HIGH-LEVEL POLITICAL FORUM ON SUSTAINABLE DEVELOPMENT

POLICY BRIEF #15

INTERLINKAGES BETWEEN ENERGY AND CLIMATE CHANGE

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This document is a part of a series of Policy Briefs being developed to support SDG7 review at the UN High-Level Political Forum to be held in July 2018. The objective is to inform intergovernmental discussions by providing substantive inputs on SDG7 and its interlinkages with other SDGs prepared through inclusive multi-stakeholder consultation processes. The development of these Policy Briefs is coordinated under the auspices of the Ad Hoc Informal Multi-stakeholder Technical Group of Advisors on SDG7.

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KEY MESSAGES[1]

Status of energy and climate and progress towards achieving energy and climate objectives (SDG7 and SDG13)

- Climate change is one of the defining challenges of our time and its adverse impacts undermine the ability of all countries to achieve the 2030 Agenda and its sustainable development goals (SDGs). The 2015 Paris Agreement is a historic turning point in the global response to climate challenge that calls for urgent action at scale to mitigate climate change. Sustainable energy services are fundamental to social and economic development and to achieve the SDGs. The energy sector accounts for roughly two-thirds of all anthropogenic greenhouse-gas (GHG) emissions today, it is a main source of air pollution and is vulnerable to climate change.
- Effective action towards a safe and sustainable low-carbon and climate-resilient energy system is essential to tackling climate change and achieving the objectives of the 2030 Agenda. Central for such action is the provision of universal access to energy, wider deployment of renewable energy, increasing resilience of energy systems and improving energy efficiency.
- On the universal access to energy, worldwide, about 1.1 billion people have no access to electricity in 2016 and up to a billion more have access only to unreliable electricity networks. The biggest challenges are in Africa, yet the issue is global and affects many other regions. Fortunately, with the right balance of policies for universal energy access can be achieved without compromising global climate objectives.
- Significant progress has been made in developing cleaner, more efficient energy technologies. The use and development of renewable energy is on the rise, and costs have been rapidly declining. There is also credible evidence in the progress of promoting energy efficiency. Together with a shift away from coal-fired power generation in some countries, renewable energy and energy efficiency have contributed to a decoupling of economic growth and energy-related emissions in a number of countries. Even as global GHG emissions continue to increase slowly, carbon dioxide (CO2) emissions from energy and industry have remained largely stable since 2014. However, the current deployment of renewable energy and promotion of energy efficiency are not advancing fast enough to bend the emission curve.
- Climate change threatens energy security worldwide, affecting all the aspects of energy systems. Energy systems are vulnerable to climate impacts such as extreme weather events, sea-level rise, higher average temperatures, drought, flooding, melting permafrost and glaciers. Making energy systems climate-resilient means assessing climate risks, and formulating adaptation measures that will help countries to achieve their sustainable development goals. At the same time, energy systems can contribute to adaptation to climate change. Renewable energy deployment can do this by promoting the diversification of the power supply and improved energy access. Resilience requires two types of adaptation measures: pre-emptive and contingency. Pre-emptive measures can make energy systems resilient to anticipated climate impacts, while contingency measures can help recover from damages that occur regardless of pre-emptive measures Governments and stakeholders can work together to ensure resilience against climate impacts.
- Urgent action at global scale towards low carbon and climate-resilient economies are critical to limit the rise in global mean temperature to well-below 2 °C and pursue efforts to limit the temperature increase to 1.5°C as well as to achieve the SDGs. Global GHG emissions in 2020 are likely to be at the high end of the range of the scenarios consistent with the well below 2°C or 1.5°C goals. Global peaking of GHG emissions as soon as possible is critical to maintain reasonable chances to attain to these goals.

Priority Actions over the Next Four Years

- Decarbonisation of the world's energy system must become a uniting vision for governments and all other stakeholders to achieve the SDGs and the goal of the Paris Agreement of keeping the global mean temperature well below 2 °C or 1.5°C. Governments will need urgently to ramp up efforts in accordance with respective capabilities and different circumstances, reviewing regularly the pledges enshrined in their Nationally Determined Contributions (NDCs) and increasing substantially their levels of ambition, setting realistic and attainable longer-term goals and tracking progress.

[1] This document is put together by IEA, at the request of the secretariat, to serve as an example of a policy brief. Please note that the content of this example draft policy brief will be discussed by the co-leads/collaborating organizations and refined further over the coming months.

