Mitigation benefits of actions, initiatives and options to enhance mitigation ambition

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SUMMARY

This updated technical paper compiles information on mitigation benefits of actions, initiatives and options to enhance mitigation ambition, with a focus on two thematic areas: promotion of renewable energy supply and acceleration of energy efficiency in urban environments. It also compiles information on support for actions in those thematic areas and possible actions to be undertaken by the Ad Hoc Working Group on the Durban Platform for Enhanced Action (ADP). Information for the update was provided at the two technical expert meetings that took place during the ninth part of the second session of the ADP, held in June 2015 in Bonn, Germany, and at the other meetings dedicated to the discussions on workstream 2 held during 2015, as well as in relevant submissions from Parties and observer organizations and literature on the implementation of policy options. This update builds on the previous versions of the technical paper, which are contained in documents FCCC/TP/2014/3 and Add.1 and FCCC/TP/2014/13 and Add.1–4.

This technical paper consists of the main document and two addenda. The addenda are focused on the promotion of renewable energy supply and the acceleration of energy efficiency in urban environments. They elaborate on drivers for accelerated implementation and key policies, practices and technologies for catalysing action in those thematic areas.

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Chapter I

BACKGROUND

A. Mandate

01. This updated technical paper on mitigation benefits of actions, initiatives and options to enhance mitigation ambition was requested by the Conference of the Parties at its twentieth session.[1] The previous versions of this technical paper are contained in documents FCCC/TP/2013/4, FCCC/TP/2013/8 and Add.1 and 2, FCCC/TP/2014/3 and Add.1 and FCCC/TP/2014/13 and Add.1–4. This latest update of the technical paper does not supersede the previous versions but rather builds on the findings, information and options to enhance mitigation ambition contained therein.

02. This update is based on information provided at the technical expert meetings (TEMs) that took place during the ninth part of the second session of the Ad Hoc Working Group on the Durban Platform for Enhanced Action (ADP), held in June 2015 in Bonn, Germany, on unlocking mitigation potential by enhancing renewable energy (RE) supply and accelerating energy efficiency (EE) in urban environments.[2] It draws on relevant submissions from Parties and observer organizations as well as other relevant sources of information on the implementation of RE and EE policy options and multilateral cooperation.

B. Objective and approach

03. The objective of this updated technical paper is to compile information on key mitigation policies, practices and technologies to promote RE supply and accelerate EE in urban environments. By disseminating it, the secretariat seeks to support Parties, non-State actors and other institutions in moving on the discussions under the technical examination process from policy identification to transformational policy implementation.

04. To facilitate the achievement of that objective, the paper presents best practice policy options and enabling practices that can lay the foundation for the effective implementation of pre-2020 mitigation policies with high potential and associated sustainable development co-benefits, including health and adaptation. In addition, it seeks to highlight inspirational and successful examples of best practice policies that present valuable lessons, successful practices and approaches that may be replicated and scaled up in the context of unique national circumstances. To that end, the RE and EE policy options and enabling practices presented in this paper are intended to support countries, cities and other jurisdictions in addressing climate challenges, replicating solutions and overcoming barriers to RE and EE in order to bring crucial climate and sustainable development goals to fruition.

05. The information presented in this paper does not imply that there is consensus among Parties on any of the issues or options covered in the relevant submissions and at the TEMs. Rather, it provides an overview of the discussions that took place at the TEMs, the submissions made on relevant policy options and approaches to the provision of support and additional literature, in accordance with the mandate for the technical paper.

[1] Decision 1/CP.20, paragraph 19(b).
[2] Detailed information on the TEMs held under the ADP in June 2015, including the summaries of the discussions at the meetings, is available at <http://unfccc.int/bodies/awg/items/8895.php> and <http://unfccc.int/bodies/awg/items/8896.php>.

C. Structure of the technical paper

06. This updated technical paper consists of the main text and two technical addenda.

07. The main text begins with background information provided in chapter I. Chapter II presents the main findings, namely on mitigation policy options, practices, technologies and enabling practices associated with sustainable development co-benefits, as well as options for enhancing support for policy implementation. Chapters III and IV elaborate on key policy options and include select best practice examples of the deployment of RE and EE in urban environments. Chapter V discusses multilateral cooperation and efforts undertaken by non-State actors, various international organizations, United Nations agencies and UNFCCC institutions to support the deployment of policies. Chapter VI describes options for enabling and mobilizing finance, technology development and transfer, and capacity-building to scale up the deployment of RE and EE around the world. Finally, chapter VII summarizes the next steps in supporting RE and EE deployment, options to enhance mitigation ambition as well as potential follow-up actions to be undertaken under the technical examination process in the period 2016–2020.

08. Two technical addenda, one focused on RE and the other focused on EE in urban environments, provide more technically in-depth information related to the policies, practices and technologies described in this updated technical paper. They also include a number of inspirational examples and short case studies detailing specific country and city experiences in designing and implementing effective RE and EE policies.

09. The content of this updated technical paper is based on a broader logical framework that was explained in the previous updates of the technical paper, contained in documents FCCC/TP/2014/3 and Add.1 (published in May 2014) and FCCC/TP/2014/13 and Add.2 (published in November 2014). The previous versions of this technical paper cover the topics discussed at the previous two TEMs on RE and EE, held in March 2014, and another TEM on urban environments, held in June 2014. This update seeks to support the continued catalysation and implementation of critical RE and EE policies by capturing in a timely manner lessons learned and enabling practices drawn from successful, innovative and inspiring efforts and progress around the world.

10. In 2015 the technical examination process has focused on the selected most promising policy options in two thematic areas. The options presented in this paper provide an updated in-depth and more robust picture of policies that can be implemented to scale up RE and EE deployment. This update provides a more complete review of the current policy landscape and the policy options discussed at the latest TEMs.

11. To that end, chapter III of this paper provides updated information on policy options included in the previous version of the technical paper, while also presenting additional policy options that have recently gained momentum, for example auctions and tendering processes for RE supply. The discussion in that chapter focuses on policies used to promote distributed energy generation and financial incentives for RE. Chapter IV focuses on EE mitigation policies in urban environments, building on the information in the two previous updates of the technical paper, and provides updated information on the sectors offering the highest mitigation potential, such as transportation, buildings, lighting[3] and district energy, focusing on city-level action.

12. This update presents a new set of country- and city-specific examples, which should be seen as complementary to and part of the broader set of examples that also encompasses those included in the previous versions of the technical paper. In addition to strong national policies, successful actions of non-State actors, the private sector and international cooperative initiatives and partnerships are highlighted throughout this paper to inspire replication and improved action.

[3] Lighting is discussed separately from buildings as lighting can also include technologies beyond those that illuminate buildings (e.g. street lighting) and because there is significant potential for reducing emissions with more efficient lighting.

Chapter II

MAIN FINDINGS

13. The continued scaling up and replication of successful and innovative RE and EE policies are urgently required to meet the climate goal put forward by the international community, namely to hold the global temperature increase to below 2 °C. With regard to achieving that goal, REmap 2030, the renewable energy road map of the International Renewable Energy Agency (IRENA), shows that doubling the share of renewables worldwide could lead to a reduction of 8.6 gigatonnes of carbon dioxide equivalent (Gt CO2 eq) emissions per year by 2030 as compared with the 'business as usual' scenario (IRENA, 2014). Furthermore, EE measures could support an additional reduction of 7.3 Gt CO2 eq emissions per year by 2030 (IRENA, 2014).

14. A combination of scaled-up RE and EE measures could lead to a major shift by 2030 to emission pathways that are consistent with the global temperature goal. The Fifth Assessment Report of the Intergovernmental Panel on Climate Change shows that, if global greenhouse gas (GHG) emissions are not kept at or below the 2010 level by 2030, the efforts and costs involved in future actions to achieve the global goal would have to increase significantly. According to The 2015 New Climate Economy Report, to sufficiently scale up and catalyse RE and EE deployment and reduce annual GHG emissions by 5.5–7.5 Gt CO2 eq by 2030, the required annual investment is estimated to be around USD 1 trillion. Many RE and EE technologies and measures have become more cost-effective and are ready to be substantially scaled up, providing a strong opportunity for early and critical action to reduce GHG emissions.

15. To support the realization of critical long-term climate goals, the international community continues to make great progress in accelerating and scaling up RE- and EE-related action. The strong and inspiring leadership and support of national and subnational governments, the private sector, multilateral institutions and other non-State actors have provided the foundation for technological advancement, improved technical performance and effective deployment of RE and EE over the last few decades. That progress has resulted in significantly lower costs and expanded deployment of RE and EE options in most countries and jurisdictions. Aligned with the overall trend for cost reduction, RE is now the lowest-cost option for meeting emission reduction commitments.

16. The crucial post-2015 sustainable development agenda provides the essential underpinning for RE and EE policies and actions, as they can contribute to realizing important sustainable development co-benefits, including:
    (a) Economic development through diversification, employment and enterprise development, energy security and independence, enhanced asset values, reduced energy costs, and technological innovation and competitiveness;
    (b) Social development through improved education, access to energy, gender equality, health and comfort;
    (c) Environmental quality through biodiversity protection, climate change mitigation and adaptation, sustainable use of natural resources, improvements to local air and water quality and decreases in water use.

17. It should be emphasized that RE and EE policies can support both mitigation and adaptation objectives. As a notable example, distributed RE can support adaptive capacity by increasing access to energy and strengthening the resilience of the overall electricity system to potential climate impacts and natural hazards.

18. Building on progress and innovative work around the world, barriers that continue to impede the progress of RE and EE deployment are being addressed, however some of these barriers still persist. From an economic perspective, despite the decreasing costs of technology, the cost of capital to finance RE and EE projects is a challenge for investment in a number of countries. In addition, governments

struggle to balance budget allocations across various, sometimes competing, national priorities and certain policies, such as inefficient fossil fuel subsidies, which can greatly hinder the development of RE and EE. Policy uncertainty and cumbersome permitting and regulatory requirements also hinder investment flows in several countries. From a technical perspective, and with many countries reaching higher penetrations of variable RE in the electricity grid, smarter and innovative grid-integration/system-wide policies are required to ensure the needed flexibility in the energy system and to address the challenges of resource variability. From a human capacity perspective, investment in education and training programmes is needed to build a strong workforce in the energy and financial services sectors and informed communities in order to support the replication and scaling up of RE and EE policies.

19. Specific to EE, the lack of good data and methodologies for assessing energy savings and the need for innovative financial models to address split incentives and, in some cases, high upfront costs are critical barriers to EE deployment. Also important is consumers' willingness to make behavioural changes that may go against cultural ideals; this is especially pertinent to the uptake of energy-efficient transportation, such as mass public transit and non-motorized travel.

20. To address the aforementioned barriers, many countries around the world are leading efforts to significantly expand RE deployment and are designing critical enabling environments to facilitate that expansion. In addition to broader climate and low-carbon development strategies and plans, 164 countries have adopted RE targets as well as other key policies and initiatives to enable distributed and utility-scale RE transformation (Renewable Energy Policy Network for the 21st Century (REN21), 2014). Policies and actions playing an important role in accelerating RE deployment include: pricing instruments such as feed-in tariffs (FITs) and carbon taxes; auction and tendering approaches; regulations and standards such as renewable electricity standards (RES); tax incentives; grid integration measures; actions to mobilize finance; cap-and-trade systems and other market-based mechanisms. FITs are the most widely used policy in the world for accelerating RE deployment, accounting for a greater share of RE development than either tax incentives or renewable electricity standards (REN21, 2014). FITs have generated significant RE deployment, helping to bring the countries that have implemented them successfully to the forefront of the global RE industry.

21. The use of distributed energy generation in many parts of the world has improved access to modern energy services, the lack of which continues to impede sustainable development. People in remote and rural areas of the world are increasingly gaining access to electricity owing to the installation and use of distributed RE technologies, which increased as a direct result of improvements in affordability and the inclusion of distributed energy in national energy policies. In particular, interconnection standards, net metering, mini-grid support measures and actions to enable finance for distributed generation (DG) can support the increased deployment of smaller-scale systems.

22. Countries are increasingly undertaking EE measures with the intention of speeding up energy-sector transformation. For example, over half of all International Energy Agency (IEA) member countries have begun to implement EE policies across the buildings, lighting, transport, utilities and other sectors (IEA, 2012a). Frequently used policies among those countries include national EE strategies and actions plans, financial incentives for building up EE, and the phasing out of inefficient lighting technologies. Many countries are also continuing to strengthen building codes, implement building certification schemes and, increasingly, conduct outreach and knowledge-sharing on building up EE practices and potentials. Mandatory auditing and retrofitting commissions, the reporting and benchmarking of performance data, and government leadership and procurement are important policy options that are regularly utilized for catalysing the deployment of efficient building technologies.

23. With regard to transport, in recent years more countries have put in place regulations regarding systems for monitoring tyre pressure, labelling programmes for tyre rolling resistance and standards for CO2 emissions from passenger vehicles and eco-driving (IEA, 2012a). Governments are also undertaking holistic transportation planning efforts, building infrastructure to encourage non-personal motorized transport and expanding or enhancing public transport.

24. City planners are focusing on the build-out and improvement of district energy systems (DES), independently or in some cases in connection with national policies. DES are increasingly incorporating waste heat, free cooling (using outdoor bodies of water) and RE and utilizing 'smart' communication technologies and two-way exchanges of energy (United Nations Environment Programme (UNEP), 2015b).

25. Many national and subnational governments expect to benefit greatly from financial, technology development and transfer and capacity-building support for scaling up RE and EE deployment. Key areas for support to catalyse RE and EE deployment include: designing effective incentives to leverage private finance and de-risking investment through innovative finance support mechanisms; mobilizing finance through the Green Climate Fund (GCF) and other key multilateral partnerships and initiatives; facilitating technology transfer; and building the capacity of project developers, domestic financial communities and other key stakeholders.

26. Non-State actors such as cities, regional actors and the private sector are also playing a crucial role in catalysing the deployment of RE and EE by: informing policy design as part of broader stakeholder engagement processes; drawing attention to the need for mitigation in the energy sector; participating as RE and EE project investors; and investing in RE and EE for direct use. Furthermore, subnational policymakers and leaders continue to provide strong models of local governance structures to support the effective implementation of RE and EE policies.

