



### SDG7 Energy Compact of the World Meteorological Organization

A next Decade Action Agenda to advance SDG7 on sustainable energy for all, in line with the goals of the Paris Agreement on Climate Change

#### SECTION 1: AMBITION

##### 1.1. Ambitions to achieve SDG7 by 2030. [ Please select all that apply, and make sure to state the baseline of each target]

(Member States targets could be based on their NDCs, energy policies, national five-year plans etc. targets for companies/organizations could be based on their corporate strategy)

<input checked="" type="checkbox"/> <b>7.1.</b> By 2030, ensure universal access to affordable, reliable and modern energy services.	<p>Target(s):</p> <p>7.1.1 – Develop a global Energy Resilience Atlas (1<sup>st</sup> version of the WMO energy toolkit)</p> <p>7.1.2 – Facilitate energy access to more than 150 million people in more than 100 developing countries in Africa, Asia and South America</p> <p>Time frame:</p> <p>7.1.1 – By 2022</p> <p>7.1.2 – By 2030</p> <p>Context for the ambition(s):</p> <p>7.1.1 – Develop an online and open access global energy resilience atlas to be applicable at regional, national, and subnational levels. The energy resilience atlas will enable countries, companies and communities around the world to assess and reflect the risk of weather, water, and climate hazards and the risk of climate change in establishment and development of renewable energy power plants and development of national energy mix plans. The atlas will be constructed based on historical observations (reanalysis) and climate projections (IPCC, CMIP6) to reflect better the evolution of resources potential over the next decades.</p> <p>7.1.2 – By 2030, the fully developed Toolkit, including the three following main components, will be used by various countries, companies, and communities around the world in the direction of transition from fossil fuels to renewables: I) Global Energy Resilience Atlas (1<sup>st</sup> version of the toolkit, target 7.1.1), II) Global Renewables Potential Assessment tool (2<sup>nd</sup> version of the toolkit, target 7.2.1), and III) Weather and climate services for global renewable power plants and electricity grids (3<sup>rd</sup> version of the toolkit, target 7.3.1). The fully developed toolkit is estimated to be used by more than 100 developing countries in Africa, Asia, and South America to plan national clean energy generation and supply (such as wind, solar, hydropower) by reaching a total capacity of 500 GW (an average of 5 GW/country). Assuming that about 20% of the generated energy is used for residential usages and the worldwide average electricity consumption is about 3000 kWh /person/year, the toolkit will facilitate energy access to more than 150 million people around the world through a mix of interconnected and decentralized renewable power plants.</p>
<input checked="" type="checkbox"/> <b>7.2.</b> By 2030, increase substantially the share of renewable energy in the global energy mix.	<p>Target(s):</p> <p>7.2.1 – Develop a global Renewables Potential Assessment tool for wind, solar and hydropower (2<sup>nd</sup> version of the toolkit)</p> <p>7.2.2 – Contribute to increase modern renewables capacity by 100% in developing countries</p> <p>Time frame:</p> <p>7.2.1 – By 2023</p> <p>7.2.2 – By 2030</p> <p>Context for the ambition(s):</p>