- Measures that would be instrumental in achieving a near-term global peak in GHG emissions required by the Paris Agreement, including energy-related emissions, according to the IEA include: increasing energy efficiency and the use of low-carbon technologies including renewable energy in all the economic sectors; phasing-out least-efficient coal-fired power plants; increasing investment in research and innovation of new technologies in the energy sector, in particular of renewables; phasing out subsidies to fossil-fuel consumption; and reducing methane emissions from oil and gas production.
- These measures are essential also to accelerate the transition to a more secure, affordable, decarbonised and climate resilient global energy system for all with combined and aligned energy and climate targets. Such transition requires governments to create the enabling policy framework, including setting renewable energy and climate targets; systematic integration of climate change, renewable energy and energy efficiency in planning and policy-making processes; providing long-term stability for private investments in renewables and energy efficiency as well as pursuing market reforms.
- Effective policies should be put in place to implement such measures that encourage a wide range of solutions, innovation and business models; avoiding barriers to renewable energy and energy efficiency, and technology and infrastructure lock-in; and dealing with climate change and sustainable energy in an integrated way. Implementation of such policies should build on best practice examples where policies have been clear and consistent, encouraged cost-effective investment from a wide range of financial streams and created enabling environment for engaging a wide range of stakeholders, including private sector and the local communities in climate action and renewable energy and energy efficiency investments.

Priority Actions to 2030

- The time between now and 2030 is critical to achieve the long-term goals of the Paris Agreement towards climate neutral and resilient economy and society in the second half of this century, including limiting warming to well below 2 ºC or 1.5 ºC above pre-industrial levels. This time period will also be critical to achieve the SDG7of providing universal access to sustainable energy and promoting energy efficiency and renewable energy with a target date of 2030.
- Transformation of the energy system in line with the well below 2°C or 1.5°C goals of the Paris Agreement is technically possible but will require significant policy reforms, including effective carbon pricing and environmental taxes, and additional technological innovation. Around 70% of the global energy supply mix in 2050 would need to be low-carbon to achieve these goals. The largest share of the emissions reduction potential up to 2050 comes from renewables and energy efficiency. Achieving such potential will require significant additional policy interventions, as well as modernization of the electricity grids to ensure minimum losses and maximum flexibility in electricity systems to integrate large shares of variable renewable generation, including the role of storage, digitalization and electric vehicles.
- Financial support, technology development and transfer as well as capacity-building at scale are essential to enable action of scale by developing countries where successful planning and implementation of climate change measures and measures to foster sustainable development require large investments. Developed countries should continue to seek to scale up their level of support to developing countries, with a concrete road map to achieve the collective mobilization goal of jointly providing USD 100 billion annually by 2020 and beyond for climate mitigation and adaptation. It is also critical to further explore ways to increase private sector financial investments.
- The Paris Agreement acknowledges that even though national-level efforts are at the core of our response to climate change, and must be scaled up rapidly, they must also be complemented by strong action and support through collaboration and partnership at all levels of government, cities, the private sector, civil society as well as co-operation through international and regional institutions. Institutions at all levels and international co-operation need strengthening to enable them to plan for and implement effective climate and sustainable energy policies, as well as to engage stakeholder groups at all levels of government, as well as civil society. This is also essential to facilitate access to clean energy research and technology, including renewable energy, energy efficiency and advanced fossil fuel technologies, and promote investment in energy infrastructure and clean energy technology.

Interlinkages between energy and climate

The United Nations Climate Change Conference (UNFCCC) in Paris in 2015 adopted a transformative, universal climate change agreement. This landmark agreement articulates the social and economic opportunities offered by a low emission and climate-resilient future, as well as the intrinsic relationship of climate change action, sustainable development and poverty eradication.

The 2015 Paris Agreement is a historic turning point in global response to the need for urgent action at scale to mitigate climate change. The Agreement sets the specific goal to limit warming to well below 2°C above pre-industrial levels and pursue efforts to limit the warming to 1.5°C . It requested all Parties to the UNFCCC to set and implement Nationally Determined Contributions (NDCs) that form the foundation of the Paris Agreement.

At the same time, the UN 2030 Agenda and the Sustainable Development Goals (SDGs) call for action by all countries to improve the lives of people everywhere. Specifically, SDG 7 calls for universal access to affordable, reliable, sustainable and modern energy for all alongside taking urgent action to increase substantially the share of renewable energy and double the rate of improvement in energy efficiency. As of 2015 in the context of SDG7, energy stands at the centre of global efforts to induce a paradigm shift towards low-carbon energy systems, green economies, poverty eradication and ultimately sustainable development.

