned enterprises, the private sector, civil society, research and education institutions, youth, the financial sector, and the development community.

In response to the request by Resident Coordinators, UN Country Teams and the Development Coordination Office, the Issue Based Coalition on Environment and Climate Change for Europe and Central Asia (IBC) offers the **Green Transition Training Programme** dedicated to RCOs and UN Country Teams in Europe and Central Asia. The Green Transition Training Programme further builds countries' capacities to design strategies and action plans for green transition. The content is based on the expertise and resources among the IBC members. The work is led by UNDP, UNECE, UNEP and UNESCO and facilitated by IISD, with contributions from the other IBC organisations and external experts.

The IBC Green Transitions Training Programme offers five webinars led by different agencies depending on capacity from September to November, with most having both a thematic and a sub-regional focus. The main themes, identified through various consultations with the RCOs and UNCTs, are: (1) Sustainable Finance; (2) Energy; (3) Circular Economy; (4) Plastics; and (5) Enabling policies and strategic frameworks for Green Transition at the country level.

This Guidance Note was prepared in support of the IBC Green Transitions Training Programme.

The Role of the Energy Sector in Green Transitions

The World's greenhouse gas emissions amounted to nearly 50 billion tons CO₂ equivalents (including CO₂, CH₄, N₂O and F-gases) in 2019¹, and 73% of that resulted from activities in the energy sector. In the ECA region, CO₂ emissions from the energy sector are responsible for almost 90% of total CO₂ emissions. This makes clear that reducing the carbon intensity of our energy system is key in achieving a climate neutral economy and society. The good news is that this is possible but requires coordinated immediate action by shifting of financial flows, replacing fossil fuels, reducing our energy consumption and modernising our energy infrastructure.

Energy Sector - Approaches and Tools for a Green Transition

The transition of the energy sector needs to be addressed at all levels, on a global, regional, national and local level. The United Framework on Climate Change Convention (UNFCCC) represents the global framework for coordinated actions in mitigating climate change and adapting to the climate change impacts. This globally coordinated approach is elemental, as the industrialised countries having caused the global heating must act and support developing countries in adapting.

Coming back to the energy sector, it is important to keep in mind that is not only the electricity and heat production we need address, but also the transport sector, the energy use by households,

¹ Source: CAIT Climate Data Explorer via Climate Watch



industries and the service sector, as well as fugitive emissions resulting mainly from leakages during fossil fuel exploitation and transport. Consequently, this offers a lot of opportunities to intervene.

In subtopic 1, we will see how this challenge is addressed at the different levels.

Global, regional and national approaches

The global ambition is set in the Paris Agreement as to limit global warming to well below 2, preferably to 1.5 degrees Celsius, compared to pre-industrial levels. In Article 4 this is specified as reaching global peaking of GHG emissions as soon as possible and achieve a balance between emissions and removal in the second half of the century.

The Paris Agreement requires all parties to put forward Nationally Determined Contribution laying down quantified emission reductions and enhance these, every five years. Parties are also invited to prepare long-term Low Emission Development Strategies. So far, only Ukraine and North Macedonia from the region submitted such to the UNFCCC.

In 2021, during the COP26 meeting, the Glasgow Climate Pact was agreed, which makes specific reference to the energy sector:

“36. Calls upon Parties to accelerate the development, deployment and dissemination of technologies, and the adoption of policies, to transition towards low-emission energy systems, including by rapidly scaling up the deployment of clean power generation and energy efficiency measures, including accelerating efforts towards the phasedown of unabated coal power and phase-out of inefficient fossil fuel subsidies, while providing targeted support to the poorest and most vulnerable in line with national circumstances and recognizing the need for support towards a just transition; “

In 2019, **the European Union** presented its European Green Deal put forward the goal to achieve climate neutrality by 2050 and to achieve a net GHG emission reduction of 55% by 2030. The framework to achieve is not only about a clean energy transition, but also on circular economy, zero-pollution, sustainable mobility, biodiversity and sustainable food systems – all under the condition to achieve a just transition (leaving no one behind). In 2019, the EU adopted also its ‘Clean energy for all Europeans package’, a set of legislation to drive the energy transition.