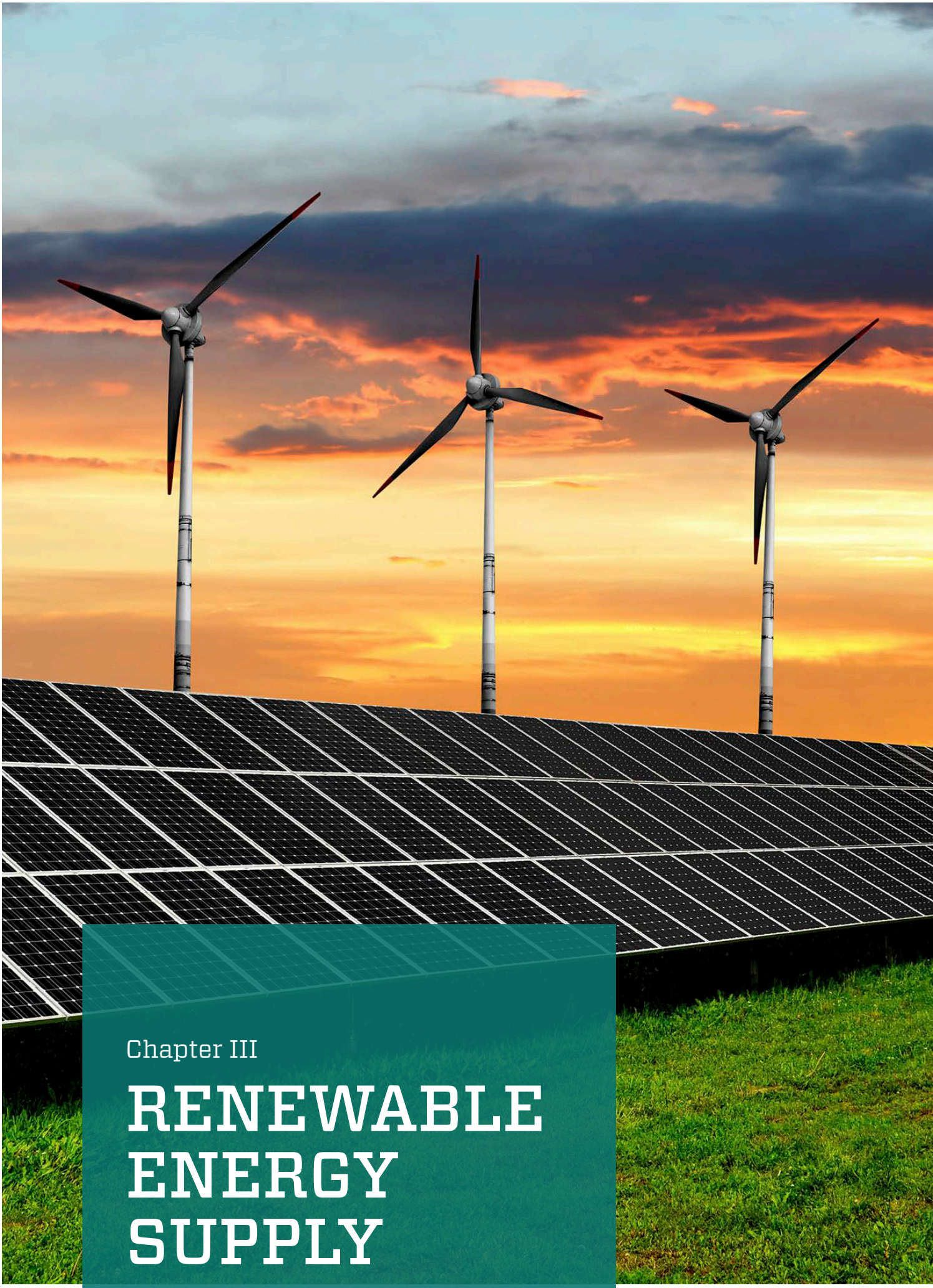
27. Building on the momentum gained at the United Nations Climate Summit in September 2014, the role of cooperation continues to grow and evolve to address new challenges and capture new opportunities for the replication of successful policies leading to large-scale economic and energy sector transformation. Building on successful collaborative efforts, there is a strong need to further enhance partnerships by engaging diverse public- and private-sector stakeholders (at the subnational, national and international levels) and to ensure effective coordination among partnerships and avoid duplication. UNEP found that over 180 initiatives conducted by non-State actors have brought together over 20,000 organizations to commit to climate action and that those initiatives could save between 2.5 and 3.3 Gt CO2 eq by 2020 across all mitigation technologies (UNEP, 2015a). These emission reductions may partly overlap with those reached under the Cancun Agreements.

28. The launch of two new initiatives in the areas of EE and RE, namely the Africa Group Renewable Energy Partnership Proposal and the Global Alliance for Buildings and Construction led by UNEP demonstrated the potential impact of the latest TEMs. The former initiative is an inspiring example of the power of collaboration among developing countries to support scaled-up RE and transformative RE deployment within the African continent.

29. Pre-2020 climate action that leads to significant emission reductions and the realization of sustainable development co-benefits provides the essential foundation for ambitious climate action in the post-2020 period and inspires Parties to take progressive climate action that will transform the global economy, leading to low-emission and climate-resilient development. Ramping up the implementation of proven and feasible policy options is vital for realizing the necessary emission reductions. Such policies could

both accelerate pre-2020 mitigation action and pave the way for post-2020 action under the new climate agreement that will enter into force in 2020.

30. The technical examination process can continue to support, until 2020 and beyond, the advancement of critical RE and EE policies after the United Nations Climate Change Conference in Paris, France, through key actions such as: the organization of TEMs; the preparation of technical papers and summaries for policymakers for the wider dissemination of information; the engagement of a broader group of stakeholders, including relevant experts, subnational authorities, international organizations, civil-society institutions, indigenous peoples, women, youth, academic institutions and private-sector entities; the showcasing and recognition of notable actions, initiatives and partnerships undertaken by governments, international institutions and non-State actors to inspire the replication and scaling up of successful approaches and to share lessons learned and best practices; and the mobilization of scaled-up support.



Chapter III

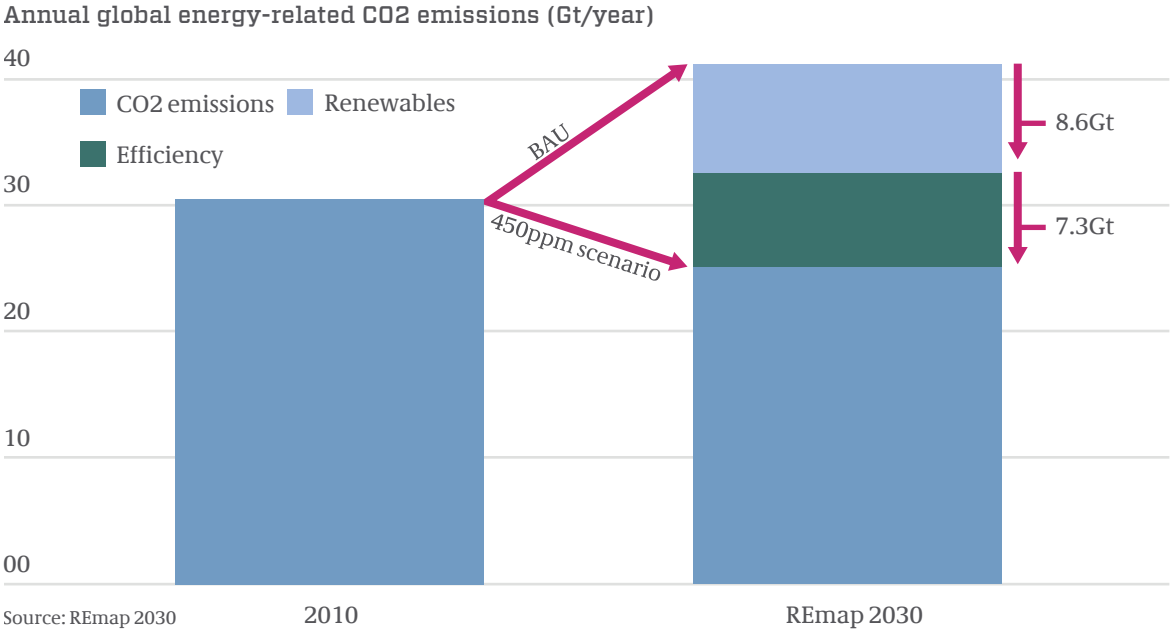
RENEWABLE ENERGY SUPPLY

A. Drivers for accelerated implementation

31. As presented in figure 1, REmap 2030 shows that doubling the share of RE[4] worldwide could lead to a reduction of 8.6 Gt CO_2 eq emissions by 2030 as compared with the 'business as usual' reference scenario.[5] REmap 2030 also provides a road map for achieving that outcome, describing a number of policies and actions to significantly scale up RE deployment globally, while building on lessons learned and progress made to date (IRENA, 2014).

32. However, it should be noted that many Parties have called for going beyond doubling the share of RE in order to reach an emission pathway that avoids dire social, economic and environmental outcomes, particularly for vulnerable developing countries and island nations. Increasing the level of global ambition to focus on transformative RE-related actions and measures is imperative to avoid catastrophic climate impacts. The REmap analysis emphasizes the need for the fundamental transformation of the electricity and transport sectors, the development and deployment of breakthrough and innovative technologies, the early retirement of high-emitting technologies and key industrial shifts in order to reach the required outcome (IRENA, 2014). It is in the international community's hands to determine how fast the roll-out of RE will take place. [6]

Figure 1
REmap 2030 scenarios



Source: Presentation made by the International Renewable Energy Agency at the Ad Hoc Working Group on the Durban Platform for Enhanced Action technical expert meeting on renewable energy in June 2015.
Abbreviation: BAU = business as usual.

33. In addition to supporting mitigation objectives, RE deployment can support critical national development goals. Key sustainable development co-benefits that can be supported by RE include:
(a) Economic development through diversification, employment and enterprise development, energy security and independence, reduced energy costs, and technological innovation and competitiveness;

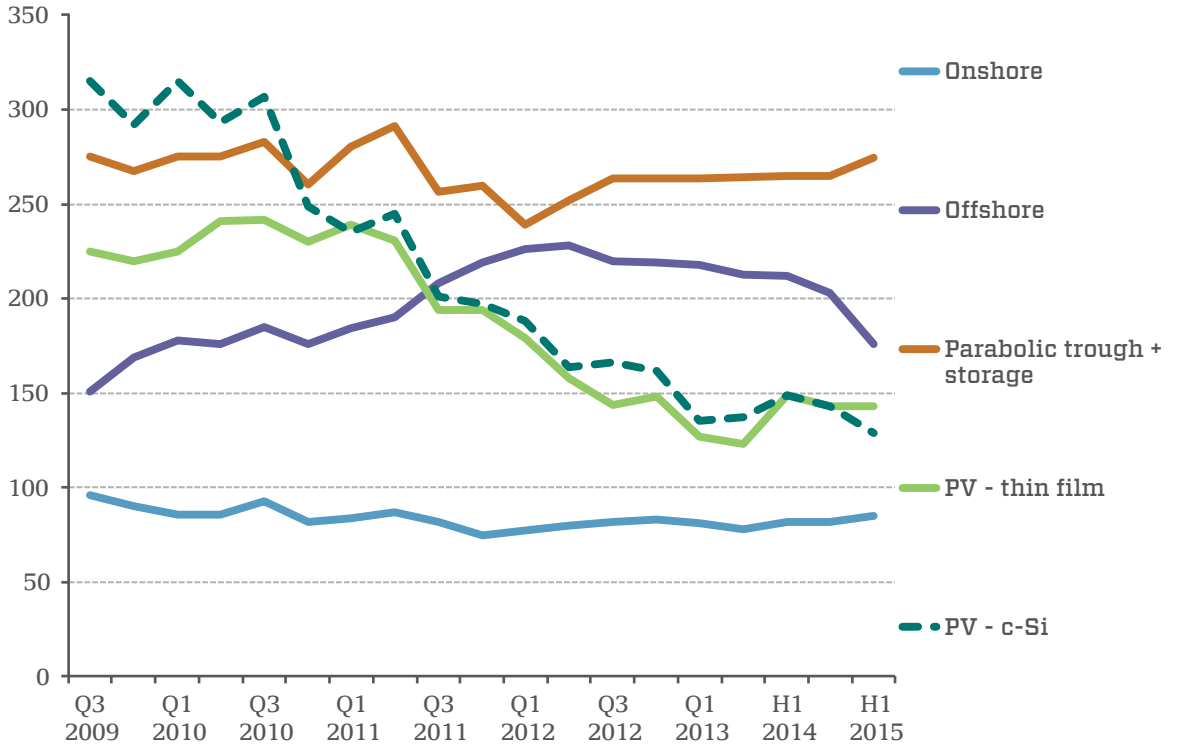
[4] Common RE resources and technologies include: solar, wind, biomass, geothermal, hydro and emerging technologies such as tidal and wave.
[5] Under the REmap 2030 450 ppm scenario.
[6] Africa Group Renewable Energy Partnership Proposal.

(b) Social development through improved education, access to energy, gender equality, health and comfort; (c) Environmental quality through biodiversity protection, climate change mitigation and adaptation, sustainable use of natural resources, improvements to local air and water quality and decreases in water use.

34. From a holistic climate perspective, RE policies are fundamental in supporting both mitigation and adaptation goals. As a notable example, distributed RE can support adaptive capacity by increasing access to energy and strengthening the resilience of the overall electricity system to potential climate impacts and natural hazards.

35. With technological advances and expanded economies of scale, RE technology costs have decreased significantly over the last few decades, driving down overall project costs and supporting scaled-up deployment.[7] As a notable example, since 2004 the cost of solar photovoltaics (PV) has declined by 75 per cent, bringing the average price of solar energy down to USD 0.08/kWh. Furthermore, Bloomberg New Energy Finance (BNEF) estimates that solar PV power plan costs (over the lifetime of the system) will decrease by close to 50 per cent by 2040 (BNEF, 2015). Figure 2 presents changes in the levelized cost of electricity for various RE technologies from 2009 to 2015.

Figure 2
Levelized cost of electricity by renewable energy technology, in USD/MWh (from third quarter of 2009 to first half of 2015)



Source: Bloomberg New Energy Finance

Source: Presentation made by Bloomberg New Energy Finance at the Ad Hoc Working Group on the Durban Platform for Enhanced Action technical expert meeting on renewable energy in June 2015. Note: The levelized cost of electricity is the price that must be received per unit of output as payment for producing power in order to break even. The calculation standardizes the units of measuring the lifecycle costs of producing electricity, thereby facilitating the comparison of the cost of producing 1 MWh by each technology. The cost is denominated in 2012 USD/MWh.
Abbreviations: H = half year, offshore = offshore wind, onshore = onshore wind, PV = photovoltaics, PV c-SI = crystalline silicone, Q = quarter year.