Further, the 2015 Sendai Framework for Disaster Risk Reduction 2015-2030 is the global blueprint for disaster risk reduction. The Sendai Framework calls for sustainable use and management of ecosystems and integrated environmental and natural resource management approaches that incorporate disaster risk reduction. The risk management is one of the key elements that binds together the 2030 Agenda for Sustainable Development and the Paris Agreement on climate change.

Both, the Paris Agreement and the 2030 Agenda together with SDGs, in particular SDG7, set clear directions and a path for humanity to a development that is powered by clean energy, based on efficient use of resources and defined by resilience to climate impacts.

Current status of energy and climate change combating effort

The energy sector, contributing to around two thirds of global greenhouse gas (GHG) emissions, has tremendous potential in mitigating climate and reducing the "gap" between the emissions reductions necessary to achieve these agreed targets at lowest cost and the likely emissions reductions from full implementation of the NDCs.

This energy-sector decarbonisation can be achieved while simultaneously fulfilling the targets of SDG 7, including ensuring access to affordable, reliable, sustainable and modern energy for all by 2030. This is confirmed by the IRENA's analysis that indicates that renewable energy technologies, in combination with greater energy efficiency gains, can achieve most of the required emission reductions by 2030 and 2050. Also, the recent IEA analysis shows that universal energy access can be achieved without causing any net increase in GHG emissions.

Slower growth in global GHG emissions

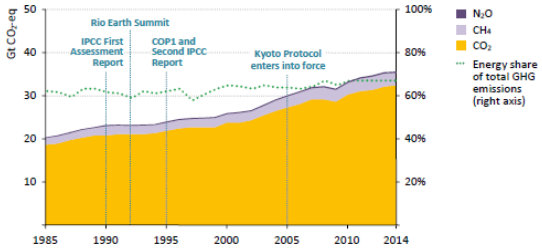
Total global GHG emissions have continued to increase since 1970, and for 2016, including emissions from land use, land-use change and forestry (LULUCF), and excluding LULUCF are estimated at about 51.9 Giga tonnes (Gt) carbon dioxide equivalent (CO2 eq) and 47.8 Gt CO2 respectively. The growth in total global GHG emissions was slower in the past three years as these emissions excluding LULUCF only increased by 0.9 % in 2014, 0.2 % in 2015, and 0.5 % in 2016

Economic and population growth continue to drive the increase in global GHG emissions

Globally, economic and population growth continue to be the most important drivers of increases in GHG emissions from fossil fuel combustion. The contribution of population growth between 2000 and 2010 remained roughly identical to the previous three decades, while the contribution of economic growth has risen sharply. Between 2000 and 2010, both drivers outpaced emission reductions from improvements in energy intensity. Over that period, increased use of coal relative to other energy sources reversed the long-standing trend of gradual decarbonization of the world's energy supply. Since 2010, however, a move away from coal in many countries has led to a decoupling of emissions growth from Gross Domestic Product (GDP) growth at the global level.

Energy as a major contributing sector to global GHG emissions

Global CO2 emissions from fossil fuel combustion, cement production and other industrial processes account for about 70 % of total global GHG emissions, and were estimated at a total of 35.8 Gt CO2 eq for 2016. These emissions have remained more or less stable for the past three years, reversing the previous steady increase. This may indicate a decoupling of energy- and industry-related CO2 emissions from economic growth during these years, in which global GDP increased by between 2 and 3 % annually. The main drivers have been reduced growth in coal use since 2011, mostly in China and in the United States, growing renewable power capacity and generation, especially in China and India, combined with enhanced energy efficiency and structural changes in the global economy.



Global anthropogenic energy-related greenhouse-gas emissions by type. Source: IEA, 2015. Energy and climate: state of play

However, the trend is still over a relatively short period, and could be reversed if growth in the world economy accelerates. Also, continued investment in more traditional technologies, especially coal-fired power stations, implies technological lock-in and related emission levels over long-term.

Energy is also a major contributor to air pollution, affecting human health and causing environmental degradation. Reducing air pollution and related health problems can be a key driver for the wider deployment of renewable energy in many countries and cities, such is the case in China

Energy as a contributing sector to adaptation to climate change

Climate change poses significant challenges to energy systems by affecting natural systems, changing climate variables, and modulating the frequency and intensity of extreme weather events. These impacts change the water, temperature, and wind regimes that provide the basis for modern energy systems. Climate change induces vulnerabilities and risks for energy production (including fossil fuel extraction), storage, transportation, transmission, and consumption.

Energy sector reform can also contribute to adaptation and resilience. For example, renewable energy deployment promotes the diversification of the power supply and builds resilience building through improved energy access.