Achieving the 2030 climate and energy targets are regulated in the Energy Governance Regulation ((EU) 2018/1999), which sets the common rules for planning, reporting and monitoring. The five pillars of the Governance Mechanisms are (1) Decarbonisation, (2) Energy Security, (3) Energy Efficiency, (4) Internal Energy Market and (5) Research, Innovation and Competitiveness. EU Member States and Members to the Energy Community are required to prepare the so-called “Integrated National Energy and Climate Plans” by 2019 detailing how on country level the five pillars are addressed. Every two years after countries must report on progress made, to allow monitoring the overall EU progress.

Regarding the countries in the region, members to the Energy Community (<https://www.energy-community.org/>) ((Albania, Bosnia and Herzegovina, Georgia, Kosovo, North Macedonia, Moldova,



Montenegro, Serbia and Ukraine) need to prepare NECPs and report on their progress in achieving energy targets. For 2020, the headline target for energy efficiency was -20%, which was achieved by all countries. Regarding the renewable target, Albania, Moldova and Montenegro have overachieved their national 2020 targets set by Directive 2009/28/EC. The targets until 2030 are not set yet but will be formalized in December 2022, and will ask for a stronger commitment.

With the support of the **EU4Climate project** (<https://eu4climate.eu/>), implemented by UNDP, Armenia, Azerbaijan, Georgia, and Moldova receive support in preparing their Low Emission Development Strategies.

Impacts of the Energy Crisis

Energy prices increased considerably since the last two years. Relatively low prices in 2020 were a result of the Covid pandemic with severe supply-chain disruptions. As many economic activities decreased during this time, leading to lower energy demand and lower energy prices. With a relatively quick recovery, prices increased again and since February this year – when Russia invaded Ukraine – the supply of key commodities is disrupted and caused the energy crisis we are in.

We are now experiencing a mismatch between energy demand and supply, driving not only production costs up, but also prices for end-consumers for energy as well as food and other products. The inflation we are experiencing now is worse than the one during the financial crisis in 2008/2009.

The governments have now additionally to deal with increased energy poverty, increased living costs and a general social discontent. To support citizens and businesses many governments are providing financial aids as wages are not covering.

The other challenge governments need to address is to maintain energy security and to no longer rely on gas and oil provided by Russia. This resulted in actions not beneficial for a green energy transition – such as the switch to liquified natural gas, postponing the closure of coal fired power, reactivation of gas power plants. Another consequence is an increased demand for nuclear energy is one of the consequences, not producing CO₂ but causing other risks for humans and the environment. But the energy crisis is also promoting a green transition, as a switch to renewable energy sources (wind, solar, bioenergy, heat pumps), to sustainable systems and infrastructure (e.g. electrification, smart grids, sector coupling) and a strong call for energy saving measures is taking place.

The International Energy Agency published in March 2020 a report called ‘A10-Point Plan to Reduce the European Union’s Reliance on Russian Natural Gas’², where this IEA analysis proposes a series of immediate actions that could be taken to reduce reliance on Russian gas, while enhancing the near-term resilience of the EU gas network and minimising the hardships for vulnerable consumers. The 10-Point Plan is consistent with the EU’s climate ambitions and the European Green Deal and also points towards the outcomes achieved in the IEA Net Zero Emissions by 2050 Roadmap, in which the EU totally eliminates the need for Russian gas imports before 2030.

² <https://www.iea.org/reports/a-10-point-plan-to-reduce-the-european-unions-reliance-on-russian-natural-gas>



Tools & Databases

In the following, several tools, reports and databases are presented which can support policy makers to better understand the complex environment and to design and guide a green energy transition.

