

Energy for Sustainable Development in the UNECE Region



AFFORDABLE



RELIABLE



SUSTAINABLE



MODERN



UNITED NATIONS ECONOMIC COMMISSION FOR EUROPE

Energy for Sustainable Development in the UNECE Region

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WHAT IS AT STAKE?

The crucial role of energy for sustainable development

If the world is to develop sustainably, it will be necessary to secure access to affordable, reliable, sustainable, and modern energy services while reducing greenhouse gas emissions and the carbon footprint of the energy sector. Energy is a fundamental need as it provides the essential services of cooking, heating, cooling, lighting, mobility, and operation of appliances, information and communications technology (ICT), and machines in every sector of every country. Energy is used by doctors as they provide healthcare in clinics, it provides lighting for children to study, and when it is unavailable women (most often) are obliged to pass their time gathering wood to burn for cooking (which then degrades indoor air quality). Energy is the golden thread that weaves throughout the 2030 agenda and is at the core of meeting the world's quality of life aspirations. Energy was not included explicitly as one of the Millennium Development Goals but has assumed a prominent place in the 2030 agenda.

Goal 7



Ensure access to affordable, reliable, sustainable and modern energy for all

Achieving the 2030 agenda depends on transformation of the energy system. There is an imperative for profound and immediate changes in how energy is produced, transformed, and consumed as the energy sector accounts for 65% of total global greenhouse gas emissions. The challenge is reconciling a tight emissions pathway with development aspirations. To avoid exceeding the amount of carbon that can be emitted that is consistent with the objectives of the Paris Agreement and to set the stage for future reductions in atmospheric greenhouse gas concentrations, all options for reducing net carbon emissions must be developed and pursued urgently to reduce energy's net carbon intensity. To support sustainable development, the world's population needs access to modern energy services that are both reliable and affordable.

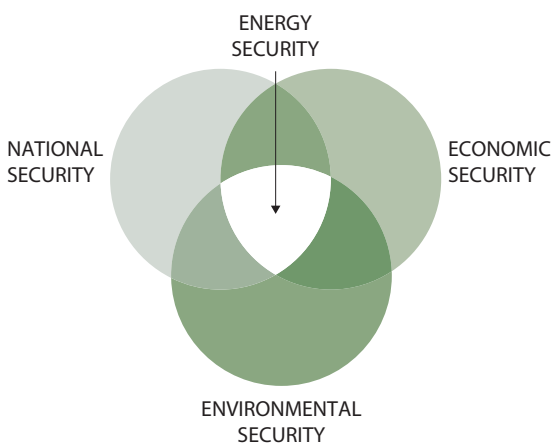
The current rate of improvement in energy efficiency, the deployment of net low carbon energy solutions, and the provision of sustainable access to modern energy services are insufficient. Energy's contribution to the 2030 agenda will falter in the absence of concrete measures to improve energy productivity, rationalize energy use, optimize energy resources, and deploy both new energy technologies and sustainable energy infrastructure.

THE STORY OF THE REGION

Critical Issues Dominate the UNECE Energy Agenda

There is no common understanding in the UNECE region¹ of what sustainable energy is or how to attain it. Divergent economic development, resource availability and energy mixes are embedded in today's national energy strategies. Each country sets its national energy strategy based on its perspectives on sustainable development, environmental protection, poverty alleviation, climate change mitigation, quality of life, and the like. As a consequence, multiple approaches and outcomes can be found in national plans.

While many of the energy challenges in the region are similar to those elsewhere in the world, other challenges relate to the region's specific climatic, economic, environmental and political circumstances and can be observed in the inefficient use of energy, power cuts, increasing energy costs, sustainable and affordable heating in winter. The region features nearly universal household electrification (99.99%) in terms of physical access, but ageing energy supply infrastructure, a lack of supply diversity and increasing tariffs lead to poor power quality and, for some, energy poverty². This situation is particularly acute during the cold winter months, and disproportionately affects poor and rural populations. Some consumers are switching back to solid fuels for cooking and heating, and others to electricity with off-grid diesel generators.



Many of the countries in the eastern part of the region (including Central Asia, Eastern and Southeastern Europe as well as the Russian Federation) have high carbon footprints due to a legacy of high energy intensity and energy inefficiency in industry and buildings. Energy losses from old infrastructure and dilapidated networks are significant. The past two decades have changed how the countries in the region use energy. At present, some countries export large quantities of fossil fuels and boast some of the world's highest rates of energy intensity. Others struggle to provide reliable and affordable energy for their own citizens. Numerous market barriers, often combined with subsidised energy prices, impede the introduction of new, efficient energy technology. Lack of access to

¹ The UNECE member States include the countries of Western, Central, and Eastern Europe, the Caucasus, Central Asia, Israel, North America, Russian Federation, and Turkey.