Climate risks on energy systems are well documented:

- Higher temperatures increase energy needs for cooling, and lower efficiencies of thermal power generation;
- Water scarcity can cause shutdowns of thermal power plants and reduced output from hydropower plants;
- Permafrost melting fractures pipelines; and
- Intensified storms jeopardize offshore energy operations, and damage power plants, transmission systems and power grids.

The need to adapt energy systems and to increase their resilience and the potential of energy systems as a contributor to adaptation are clear. However, significant challenges must be addressed. Important first step is cooperation among governments, organizations, and stakeholders to identify how climate risks translate to specific energy sector operations.

Progress in promoting sustainable energy with impact on climate change options

In 2017, in its report "Progress towards the Sustainable Development Goals", the UN Secretary General concluded that progress in every area of sustainable energy falls short of what is needed to achieve energy access for all and to meet targets for renewable energy and energy efficiency. He emphasized that meaningful improvements demand higher levels of financing and bolder policy commitments, together with the willingness of countries to embrace new technologies on a much wider scale than what was observed so far. For SDG 7, progress has been mixed for the three main targets of energy access, increasing renewable energy and doubling energy efficiency.

According to the IEA, around 86 per cent of the global population had access to electricity in 2016, meaning that 1.1 billion people, predominantly rural dwellers, still live without electricity. While the number has dropped substantially from 1.6 billion in 2000, more than half of those still without electricity live in sub-Saharan Africa.

Progress on providing access to clean cooking facilities has been slower. Despite growing awareness of the health risks of indoor cooking with solid fuels, and after decades of effort targeting access to modern cooking, the IEA estimates that in 2016 2.8 billion people (38% of the population) still did not have access to clean cooking facilities, almost the same number of people as in 2000.

The share of renewable energy in final energy consumption grew modestly from 2012 to 2014, from 17.9 per cent to 18.3 per cent, and has continued to grow steadily since then. Most of the increase was from renewable electricity from water, solar and wind power. Solar and wind power still cover a relatively small share of energy consumption, despite their rapid growth in recent years. The challenge is to increase the share of renewable energy in the heat and transport sectors, which together account for 80 per cent of global energy consumption.

From 2012 to 2014, three quarters of the world's 20 largest energy-consuming countries had reduced their energy intensity — the ratio of energy used per unit of GDP. The reduction was driven mainly by greater efficiencies in the industry and transport sectors. However, that progress is still not sufficient to meet the target of doubling the global rate of improvement in energy efficiency.

Looking at the future options and opportunities to ensure universal affordable, reliable, sustainable and modern energy for all in the 2017 Energy Access Outlook, the IEA underscored the need for a new level of political agreement on the importance of access to modern energy services and

linkages to climate change. Without this, the targets of SDG 7 and 13 will likely not be met by 2030.

The IEA outlined the opportunities stemming from the declining cost of decentralised renewables, increased access to affordable energy, efficient appliances and the use of mobile platforms that are changing the way we think about providing energy access. It further provides a pathway for achieving access to modern energy for all by 2030, identifying policy priorities and detailing investment needs, and suggests how such energy access intersects with other issues such as gender, health and climate change.

The IEA identified that achieving energy for all by 2030 will not cause a net increase in global GHG emissions. Providing energy for all would have a minimal impact on global energy demand, with an increase of 0.2% (37 million tonnes (Mt) of oil equivalent) relative to the IEA base case. However, the corresponding rise in emissions of around 0.2% (70 Mt of CO2) in 2030, is more than offset as reducing the biomass used for cooking provides a net GHG reductions, which would save the around 165 Mt of CO2 eq. from methane and nitrous oxide.

Are we on track to achieving climate goals?

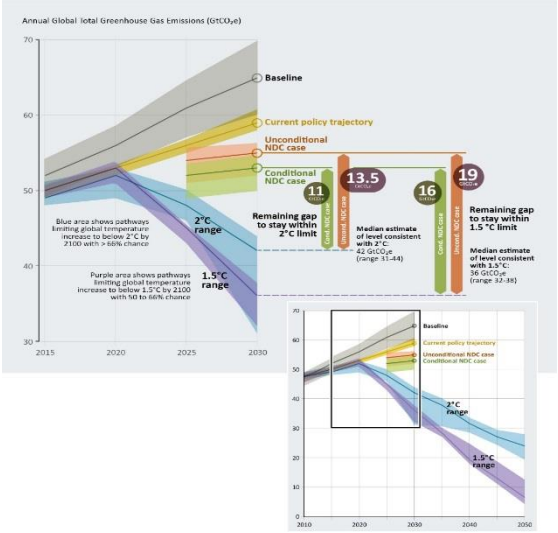
Since late 1990s many countries have taken action under the UNFCCC and the Kyoto Protocol to mitigate climate change and adapt to its negative impacts. The Paris Agreement has generated and incentivized action at scale by both governments and the private sector. The latest ambition of climate action is manifested in the NDCs submitted under the Paris Agreement by all countries in the world that focus on climate mitigation but also contain in many cases adaptation components.