	<p>7.2.1 – The extended toolkit will include global renewables potential assessment of wind, solar, and hydro, using historical, observational, and climate projection data. This extension of the toolkit will guide on optimum site selection for renewable power plants by considering the effects of climate change. In addition, the tool will help to detect high potential remote areas in terms of wind and solar energy to establish decentralized wind and solar power plants.</p> <p>7.2.2 – Global renewable capacity is estimated to be tripled by 2030 (IRENA, 2014, and UN HLD, 2021). Given the diverse application of the fully developed toolkit, it is estimated that it will contribute to 100% increase in global renewable capacities by scaling up global modern renewable capacity in more than 100 developing countries.</p>	
<p><input checked="" type="checkbox"/> <b>7.3.</b> By 2030, double the global rate of improvement in energy efficiency.</p>	<p>Target(s):</p> <p>7.3.1 – Extend the toolkit to provide weather, water, and climate services for renewable power plants and electricity generation sector (3<sup>rd</sup> version of the toolkit)</p> <p>7.3.2 – Increase global average energy efficiency by 1.2%</p> <p>Time frame:</p> <p>7.3.1 – By 2024</p> <p>7.3.2 – By 2030</p> <p>Context for the ambition(s):</p> <p>7.3.1 – The extended version of the toolkit (3<sup>rd</sup> version) will provide weather, water, and climate services to the energy sector players, including transmission system operators (TSOs), renewables power plants operators, and energy sector policymakers. These services, such as high-resolution short- to medium-term weather prediction, sub-seasonal to seasonal climate forecasting, and multi-hazard early warning system, will help to increase the resiliency and efficiency of clean electricity generation and grid integration.</p> <p>7.3.2 –The fully developed toolkit will contribute to increase global energy efficiency, mainly by facilitating energy transition from fossil fuels to renewables. It is not straightforward to estimate an improved energy efficiency rate. Weather, water and climate services component provides information for optimal renewable energy mix for cities and countries that will result in enabling energy systems to operate more efficiently in terms of storage and transmission of electricity. The global energy resilience atlas will indirectly increase the rate of efficiency by leading to develop optimum energy mix plans and establish and/or develop efficient renewable power plants though considering climate risks. Assuming that the fully developed toolkit will be applied to almost half of the total global modern renewables capacity by 2030 and considering that renewable energies improve efficiency with an average of 60% compared to traditional types of energy (IRENA, 2015), the renewables potential assessment component plays an important direct role to increase the energy efficiency. Considering all the direct and indirect effects of the toolkit components, we can estimate that it could improve the global energy efficiency by almost 1.2% through optimizing the renewables integration in the global energy mix and providing weather, water and climate services to the global energy sector in more than 100 developing countries.</p>	
<p><input checked="" type="checkbox"/> <b>7.a.</b> By 2030, enhance international cooperation to facilitate access to clean energy research and technology, including renewable energy, energy efficiency and advanced and cleaner fossil-fuel technology, and promote investment in energy infrastructure and clean energy technology.</p>	<p>Target(s):</p> <p>2 million new renewable energy related jobs</p> <p>Time frame:</p> <p>2030</p> <p>Context for the ambition(s):</p> <p>Assuming that the fully developed toolkit will contribute to establish more than 500 GW renewables capacity (target 7.1) in more than 100 developing countries around the world, about 2 million direct new jobs can be created. These jobs are mainly for enhanced skillful human resources in different areas of research, development, establishment, operation, and maintaining (IRENA, 2020).</p>	
<p><input type="checkbox"/> <b>7.b.</b> By 2030, expand infrastructure and upgrade technology for supplying modern and sustainable energy services for all in developing countries, in particular least developed countries, small island</p>	<p>Target(s):</p> <p>Time frame:</p> <p>Context for the ambition(s):</p>	

developing States, and land-locked developing countries, in accordance with their respective programs of support.

**1.2. Other ambitions in support of SDG7 by 2030 and net-zero emissions by 2050. [Please describe below e.g., coal phase out or reforming fossil fuel subsidies etc.]**

**Target(s):**

Reduction of 5 billion tons of GHG emissions

**Time frame:**

2030

**Context for the ambition(s):**

One important application of the proposed toolkit is to help countries to decarbonize their economies by supporting the development of both interconnected and decentralized renewable energies systems. The estimated GHG emission reduction is equal to the amount of emitted GHG by a fossil fuel power plant replaced by a renewable one that generates the same unit of electricity. Referring to item 7.1, about 500 GW renewable energy generation is required to assure energy access to 150 million people. Generating this amount of electricity by traditional fossil fuels will produce about 5 billion tons of GHG. This amount of GHG emission will be reduced if renewable power plants are being used instead of burning coal, oil and natural gas. (U.S. Energy information administration, 2020)