[7] Presentation made by IRENA at the ADP TEM on RE in June 2015.

36. Financial risks associated with RE continue to be better understood and, thus, more easily addressed,[8] allowing for expanded investment and the design of innovative finance instruments. As such, in 2014 USD 310 billion was invested in RE, a fivefold increase since 2004. Furthermore, since 2012 investment in new RE capacity has grown at a greater pace than investment in fossil fuel power capacity and is expected to continue to increase significantly. To reach the goal of doubling RE capacity by 2030,[9] IRENA estimates that annual global investment must be increased to USD 650 billion on average between now and 2030. Under more ambitious scenarios going beyond doubling RE capacity, the investment needs will be greater. However, in combination with EE-related actions and fuel cost savings, the required investments can be partially or fully offset.[10]

37. Much progress has been made in scaling up RE deployment around the world. Since 2011, over half of global additions to the capacity of the power sector have come from RE sources. Technical aspects of energy storage technologies also continue to improve, further benefitting RE technology deployment. Notably, BNEF estimates that, between 2015 and 2040, USD 3.7 trillion will be invested in solar technologies (BNEF, 2015).

38. System-wide grid integration measures must also continue to improve to support the significant scaling up of RE. In the future, energy system integration across energy-use sectors and energy carriers will present both challenges and opportunities for RE deployment, as future energy systems will become more complex and offer multiple energy supply and management solutions for energy users. The RE systems of the future will offer opportunities for new actors, households, communities, cooperatives, civil-society organizations, small businesses, larger private companies and public-service institutions such as health clinics, schools and government offices to become active participants as both producers and consumers ('prosumers') of electricity. With that transformation, ownership patterns can become more diverse and democratized.

39. Despite strong progress, a number of barriers, unique to various national circumstances, continue to hinder RE deployment. From an economic perspective, despite the decreasing costs of technology, the cost of capital to finance RE projects, as well as real or perceived investment risks, are significant barriers in a number of national contexts. Governments struggle to balance budget allocations across various, and sometimes competing, national priorities, and certain policies, such as fossil fuel subsidies, can greatly hinder RE development. Evolving market conditions and policy uncertainty or instability also present challenges for RE investment.[11] In addition, cumbersome permitting and regulatory requirements can impede investment.

40. Furthermore, with various countries reaching higher levels of penetration of renewables in the electricity grid, smarter and innovative grid integration/system-wide policies and actions are also required to ensure flexibility and address the challenges of variability.[12] Traditional reliance on large-scale RE sources, such as hydropower and geothermal, integrated with centralized energy grids for renewable electricity production is now being complemented by other RE technologies (e.g. solar, wind and bioenergy) that are scaling up to matching capacities (e.g. from 1 to >500 MW) and competing in existing electricity markets. To further those advances, changes in the design of electricity markets and policy support tools can maximize RE penetration and enhance the financial viability of RE technologies.

41. Needs and challenges in terms of human capacity and public acceptance necessitate investment in education and training programmes in order to build a strong workforce and informed communities in support of RE deployment.[13] Capacity-building is critical in a number of contexts. The training of local bankers, financiers and project developers and a broader workforce in the area of RE will provide a strong foundation for scaled-up action.

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[8] Presentation made by IRENA at the ADP TEM on RE in June 2015.
[9] As footnote 8 above.
[10] Presentation made by the Institute for Sustainable Development and International Relations at the ADP TEM on RE in June 2015
[11] Presentation made by BNEF at the ADP TEM on RE in June 2015.
[12] Greening the Grid. Available at <http://greeningthegrid.org/>.

B. Policy options, practices and technologies to accelerate renewable energy supply

42. Accelerating RE deployment will require collective action that is well grounded on sustainable development goals and based on unique national circumstances. Countries are continuing to adopt and refine policies to support RE deployment, address key barriers and mobilize the support needed by developing country Parties. In the context of unique national circumstances, both large-scale renewables that are part of the energy systems and DG are playing and will continue to play a key role in meeting low-carbon development goals.

B.1. Policy options for promoting distributed energy generation

43. The use of distributed energy generation in many parts of the world has improved access to modern energy services, the lack of which continues to impede sustainable development. Recent assessments suggest that as many as 1.3 billion people still do not have access to electricity and more than 2.6 billion people rely on traditional biomass for cooking and heating (REN21, 2014). However, people in remote and rural areas of the world have continued to gain access to electricity, modern cooking, heating and cooling as the installation and use of distributed RE technologies have increased. This expansion is a direct result of improvements in affordability, the inclusion of distributed energy in national energy policies, greater access to financing, increased knowledge about local resources and more advanced technologies that can be tailored to meet customers' specific needs.

44. Many countries and jurisdictions are transitioning from a significant reliance on a centralized electricity supply to models that incorporate local and diverse distributed energy generation through mini-grids and small-scale systems, both on and off grid. RE is a key driver in supporting that shift. As a notable example, BNEF estimates that 13 per cent of global electricity will be derived from smaller-scale solar systems by 2040 and that, in all major economies, rooftop solar power will be less expensive than power from the electricity grid (BNEF, 2015).

45. In the case of grid-connected DG, the aggregation of DG systems can support grid resilience, flexibility and efficiency by diversifying the electricity supply and decreasing transmission and distribution losses.[14] Furthermore, both on-grid and off-grid DG can support critical sustainable development goals associated with health, poverty reduction and income generation by expanding access to clean energy in remote areas. It should be noted that, with grid reliability as a fundamental objective, centralized energy networks play a critical role in planning and designing DG-related policies, taking into account the needs of centralized RE production in many countries. It should also be noted that the deployment of DG comes with certain challenges that could increase poverty in cases of energy distribution costs being borne by the energy users. From a societal perspective, different configurations of DG and centralized electricity production may result in the lowest possible costs.

46. Many countries and communities around the world have successfully implemented policies and actions to support DG and addressed key barriers. Short descriptions of key policies and actions are presented in paragraphs 47–50 below.

47. Interconnection standards set out the conditions and technical requirements that must be met to connect DG to the electricity grid. Clear and robust standards are crucial for all RE development and provide the foundation for DG-related policies and actions (Barnes et al., 2013; Freeing the Grid, 2015; and Varnado et al., 2009).[15]

[13] Presentation made by IRENA at the ADP TEM on RE in June 2015.
[14] Electric Power Research Institute. Available at <http://www.epri.com/Pages/Default.aspx>.

48. Net metering policies are used to determine the value of excess electricity produced by DG systems, typically connected to a home or business, and fed into the grid (Barnes et al., 2010; Barnes et al., 2013; and Varnado et al., 2009).[16] Net metering and FIT rules that guarantee the off-take of surplus production provide critical incentives to support the connection of small-scale systems and, when aggregated, can add considerable generation capacity at the national level.

49. Mini-grid support mechanisms are used to support mini-grid systems that serve communities or groups of end-users, which may or may not be connected to the electricity grid. Mini-grids may be operated and maintained by communities, private entities, utilities or some combination of those actors through hybrid models. In particular, mini-grids are providing a cost-effective electricity supply option in a number of rural and remote areas as well as small island nations.

50. Further actions to enable finance for DG: At the highest level, consistent and stable policy and regulatory frameworks are critical in facilitating the growth of DG markets and catalysing private investment via domestic and international funding sources. Various policy mechanisms and approaches can be used to support finance for distributed RE, such as: FITs, net metering, hybrid policies and other innovative electricity pricing policies, such as block rate design and progressive pricing of electricity consumption. Furthermore, ensuring policy stability to provide investors with certainty of revenue, supporting the development of innovative and effective DG business models, and streamlining and standardizing contracts and related DG processes can be critical factors in supporting finance for DG.[17]

51. Table 1 summarizes policy options and enabling practices for supporting the successful design and implementation of those key policies, as well as providing country-specific examples to support the dissemination of lessons learned and the replication of successful efforts. Detailed descriptions of each of the policies as well as short country case studies (describing examples of policies in Bangladesh, Kenya, Mali and the United Kingdom of Great Britain and Northern Ireland) are also presented in document FCCC/TP/2015/4/Add.1.

[15] The American Council for an Energy-Efficient Economy. Available at <http://aceee.org/>.
[16] Freeing the Grid 2015: Best Practices in State Net Metering Policies and Interconnection Procedures, available at <http://freeingthegrid.org/>; and Clean Energy Solutions Center, available at <https://cleanenergysolutions.org/>.
[17] Presentation made by the Technology Executive Committee at the ADP TEM on RE in June 2015.

Table 1
Policy options for promoting distributed energy generation

Policy options and key elements of enabling environments to support successful policy replication and implementation	Select examples
Policy option: interconnection standards	
• **Ensure the eligibility** of all renewable energy (RE) technologies (including combined heat and power) and equal access for all developers and self-generators • **Engage utilities** as critical stakeholders in the design and implementation of interconnection standards • **Reduce interconnection application costs** (especially for small-scale technologies) and simplify/fast-track the application process for small generators • **Conduct grid integration studies** to inform capacity and engineering limits associated with interconnection • **Ensure** the transparency, accessibility and timeliness of the process[a]	• European Union – PV GRID project[b] • Philippines – manual on photovoltaic (PV) interconnection[c] • United States – Massachusetts Department of Energy Resources – interconnection standards[d]
Policy option: net metering	
• **Ensure the inclusion and eligibility** of all RE technologies (including combined heat and power) and all customer classes • **Set capacity limits** based on distributed generation (DG) grid integration studies and on-site consumer loads • **Consider a tiered policy** for smaller-scale or less complex projects • **Set billing system** on the basis of net electricity used and allow excess power to 'roll over' to the next billing cycle for a set period of time • **Consider community** solar approaches and aggregated net metering[e]	• Jamaica – net billing pilot project[f] • Seychelles – net metering programme[g] • United States – California Public Utilities Commission net metering policy[h]
Policy option: mini-grid support mechanisms	
• **Support a stable and long-term mini-grid policy environment** to raise investor confidence	• Cabo Verde – community-based support for hybrid

Policy options and key elements of enabling environments to support successful policy replication and implementation	Select examples
Policy option: mini-grid support mechanisms	
• **Ensure robust, transparent and standardized policies and regulations** that clearly articulate guidelines, requirements and permissible tariffs • **Streamline permitting** and other project development processes to ensure cost-effectiveness and ensure that all relevant entities supporting permits, finance and other aspects of mini-grid development are easily accessible • **Consider exempting very small mini-grids** from certain regulations to facilitate an efficient mini-grid support environment[i]	wind-PV-diesel mini-grids[j] • India – biomass-PV mini-grid support[j] • Kenya – Rural Electrification Authority mini-grid support (see document FCCC/TP/2015/4/Add.1) • Mali – micro-grid capital cost grants, competitive bidding and other actionsk (see document FCCC/TP/2015/4/Add.1)
Further actions to facilitate finance for DG	
• **Design and implement financial incentives** such as feed-in tariffs, net metering or hybrid policies • **Ensure policy stability** to provide investors with certainty of revenue, support the development of innovative and effective DG business models, and streamline and standardize contracts and related DG processes • **Consider the elimination or revision of fossil fuel subsidies** and RE import taxes • **Ensure that utilities are key players** in DG implementation and broader grid integration efforts • **Consider international finance mechanisms,** such as nationally appropriate mitigation actions and the Green Climate Fund[l]	• Bangladesh – Solar Home System microfinance programme (see document FCCC/TP/2015/4/Add.1) • China – progressive pricing of electricity consumption • Ethiopia – workshop on nationally appropriate mitigation actions (NAMAs) to support mini-grids and rural electrification[m] • Pakistan – NAMA supporting mechanisms for promoting DG[n] • United Kingdom – feed-in tariff for small-scale renewables (see document FCCC/TP/2015/4/Add.1)

Sources:

[a] Barnes J, Culley T, Haynes R, Passera L, Wiedman J and Jackson R. 2013. Best Practices in State Net Metering Policies and Interconnection Procedures. Interstate Renewable Energy Council and The Vote Solar Initiative. Available at <http://freeingthegrid.org/wp-content/uploads/2013/11/FTG_2013.pdf>; Varnado L and Michael S. 2009. Connecting to the Grid: A Guide to Distributed Generation Interconnection Issues. Interstate Renewable Energy Council. Available at <http://www.irecusa.org/connecting-to-the-grid-guide-6th-edition/>; American Council for an Energy-Efficient Economy. Available at <http://aceee.org/>; Freeing the Grid 2015: Best

Practices in State Net Metering Policies and Interconnection Procedure. Available at <http://freeingthegrid.org/>; and Clean Energy Solutions Center. Available at <https://cleanenergysolutions.org/>.

[b] PV GRID. Available at <http://www.pvgrid.eu/de/home.html>.

[c] Deutsche Gesellschaft für Internationale Zusammenarbeit. 2013. Manual for interconnection: Report for supporting the interconnection of rooftop-PV systems in the Philippines. Available at <http://www.giz.de/expertise/downloads/Fachexpertise/giz2013-en-manual-interconnection-rooftop-pv.pdf>.

[d] Massachusetts Department of Energy Resources. 2015. Interconnection. Available at <https://sites.google.com/site/massdgic/home/interconnection>.

[e] Barnes J and Varnado L. 2010. The Intersection of Net Metering and Retail Choice: An Overview of Policy, Practice, and Issues. Interstate Renewable Energy Council. Available at <http://www.irecusa.org/the-intersection-of-net-metering-and-retail-choice-an-overview-of-policy-practice-and-issues/>; Barnes J, Culley T, Haynes R, Passera L, Wiedman J and Jackson R. 2013. Best Practices in State Net Metering Policies and Interconnection Procedures. Interstate Renewable Energy Council and The Vote Solar Initiative. Available at <http://freeingthegrid.org/wp-content/uploads/2013/11/FTG_2013.pdf>; Varnado L and Michael S. 2009. Connecting to the Grid: A Guide to Distributed Generation Interconnection Issues. Interstate Renewable Energy Council. Available at <http://www.irecusa.org/connecting-to-the-grid-guide-6th-edition/>; Freeing the Grid 2015: Best Practices in State Net Metering Policies and Interconnection Procedures. Available at <http://freeingthegrid.org/>; and Clean Energy Solutions Center. Available at <https://cleanenergysolutions.org/>.