² World Bank Global Tracking Framework for Sustainable Energy for All 2017.

basic energy services and frequent disruption of power supply are of particular concern in Central Asia and the South Caucasus.

Although the region as a whole has tremendous untapped potential for almost all forms of sustainable energy, so far renewable energy sources from wind, solar, and geothermal account for only 1.6% in total primary energy supply (TPES) in 2014 compared to a global share of 1.4%. Including hydropower, biofuels and waste renewable energy sources account for 9% compared to a global share of 14%³. Between 2000 and 2015, the region increased installed renewable energy generating capacity by 442 GW to 912 GW, 39% of all global additions, from which non-hydro additions accounted for 86%, or 381 GW. The current share of total renewable energy installed capacity is 54% hydro-based⁴.

Key challenges for the region include:

- Energy security concerns impede improvements in technical, environmental, and economic efficiency, often by promoting energy independence instead of more efficient enhanced integration of energy markets.
- Fossil fuels dominate the region's energy mix and underpin today's energy access. This reality is neglected in conversations about energy efficiency and renewable energy and the neglect slows attainment of objectives. Even under a climate change scenario that meets a 2° target, fossil energy will still represent 40% of the energy mix in 2050 and must be addressed whether through efficiency improvements or through emissions controls.
- Certain options for improving the overall performance of today's energy system are excluded for reasons of public perception, politics, imposed market distortions, or legitimate but possibly solvable concerns of safety or environment (e.g., nuclear power, carbon capture and storage, shale gas, using natural gas in transport).
- Truly transforming the energy system will require a shift in policy and regulation to treat energy as a series of services rather than as a series of commodities. In many countries, the current political, regulatory, and industrial infrastructure is not ready for such a transformation.

³ IEA Statistics.

⁴ IRENA Statistics.

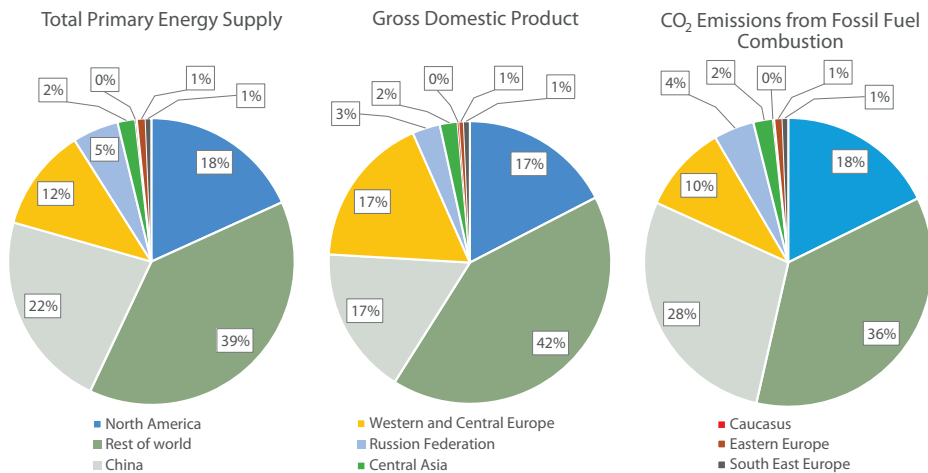
Progress made to date does not reflect the opportunity for improvement that exists

The UNECE region's 56 countries used 39% of the world's primary energy consumption in 2014 to produce 41% of world GDP. With a 21% share of the total, UNECE countries from the Eurasian continent consumed slightly more of the global primary energy supply than North America with 18%. The region produced 38% of the world's primary energy resources (18% from North America), and emitted 36% of global CO₂ emissions from fossil fuel combustion. The region is comprised of high and low income countries, countries that are energy rich and energy poor and countries that are in economic transition. The UNECE region as a whole uses significantly higher primary energy supply per capita than world levels, but within the region there is significant variance.

Official data do not reflect a number of critical issues for the region, and UNECE is working in collaboration with the other UN regional commissions, the International Energy Agency, the World Bank, IRENA, UN DESA, UNDP, REN21, C2E2, and UNEP to ensure that available information is accurate and can support policy decisions.