**SECTION 2: ACTIONS TO ACHIEVE THE AMBITION**

**2.1. Please add at least one key action for each of the elaborated ambition(s) from section 1. [Please add rows as needed].**

<i>Description of action (please specify for which ambition from Section 1)</i> 2.1.1 – WMO approval and resource allocation for developing the tool (For all ambitions)	<i>Start and end date</i> August 2021 – December 2021
<i>Description of action (please specify for which ambition from Section 1)</i> 2.1.2 – Establishment of international consortium and Development of the 1 <sup>st</sup> version of the toolkit (Global Energy Resilience Atlas) (For all ambitions)	<i>Start and end date</i> December 2021 – December 2022
<i>Description of action (please specify for which ambition from Section 1)</i> 2.1.3 – Development of the 2 <sup>nd</sup> version of the toolkit to include global renewables potential assessment for wind, hydro, and solar. (For all ambitions)	<i>Start and end date</i> December 2022 – December 2023
<i>Description of action (please specify for which ambition from Section 1)</i> 2.1.4 – Development of the 3 <sup>rd</sup> version of the toolkit to include other climate-energy services (high-resolutions short to medium range weather forecast services for renewable energy power plants and provide energy mix plans for cities and countries around the world focusing on developing countries) (For all ambitions)	<i>Start and end date</i> December 2023 – December 2024

**SECTION 3: OUTCOMES**

3.1. Please add at least one measurable and time-based outcome for **each** of the actions from section 2. *[Please add rows as needed].*

<i>Outcome</i> Internal organizational approval and allocated resources to start the project (For action 2.1.1)	<i>Date</i> October 2021
<i>Outcome</i> Launching the 1st version of the tool and open it to public use (For action 2.1.2)	<i>Date</i> October 2022
<i>Outcome</i> Launching the 2nd version of the tool and open it to public use (For action 2.1.3)	<i>Date</i> October 2023
<i>Outcome</i> Launching the 3rd version of the tool and open it to public use (For action 2.1.4)	<i>Date</i> October 2024
<i>Outcome</i> Facilitate energy access to more than 150 million people by 2030 (50 million by 2025), Contribute to 100% increase in global modern renewables capacity (50% by 2025), Contribute to reduce 500 million tons of global GHG emission (250 Gt by 2025), and Facilitate to create about 2 million new renewable energy jobs (up to 700 thousand by 2025) (For action 2.1.4)	<i>Date</i> October 2030

**SECTION 4: REQUIRED RESOURCES AND SUPPORT**

4.1. Please specify required finance and investments for **each** of the actions in section 2.

The required finance and investments for development phases of the toolkit and the operational costs until 2030 is summarized below. Some finance is secured to initiate developing the 1<sup>st</sup> version of the tool, but to complete it and to develop the 2<sup>nd</sup> and 3<sup>rd</sup> versions, external financial support is needed.

\$ 800,000: 1st version of the tool (Global energy resilience atlas) (For action 2.1.2)

\$ 2,400,000: 2nd version of the tool (Global renewable energy potential assessment) (For action 2.1.3)

\$ 3,500,000: 3rd version of the tool (Integrating weather and climate forecasts services for renewable energies power plants and energy mix plans) (For action 2.1.4)

\$ 500,000: Yearly operational cost from the 4th year, equal to \$ 3,000,000 until 2030)

In total, \$ 9,700,000 investment is required until 2030, and average of 90,000 per year.

4.2. [For countries only] In case support is required for the actions in section 2, please select from below and describe the required support and specify for which action.