[f] Jamaica Public Service Limited. Available at <http://www.myjpsco.com/>.

[g] Couture T, Jacobs D, Rickerson W and Healey V. 2015. The Next Generation of Renewable Electricity Policy. Clean Energy Solutions Center. National Renewable Energy Laboratory. Available at <http://www.cleanenergyministerial.org/Portals/2/pdfs/Solutions-Center-NextGenREPolicy.pdf>.

[h] California Public Utilities Commission. Available at <http://www.cpuc.ca.gov/puc/>.

[i] Adapted from European Union Energy Initiative Partnership Dialogue Facility. 2014. Mini-grid Policy Toolkit. Available at <http://minigridpolicytoolkit.euei-pdf.org/policy-toolkit>.

[j] European Union Energy Initiative Partnership Dialogue Facility. 2014. Mini-grid Policy Toolkit. Available at <http://minigridpolicytoolkit.euei-pdf.org/policy-toolkit>.

[k] Presentation made by Mali at the Ad Hoc Working Group on the Durban Platform for Enhanced Action technical expert meeting on renewable energy in June 2015.

[l] Presentation made by the Technology Executive Committee at the Ad Hoc Working Group on the Durban Platform for Enhanced Action technical expert meeting on renewable energy in June 2015.

[m] Ecofys. 2015. Ethiopian Minister and stakeholders join forces to shape rural electrification NAMA. Available at <http://www.ecofys.com/en/news/ethiopian-minister-and-stakeholders-join-forces-to-shape-rural-electrificat/>.

[n] Ecofys nationally appropriate mitigation actions database. Available at <http://www.nama-database.org/index.php/Main_Page>.

B.2. Policy options and financial incentives for promoting renewable energy supply

52. Developing a strong and robust RE policy framework, aligned with national circumstances, provides the foundation for successful RE-related action. Such frameworks should be transparent, progressive and monitored over time to inform policy iteration and revisions under evolving market circumstances. Policy frameworks are based on a high-level vision for RE deployment, informed by diverse stakeholder interests and perspectives. Champions across the government can be instrumental in building interministerial support and facilitating the realization of such a vision.

53. RE policy frameworks and strategies incorporate: robust data and analysis to provide a strong evidence base for action; effectively designed policies and actions to catalyse deployment; critical grid integration considerations; innovative finance mechanisms and opportunities for private-sector collaboration to support implementation; and actions to build capacity in key areas of need. In this context, key policies and actions to support successful RE deployment are described in paragraphs 54–60 below.

54. **FITs** support investment in RE by providing a guaranteed per kWh price for renewable electricity generation through purchase contracts with developers. FITs also often incorporate 'guaranteed access to the grid' provisions to decrease investor risk and to ensure developed resources are integrated into the grid. FITs can either be set at a fixed rate or linked to the market electricity rate with an added premium (Couture et al., 2010; Couture et al., 2015; and Organisation for Economic Co-operation and Development (OECD), 2015).[18] Over 100 countries and jurisdictions have instituted various forms of FITs (REN21, 2014) and the experience has provided a wealth of knowledge to enable the fine-tuning and design of appropriate FITs for specific country contexts.

55. **Auction or tendering contract** processes allow governments and/or utilities to select competitive project bids to meet RE capacity goals. On the basis of national circumstances, policymakers may choose

[18] Clean Energy Solutions Center. Feed-in Tariffs: Good Practices and Design Considerations. Available at <https://cleanenergysolutions.org/policy-briefs/fit>; and National Renewable Energy Laboratory. Feed-In Tariffs. Available at <http://www.nrel.gov/tech_deployment/state_local_governments/basics_tariffs.html>.

to use both FITs and auctions to support different sizes or types of RE project. To support cost reductions, many governments have adopted reverse auction approaches, whereby lowest price viable project bids are selected from prequalified project developers (Miller et al., 2013; IRENA, 2015b; and OECD, 2015).

56. **Renewable electricity standards (RES) or quotas** mandate a specific amount of generated or sold electricity to be supplied by RE resources, such as wind and solar. RES compliance mechanisms, such as alternative compliance payments, are important for controlling costs and ensuring that targets are met. Many countries have also established renewable electricity certificate (REC) programmes to provide an alternative approach to meeting RES requirements. RECs encompass the environmental attributes of RE generation and can be bought by entities to comply with a RES (Bird et al., 2010; and OECD, 2015).

57. **Grid integration actions**: Building on grid impact assessment studies and national RE targets, countries can consider various measures to support optimal outcomes, including: the use of ancillary services to support system reliability and flexibility; measures to balance electricity supply and demand; improvements to system operations; the use of flexible generation; the improvement of forecasting methods; and the implementation of demand response and storage measures.[19] The actions chosen are highly dependent on specific national circumstances and the level of penetration of RE.

58. **RE tax incentives and measures** include common incentives, namely production tax credits (PTCs) and investment tax credits (ITCs). PTCs are based on kWh energy produced and, thus, explicitly tied to actual RE production. ITCs are linked to project capital investment and reduce the tax liability of the project owner on the basis of that investment (Mendelsohn and Kreycik, 2012). Reducing or eliminating import and value-added taxes on RE technologies and components can provide a strong impetus for expanded investment.

59. **Emission pricing instruments such as carbon taxes and emissions trading**: Carbon taxes are linked to the emission intensity of energy sources and can support positive changes in consumer behaviour, production and investment. Emissions trading systems (ETSs) establish a cap on GHG emissions or intensity. Under ETSs, entities emitting GHG emissions are allocated tradable allowances linked to emissions, providing a market-based mechanism to determine the price of carbon and meet the cap (OECD, 2015).

60. **Further actions to facilitate the provision of finance for RE**: Building on the policies described in paragraphs 54–59 above, a number of further actions can be taken to catalyse investment in RE. Concessional loans can support RE deployment by reducing the cost of capital for project development. The risk associated with such loans is often spread across government agencies, developers and other finance partners (Climate Policy Initiative, 2014). In addition, green bonds are debt obligation instruments that can be used to provide finance for RE projects on the basis of benefits to the environment and the climate (Climate Economic Analysis for Development, Investment and Resilience, 2015).[20] Finally, loan guarantees and insurance products can be used to mitigate real or perceived risks associated with RE development. By taking on a portion of the project risk, the cost of capital can be reduced and the investment increased (World Bank, n.d.).

61. Capacity-building for financial actors and project developers addresses the need for training of domestic financial actors, such as bankers, to support investment in RE. In addition, there is a need to build the capacity of local RE project developers and entrepreneurs to enable them to plan for and implement successful projects and business models. Many governments and institutions have designed successful capacity-building programmes that have resulted in increased local investment in RE.

[19] Greening the Grid. Available at <http://greeningthegrid.org/>.
[20] Climate Bonds. Explaining Climate Bonds. Available at <https://www.climatebonds.net/market/explaining-green-bonds>.

62. Table 2 summarizes policy options and enabling practices for promoting the successful design and implementation of those key policies, as well as providing country-specific examples to support the dissemination of lessons learned and the replication of successful efforts. Detailed descriptions of each of the policies as well as short country case studies (describing examples of policies in Chile, Mexico, Sweden, South Africa, the United Arab Emirates, the United States of America and Uruguay) are also presented in document FCCC/TP/2015/4/Add.1

Table 2
Policy options and financial incentives for promoting renewable energy supply

Policy options and key elements of enabling environments to support successful policy replication and implementation	Select examples
Policy option: feed-in tariff	
• **Establish and support stable and predictable feed-in tariff (FIT)** payment levels, ensure long-term FIT contractual agreements and streamline process, administration and approval • **Design varying FITs** adjusted to technology and consider variations in relation to location, resource availability and project size • **Set FIT payments** on the basis of robust technology/project cost data • **Guarantee access to the grid** and consider linking FITs with grid support services	• Ghana – FIT policy • Indonesia – subnational FIT policies • Mexico – FIT • United Kingdom – small-scale FITs (see document FCCC/TP/2015/4/Add.1)
Policy option: auction/tendering contracts[a]	
• **Support utility-scale projects** through auction and tendering approaches and consider complementary policies such as FITs to support smaller-scale projects • **Design an auction** approach that minimizes costs and aligns with unique national circumstances and goals • **Link project selection to sustainable development criteria** to support broader climate and socioeconomic goals • **Streamline auction processes** and reduce administrative costs • **Ensure transparent, accurate and timely information** for developers/bidders • **Consider a more robust assessment** of the technical capabilities of developers/bidders through a two-stage approach	• Egypt – auction for solar and wind tariffs[b] • South Africa – Renewable Energy Independent Power Producer Procurement Programme (see document FCCC/TP/2015/4/Add.1) • Taiwan, Province of China – combined FIT policy and competitive tendering for renewable energy (RE)[c] • Uruguay – reverse auction for RE (see document FCCC/TP/2015/4/Add.1)

Policy options and key elements of enabling environments to support successful policy replication and implementation	Select examples
Policy option: auction/tendering contracts[a]	
• **Support policy stability** and, if required, ensure transparent changes to the process	
Policy option: renewable electricity standard/quota	
• **Conduct robust analysis of RE resources**, geospatial and siting considerations, grid integration requirements, costs and project economics, and complementarities with other policies prior to designing RE policies • **Set and steadily increase interim goals** over time, leading up to a final goal at a specified date • **Ensure policy predictability and stability** and design complementary policies • **Consider set-asides** that may support broader policy goals • **Adopt cost compliance** payments and cost control provisions • **Consider the design** of a renewable electricity certificate system	• Nova Scotia, Canada – 25 per cent RE by 2015 • Republic of Korea – 10 per cent RE by 2020 • California, United States – 33 per cent RE by 2020 (see document FCCC/TP/2015/4/Add.1)
Policy option: grid integration actions	

• **Conduct a grid integration impact study** to inform high-level RE targets and opportunities to support system reliability, flexibility and efficiency with increased levels of variable RE
• **Design and implement measures** most appropriate to unique national circumstances, which may include[d]
  • Ancillary services to support system reliability and flexibility
  • Improvements to system operations
  • Use of flexible generation
  • Improvement of forecasting methods and use of other smart-grid technologies
  • Demand response and balancing
  • Storage measures
  • Actions and policies related to distributed generation covered in document FCCC/TP/2015/4/Add.1.
	• Ireland – all island grid study[e]
	• Jamaica – grid impact analysis for RE penetration
	• Spain – ancillary service study[f]

Policy options and key elements of enabling environments to support successful policy replication and implementation	Select examples
Policy option: tax incentives and measures	
• **Design tax incentive levels** and cost control provisions on the basis of specific country circumstances and goals • **Support a stable and predictable tax policy environment** • **Consider and address risks** associated with tax credits that are not tied to actual production • **Establish appropriate time frames** that align with overall policy goals	• China – 50 per cent value-added tax rebate for solar development[g] • Japan – green investment tax incentive[h] • Sweden – wind depreciation tax incentives[h]
Policy option: carbon tax[i]	
• **Perform robust analysis** to inform design of an efficient and equitable carbon tax policy • **Consider trade-offs (winners and losers) and implement actions** (e.g. revenue distributions) to address equity issues • **Regularly assess complementarity** of carbon tax and emissions trading • schemes (ETSs) with other policies to support cost-effective outcomes and avoid overlap	• Chile – carbon tax • British Columbia, Canada – carbon tax • Sweden – carbon tax and renewable certificate programme (see document FCCC/TP/2015/4/Add.1)
Policy option: emissions trading	
• **Design an appropriate cap level** for ETSs to ensure carbon price incentivizes investment • **Regularly assess complementarity** of ETSs with other policies to support cost-effective outcomes and avoid overlap	• China – subnational ETS pilots (recently announced national ETS to commence in 2017) • European Union – ETS • North-eastern United States – regional greenhouse gas initiative

Policy options and key elements of enabling environments to support successful policy replication and implementation	Select examples
Further actions to facilitate the provision of finance for RE	
• **Ensure a stable policy, regulatory and legal environment** • **Consider property rights** issues that may hinder investment • **Build capacity of finance-related institutions** (public and private), project developers and entrepreneurs • **Design effective actions to reduce investment risks** and costs of long-term financing for RE • **Consider aggregation of smaller-scale projects** to reduce transaction costs associated with finance • **Streamline permitting processes** associated with project development • **Build social and community support** for RE	• Chile – Chilean Economic Development Agency concessional loan programme (see FCCC/TP/2015/4/Add.1) • Mexico – syndicated loan programme (see FCCC/TP/2015/4/Add.1) • Philippines – Leyte geothermal partial credit guarantee[j] • Ukraine – sustainable energy lending facility[k] • United Arab Emirates – Masdar City to support long-term RE investment (see document FCCC/TP/2015/4/Add.1)

Sources:

[a] International Renewable Energy Agency and Clean Energy Ministerial. 2015. Renewable Energy Auctions – A Guide to Design. Available at <http://www.irena.org/DocumentDownloads/Publications/IRENA_RE_Auctions_Guide_2015_2_policies.pdf>.

[b] Presentation made by Bloomberg New Energy Finance at the Ad Hoc Working Group on the Durban Platform for Enhanced Action technical expert meeting on renewable energy in June 2015.

[c] Couture T, Jacobs D, Rickerson W and Healey V. 2015. The Next Generation of Renewable Electricity Policy. Clean Energy Solutions Center. National Renewable Energy Laboratory. Available at <http://www.cleanenergyministerial.org/Portals/2/pdfs/Solutions-Center-NextGenREPolicy.pdf>.

[d] International Renewable Energy Agency. 2015. Offgrid renewable energy systems: Status and methodological issues. Available at <http://www.irena.org/DocumentDownloads/Publications/IRENA_Off-grid_Renewable_Systems_WP_2015.pdf>.

[e] Department of Communications, Energy and Natural Resources of the Government of Ireland. 2008. All Island Grid Study. Available at <http://www.dcenr.gov.ie/Energy/North-South+Cooperation+in+the+Energy+Sector/All+Island+Electricity+Grid+Study.htm>.

[f] RED Eléctrica de España. Available at <http://www.ree.es/en>.