Name	Energy Transition Toolkit
Publisher	Developed by World Energy Council
Description	<p>To drive impact and promote effective collaboration, members of the Council have developed transition tools that help define and better manage successful energy transitions.</p> <p>These tools – which can be used individually or in combination – enable the development of new, timely and actionable insights. The flexibility of the toolkit recognises different starting points and a no ‘one size fits all’ approach to a successful transition. The tools can be used to support interventions on a global, regional, national, sectoral, and/or cross-sectoral basis.</p> <p>The tools available are:</p> <ul style="list-style-type: none"> - World Energy Pulse 2022: Report how crises are impacting the pace of transition - World Energy Issues Monitor 2021: The Issues Survey captures 25 core energy transition issues across 5 categories - World Energy Trilemma index: Energy Security, Energy Equity and Environmental Sustainability - World Energy Scenarios - Innovation Insights - World Energy Transition Radar
Link	https://www.worldenergy.org/transition-toolkit#fullpage1

Name	Carbon Neutrality Toolkit
Publisher	Developed by UNECE
Description	<p>The UNECE region currently depends on fossil fuels for some 80% of its primary energy demand. Hard-to-abate sectors, such as energy intensive industries, account for about 25% of total CO₂ emissions globally. These industries are also the backbone for modern economies, and they play an important role in driving a low-carbon post-Covid recovery.</p> <p>Decarbonization of hard-to-abate sectors is a priority for the region to attain carbon neutrality and meet the Paris Agreement targets.</p> <p>To help countries to explore achievable pathways to design and attain carbon-neutral energy systems the UNECE Sustainable Energy Subprogramme developed a Carbon Neutrality Toolkit. The Toolkit identified technology and policy options and provided recommendations</p>



	<p>on facilitating the move towards carbon neutrality and specified the requirements for a carbon-neutral energy system.</p> <p>The Toolkit consists of:</p> <ul style="list-style-type: none"> - Technology Brief on Carbon Capture, Use and Storage - Technology Brief on Hydrogen - Technology Brief on Nuclear Power - Report on Geologic CO₂ storage in Eastern Europe, Caucasus and Central Asia - Report on Integrated life-cycle assessment of electricity sources - Report on Technology interplay under the carbon neutral concept
Link	https://carbonneutrality.unece.org/y Toolkit

Name	Fossil Fuel Subsidy Simulator
Publisher	Developed by UNDP
Description	<p>The tool allows to simulate the re reallocation of a percentage of a country's fossil fuel subsidy towards Temporary Basic Income (TBI), as well as other outcomes such as education, health, and renewable energy and its impact on vulnerable people and welfare.</p> <p>Fossil fuel subsidies make up a large percentage of the GDP of many low- and middle-income countries. That is why fossil fuel subsidy reform presents a viable avenue for governments to create fiscal space which can be channeled into green investment, correcting environmental externalities, and enhancing social protection programs, especially in the light of the impacts of the COVID-19 pandemic. Reallocating fossil fuel subsidies could also free up resources to accelerate progress on the Sustainable Development Goals (SDGs).</p> <p>However, the success of fossil fuel subsidy reform requires detailed analysis of potential consequences and ensuring that economically disadvantaged groups and fossil fuel dependent sectors of the economy are not disproportionately affected. With this interactive simulator users can explore different scenarios of fossil fuel subsidy reforms and their impacts.</p>
Link	https://data.undp.org/fossil-fuel/