*[Examples of support for Member States could include: Access to low-cost affordable debt through strategic de-risking instruments, capacity building in data collection; development of integrated energy plans and energy transition pathways; technical assistance, etc.]*

<input type="checkbox"/> Financing	<i>Description</i>
<input type="checkbox"/> In-Kind contribution	<i>Description</i>
<input type="checkbox"/> Technical Support	<i>Description</i>

<input type="checkbox"/> Other/Please specify	Description

## SECTION 5: IMPACT

### 5.1. Countries planned for implementation including the number of people potentially impacted.

The toolkit is planned to be fully developed in three phases. In each phase, an additional new service will be provided. The tool follows a world coverage approach for all the development phases to ensure the maximum benefit for the world population, particularly for the developing countries. In order to estimate the number of potentially impacted people, we need to consider both direct and indirect impacted populations. The first group is estimated 150 million as targeted in 7.1. The second group is much larger in terms of population and includes the residents of those cities and countries that will use the WMO energy toolkit (either global energy resilience atlas, global renewables potential assessment, or weather and climate services) to improve their electricity operation systems or establishment of new renewable power plants. Hence, this is not straightforward to estimate the potentially impacted people, however, by considering 100 developing countries indicated in targets 7.2 and 7.3, it can be estimated that a population of 500 million to 1 billion will be indirectly affected.

### 5.2. Alignment with the 2030 Agenda for Sustainable Development – Please describe how **each** of the actions from section 2 impact advancing the SDGs by 2030.

*[up to 500 words, please upload supporting strategy documents as needed]*

The renewable energy (RE) resources potential assessment will guide countries in identifying the best locations for building new REs plants or retrofitting existing plants. The tool will provide information based on historic past (reanalysis), current observational data, near- and long-term forecast and climate projections for decades ahead. Providing RE resources assessment based on this wide time horizon of weather and climate information will provide a higher level of accuracy and a justification of financial investments in new projects for RE development. Hence, applications of the developed tool will result in more REs power plants, increasing the share of renewables in the global energy mix and more energy efficiency. With that introduction, the role of the actions in advancing the SDGs by 2030 is summarised below:

#### **SDG 1 and 2: NO POVERTY, NO HUNGER:**

Energy access is a critical enabler of development and hence poverty reduction. Energy systems are crucial for all aspects of people's lives and livelihoods, including access to healthcare and education, digital content, and industrialization. The lack of access to electricity is associated with fundamental constraints on people's lives and socioeconomic prospects, and cause of poverty.

Ending hunger and achieving food security will not be possible without access to sustainable energy. Energy is required throughout the agri-food value chain, including irrigation, agro-processing (grinding, milling, pounding, husking, etc.), food preparation, storage, refrigeration, and transport. The tool will support the development of modern energy systems for more than 80 million people around the world and hence contribute to decrease poverty.

#### **SDG 5: GENDER EQUALITY:**

Access to modern energy has significant potential to improve women's health (through reduced exposure to household air pollution due to cleaner cooking), safety (through Improved street lighting and access to mobile phone access and online communication), and income (through reduction of electricity costs by using off-grid energy technologies for business typically operated by women in rural areas)

#### **SDG 6 and 16: CLEAN WATER AND SANITATION, LIFE BELOW WATER:**

Energy and water are closely linked. Energy is required to treat and supply drinking and wastewater for use in households, agriculture, and industry. The advantage of REs compared to fossil fuels is that the production, transport, and supply of fossil fuels threaten water quality by polluting rivers, lakes, oceans and marine ecosystems - accidental oil spills, dumping of hazardous fuels and chemicals. Increasing the share of renewables in the global energy mix (using the tool for initial studies of RE resources assessment) can mitigate this threat.

#### **SDG 9 and 10: INDUSTRY, INNOVATION AND INFRASTRUCTURE, REDUCING INEQUALITY:**

Modern energy is a critical enabler of industrial activity, research, development, and technological innovation. Therefore, sustainable energy solutions, including decentralized, off-grid energy solutions, for households, businesses, and industries can significantly facilitate sustainable and resilient infrastructure development in developing countries. On the other hand, the establishment of decentralized energy systems, run on renewable energy and identify the spots using the developed tool, holds the potential to increase the rate of clean and reliable energy deployment among those in need, and thus to help remedy inequality in access.

**SDG 11: SUSTAINABLE CITIES AND COMMUNITIES:**

Energy plays a fundamental role in building inclusive, safe, resilient, and sustainable cities and human settlements. The developed tool can be used to identify the best spots and types of decentralized renewable energy technologies that can help many urban and rural populations access affordable and safe energy, contributing to inclusive and sustainable urbanization.