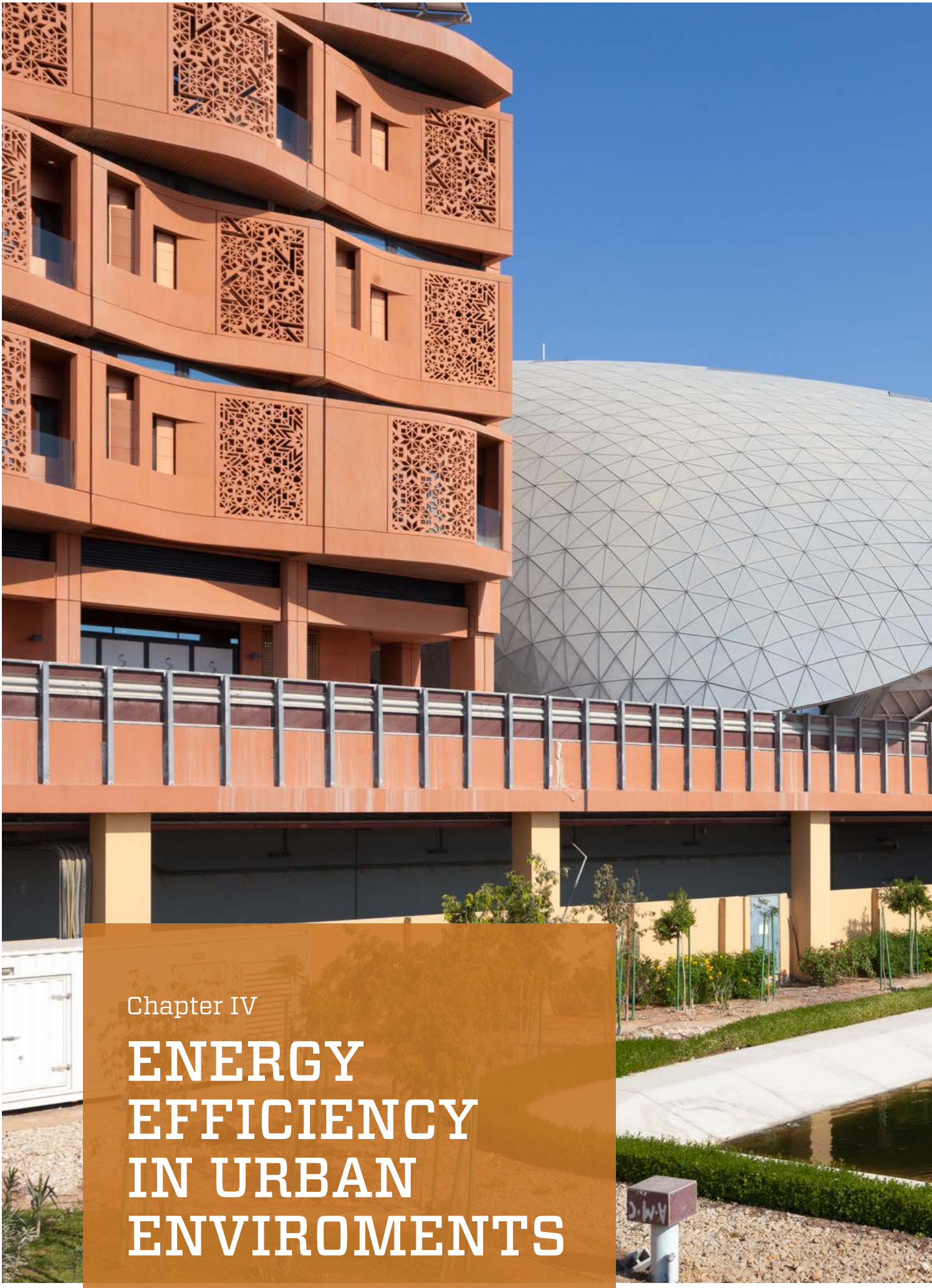
[g] Renewable Energy Policy Network for the 21st Century. 2014. Renewables 2014 Global Status Report. Available at <http://www.ren21.net/portals/0/documents/resources/gsr/2014/gsr2014_full%20report_low%20res.pdf>.

[h] The KPMG Green Tax Index 2013. Available at <kpmg.com/greentax>.

[i] Carbon Tax Center. Available at <http://www.carbontax.org/>. Available at <http://siteresources.worldbank.org/EXTENERGY2/Resources/SREP_financing_instruments_sk_clean2_FINAL_FOR_PRINTING.pdf>.

[j] The World Bank. No date. Financing renewable energy: Options for developing financing instruments using public funds. Available at <http://siteresources.worldbank.org/EXTENERGY2/Resources/SREP_financing_instruments_sk_clean2_FINAL_FOR_PRINTING.pdf>.

[k] European Bank for Reconstruction and Development. Case Study: Ukraine Sustainable Energy Lending Facility. Available at <http://www.ebrd.com/downloads/sector/sei/uself.pdf>.



Chapter IV

ENERGY EFFICIENCY IN URBAN ENVIROMENTS

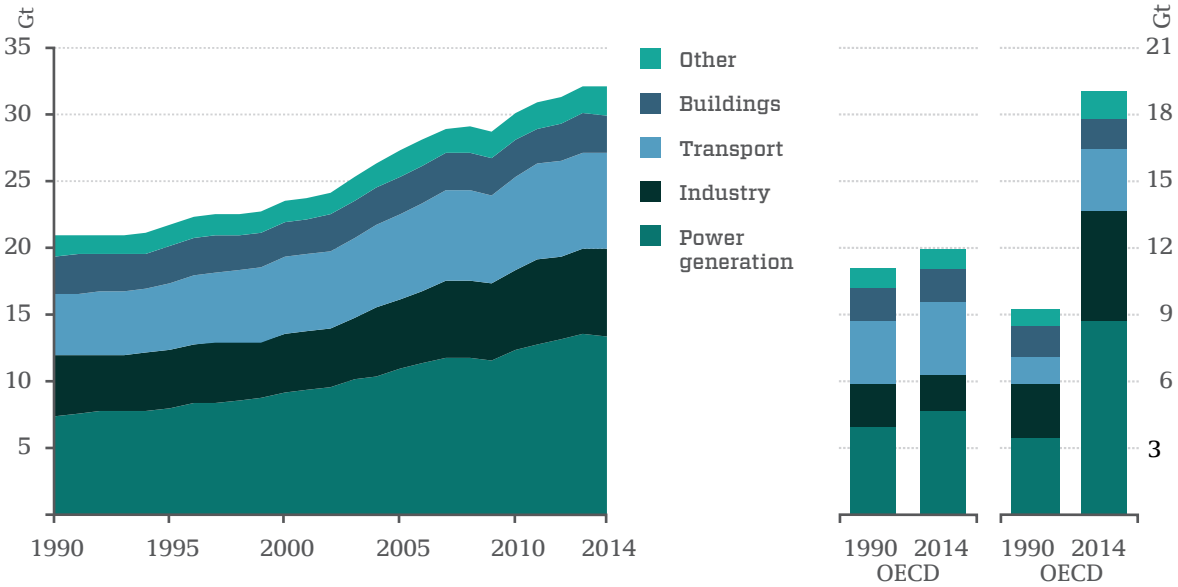
A. Drivers for accelerated implementation

63. With 60 per cent of CO2 eq emissions coming from the energy sector, EE[21] gains are critical in ensuring that the global temperature increase is held at below 2 °C.[22] As indicated in figure 3, emissions from energy have increased at a steady rate over the past two and a half decades. Much of the potential for reducing emissions from energy lies in urban areas, which contribute 71–76 per cent of energy-related CO2 emissions globally (UNEP, 2015a).

64. According to IEA, emissions from the energy sector could be reduced by 1.5 Gt CO2 eq by 2020 if new EE measures were enacted (IEA, 2013c). Additional emission reductions would build on earlier progress: energy intensity is estimated to have been reduced by 1.6 per cent each year from 2002 to 2012 (IEA, 2013c). Another indication of potential progress is that energy-sector emissions appear to have decoupled from economic growth during 2014, as energy usage held steady while the global economy grew at a rate of 3 per cent (Global Commission on the Economy and Climate, 2015).

65. In fact, EE is increasingly becoming known as the 'first fuel', given that avoided energy usage is providing a larger share of the energy mix than conventional sources, such as oil, electricity and gas. However, without increased efforts to quickly deploy EE, an estimated two thirds of EE potential will remain unrealized by 2025 (IEA, 2012b).

Figure 3
Global energy-related carbon dioxide emissions by sector and region



Notes: "Other" includes agriculture, non-energy use (except petrochemical feedstock), Oil and gas extraction and energy transformation. International bunkers are included in the transport sector at the global level but excluded from the regional data.

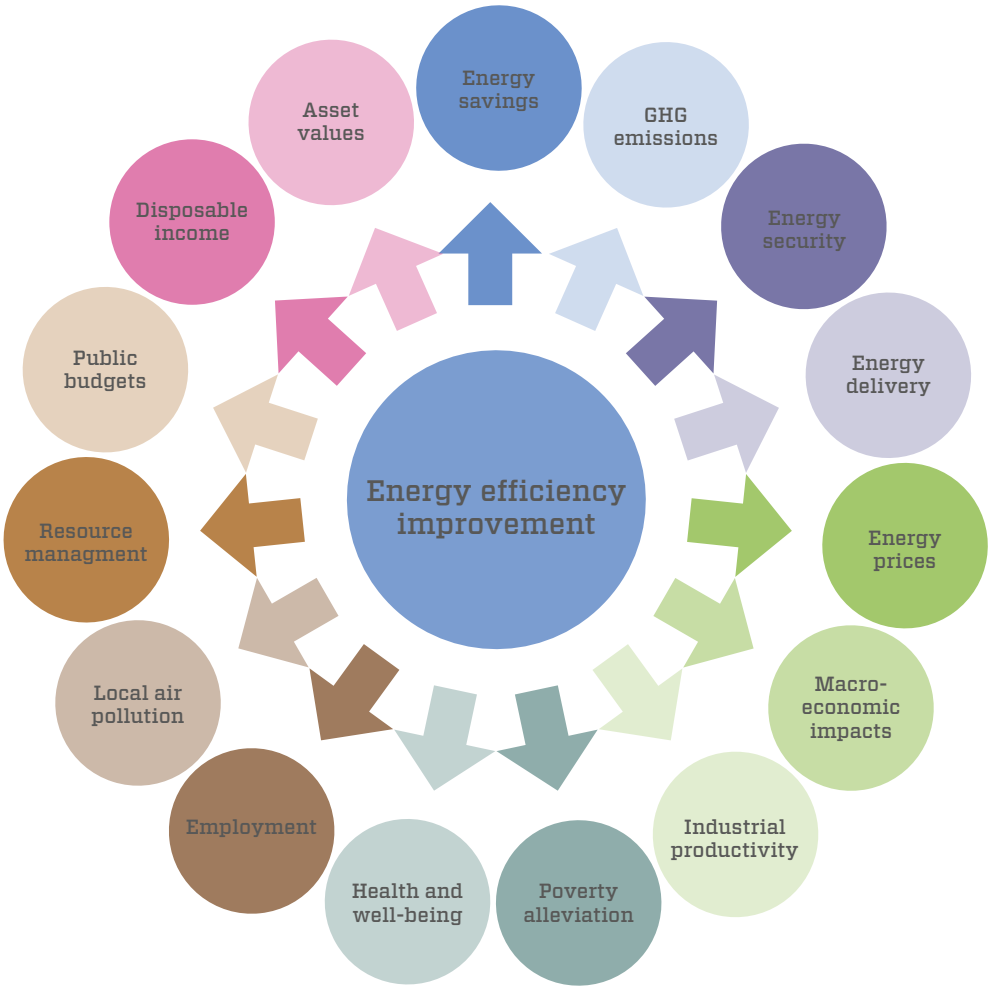
Source: International Energy Agency. 2015. World Energy Outlook.
Abbreviation: OECD = Organisation for Economic Co-operation and Development.

[21] Common EE technologies include: energy-efficient lighting technologies (e.g. compact fluorescent lamps and light-emitting diodes); buildings with a bioclimatic design; fuel-efficient vehicles; energy-efficient appliances and equipment; and combined heat and power technologies, among others (IEA, 2014b).
[22] Presentation made by IEA at the ADP TEM on EE in June 2015.

66. In addition to emission reductions and energy savings, EE can provide several sustainable development co-benefits, including those pertaining to the economy, energy security, society and the environment, which are summarized in figure 4. More specifically, EE can: improve access to energy; increase industrial productivity; alleviate poverty; and improve climate resilience by reducing the development of vulnerable energy infrastructure (IEA, 2014a).

67. EE can also improve the ability of communities to adapt to climate change by: (1) reducing demand on power systems that could be operating at lower power levels due to higher ambient temperatures; (2) lowering demand for peak power, which could be affected by higher ambient temperatures and/or unexpected weather events; (3) improving the comfort level of buildings in uncertain weather and (4) lowering the ambient temperature of urban areas via the installation of cool and green roofs (Alliance to Save Energy, 2012). It is important for policymakers to understand and appropriately assess the value of such co-benefits in order to adequately analyse and communicate the benefits of EE policies and programmes as compared with alternatives.

Figure 4
Examples of the broad range of potential positive impacts of energy efficiency investments



Source: International Energy Agency. 2014. Capturing the Multiple Benefits of Energy Efficiency.
Abbreviation: GHG = greenhouse gas.

68. To achieve the emission reduction targets for the energy sector, significant levels of investment are needed throughout the technology development and deployment cycle. For example, UNEP estimates that USD 300 billion to 1 trillion is needed on an annual basis from 2011 through to 2050 in order to finance energy consumption savings in the buildings sector of a third globally (UNEP, 2011). For the transportation sector, an investment of 0.34 per cent of gross domestic product is required to reach a 33 per cent reduction in road vehicle travel by 2050. Given a lack of public funds, only a relatively small portion of the needed investment can come from governments and development banks in the form of procurement and incentives. Rather, the private sector will need to provide much of the required capital.

69. Private-sector investment can be attracted through a variety of policy options, including: tax incentives; capital grants; soft loans; stakeholder engagement processes; training; and outreach, among other opportunities. Fortunately, given the cost savings involved in and cost-neutral nature of some EE investments, incentives may not be necessary. However, even for those technologies and markets where certain EE technologies can reduce energy costs for the end-user, the additional upfront costs could be prohibitive. The private and public sectors have both played roles in providing financing. In the case of the private sector, banks and technology providers may provide loans or other financing, such as energy service contracts.

70. Governments, including municipalities, may offer soft loans or work in public–private partnerships (PPPs) to provide loan guarantees or other credit enhancements. Governments can utilize PPPs for larger infrastructure investments, building projects and renovations. Investments in personal transportation, lighting and buildings are ideally funded via energy savings, whereas public transportation and district energy can be supported through payments from end-users. Carbon credits may be another source of revenue for EE projects, although current prices are generally insufficient to be a strong driver for investment. A few examples of actions undertaken by non-State actors are presented in spotlight box 1.