Name	Net Zero by 2050
Publisher	Developed by IEA
Description	<p>The number of countries announcing pledges to achieve net zero emissions over the coming decades continues to grow. But the pledges by governments to date – even if fully achieved – fall well short of what is required to bring global energy-related carbon dioxide emissions to net zero by 2050 and give the world an even chance of limiting the global temperature rise to 1.5 °C. This special report is the world's first</p>



	comprehensive study of how to transition to a net zero energy system by 2050 while ensuring stable and affordable energy supplies, providing universal energy access, and enabling robust economic growth. It sets out a cost-effective and economically productive pathway, resulting in a clean, dynamic and resilient energy economy dominated by renewables like solar and wind instead of fossil fuels. The report also examines key uncertainties, such as the roles of bioenergy, carbon capture and behavioural changes in reaching net zero.
Link	https://www.iea.org/reports/net-zero-by-2050

Name	De-risking renewable energy investment - DREI
Publisher	Developed by UNDP
Description	<p><i>Derisking Renewable Energy Investment</i> (DREI) introduces an innovative, quantitative framework to assist policymakers in developing countries to cost-effectively promote and scale-up private sector investment in renewable energy.</p> <p>The DREI framework systematically identifies the barriers and associated risks which can hold back private sector investment in renewable energy. It then assists policymakers to put in place packages of targeted public interventions to address these risks. Each public intervention acts in one of three ways: either <i>reducing</i>, <i>transferring</i> or <i>compensating</i> for risk. The overall aim is to cost-effectively achieve a risk-return profile that catalyzes private sector investment at scale. The end result is reliable, clean and affordable energy solutions in developing countries.</p>
Link	https://www.undp.org/publications/derisking-renewable-energy-investment

Name	IRENA Flex tool
Publisher	International Renewable Energy Agency (IRENA), developed with the VTT Technical Research Centre of Finland Ltd.,
Description	<p>This tool allows to analyse the flexibility of a power system in order to accommodate the largest possible share of renewable (solar and wind) energy sources. The FlexTool is a detailed but user-friendly tool that intends to analyse not only the traditional concept of flexibility (concerning, for example, flexible thermal and hydropower generation with high ramping capability and very low start-up time), but also other innovative technologies that enrich the concept of flexibility, such as flexible demand, energy storage and sector coupling. The FlexTool is capable, on the one hand, of analysing system operations using a time step that represents real-world challenges (an hour or less in the case of variable renewable energy, VRE) and, on the other hand, of carrying out</p>