More ambitious NDCs are needed to close the emission gap

The IPCC established that mitigation scenarios in which it is likely that the temperature change caused by anthropogenic GHG emissions can be kept to well below 2 °C relative to pre-industrial levels are characterized by atmospheric concentrations in 2100 of about 450 parts per million (ppm) CO2 eq. These scenarios include substantial cuts in anthropogenic GHG emissions by mid-century through large-scale changes in energy systems and potentially land use.

According to the UN Environment Gap report 2017, the NDCs cover only approximately one third of the emissions reductions needed to be on a least cost pathway for the goal of staying well below 2°C. A large gap exists between 2030 emission levels and those consistent with least cost pathways to the 2°C and 1.5°C goals respectively. The 2°C emissions gap for the full implementation of both the conditional and unconditional NDCs for 2030 is estimated at 11 to 13.5 Gt CO2e. The gap in the case of the 1.5°C target is estimated at 16 to 19 Gt CO2e.

Global greenhouse gas emissions under different scenarios and



the emissions gap in 2030. Source: UN Environment 2017. Gap report

Global GHG emissions in 2020 are likely to be at the high end of the range of the scenarios consistent with the 2°C and 1.5°C goals respectively, making it increasingly difficult to be on track to meet the 2030 emission goals.

Therefore, to close the 2030 emissions gap, urgent action is needed to significantly enhance the ambition in the new and updated NDCs that will be submitted in 2020 facilitated through the Talanoa Dialogue. For the climate targets in the Paris Agreement to remain credible and achievable, all countries will need to contribute to significantly enhancing their national ambitions, augmenting their national policy efforts in accordance with respective capabilities and different circumstances, and ensuring full accounting of subnational action.

Sufficient mitigation potential exists

If the emissions gap is not closed by 2030, it is extremely unlikely that the goal of holding global warming to well below 2°C can still be reached. Even if the current NDCs are fully implemented, the carbon budget for limiting global warming to below 2°C will be about 80 percent depleted by 2030. Given currently available carbon budget estimates, the available global carbon budget for 1.5°C will already be well depleted by 2030. The assessed global scenarios show that if least-cost trajectories are followed, then emissions of all greenhouse gases should not exceed 42 Gt CO2 in 2030.

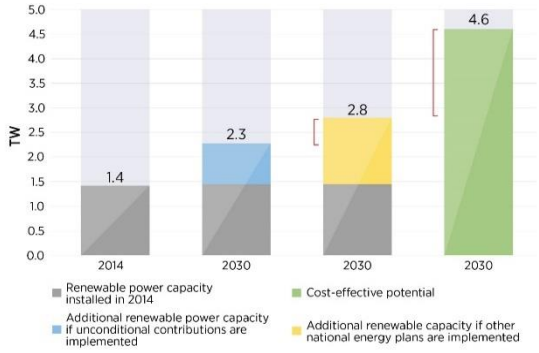
There is a proven emission reduction potential that is sufficient to close the gap. A systematic assessment of

sectoral mitigation options presented in the UN Environment Emissions Gap Report 2017 shows that the gap can be closed before 2030 by adopting already known and cost-effective technologies, often by simply adopting or adapting best practice examples already deployed in the most innovative country contexts.

The assessment also shows that the total emission reduction potentials in 2030 amounts to 30–41 Gt CO2e/year depending on assumptions and uncertainties, with costs below 100 USD/t CO2eq. This is more than double the 2030 emissions gap for the 2°C goal.

It is remarkable that a large part of this potential comes from just six relatively standardized categories mostly relating to energy (namely solar and wind energy, efficient appliances, efficient passenger cars) and in addition forestry, afforestation and stopping deforestation. The measures in these six categories sum up a potential of 15–22 Gt CO2 eq, making up over 40 % of the total potential. All these measures can be realized at modest or even net-negative incremental costs, and proven policies exist that can be replicated.

Specifically, on renewable energy, the IRENA's NDC analysis indicates that renewable energy targets in NDCs are often less ambitious than targets that countries have already established in their national energy plans and strategies, and that the cost-effective potential for renewables is much higher than what is captured in NDCs. This suggests significant opportunities for increased ambition of the renewable energy component of NDCs.