Spotlight box 1

The role of non-State actors in accelerating energy efficiency deployment

Non-State actors such as cities, regional authorities, companies and non-governmental organizations can spur the deployment of energy efficiency (EE) in urban environments by:

- Supporting stakeholder engagement processes and policy design;
- Raising awareness of the potential for EE deployment;
- Investing in or procuring EE systems.a

In addition to broad collaborative efforts, companies can play an important and more individualized part in mobilizing EE technologies through their roles as technology and project developers, financiers, funders and collaborative stakeholders. For example:

- VELUX Group has developed prototypes for energy-efficient housing;
- PHILIPS not only offers energy-efficient lighting technology but has also provided foundational support to the en.lighten initiative together with UNEP;
- BYD has developed electric buses and taxis;
- Danfoss offers EE and renewable energy technologies and services.

There are countless other companies that are engaged in providing EE technologies and working collaboratively with governments and other institutions to address barriers to technology transfer and deployment.b

Sources:

a United Nations Environment Programme. 2015. Climate commitments of subnational actors and business: a quantitative assessment of their emission reduction impact. Available at <http://apps.unep.org/publications/pmtdocuments/-Climate_Commitments_of_Subnational_Actors_and_Business-2015CCSA_2015.pdf.pdf >.

b Presentations made by Velux and BYD at the Ad Hoc Working Group on the Durban Platform for Enhanced Action technical expert meeting on energy efficiency in June 2015.

71. Despite the fact that many EE investments save costs or are cost neutral and that many governments have implemented EE policies, there are several barriers that can impede the speed at which EE technologies are deployed. One of the key challenges for governments in encouraging EE investments is undertaking a fossil fuel subsidy reform. Inefficient fossil fuel subsidies hide the actual cost of energy and therefore have a negative impact on the assessed value of EE investments. Similarly, currently low carbon prices do not take into account the societal costs of fossil fuels, thereby affecting investment decisions and undervaluing EE.

72. Policymakers must also take into account the rebound effects of EE, whereby end-users use energy cost savings to procure additional energy, thereby reducing or entirely mitigating any efficiency gains. The lack of visibility of direct savings and difficulties in quantifying the rebound effects of EE may impede political action as progress is primarily demonstrated conceptually in terms of energy and cost savings, although in the case of transportation there may be more impressive infrastructure that can be showcased. Importantly, EE is not just about installing new technologies; EE gains can also be achieved

through behavioural change, which may be more difficult to influence given cultural preferences and a lack of public awareness.

B. Policy options, practices and technologies to accelerate energy efficiency in urban environments

73. Countries are increasingly undertaking EE measures with the intention of speeding up technology deployment. For example, over half of all IEA member countries have begun to implement EE policies across the buildings, lighting, transport, utilities and other sectors (IEA, 2012a). Frequently implemented policies among those countries include national EE strategies and action plans, financial incentives for building up EE and the phasing out of inefficient lighting technologies (IEA, 2012a). With regard to transport, governments are: undertaking holistic transportation planning efforts; building infrastructure to encourage non-personal motorized transport; and expanding or enhancing public transport. Cities are primarily undertaking the building out and improvement of DES, sometimes independently but also, in some cases, in connection with national policies.

74. Cities play a vital role in enhancing the speed and scale of the uptake of EE technologies and practices. As urban environments are the major place where EE policies and measures actually need to be implemented, stakeholder information, activation, coordination and collaboration are of utmost importance. As with investments in RE, policymakers need to be aware that their decisions may determine urban structures for decades or even centuries.

75. Usually national policies provide the framework for EE policies at the municipal level. However, local differences require flexibility, allowing municipal governments to tailor the design and implementation by adding information and through capacity-building, regulations, procurement programmes, incentives, etc. In order for such measures to be effective, the policies must send strong, consistent and long-lasting messages to the private sector and consumers. Local governments should collaborate with State/provincial, national and regional governments to ensure that policies are complementary.

76. The following section summarizes effective policies that governments can adopt in the transportation, buildings, lighting and district energy sectors in an effort to use energy efficiently (IEA, 2012a). While the policy descriptions are organized by sector, it is important for policymakers to understand potential interactions between each sector. For example, buildings include lighting systems and can be connected with DES. The development of transportation systems can be effected in conjunction with that of DES. Transportation planning depends significantly on city structure, including the location of residential and commercial buildings.

B.1. Policy options for promoting energy efficiency in transportation in urban environments

77. Governments, both national and subnational, are instrumental in transportation planning and have several policy levers at their disposal to reduce energy consumption in the sector. Governments can improve the efficiency of the transport sector by implementing various policy options affecting the modes of transport used and also by directly procuring energy-efficient technologies, vehicles and fuels, which, in a number of cases, are linked to the use of RE.

78. **Cross-cutting policy options** support general transport system efficiency and urban planning. Cities can examine the overall efficiency of their transport systems, including intermodal and regional connections, to develop transportation strategies and action plans. Transportation planning should be closely integrated with urban planning, including energy system planning, and often requires inter-agency collaboration.

79. Transportation policies that are organized around the 'avoid-shift-improve' framework allow for the paradigm shift needed to reconcile transportation and climate change objectives. **'Avoid' policy options** reduce the demand for travel; in other words, the number of motorized vehicle trips taken. They primarily concern city structure and transport infrastructure and can be best addressed via urban planning (Bongardt et al., 2013). Policy options include:
(a) **Use of non-motorized travel**, which includes biking, walking and skating, which require no fuel sources. By building or improving upon bike rental schemes, pedestrian and cyclist pathways, intermodal connections and car-free zones, city governments can encourage non-motorized transit;
(b) **Changing mobility patterns:** In addition to incentives or 'carrots', governments can also enact 'sticks' or cost-adders to encourage consumers to reduce the number or length of trips taken by personal motorized vehicle. Congestion charges, taxes, tolls, parking fees or proof of parking space ownership, registration, limited road space, parking restrictions, high-occupancy lanes, car sharing and restricted vehicle purchases are all potentially effective means of encouraging the use of public or non-motorized transit and ride sharing. This can include raising awareness of the actual cost of personal vehicle use in order to help overcome misconceptions about the cost of different transportation modes.

80. **'Shift' policy options** seek to replace inefficient travel with more efficient modes, such as replacing personal motor vehicle use with use of public transport. 'Shift' policies are mostly implemented via transportation planning and management (Bongardt et al., 2013). **An example is the development of mass public transportation systems,** an energy-efficient means of providing transportation to large numbers of passengers. Cities can plan for, invest in or procure services for mass public transit. Subways, light rail, trams, ferries, commuter buses, bus rapid transit and intermodal hubs are all possible components of mass transit systems.

81. **'Improve' policy options** improve EE and reduce energy intensity for a given trip and are implemented primarily through vehicle and fuel regulations and incentives (Bongardt et al., 2013). Policy options include:
(a) **Vehicle and fuel efficiency and fuel switching:** Enhanced technologies and practices can either reduce the energy vehicles need to provide the same service or support the use of less-polluting fuel sources. Improvements can be made through: more efficient motors; lighter vehicles; improved tyres; eco-driving; and more efficient and/or lower-emitting fuels, including electric[23] and biomass-powered vehicles. Although vehicle and fuel standards, mandates and regulations are often set at the national level, it is feasible for cities to implement such policies or complementary ones intended to reduce the GHG emissions and energy usage associated with private motorized vehicles by providing favourable conditions or practical benefits for using low-emission cars. City governments can also be instrumental in building electric vehicle charging infrastructure;
(b) **Taxis and paratransit transportation services:** Taxis and paratransit play a key role in supplementing personal and public transit usage and in connecting passengers between various modes of transit and should be incorporated into transport strategies. Governments can institute policies to ensure that the vehicles used by taxis and paratransit are efficient and safe and that taxis complement rather than obstruct the goals of the local transportation system.

[23] The level of emissions associated with electric vehicles is dependent upon the energy mix used to generate electricity. The higher the percentage of renewables in the energy mix (e.g. wind and solar), the lower the associated emissions from the electric vehicle.

82. Table 3 describes in further detail the design considerations for each of the aforementioned policies, including enabling practices that can enhance the efficacy of the policy options and the potential co-benefits. Detailed descriptions of each of the policies as well as short country and city case studies (describing examples of policies in Belgrade, Serbia; Bogor, Indonesia; Johannesburg, South Africa; and Seoul, Republic of South Korea) are also presented in document FCCC/TP/2015/4/Add.2.

Table 3
Policy options for promoting energy-efficient transportation in urban environments

Policy options and key elements of enabling environments to support successful policy replication and implementation	Select city-specific examples
Cross-cutting policy option: enhanced efficiency of the transport system and urban planning	
• **Facilitate easy interchange** between travel modes around transfer hubs and coordinate local, regional and national transport systems through a local public transport association[a] • **Provide easy access** to public transport in city centres (<500 m) • **Study growth trends and cost differences** between transport system sizes to access opportunities for economies of scale • **Consider enacting** building codes that support mixed-use buildings and high population density, integrating biking and public transportation infrastructure, exploring underground or elevated systems and approvals for gas stations on the basis of the availability of low-emission fuels[a] • **Consider co-financing** by area/stakeholder benefitting from improved public transport • **Consider employing 'sustainable neighbourhood' schemes** like e.g. Leadership in Energy and Environmental Design neighbourhood development, which encompasses detailed ideas for efficient transport	• Bogor, Indonesia – multimodal mobility development policy[b] (see document FCCC/TP/2015/4/Add.2) • Curitiba, Brazil – integrated transport and land-use planning[c] • Madrid, Spain – integrated transport and land-use planning[d] • Qingdao, China – integrated transport and land-use planning[e]
'Avoid' policy option: promotion of non-motorized travel	
• **Consider current trends** in the usage of non-motorized transport and personal motor vehicles, spatial patterns, income levels and economic growth • **Explore investments** in non-motorized transport infrastructure and policy options to limit the use of personal vehicles • **Design cycling and walking routes** that are connected, direct, safe, enjoyable to use and attractive[a]	• Istanbul, Antalya, Sakarya, Eskişehir, Konya and Kayseri, Turkey – BikeLab projects to improve bike lanes[f] • Madrid, Spain – car-free zones[g]

Policy options and key elements of enabling environments to support successful policy replication and implementation	Select city-specific examples
'Avoid' policy option: promotion of non-motorized travel	
• **Offer bike sharing programmes** that are free or low cost to replace short-distance personal vehicle travel and facilitate connections to public transport[a]	• Mexico City, Mexico – law prioritizing walking and cycling modes[h] • Paris, France – public bike rentals[i] • Johannesburg, South Africa – one-month car-free zone (see document FCCC/TP/2015/4/Add.2)
'Avoid' policy option: changing mobility patterns[j]	
• **Explore policy options for motorbikes** (e.g. limiting use within certain areas, time frames or purposes)c • **Reduce availability or increase cost of parking** to discourage personal vehicle usage • **Consider introducing measures** such as congestion charges, taxes, tolls, vehicle registration, limited road space, high occupancy lanes, car sharing and restricted vehicle purchases	• Belgrade, Serbia – pricing scheme for downtown parkingk (see FCCC/TP/2015/4/Add.2) • Valletta, Malta – user charges • Milan, Italy – area charging policy for private vehicles[l] • London, United Kingdom – congestion charges for urban transport[m]
'Shift' policy option: promotion of mass public transport	
• **Consider cost recovery** from public transport fares and corresponding quality–cost trade-offs as well as impact on low-income groups • **Integrate considerations** such as passenger safety, comfort and satisfaction, reliability, timeliness and ease of usea • **Consider a payment system** for non-users for tangential benefits • **Attract various users** by offering tiered classes (e.g. one level that provides more services at a higher cost and another that provides fewer services at a lower cost) • **Explore impact of bus lanes** on traffic flows, which could be made worse and result in increased emissions	• Auckland, New Zealand – bus rapid transit (BRT)[n] • Belo Horizonte, Brazil – BRT[o] • Bogor, Indonesia – efficient bus system project[p] • Bogota, Colombia – BRT and land-value capture[q] • Cagliari, Italy – light rail servi-cer• Chengdu, China – BRT[s] • Hong Kong, China

Policy options and key elements of enabling environments to support successful policy replication and implementation	Select city-specific examples
'Shift' policy option: promotion of mass public transport	
• **Study and plan for alternatively fuelled buses**, considering potential cost increases and resulting impacts on the number of buses deployed and/or fare increases • **Analyse trade-offs** between different modes (e.g. BRT may require less upfront investment and may be more flexible than rail)[a]	– land-value capture[t] • Seoul, Republic of Korea – BRTk (see document FCCC/TP/2015/4/Add.2) • Singapore, Singapore – metro rail system[u] • Tokyo, Japan – land-value capture[t]
'Improve' policy option: enhanced vehicle and fuel efficiency and fuel switching	
• **Explore the impacts of increasing parking spaces** (e.g. more space reduces time spent finding parking but could result in greater use of personal vehicles) • **Consider** fiscal incentives, vehicle standards, user sensitization, leadership through public procurement, research and development, and developing harmonized standards for infrastructure for the promotion of biofuel use, if relevant • **Look for** options to reduce vehicle weight, increase occupancy rates and encourage eco-driving • **Consider impacts on the grid** and the power mix of the use of electric vehicles, if relevant • **Analyse opportunities** to encourage the efficiency of non-engine components (e.g. tyres)	• Aguascalientes, Mexico – fuel efficiency standard for light-duty trucks[v] • Beijing, China – vehicle inspections and maintenance systems[w] • Taj Mahal area, India – Taj Trapezium Zone with limitations on the types of vehicle that can access it
'Improve' policy option: use of taxi and paratransit services	
• **Consider taxi licensing programmes**, operation and maintenance standards and driver training for paratransit services such as taxis, if relevant, and introduce scrapping and recycling schemes • **Explore opportunities for integrating alternative and electricity-fuelled vehicles** into the taxi fleet[z]	• Cairo, Egypt – scrapping and recycling of taxis[x] • Rajkot, India – auto rickshaw entrepreneurship programme[y] • Shenzhen, China – transitioning conventional taxis to electric taxis[z]

Sources:

[a] Bongardt D, Creutzig F, Hüging H, Sakamoto K, Bakker S, Gota S and Böhler-Baedeker S. 2013. Low-Carbon Land Transport: Policy Handbook. Available at <https://www.routledge.com/products/9781849713771>.