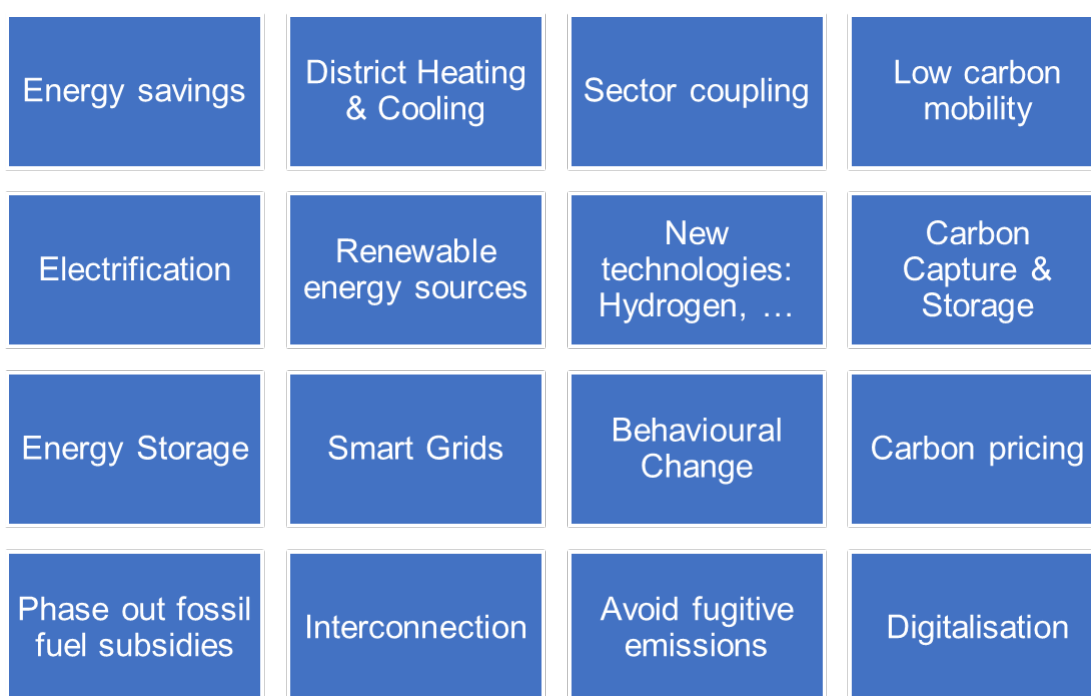


	least-cost optimisation of the generation mix, as well as flexibility solutions with regard to grids, storage, the demand side and sector coupling. To perform a FlexTool simulation the required inputs are, in brief: demand, generation mix, hydrological data, VRE (variable renewable energy) time series, interconnections and fuel costs.
Link	https://www.irena.org/energytransition/Energy-System-Models-and-Data/IRENA-FlexTool

Strategic and Programmatic Guidance

There is a list of possible interventions to decarbonise the energy sector, whereby none of these can work a stand-alone activity as the effectiveness of the possible interventions is largely depending on others. For example, the increase of renewable energy alone, is not effective if the electricity grid cannot deal with the variability of the renewables, so it will need possibilities for energy storage and sector coupling systems. Another obvious example is that if we do everything except increasing our energy efficiency, we will not be able to deal with increasing energy demand in a sustainable way.

The figure below shows the areas we must work in to enable a green energy transition:

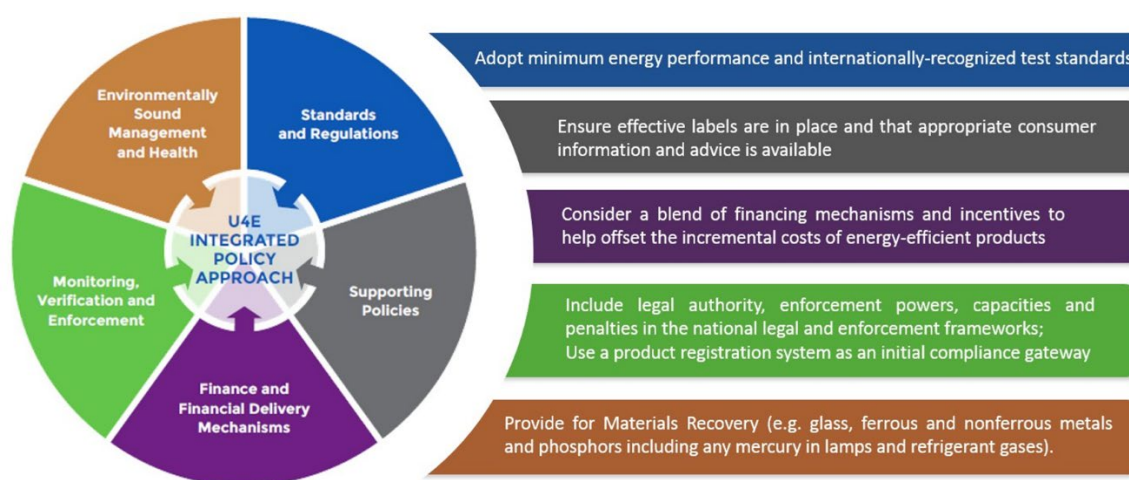


In the following four these possible interventions are addressed in more detail:



Intervention 1: Addressing energy efficiency

The UNEP's programme 'United for Energy Efficiency' supports emerging and developing economies to accelerate their transition to energy efficient and climate friendly products through an Integrated Policy Approach.