Fossil fuels remain dominant in the UNECE region, a reality that must be considered fully in devising economically rational pathways to achieving the 2030 agenda. When averaged across the entire UNECE region, the share of fossil fuels in Total Primary Energy Supply (TPES) is 80%, equal to the global share (81%). When evaluated across the sub-regions, the least share is in Western Europe at 71% and on country-level in Iceland at 11%, and the greatest is in Central Asia at 94%.⁵

Figure 1: UNECE Share of Global TPES, GDP and CO₂ Emissions from Fossil Fuel Combustion (2014)



⁵ IEA Statistics.

Historically high levels of industrialization and energy service provision have delivered relatively high levels of energy access in all UNECE countries -- 100% electricity access according to current indicators, although some areas have scope for improvement in service quality, reliability, and affordability. Cooking energy services in the region are provided almost entirely by clean fuels.

The UNECE region improved its energy intensity by 36% from 8.0 MJ/USD to 5.1 MJ/USD in the period between 1990 to 2014.⁶ Many UNECE countries enjoy some of the world's best quality of life with high levels of energy productivity because their economies are founded on low energy intensive activities. Others achieve more moderate levels of well-being and productivity because of environmental and resource constraints that impede energy productivity and because their economies are founded on more energy intensive activities. The greatest factor underpinning improvements in energy intensity over the period was the restructuring of planned economies.

Energy Access

The region has almost universal household electrification. However, electrification does not tell the entire story. Energy access challenges in the region are not properly reflected using the degree of electrification as an indicator. For the UNECE region, this indicator is given as 100%, whereas if other factors are included, the performance is not so perfect. Access to reliable and sustainable energy is important for food security, economic development, human health and poverty reduction, particularly in Central Asia and the far eastern parts of Russia. The three main impediments to achieving sustainable, reliable and affordable energy access in the region are: (1) remote, off-grid locations (2) on-grid access with limited or intermittent supply due to poor infrastructure or fuel supply problems and (3) affordability issues. These issues are closely linked to additional problems: energy security and energy poverty. Countries have the advantage of nearly universal access to the power grid, with a rate of access to electricity (99.4%) that is unmatched by any region other than North America. However, interruptions or shortages in electricity supply, insufficient access to clean and efficient cooking facilities and affordable heating restrict access to energy in particular groups, populations and countries. In addition, the 1990s war in the countries of the former Yugoslavia (Croatia, Kosovo, Bosnia and Herzegovina, and Serbia) damaged the energy infrastructure, leaving many people who had previously been connected to the grid without access.



Energy access should also consider affordability as the share of populations in the region for whom energy poverty is an important issue is non-negligible. All countries have at least part of their household population in energy poverty, defined as more than 10% of household income spent on energy. In the Russian Federation 29% of households spend

⁶ IEA Statistics.

more than 10% of income on energy; in 4 other UNECE countries more than 40% of households spend over 10% of their income on energy (Albania 46%, Moldova 52%, Serbia 49%, and Tajikistan 60%).⁷ This aspect is particularly important for the heating market. The region's countries circle the arctic, and cold continental climates over most of the region create the highest demand for heat services in the world. The region has a legacy of older (often poorly insulated) buildings with inefficient heating systems. The heating is inadequate, inefficient and unaffordable without significant subsidies. The high dependence on fossil fuels for heating creates a locked-in dependence on fossil fuels that are used inefficiently. A second measure of energy access is the quality of service. Simply having physical access to a grid is not a guarantee that the energy supply available on that grid is sufficient to meet needs. The quality of service provided on energy networks is far from homogeneous across the region.

Energy Efficiency

Many countries in the region enjoy some of the world's best quality of life. They feature high levels of energy productivity because their economies are founded on low energy intensive activities. Other countries have more moderate levels of wellbeing and their energy productivity is constrained because their economies are founded on more energy intensive activities. The greatest factor underpinning improvements in energy intensity over the period since 1990 was the restructuring of formerly planned economies.

Energy efficiency indicators currently are based on measurements of energy intensity, which is the amount of energy used to produce a unit of GDP. The inverse of energy intensity is energy productivity, which is the amount of GDP produced per unit of energy consumed. While the two are equivalent mathematically, the latter indicator represents an opportunity for improvement, not a judgement of inadequacy. Further, while the greatest opportunities for improvement appear to lie still in formerly planned economies, such presentation omits the enormous potentials that exist for efficiency improvements throughout the region in transport, buildings, industry, and the upstream segments of the energy sector. For example, improving the energy efficiency of EU buildings (35% of which are over 50 years old) could result in a reduction in the region's total energy consumption by an estimated 5–6%. Western Europe represents the largest market for energy-efficient buildings, which is attributable to its high energy prices and strict building codes.