[b] Presentation made by Bogor at the Ad Hoc Working Group on the Durban Platform for Enhanced Action technical expert meeting on energy efficiency in June 2015.

[c] Curitiba, Brazil: A model of transit oriented planning. Available at <http://www.ecomobility.org/fileadmin/template/project_templates/ecomobility/files/Publications/Case_stories_EcoMobility_Curitiba_PDF_print.pdf>.

[d] Carpio-Pinedoa J, Aldecoa Martínez-Conde J and Amíquiz Daudéna F. Mobility and Urban Planning Integration at City-regional Level in the Design of Urban Transport Interchanges (EC FP7 NODES Project–Task 3.2.1.). Available at <http://www.sciencedirect.com/science/article/pii/S1877042814062351>.

[e] World Resources Institute. Project Directory. Integrating transport and land use planning in Qingdao, China. Available at <http://www.wricities.org/our-work/project-city/integrating-transport-and-land-use-planning-qingdao-china>.

[f] World Resources Institute. Great expectations: EMBARQ Turkey grows BikeLab project. Available at <http://www.wricities.org/news/great-expectations-embarq-turkey-grows-bikelab-project>.

[g] Central Madrid Rolls Out a Tough-Love Plan to Limit Cars. Available at <http://www.citylab.com/commute/2014/09/central-madrid-rolls-out-a-tough-love-plan-to-limit-cars/380642/>.

[h] World Resources Institute. Project Directory. Guaranteeing the "right to mobility" in Mexico City. Available at <http://www.wricities.org/our-work/project-city/guaranteeing-right-mobility-mexico-city>.

[i] Complete Guide to Velib' Bike Rentals in Paris. Available at <http://goparis.about.com/od/gettingaround/ss/Guide-To-Paris-Bikes-Velib.htm>.

[j] Additional motorbike-specific policies include restricting two-stroke engines, implementing higher taxes to discourage high engine power, and linking motorbikes with public transport through parking fee reductions and other complementary services.

[k] International Energy Agency. 2013. A Tale of Renewed Cities: A Policy Guide on How to Transform Cities by Improving Energy Efficiency in Urban Transport Systems. Available at <https://www.iea.org/publications/freepublications/publication/Renewed_Cities_WEB.pdf>.

[l] European Platform on Mobility Management. E-update on congestion charging. Available at <http://www.epomm.eu/newsletter/v2/content/2015/0415/doc/eupdate_en.pdf>.

[m] Energy Sector Management Assistance Program. Good practices in city energy efficiency. London, United Kingdom – Congestion Charges for Urban Transport. Available at <https://www.esmap.org/node/1279>.

[n] Auckland Rapid Transit System, New Zealand. Available at <http://www.railway-technology.com/projects/auckland_rapid/>.

[o] World Resources Institute. MOVE Bus Rapid Transit (BRT) – Belo Horizonte, Brazil. Available at <http://www.wricities.org/media/photo-to-essay/move-bus-rapid-transit-brt-belo-horizonte-brazil>.

[p] Ministry of Transportation Indonesia and the Deutsche Gesellschaft für Internationale Zusammenarbeit. 2014. Supported NAMA. Sustainable Urban Transport Programme Indonesia (NAMA SUTRI). Pilot Phase. Available at <http://transport-namas.org/wp-content/uploads/2015/02/Indonesia_NAMA-SUTRI_Full-NAMA-Concept-Document.pdf>, and presentation made by Bogor at the Ad Hoc Working Group on the Durban Platform for Enhanced Action technical expert meeting on energy efficiency in June 2015.

[q] World Resources Institute. TransMilenio BRT in Bogotá, Colombia. Available at <http://www.wricities.org/media/image/transmilenio-brt-bogot%C3%A1-colombia>.

[r] International Railway Journal. Cagliari opens light rail extension. Available at <http://www.railjournal.com/index.php/light-rail/cagliari-opens-light-rail-extension.html>.

[s] World Resources Institute. Project Directory. Multimodal transport integration in Chengdu, China. Available at <http://www.wricities.org/our-work/project-city/multimodal-transport-integration-chengdu-china>.

[t] Murakami J. 2012. Transit Value Capture: New Town Co-Development Models and Land Market Updates in Tokyo and Hong Kong. Value Capture and Land Policies, eds. Ingram, Gregory K., and Yu-Hung Hong. Cambridge, MA: Lincoln Institute of Land Policy. Available at <https://www.lincolninst.edu/pubs/2198_Transit-Value-Capture-New-Town-Co-Development-Models-and-Land-Market-Updates-in-Tokyo-and-Hong-Kong>.

[u] SMRT. Available at <http://www.smrt.com.sg/>.

[v] International Council on Clean Transportation. 2013. Mexico light-duty vehicle CO2 and fuel economy standards. Policy update. Available at <http://www.theicct.org/sites/default/files/publications/ICCTupdate_Mexico_LDVstandards_july2013.pdf>.

[w] Environmental Protection Bureau of Chongqing, People's Republic of China. 2002. Action Plan: Strengthening Vehicle Inspection and Maintenance in Chongqing, People's Republic of China. Available at <http://www.unep.org/transport/pcfv/PDF/DataAPChina.pdf>.

[x] World Bank. 2015. Scrapping and Recycling Old Vehicles in Egypt. Available at <http://www.worldbank.org/en/results/2015/08/12/scrapping-recycling-old-vehicles-egypt\>.

[y] World Resources Institute. 2012. Review of Literature in India's Urban Auto-rickshaw Sector: A Synthesis of Findings. Available at <http://thecityfix.com/blog/new-release-review-of-literature-in-indias-urban-auto-rickshaw-sector/>.

[z] Presentation made by BYD at the Ad Hoc Working Group on the Durban Platform for Enhanced Action technical expert meeting on energy efficiency in June 2015.

B.2. Policy options for promoting energy efficiency in the buildings sector in urban environments

83. Buildings consume large quantities of energy for air heating and cooling, water heating, ventilation, lighting, and appliances and equipment. Policies and derived measures for improving EE in buildings need to reflect whether new or existing, residential or non-residential buildings are to be addressed, who invests in and uses the building and where a building is located (climate, economic strength and demography of a city/region/district). Several proven and well-known measures are available across the world to support expanded EE deployment.
84. With regard to urban EE, it is important to stress that urban planning can significantly influence energy consumption more broadly. Building arrangements, their shape and the space between buildings largely determine heat island effects and the possibility of using RE locally (specifically solar energy, urban wind turbines and geothermal energy, all potentially feeding DES).

85. Aspects of a policy portfolio for EE in buildings are addressed at the national level, while others need to be tailor-made for the unique national circumstances. Municipal governments can influence the energy usage of buildings through regulations, policies and incentives for both new and existing buildings. Some key scalable policy options used at the city level are described in paragraphs 86–92 below.

86. **Building energy codes and minimum energy performance standards**: Cities have been implementing building codes for decades in an effort to ensure occupants' safety and comfort. Local governments can also incorporate EE and/or GHG emission standards as part of – or supplementary to – building codes and by-laws. Standards are often set on the basis of the size and intended use of the building as well as other considerations, such as location and associated weather conditions.

87. **Mandatory auditing and retro-commissioning**: For existing buildings, cities can require audits that assess their energy usage. The audits can either be simply informative or result in required EE improvements if minimum standards are not met.

88. **Building performance certificates and labelling** programmes can support market creation and enable builders and investors to differentiate highly energy-efficient buildings from those that meet standard efficiency requirements (i.e. those prescribed within building codes). Certificates and labels can also provide potential buyers or renters with sufficient information to understand long-term energy costs.

89. **Financial incentives and models**: Given the potentially significant upfront costs associated with larger EE improvements, financial incentives and models may be needed to unlock investments. Incentives can include tax credits, rebates, loans, grants, green mortgages and bridging loans. Governments can also provide or clear the way for financial models, such as those provided by energy service companies (ESCOs), to reduce upfront costs and enable repayment via energy savings. See spotlight box 2 for further information on the opportunities provided by ESCOs and ways in which governments can enable market development.

Spotlight box 2

The role of energy service companies in financing energy efficiency upgrades

Through energy performance contracts, energy service companies (ESCOs) finance, install and maintain energy efficiency (EE) upgrades to commercial and public buildings and infrastructure. ESCOs can implement a variety of EE measures, such as those pertaining to lighting, heating, air conditioning, motors, industrial processes, combined heat and power, waste heat recovery and energy management systems.a ESCOs cover the upfront costs and take on the project and financial risks. The building owner repays the ESCO through energy savings, a portion of which goes towards the return on investment of the ESCO.

There are multiple opportunities for collaboration between ESCOs and governments. Governments can utilize the services of ESCOs for upgrades to public buildings and infrastructure and create enabling markets in which ESCOs can participate. ESCOs can also be included within stakeholder engagement processes. Examples of policy options that enable ESCO market development include:

- Implementation of overarching national EE strategies and action plans;
- Clarifying the legality and tax obligations of ESCOs;
- Enabling energy agencies to coordinate with ESCOs and highlight demonstration projects;
- Implementing building codes and audit and retrofit programmes.b

Sources:

[a] International Institute for Sustainable Development. 2006. Energy Service Companies in Developing Countries. Available at <https://www.iisd.org/sites/default/files/pdf/2009/bali_2_copenhagen_escos.pdf>.

[b] United Nations Economic Commission for Europe. 2013. Development of Energy Service Companies: Market and Policies. Available at <http://www.unece.org/uploads/pics/Dev_ESCO.pdf>.

90. Data gathering and reporting and benchmarking of performance data: Valid, relevant and sufficiently detailed data about the building stock, including planned new construction, are needed to inform housing, urban and transportation planning. Cities can develop either mandatory or voluntary reporting and benchmarking programmes, which, like performance certificates and labelling, can enable market differentiation and enhance the decision-making of potential buyers and renters. Such programmes could also supplement emission cap-and-trade or taxation schemes.

91. Outreach, stakeholder engagement and workforce training: Building public awareness and capacity are important aspects of building EE policy portfolios. Educational efforts can improve the ability of builders, investors and consumers to appropriately assess the value of energy-efficient buildings and encourage the uptake of technologies and practices for energy-efficient buildings. Coordinating different stakeholders, like housing associations, energy providers and various departments in the municipal administration, is key to synchronizing planned activities affecting EE, integrating RE and synergies between the two.

92. Government leadership programmes and procurement: Municipal governments support market creation and also raise public awareness by building highly efficient public spaces and undertaking significant renovations aimed at significant improvements in EE.

93. The above-listed policy options are summarized in table 4, together with enabling practices for promoting the successful design and implementation of those key policy options. City-specific examples to support the dissemination of lessons learned and the replication of successful efforts are also highlighted. Detailed descriptions of the policies as well as short case studies (describing examples of policies in Tshwane, South Africa; Recife, Brazil; and Byron Shire, Australia) are presented in document FCCC/TP/2015/4/Add.2.

Table 4
Policy options for promoting energy efficiency in the buildings sector in urban environments

Policy options and key elements of enabling environments to support successful policy replication and implementation	Select city-specific examples
Policy option: building energy codes and minimum energy performance standards	
• **Incorporate energy performance criteria** into building permit requirements • **Consider stricter or more comprehensive local building codes** than provincial/State or national codes • **Set specific codes** for parts of buildings, certain sectors and/or building sizes and consider complementing building codes by appliance and equipment standards • **Analyse the appropriate level of renovation** that would require adherence to building codes • **Allow for regular revisions** that reflect technological advancements and market dynamics • **Ensure that building codes are enforceable** and the appropriate institutions are in place	• Boston, United States – Leadership in Energy and Environmental Design certification requirement for large-scale developments[a] • Hong Kong, China; Singapore, Singapore; Chicago and New York, United States; Stockholm, Sweden; and Johannesburg, South Africa – additional cities with policies for existing and new buildings • Singapore, Singapore – certified rating under the Green Mark Scheme required for all new buildings and significant retrofits[b] • Stockholm, Sweden – maximum energy intensity of no higher than 55 kWh/m^2 for new buildings[c] • Tshwane, South Africa –

Policy options and key elements of enabling environments to support successful policy replication and implementation	Select city-specific examples
Policy option: building energy codes and minimum energy performance standards	
	by-laws addressing energy efficiency of new buildings and major retrofits and additionsd (see document FCCC/TP/2015/4/Add.2)
Policy option: mandatory auditing and retro-commissioning	
• **Determine whether periodic audits** would be required (e.g. every 3, 5 or 10 years) • **Explore applying audits** to entire buildings or just specific components (e.g. heating, ventilation and air conditioning and lighting) • **Complement with benchmarking** and reporting schemes • **Require certain renovations** of existing buildings, such as replacing heating or cooling systems	• Hong Kong, China – mandatory audits for commercial buildings of over 30 years old and taller than two stories[e] • Recife, Brazil – the new Green Roof Law, which requires residential and non-residential buildings of a certain size to install rooftop gardens[f] (see document FCCC/TP/2015/4/Add.2)
Policy option: building performance certificates and labelling	
• **Consider labels** for specific areas of performance, such as thermal performance and use of renewables • **Require that labels be provided** in sale listings, lease contracts, financial incentives qualification and municipal or city-funded building projects • **Incorporate labels into existing standards** and make any labels easily understandable and comparable • **Explore including green construction guidelines** as part of a labelling programme along with monitoring[h]	• Beijing, China – the China Green Building Label requires all new buildings to have at least a one star rating[g] • Hong Kong, China; Tokyo, Japan; Singapore, Singapore; New York, United States; and Johannesburg, South Africa – additional cities with policies for existing and new buildings