Country Saving Assessments are carried out for six different product categories: Lighting, Residential refrigerators, Commercial Refrigeration, Room Air Conditioners, Distribution Transformers and Industrial Electric Motors. The assessment provides three scenarios:

- Business As Usual Scenario (BAU)– No policy intervention;
- Minimum Ambition Scenario – assumes Minimum Energy Performance Standards (MEPS) implemented; and
- High Ambition Scenario – Assumes MEPS are implemented at a higher level of ambition for six products.

The energy savings potential is calculated till 2040 and is computed based on the difference between total energy consumption in the ambition scenarios and that of the BAU scenario and is expressed in terms of GHG emissions mitigated, Capacity (Power plants) avoidance and Financial savings.

Assessments for Central Asia and Eastern Europe show that the six product categories are responsible for nearly 50% of the current electricity consumption. Annual savings of all six products in the Minimum Ambition Scenario show that 57 TWh of electricity consumption could be saved, which is equivalent to 33 Mio t CO₂ and 5.2 Billion USD on electricity bills.

Individual country assessment for all 156 developing and emerging economies are available at: <https://united4efficiency.org/countries/country-assessments>



Intervention 2: Sustainable and Efficient Cooling

The 2016 Kigali Amendment to the Montreal Protocol encourages sustainable cooling by progressively reducing the reliance on high-GWP Hydrofluorocarbons (HFCs) and offers opportunities for energy efficiency gains. Ten countries in the region have committed to a phase-down of the HFC consumption and production, as 137 countries have done so worldwide. All countries in the region are eligible to receive financial support to ensure compliance with the Montreal Protocol, through either the Multilateral Fund or the Global Environment Facility.

The development of National Cooling Action Plans (NCAPs) is a best practise policy to address the cross-cutting nature of cooling, to bring stakeholders from government, industry and academia to the table, discuss needs and possible solutions, and translate this into a document that provides a roadmap for action. Currently, over 30 NCAPs are at various stages of development. In the region, currently Kazakhstan and Uzbekistan are preparing with UNDP to support NCAPs.

Several tools are available to support sustainable cooling policies and actions:

1. [Cool calculator](#) - This Cool Calculator, developed by Cool Coalition is a 2050 scenario tool that allows stakeholders to run simple but open calculations on key aspects of cooling decarbonisation, empowering them to identify a set of solutions that works best for particular regions and/or sectors.
2. [MEPSy](#) - MEPSy is a policy tool developed by CLASP to determine the impact of appliance performance standards (like air conditioners) to determine national side metrics like reduced energy usage, emissions mitigated, and consumer side metrics like payback period and life cycle cost savings.
3. [Factsheets and final reports for demonstration projects](#) on low-global-warming-potential alternatives to HCFC technologies on the web site of the Multilateral Fund for the implementation of the Montreal Protocol and [Sustainable Cooling solutions](#) from the Clean Cooling Collaborative

Intervention 3: Phase out fossil fuel subsidies

According to the International Monetary Fund (IMF) overall fossil fuel subsidies (FFS) amounted globally to USD 5.9 trillion in 2020 (or 6.8 percent of global GDP) and are expected to rise to 7.4 percent of GDP by 2025. In the ECA region fossil fuel subsidies amounted to USD 1.1 trillion in 2020. Expected to have increased to USD 1.2 trillion in 2021 but below pre-pandemic level. However, FFS is expected to have increased considerably in 2022 owing to the global energy crisis.

There are two types of subsidies:

- Explicit (direct) subsidies, which occur when retail prices are below a supply cost/production cost/opportunity costs (for tradeable products). This includes for example tax exemptions, tax rebates or other financial incentives to promote the use of one energy type over another.



- Implicit (indirect) subsidies reflect vast negative externalities stemming from the excessive consumption of fossil fuels. Such ignored or underpriced externalities are the impacts on greenhouse gas emissions, air pollution, depletion of natural resources, traffic or other harmful impacts.

In the ECA countries, indirect FFS are about six times as high as direct FFS, and are mostly spent on oil and coal. The adverse effect of indirect FFS is highest for local air pollution.