**SDG 13: CLIMATE CHANGE:**

The CO2 emissions from the combustion of fossil fuels account for 85% of the total CO2 emissions. The energy transition and increasing the share of renewables in the global energy mix will help to decrease the amount of GHG emissions substantially. The developed tool plays an important role in this transition.

5.3. Alignment with Paris Agreement and net-zero by 2050 - Please describe how **each** of the actions from section 2 align with the Paris Agreement and national NDCs (if applicable) and support the net-zero emissions by 2050. *[up to 500 words, please upload supporting strategy documents as needed]*

The transition towards renewables such as solar and wind energy is a critical part of meeting the goals of the Paris Agreement, which aims to limit the rise of global average temperatures to well below 2 degrees Celsius, and ideally, below 1.5 degrees Celsius above pre-industrial levels by reducing GHG emission. To date, 190 Parties have ratified the Paris Agreement, and 188 have submitted NDCs to the United Nations Framework Convention on Climate Change (UNFCCC). Of these, 170 NDCs (or 90% of the total) mentioned renewables, while 134 (or 71%) included quantified renewable energy targets. While all 134 of those NDCs included renewable energy targets for electricity generation, only 56 included targets for direct heat and for transport, even though decarbonization is key to achieving the objectives of the Paris Agreement.

The developed tool will help the countries to establish more sustainable and efficient renewable power plants by identifying the best spot and type of RE through an online free platform that will end to GHG emission reduction aligned with the Paris agreement, countries NDCs, and net-zero by 2050. On the other side, the tool will provide an energy mix plan to countries, which maximize renewable energy share and minimize fossil fuel share in the energy mix plans and, in turn, will result in GHG emission reduction.

**SECTION 6: MONITORING AND REPORTING**

6.1. Please describe how you intend to track the progress of the proposed outcomes in section 3. Please also describe if you intend to use other existing reporting frameworks to track progress on the proposed outcomes.

Tracking the progress of the proposed outcomes will be conducted through several ways:

- 1) Track the number of toolkit visitors by automatically collect general information (such as country and region of access, support needs, interests, etc.) as an initial indicator representing the popularity of the developed toolkit to be used for further analysis.
- 2) Collect information via distributed surveys to those companies and countries who are consulting the platform or applying the toolkit. This feedback will be used to monitor the success of the provided services and to address the required technical needs and gaps.
- 3) Track the number of the projects, where the toolkit is applied. Collect in-detail information for each project to track the progress of the outcomes, considering the SDG7 and net-zero emission 2050 indicators, such as universal energy-access, the share of renewable energy in the global energy mix, improvement in the global rate of energy efficiency, greenhouse gas emission reduction, etc.

**SECTION 7: GUIDING PRINCIPLES CHECKLIST**

Please use the checklist below to validate that the proposed Energy Compact is aligned with the guiding principles.

**I. Stepping up ambition and accelerating action** - Increase contribution of and accelerate the implementation of the SDG7 targets in support of the 2030 Agenda for Sustainable Development for Paris Agreement

*1.1. Does the Energy Compact strengthen and/or add a target, commitment, policy, action related to SDG7 and its linkages to the other SDGs that results in a higher cumulative impact compared to existing frameworks?*

Yes  No

*1.2. Does the Energy Compact increase the geographical and/or sectoral coverage of SDG7 related efforts?*  Yes  No

*1.3. Does the Energy Compact consider inclusion of key priority issues towards achieving SDG7 by 2030 and the net-zero emission goal of the Paris Agreement by 2050 - as defined by latest global analysis and data including the outcome of the Technical Working Groups?*  Yes  No

**II. Alignment with the 2030 agenda on Sustainable Development Goals** – Ensure coherence and alignment with SDG implementation plans and strategies by 2030 as well as national development plans and priorities.