Energy efficiency is an essential component of attaining the energy-related sustainable development goals. In order to support continued economic growth, the region needs access to secure, affordable and sustainable energy supply. Many countries in the eastern part of the region have low energy productivity and energy consumption per capita and the quality of energy services is insufficient. Long-term patterns of energy use in the built environment, transportation infrastructure, industry, and agriculture hinder the penetration of energy efficiency technologies and practices, resulting in excessive energy consumption. Energy production and distribution infrastructure need major investments to provide better efficiency and improved quality of service.

⁷ UNDP (2014) Sustainable Energy and Human Development in Europe and the CIS. <http://www.tr.undp.org/content/dam/turkey/docs/Publications/EnvSust/UNDP,2014-Sustainable%20Energy%20and%20Human%20Development%20in%20Europe%20and%20the%20CIS.pdf>

Low efficiency in buildings increases the need for energy products to meet heating and electric requirements. When commercial energy products are constrained, households tend to switch to non-commercial, traditional fuels. Wood collection by rural communities contributes to deforestation, biodiversity loss, and soil degradation, and the use of obsolete technologies for the combustion of non-commercial energy carriers leads to indoor air pollution and high greenhouse gas emissions. Uncomfortable thermal conditions in homes combined with poor lighting contribute to higher medical bills and productivity loss. Problems at health and educational facilities due to the lack of or low quality heat and electricity supply undermine human potential and ultimately contribute to lower labor productivity.



Renewable Energy

Renewable energy share in total final energy consumption nearly doubled from 1990 to 2014 across the UNECE region from 5.9% to 11.5%, totaling 15.9 EJ in 2014. To double the share again from 2012 levels will depend on the potential for renewable energy (which varies considerably from country to country based on climate), prevailing energy market conditions, and available socio-economic drivers. Although the rate of growth has been significant, renewables represent only a small share of total primary energy supply.

Higher financing costs for renewable energy technologies reflect a number of informational, technical, regulatory, financial and administrative barriers and their associated investment risks in the region. Whilst countries employ a number of promotional schemes for renewable energy in the region (the EU adopted a new regionally binding target calling for a minimum of 27% renewable energy in final energy consumption by 2030), analysis reveals that important barriers to investment remain. Promotional schemes for renewable energy have led to increased deployment, but the correlation between promotion and deployment is not always clear. Western European countries recognized for their renewable energy programmes (such as Germany, Spain and Denmark) continue to depend on fossil fuels in their overall energy mix, with Germany's share standing at 81% of total energy consumption in 2013. Lessons learned from feed-in tariff schemes have led to introduction of more competitive approaches such as renewable energy auctions (Germany expects that more than 80 % of future added capacity will be open to tendering).⁸ Countries with increasing shares of variable renewable energies such as wind and solar face challenges to develop market or capacity based solutions to ensure flexible supply that can maintain grid stability, and the flexibility is often supplied by natural gas or coal-fired power plants.

⁸ Agora Energiewende (2017): Energiewende: What do the new laws mean? https://www.agora-energiewende.de/fileadmin/Projekte/2016/EEG-FAQ/Agora_FAQ-EEG_EN_WEB.pdf.

WHAT NEEDS TO HAPPEN?

Main policy steps

Reshaping policies to stimulate the transition to a sustainable energy system

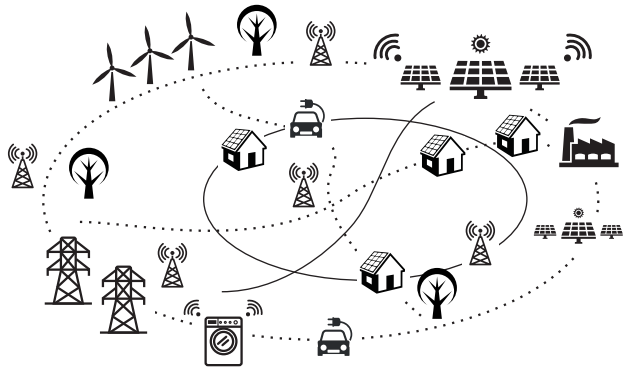
The objectives of energy sustainability are attainable, and need not contradict more short-term considerations, if the world embarks on a determined, collective effort. Re-inventing the energy system to one in which 1) a systems perspective shapes overall policy and 2) the transformation of energy from a series of commodities to a series of services will not be an instantaneous process. At the outset, it will be necessary to start with the system that is in place today. Nevertheless, action by national governments and regulators, international organizations and civil society, and private sector investors will accelerate the needed transformation. The details of the proposed actions can be found in the Hammamet Declaration and the Yerevan Action Agenda.