The current energy crisis will contribute to growing fiscal and external pressures. Even among stronger economies, blanket subsidies incur significant opportunity cost: money that could be better used for strengthening social protection, provide impactful economic stimulus and countering climate change. Developed country subsidies would dent fiscal space that would have otherwise supported ODA (official development assistance) –very much needed by developing countries facing considerable adversities.

Switching the provision of subsidies from fossil fuels to renewables is key. EU subsidies for renewable energy (RES) has increased nearly four-fold from 2008. The growth in renewable energy subsidies has contributed to the increase in the share of renewable energy in the EU energy mix, rising from 12.6 % in 2008 to 19.7 % in 2019³. In general, throughout the EU, renewable energy subsidies exceed FFS. However, in several states the opposite is witnessed.

Intervention 3: Carbon Pricing

The use of Carbon Taxes as an explicit means of controlling emissions and thereby lowering indirect subsidies have grown in the EU – from 8 states in 2008 to currently 14 states. Carbon taxes vary significantly across nations, from e.g. Poland €0.1/Ton CO₂ to the highest in Sweden at €100/Ton CO₂. The comparison among countries has to consider that national carbon tax initiatives are individually set with different scope and coverages (e.g. transport, heating, fossil energy supply). Ireland has the highest share of emissions covered under the carbon tax regime (49%), whilst in Estonia and Spain it is only 3%.

In the region, only Kazakhstan and Ukraine have introduced carbon taxes, with prices slightly above 1USD per t CO₂. The highest carbon tax has Liechtenstein with almost 130USD/t CO₂⁴. The OECD published in May 2021⁵ its effective carbon rates which serves as valuable benchmark:

- €30/tonne of CO₂ – a historic low-end of the benchmark. **CO₂ prices below this benchmark do not trigger meaningful abatement.**

³ Source: European Court of Auditors, 2021 and 2022

⁴ Source: Worldbank, Carbon Pricing Dashboard, Nominal prices on April, 01 2022

⁵ OECD (2021), Effective Carbon Rates 2021: Pricing Carbon Emissions through Taxes and Emissions Trading, OECD Series on Carbon Pricing and Energy Taxation, OECD Publishing, Paris, <https://doi.org/10.1787/0e8e24f5-en>.



- €60/tonne of CO₂: a mid-range estimate of carbon costs in 2020 **commensurate with a slow rate of decarbonization**.
- €120/tonne of CO₂ – an estimate of the carbon price needed in 2030 to **effectively decarbonise by mid-century (2050)**.

Beside carbon taxes there are emission trading regimes, the most well-known is the European Emission Trading Scheme (EU-ETS). The difference between carbon taxes and emission trading, is that trading of emissions requires first the setting of an emission reduction level, so the allowances are traded following the market principle of supply and demand, and hereby supporting a cost-effective emission reduction with a changeable price. Currently, EU emission allowances under the EU ETS are traded at about 80€. When using Carbon taxes, the price is set and the emission reductions achieved can only be estimated.

Conclusions

There is a range of tools and guidance material available to support a green energy transition. The national plans and actions will need to take into account the national circumstances (e.g. existing energy system, energy demands, potentials of renewables and the financing schemes) to achieve an effective, sustainable and just transition.

A transition will also bring along a range of economic, social and environmental benefits, such as less dependency from fossil fuels, better air quality and better health, millions of net green jobs, chance of a whole-of-society development, local development options, a more resilient energy sector and overall, a chance for a better future.

Although we currently experience critical times, we should make use of the momentum, as energy prices for renewables become more and more competitive, countries want to reduce their energy dependency, citizens care more and more about energy and climate, and a shift from fossil fuel subsidies to green subsidies is unavoidable.

We know how climate neutrality can be achieved, we know our portfolio of interventions – and we also know what happens if we do not act now. Enough knowledge to move away from business as usual!