- II.1. Has the Energy Compact considered enabling actions of SDG7 to reach the other sustainable development goals by 2030? Yes No
- II.2. Does the Energy Compact align with national, sectoral, and/or sub-national sustainable development strategies/plans, including SDG implementation plans/roadmaps? Yes No
- II.3. Has the Energy Compact considered a timeframe in line with the Decade of Action? Yes No

**III. Alignment with Paris Agreement and net-zero by 2050** - Ensure coherence and alignment with the Nationally Determined Contributions, long term net zero emission strategies.

- III.1. Has the Energy Compact considered a timeframe in line with the net-zero goal of the Paris Agreement by 2050? Yes No
- III.2. Has the Energy Compact considered energy-related targets and information in the updated/enhanced NDCs? Yes No
- III.3. Has the Energy Compact considered alignment with reaching the net-zero emissions goal set by many countries by 2050? Yes No

**IV. Leaving no one behind, strengthening inclusion, interlinkages, and synergies** - Enabling the achievement of SDGs and just transition by reflecting interlinkages with other SDGs.

- IV.1. Does the Energy Compact include socio-economic impacts of measures being considered? Yes No
- IV.2. Does the Energy Compact identify steps towards an inclusive, just energy transition? Yes No
- IV.3. Does the Energy Compact consider measures that address the needs of the most vulnerable groups (e.g. those impacted the most by energy transitions, lack of energy access)? Yes No

**V. Feasibility and Robustness** - Commitments and measures are technically sound, feasible, and verifiable based a set of objectives with specific performance indicators, baselines, targets and data sources as needed.

- V.1. Is the information included in the Energy Compact based on updated quality data and sectoral assessments, with clear and transparent methodologies related to the proposed measures? Yes No
- V.2. Has the Energy Compact considered inclusion of a set of SMART (specific, measurable, achievable, resource-based and time based) objectives? Yes No
- V.3. Has the Energy Compact considered issues related to means of implementation to ensure feasibility of measures proposed (e.g. cost and financing strategy, technical assistant needs and partnerships, policy and regulatory gaps, data and technology)? Yes No

**SECTION 8: ENERGY COMPACT GENERAL INFORMATION**

8.1. Title/name of the Energy Compact

WMO Climate-energy services toolkit (CLERVICE TOOL)

8.2. Lead entity name (for joint Energy Compacts please list all parties and include, in parenthesis, its entity type, using entity type from below)

World meteorological organization

8.3. Lead entity type

- Government
- Local/Regional Government
- Multilateral body /Intergovernmental Organization
- Non-Governmental Organization (NGO)
- Civil Society organization/Youth
- Academic Institution /Scientific Community
- Private Sector
- Philanthropic Organization
- Other relevant actor

8.4. Contact Information

Roberta Boscolo, Climate and energy scientific officer, [rboscolo@wmo.int](mailto:rboscolo@wmo.int);  
Hamid Bastani, Energy consultant, [hbastani@wmo.int](mailto:hbastani@wmo.int)

8.5. Please select the geographical coverage of the Energy Compact

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Africa  Asia and Pacific  Europe  Latin America and Caribbean  North America  West Asia  Global

8.6. Please select the Energy Compact thematic focus area(s)

Energy Access  Energy Transition  Enabling SDGs through inclusive just Energy Transitions  Innovation, Technology and Data  Finance and Investment.

### SECTION 9: ADDITIONAL INFORMATION (IF REQUIRED)

Please provide additional website link(s) on your Energy Compact, which may contain relevant key documents, photos, short video clips etc.

#### References

IRENA, 2014,

REmap 2030, A renewable energy roadmap.

IRENA, 2020, Renewable Energy and Jobs, Annual review.

IRENA, 2015, Synergies between renewable energy and energy efficiency, A working paper based on REmap 2030.

U.S. Energy information administration, 2020, <https://www.eia.gov/tools/faqs/faq.php?id=74&t=11>.

United Nations, 2021, United Nations High-level dialogue on energy, Global Roadmap -Technical Working Group II on Energy Transition