Renewable energy components in G20 NDCs, national targets and cost-effective potential

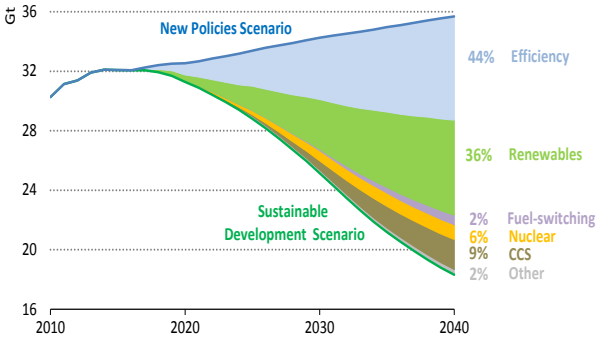
How to reduce the emission gap while also meeting energy access for all and air quality goals

Limiting the global mean temperature rise well below 2 °C with a probability of 66 % would require an energy transition of exceptional scope, depth and speed. An ambitious set of policy measures, including the rapid phase out of fossil fuel subsidies, CO2 prices rising to unprecedented levels, extensive market reforms, and stringent low-carbon and energy efficiency measures would be needed to achieve this transition.

This is confirmed by the IEA scenarios that outline how the energy sector could contribute to achieving the well below 2 °C target (known as the 450 Scenario). In 2015, the IEA put forward a set of short-term measures to bring forward a peak in CO2 emissions (the Bridge Scenario, with measures including increasing energy efficiency, phasing out least-efficient coal-fired power plants; increasing investment in new technologies, including renewables; phasing out subsidies to fossil-fuel consumption; and reducing methane emissions from oil and gas production). While some of these measures have been included within the NDCs, the remaining emissions gap projection shows that considerable further action is required.

Government action to close the emissions gap is urgent, but it competes with other pressing energy-related policy priorities. These include energy access – the main goal of SDG 7 – and tackling the health impacts of energy-related air pollution among others.

A new 2016 IEA scenario, the Sustainable Development Scenario, shows how all three objectives can be met simultaneously, at relatively little extra cost. This aims to convince governments that they need not abandon other energy priorities in order to pursue climate objectives.



Impact of policies in the energy sector in reducing GHG emissions by 2040 under sustainable development scenario. Source: IEA, World Energy Outlook 2017

In the Sustainable Development Scenario, full energy access is achieved by 2030. In addition, by 2040, the number of deaths attributed to air pollution drops by half relative to what would occur with existing and planned policies. In parallel, annual energy-related CO2 ¬emissions drop to around 18 Gt by 2040, driven primarily by a large increase in energy efficiency and deployment of renewables.

Also, the IRENA Remap scenario provides a detailed analysis of the CO2 emissions reductions by technology by 2050 that proves feasibility of achieving more than 70% emission reduction in 2050 compared to 2015.

Promoting renewable energy sources

The shift towards renewable energy is being made not only because of the climate benefits but also because of the positive impacts on welfare, trade, jobs and GDP. Also, such shift is essential to reduce local air pollution and address related health problems. Renewables, including decentralised applications, can also play a key role in providing electricity access to the most difficult to reach populations in developing countries (IEA, 2017b).

Best practices for policy options aim at increasing the share of renewable energy in the energy supply mix by facilitating grid access and promoting distributed generation for renewables, establishing renewable energy targets, providing fiscal and financial incentives and putting in place feed-in tariffs or setting up auctions to decide tariff levels.

IRENA analysis (2017a) has shown that to cost-effectively raise the share of renewables in the global energy mix, in line with meeting the 2 °C goal, renewable energy investment needs to be scaled up significantly above current level. The decarbonisation of the energy sector would require a total of USD 25 trillion to be invested in renewables up to 2050, or on average more than USD 700 billion per year. Full implementation of renewable energy components would require more than USD 1.7 trillion between 2015 to 2030. As public sources are generally limited, most of such investment should come from the private sector.

All energy sub-sectors (electricity, heating and cooling, transport) should contribute to climate change mitigation. Although electricity generation from renewables increased significantly (by 20 % or 1100 TWh) during 2011-2015, progress in deploying renewables in heating and cooling, and scaling-up of renewables in the transport sector is slow.

Advancing energy efficiency

Energy efficiency measures often provide positive financial returns and can support energy security, greater reliability of energy systems and provide social and environmental benefits.

Best practice policy options for increasing energy efficiency include: the introduction of electrical appliance standards and labelling programmes, provision of economic incentives, energy performance standards for buildings and certification programmes, fuel efficiency standards and the encouragement of energy efficiency in industry.