Energy markets should be reformed so that energy prices reflect full costs, including emissions, while eliminating market-distorting subsidies throughout the system. The use of energy subsidies could be attenuated by exploring more efficient and effective ways to protect vulnerable groups. Policy-makers should work to enable a transition from an energy commodity industry to an energy services industry.

Energy market reform will not happen unless energy security is assured. A full range of normative instruments such as standards and best practice guidance is needed throughout the energy system including development of regional and international norms covering interconnections, interoperability and trading. It will be important to maintain an open dialogue among energy-producing, -transit and -consuming countries on energy security, technology and policy. Achieving greater interconnectivity and mutually beneficial economic interdependence will require investment in energy infrastructure projects to enhance energy efficiency, integrate renewable energy, and optimize energy resource utilization. Encouraging interconnection infrastructure projects among countries with complementary energy resources is a cost-effective way to enhance mutual energy security.

Energy efficiency in most countries needs to improve more quickly. Improving energy efficiency is one of the most cost-effective options for meeting growing energy demand in most countries. It contributes to energy security, a better environment, improved quality of life, and economic well-being. Significant potential for improving energy efficiency exists worldwide, but attempts to improve energy efficiency often fall short because of flawed national policy frameworks: policies that artificially lower energy prices encourage wasteful consumption; production and

consumption subsidies distort markets; housing stocks are poorly managed; land use management is inefficient; new participants face barriers to entry; there are inadequate norms and standards; and the statistics and information to manage energy use and track progress are incomplete. In addition, there is of-



ten a lack of public awareness and education about the long-term economic and social benefits of action to improve energy efficiency and industrial productivity.

Equitable access to modern energy services requires mobilizing adequate resources.

Ensuring physical and economic access to quality energy services requires investment throughout the energy value chain, from primary energy development to end use. Enabling investment requires that governments have a long-term vision for providing sustainable energy services, and that they promulgate sustainable policies and regulations that allow producers and consumers to respond to a dynamically changing energy market. Such a vision should be based on a total energy system perspective that includes provision of access to modern energy services for vulnerable groups. It also requires proper integration of the full slate of development goals (e.g., energy, gender, and youth; the water-food-energy-ecosystems-health nexus).

Renewable energy policies need to be redesigned. Renewable energy resources are gradually becoming cost-competitive in comparison to conventional resources. They offer a way to reduce the net carbon intensity of the energy sector, improve energy security, provide energy access in remote areas, and encourage economic development. Integrating renewables into the global energy mix will be important as future energy systems are optimized both on- and off-grid. However, wider uptake of renewables requires addressing barriers to fair competition vis-à-vis conventional technology (without resorting to long-term subsidies), implementing stable long-term energy policy frameworks in a future energy system context, and deploying innovative and targeted financial mechanisms.

Finance will be critical. The transformation of the energy system will involve mobilization of significant financial resources. It will be necessary to align investment incentives with the objectives of the 2030 agenda.

The future energy system will need new technology. Research and development and commercial introduction of new technology, capital, and management skills are essential to support the needed transitions. It will be important to extend international collaboration on research and development of new technology and exchange lessons learned about large scale deployment of low carbon energy sources.

Lies, damned lies, and statistics. It will be vitally important to develop appropriate indicators that show progress on energy for sustainable development in the context of the whole 2030 agenda and its nexus challenges. Many countries need support to establish energy statistics programmes that monitor and report key energy production and consumption variables, and that are fully integrated into other economic and social national statistical efforts. It will be necessary to collect data on energy production and consumption patterns consistent with the desired future energy system and to strengthen the analytical capacity of the different interactions involving energy policy in order to provide innovative sustainable policy approaches to address multidisciplinary energy-related issues.

SUSTAINABLE ENERGY IN THE 2030 AGENDA FOR SUSTAINABLE DEVELOPMENT

Action Agenda

The following priority areas by the United Nations Regional Commissions and other international organizations would assist Member States in enhancing the contribution that energy can make to the 2030 agenda.

1. Assist member States in developing national sustainable energy action plans that are aligned with their future energy needs and that are consistent with the policy steps set forth above.
2. Collaborate with member States to improve their national energy statistics programmes including collecting, analyzing and publishing data related to energy for sustainable development.
3. Provide capacity-building to member States in a range of action areas: Energy Market Reform, Energy Efficiency, Renewable Energy, Energy Access, Energy Security, Finance and Investment, Technology, and Energy Data, Indicators and Analysis.
4. Encourage international dialogue for technological and knowledge exchange on lessons learned and best practices.
5. Develop internationally recognized minimum energy performance standards in all sectors.

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