By the end of 2016, at least 137 countries had enacted some efficiency policies, including 48 countries that adopted new or revised policies during the year. New or revised energy efficiency targets also have been adopted in all regions of the globe: 149 countries have one or more energy efficiency targets in place; 56 of these countries adopted new targets since 2015.

Strengthening carbon pricing, limiting coal-based power and creating a just transition

Putting a meaningful price on CO2 emissions is viewed by many as critical to achieving the 2 °C goal at least cost. While carbon pricing policies have been spreading globally, both through taxes and permit trading schemes, the geographic coverage and prevailing price levels are, for the most part, lower than what is required.

Avoiding building new coal-fired power plants and phasing out existing ones is crucial to closing the emissions gap. This will require careful handling of issues such as employment impacts, investor interests, grid stability and energy access to achieve a just transition.

Promoting technologies

Fostering the development of new technologies will facilitate further decarbonization necessary to achieve the 2 °C goal. The use of policies and financial frameworks to grow green technology markets can combat climate change, reduce pollution and create a more sustainable society.

Enabling technologies are facilitating and advancing the deployment of renewable energy. ICT (information and communication technology), storage systems, EVs and heat pumps – to name a few – are facilitating and advancing the deployment of renewable energy.

Carbon capture and sequestration (CCS) technologies need to play a role in low-carbon scenarios compatible with the Paris Agreement, both for industry and power generation. Deployment has however so far been slower than anticipated and their cost remains high, and national level attention is needed to support the widespread adoption of CCS.

For both current and evolving technologies, it is essential to ensure that international technical and financial support is available to facilitate action in developing countries and that signals are provided to innovators by the Governments to create sustainable markets for low-carbon technologies, fill in

research and development funding gaps and create the enabling infrastructure.

Promoting adaptation to climate change

Ensuring that energy systems are climate resilient and contribute to adaptation efforts, requires action and cooperation by governments and all stakeholders. The 2030 Agenda is an opportunity to ensure climate-resilient low-carbon energy systems, in synergy with providing electricity access to rural populations.

In their NDCs, more than 50 countries (out of 167 who have submitted a NDC) identify the energy sector as an adaptation priority and identify specific measures. According to IRENA, 43 Parties already recognise in their NDCs the potential contribution of renewables, although only a handful of them include quantified targets.

Governments can provide direction and coordination for enhancing the resilience of energy systems by i.a.:

- Providing climate-information and data;
- Integrating climate change considerations into energy policies;
- Ensuring synergies between mitigation and adaptation;
- Promoting flexibility and diversification (e.g. through distributed generation and minigrids);
- Inter-sectoral institutional coordination;
- Safety and efficiency standards;
- Research and development of adaptation technologies,
- Reporting frameworks;
- Finance for resilience of energy systems.

The UNFCCC process to formulate and implement national adaptation plans (NAPs) enables governments to identify long-term adaptation needs, plan their adaptation measures, and integrate adaptation into sectoral development plans. As such NAPs provide a vehicle for planning adaptation efforts in the energy sector. Financial support for developing countries for their NAP is available from variety of bilateral and multilateral funding mechanisms, including the Green Climate Fund.

Energy sector stakeholders, especially utilities, transmission systems operators and energy companies, need to address the risks and adapt their facilities and supply chains by:

- Considering climate risks in all plans, projects, and day-to-day operations;
- Adopting “hard” measures, such as flood barriers, reinforcing infrastructure, or moving facilities to safer locations;
- Applying “soft” measures such as building redundancy measures into facility design, adopting dry cooling technologies for thermal generation, or designing wind turbines that can be lowered to the ground during a gust.

In addition to pre-emptive adaptation measures, governments and stakeholders can take contingency measures to deal with impacts that were not anticipated in the preparatory stages and to recover from inevitable damage. This could be in the form on insurance instruments, set-off funds, and/or emergency preparedness measures.

Partnerships and action by subnational and non-state actors

Action by subnational and non-state actors, including regional and local governments and businesses, is key to enhancing future ambition on climate and sustainable energy.

The 2017 UNEP Gap assessment suggests that the aggregated additional impact of the various non-state initiatives is of the order of a few Gt CO2 eq in 2030, over and above current NDCs. This is potentially a significant contribution to closing the gap. Enhanced monitoring and reporting of non-state actions and the resulting emissions reductions be will be essential to making pledged actions transparent and credible.

The Marrakech Partnership for Global Climate Action was launched by the High-Level Champions at the COP 22 in 2016 and is designed to structure and enhance coherence of the activities of the various coalitions, initiatives and organizations with a view to mobilizing climate action up to 2020 by Parties and non-Party stakeholders.

The first Yearbook of the Marrakech Partnership informs Parties about what has been achieved during the year by non-Party stakeholders, and spotlights how pre-2020 ambition can be accelerated. The Yearbook highlights three key emerging trends:

- Climate action in the context of the Marrakech Partnership is growing and getting more diverse; more non-Party stakeholders, subnational governments, businesses and civil society, are making commitments and taking action, and in addition to mitigation, many of those actions relate to increasing resilience
- Climate action is spreading to the South and has scaled up in the lowest income countries, facilitated by the link with SDGs and the Sendai Framework for Disaster Risk Reduction

- Climate action is delivering: initiatives are moving from being commitments on paper, to actions, and are delivering a variety of outputs and creating the conditions to fully meet their commitments.

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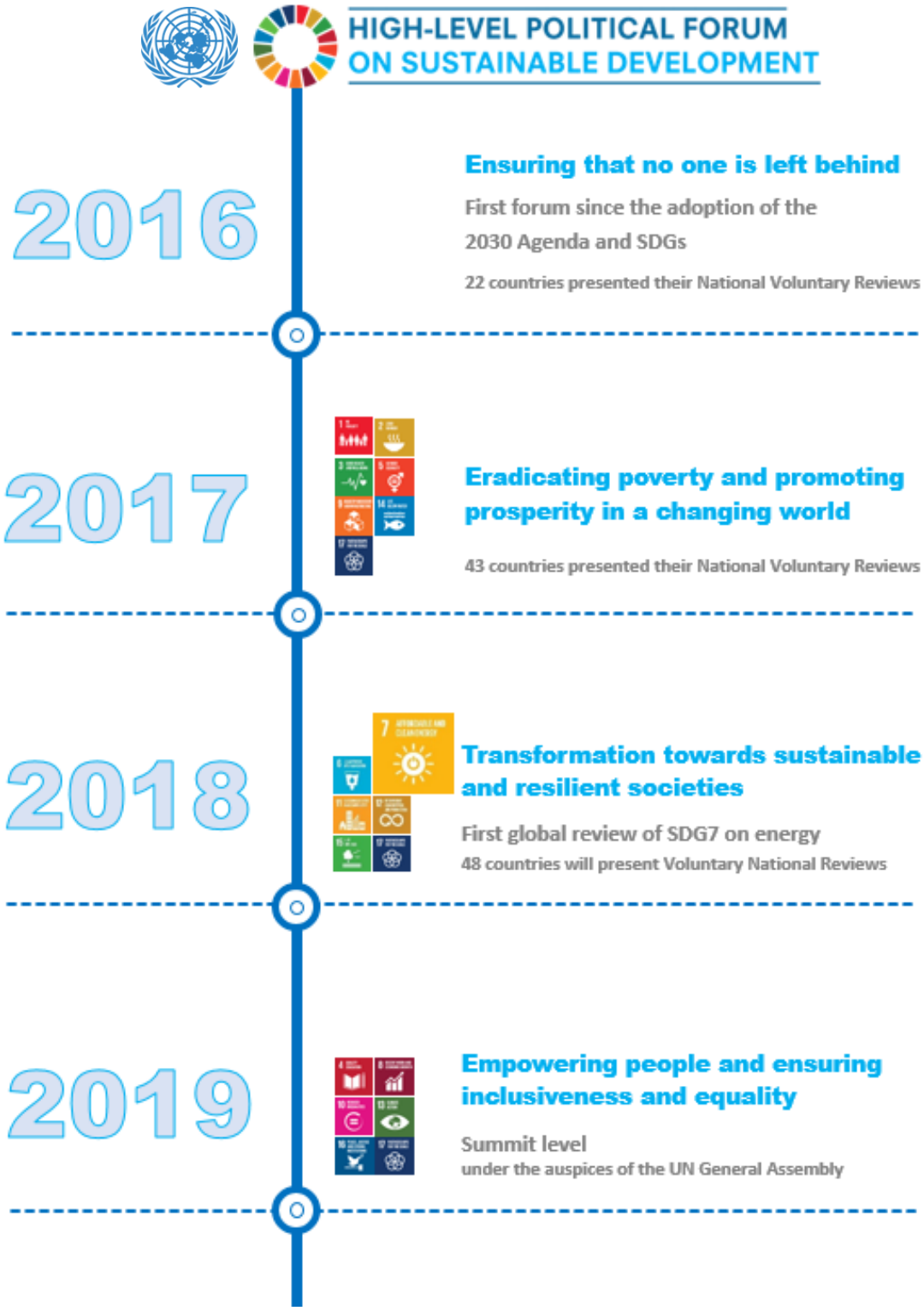

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