Policy options and key elements of enabling environments to support successful policy replication and implementation	Select city-specific examples
Policy option: financial incentives and models	
• **Incorporate financial incentives** into a holistic energy efficiency policy package and ensure that energy market laws and regulations allow for third-party financing (e.g. contracts for energy services) • **Design incentives and financing programmes** to leverage private-sector investment • **Work with the private sector** to allow for green leases that address split incentives between landlords and tenants • **Use grants and loans** to promote building refurbishment • **Explore emissions trading schemes** as a means of providing additional revenue • **Customize instruments** to a city's context and market for maximum impact[j]	• Houston, United States – property-assessed clean energy financing[i] • Monterrey (and various other cities), Mexico – Ecocasa programme's concessional bridging loans to developers[j] • Nairobi, Kenya – subsidized energy audits for property owners[k] • Shanghai, China – various incentives • Various cities in South Africa – Eskom's energy servicing company model for industrial and commercial customers[m]
Policy option: data gathering (including reporting and benchmarking of performance data)	
• **Consider what level of disclosure** would be effective given a city's policy priorities (e.g. information can be exchanged between a buyer and seller or posted online) • **Provide tools to support benchmarking**, such as online assessment tools • For cities with carbon emissions trading schemes, **explore interactions between reporting and emissions trading**	• For existing buildings: Hong Kong, China; Tokyo, Japan; Singapore, Singapore; Chicago and Philadelphia, New York, San Francisco and Seattle, the United States; and Johannesburg, South Africa
Policy option: outreach, stakeholder engagement and workforce training	
• **Offer capacity-building on architectural techniques**, building materials and processes, and conducting ex ante simulations of effectiveness • **Help owners and building occupants** to reduce energy usage by informing them of the benefits of energy-efficient components and building systems, both new and renovated, and also of the	• Houston, United States; Byron shire, Australia (see document FCCC/TP/2015/4/Add.2) and Stockholm, Sweden – additional cities with policies for existing and new buildings

Policy options and key elements of enabling environments to support successful policy replication and implementation	Select city-specific examples
Policy option: outreach, stakeholder engagement and workforce training	
programmes and technologies available • **Consider a certification/accreditation scheme** to ensure adequate training of the personnel assessing building efficiency and implementing projects	• Lagos, Nigeria – Power Kids Programme providing extra-curricular education on the nexus of behaviour and environmental impacts[m] • Paris, France – Paris Climate Energy Action Plan, including educational opportunities for secondary students[n]
Policy option: government leadership programmes and procurement	
• **Research opportunities** to pursue ambitious and binding targets for renovations, coupled with a road map for meeting targets for public buildings • **Complement investments** in social housing with energy efficiency improvements and urban planning[l]	• Tshwane, South Africa – a new municipal office that aims for a five-star green rating[d]

Sources:
[a] City of Boston.gov. Available at <http://www.cityofboston.gov/eeos/buildings/>.
[b] Building and Construction Authority of the Singapore Government. Available at <http://www.bca.gov.sg/greenmark/green_mark_buildings.html>.
[c] The Stockholm Environment Programme 2012–2015. Available at <http://international.stockholm.se/globalassets/ovriga-bilder-och-filer/the-stockholm-environment-programme-2012-2015.pdf>.
[d] Presentation made by Tshwane at the Ad Hoc Working Group on the Durban Platform for Enhanced Action technical expert meeting on energy efficiency in June 2015.
[e] Buildings Department of the Government of the Hong Kong Special Administrative Region. Available at <http://www.bd.gov.hk/english/services/index_mbis.html>.
[f] Presentation made by Recife at the Ad Hoc Working Group on the Durban Platform for Enhanced Action technical expert meeting on energy efficiency in June 2015.
[g] Institute for building efficiency. Green Building Rating Systems: China. Available at <http://www.institutebe.com/InstituteBE/media/Library/Resources/Green%20Buildings/Fact-Sheet_Green-Building-Ratings_China.pdf>.
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[j] Presentation by the Inter-American Development Bank at the Ad Hoc Working Group on the Durban Platform for Enhanced Action technical expert meeting on energy efficiency in June 2015.
[k] The Center for Energy Efficiency & Conservation. Available at <http://kenyasustainableenergyweek.com/about/about-the-center/>.
[l] Presentation made by the International Energy Agency at the Ad Hoc Working Group on the Durban Platform for Enhanced Action technical expert meeting on energy efficiency in June 2015.
[m] Lagos State Government Power Kids Program. Available at <http://www.lseb.gov.ng/content/lagos-power-kids-program>.
[n] Paris Green Invest For Future – Regional Strategy: Climate and Energy Framework. Available at <http://www.paris-green.com/en/regional-strategy-climate-and-energy-framework/>.

B.3.Policy options for promoting energy-efficient lighting in urban environments

94. Through policies, regulations and incentives, cities can influence the amount of energy used for lighting in the municipal, commercial, residential and industrial sectors. Lighting policies can be incorporated within building codes or implemented separately. Municipalities can coordinate with higher levels of government (State/provincial, national and regional) to ensure that local policies are well aligned and to enforce polices enacted at higher levels. The key policy options that could be replicated and scaled up across the world are detailed in paragraphs 95–98 below.

95. **Municipal procurement**: Governments support market development by procuring energy-efficient lighting for municipal buildings and street and traffic lights, among other public infrastructure. City governments can consider installing high-efficiency light-emitting diodes (LEDs) and compact fluorescent lamps (CFLs) and replacing mercury vapour streetlights with high-pressure sodium lights. Another increasing trend is the use of solar PV for light streets and in public spaces.

96. **Economic, market and fiscal incentives**: Cities offer incentives, such as rebates, tax breaks and bond financing, to attract investment in efficient lighting by offsetting the upfront costs. Lighting improvements can be financed by ESCOs (see spotlight box 2).

97. **Phasing out of incandescent bulbs**: CFLs use only a quarter of the energy required by incandescent bulbs, and thus phasing out incandescent bulbs provides a significant opportunity to reduce the energy used by lighting systems. Whether cities can effectively implement phase-outs depends on local market conditions. Cities, however, can provide incentives for purchasing CFLs and LEDs. And, in line with municipal waste management services, local governments can facilitate the safe disposal of CFLs.

98. **Outreach and awareness**: There are many misconceptions about energy-efficient lighting, which governments can help to address through public outreach and awareness programmes. For example, outreach programmes can help to mitigate concerns about the aesthetics, functionality and financial feasibility of energy-efficient lighting.

99. Table 5 describes the key policy options for catalysing the deployment of energy-efficient lighting. Also included are enabling practices that could enhance the impacts of those policies, as well as city-specific examples from various countries. Detailed descriptions of the policies as well as short case studies (describing examples of policies in Akola, India; and Catalonia, Spain) are also presented in document FCCC/TP/2015/4/Add.2.

Table 5
Policy options for promoting energy-efficient lighting in urban environments

Policy options and key elements of enabling environments to support successful policy replication and implementation	Select city-specific examples
Policy option: municipal procurement	
• **Procure efficient lighting** for public buildings and infrastructure to help spur markets and lead by example • **Work with energy service companies** to improve energy efficiency and reduce upfront costs • **Replace less-efficient**, high-pressure sodium street lights with light-emitting diodes (LEDs) • **Combine lighting upgrades with communication upgrades**, including sensors to oversee traffic conditions, air quality, security and others • **Conduct internal training** on the procurement of energy-efficient lighting, operations and maintenance, and proper disposal of used compact fluorescent lamps (CFLs)	• Akola, India and Catalonia, Spain – performance contracting for street lightinga (see document FCCC/TP/2015/4/Add.2) • Portland, Houston, and Los Angeles, United States – LEDs for traffic signals • Stockholm, Sweden – LEDs for traffic signals[b] • Sydney, Australia – LEDs for street and park lighting[b] • Various cities, China – solar photovoltaic lighting for streets and public spaces[c]
Policy option: economic, market and fiscal incentives	
• **Use various incentives** to address potential higher upfront costs associated with purchasing and installing more efficient lighting systems	• Winter Park, United States – rebates for upgrading lighting[d]
Policy option: phasing out of incandescent bulbs	
• **Raise awareness** of the broader public on the benefits of CFLs and LEDs • **Distribute limited amounts of free CFLs** to encourage uptake • **Provide information on and/or facilities for the safe disposal** of CFLs, which contain mercury vapour • **Partner with businesses** to facilitate drop-off points for disposal of CFLs	• Western Cape, South Africa – distribution of free CFLs and safe disposal programme[e]

Policy options and key elements of enabling environments to support successful policy replication and implementation	Select city-specific examples
Policy option: outreach and awareness	
• **Provide audit programmes,** including potentially discounted audits, to improve consumers' understanding of the energy usage associated with lighting • **Develop information resources** such as leaflets, websites and others to inform the public on the benefits of and other considerations for energy-efficient lighting	• Accra, Ghana – CFL distribution and education programme[f] • New Jersey, United States – Clean Energy Outreach Team high school education programme and lighting fairs[g]

Sources:
[a] Energy Sector Management Assistance Program. 2009. Good Practices in City Energy Efficiency: Akola Municipal Corporation, India – Performance Contracting for Street Lighting Energy Efficiency.
[b] The European association of local authorities in energy transition. Installing energy efficient traffic signals. Available at <http://www.energy-cities.eu/db/stockholm_566_en.pdf>.
[c] Frankfurt School–UNEP Collaborating Centre for Climate & Sustainable Energy Finance/Bloomberg New Energy Finance. 2015. Global Trends in Renewable Energy Investment 2015. Available at <http://apps.unep.org/publications/pmtdocuments/-Global_trends_in_renewable_energy_investment_2015-201515028nefvisual8-mediumres.pdf.pdf>.
[d] City of Winter Park, Florida, Energy Conservation Rebates and Incentive Program. Available at <https://cityofwinterpark.org/departments/electric-utility/energy-conservation-rebates-and-incentive-program/>.
[e] Eskom. 2014. Eskom National CFL Programme: Residential Sector. Available at <http://www.energy.gov.za/files/esources/kyoto/2014/Presentations/PoA-Eskom-National-CFL-Programme-Residential-Sector.pdf>.
[f] ECOWAS Centre for Renewable Energy and Energy Efficiency. Towards efficient Lighting Market, the case of Ghana. Presentation. Available at <http://www.ecreee.org/sites/default/files/event-att/k.agyarko-ouaga_ecreee_presentation.pdf>.
[g] New Jersey's clean energy program. Available at <http://www.njcleanenergy.com/residential/programs/energy-efficient-products/lighting>.

B.4. Policy options for promoting energy efficiency in urban district energy systems

100. District energy systems can provide cooling and heating more efficiently than individual heating, venting and air cooling systems by utilizing centralized power sources and pumping cool or warm water or steam through a series of pipes to end-user facilities. As cities play an important role in land-use management and infrastructure development (and also sometimes provide energy services), it makes sense that cities can also be effective at planning and developing DES. Key actions that support the effective implementation of and planning for DES are highlighted in paragraphs 101–104 below.

101. **Developing or expanding a district cooling/heating system**: As cities grow, existing DES can also be expanded to provide for additional end-users. If sufficient standards are in place, it may be possible to interconnect neighbouring systems.

102. **Improving the efficiency of existing systems**: DES have been around for decades. Thus, there may be an opportunity to improve the efficiency of existing systems through enhancements to their infrastructure.

103. **Integrating renewables and utilizing waste heat**: Various fuel sources can power DES. Cities can influence the choice of fuel source towards utilizing RE, combined heat and power, heat pumps and/or waste recovery to lessen the overall GHG emissions from the system and possibly reduce fuel expenditure.

104. **Financial incentives and market structure**: Investments in DES and consumer participation can be encouraged through the use of financial incentives, net metering and interconnection policies, and energy tariff and market structures.

105. Table 6 describes the key policy options for catalysing EE in DES, as well as enabling practices that could enhance the impacts of those policies and city-specific examples from various countries. Detailed descriptions of the policies as well as short case studies (describing examples of policies in Catalonia, Spain; Paris, France; and Rajkot, India) are presented in document FCCC/TP/2015/4/Add.2.

Table 6
Policy options for promoting energy efficiency in urban district energy systems

Policy options and key elements of enabling environments to support successful policy replication and implementation	Select city-specific examples
Policy option: development or expansion of district cooling/heating systems	
• **Consider in the regulations dedicating areas** to district energy systems (DES) and making it mandatory for certain energy end-users to interconnect • **Conduct an integrated energy assessment** and integrate DES planning with land-use and infrastructure planning and mapping • **Coordinate development of DES** with that of other infrastructure (e.g. coupling with a light-rail development) • **Explore public–private partnerships** that may be able to access additional investment sources and utilize development and operational expertise • **Provide capacity-building** to developers on structuring financeable projects • **Consider lower energy prices** for social housing areas	• Anshan, China – public–private partnership to develop new DES[a] • Copenhagen, Denmark – regulations governing the municipal development of district heat system[b] • Cyberjaya, Malaysia – district cooling system 30-year concession contract[c] • Gujarat, India – development of a public district cooling system • Rajkot, India – demonstration project for district cooling (see document FCCC/TP/2015/4/Add.2) • Paris, France – district energy network[d] (see document FCCC/TP/2015/4/Add.2) • Port Luis, Mauritius – development of the first seawater district cooling system in Africa[c]

Policy options and key elements of enabling environments to support successful policy replication and implementation	Select city-specific examples
Policy option: improving the efficiency of existing DES	
• **Interconnect energy systems** to allow for exchange of excess heat and/or reserve capacities • **Put in place energy efficiency targets for DES**	• Copenhagen, Denmark – connection of district heat network to solar thermal plant with heat storage[c] • Toronto, Canada – Lake Ontario used to provide district cooling[e]
Policy option: integrating renewable energy sources and utilizing waste heat	
• **Set specific targets** for renewable energy procurement • Ensure that energy system interconnection, grid access and permitting rules **do not impede the installation of renewable energy systems**	• Catalonia, Spain – integration of biomass, biogas and waste treatment as renewable power sources[f] (see document FCCC/TP/2015/4/Add.2) • Reykjavik, Iceland – geothermal energy use for district heating and electricity generation[g] • Vancouver, Canada – demonstration project capturing waste heat from wastewater[c]
Policy option: financial incentives and market structures	
• **Use incentives**, such as soft loans, bond financing, loan guarantees, underwriting, grants, revolving funds, subsidies and land-value capture, to steer investments away from traditional fossil fuel energy sources • **Design energy market tariffs** to reflect the cost of connecting to DES and a guaranteed heat supply (e.g. compensation for providing reserve capacity, grid balancing, voltage support and waste heat) • **Allow combined heat and power systems** to compete on the retail electricity markets • Enact net metering policies and incentives for distributed energy	• Amsterdam, Netherlands – land-use and interconnection policies[c] • London, United Kingdom – grants for feasibility studies[h] • Ludz, Poland – land-use and interconnection policies[c]

Policy options and key elements of enabling environments to support successful policy replication and implementation	Select city-specific examples
Policy option: financial incentives and market structures	
generation • **Use land-use and energy system interconnection** policies to ensure an adequate consumer base and thus reduce risk	

Sources:
[a] International District Energy Association. New Danfoss district energy system in Anshan, China to use steel plant's waste heat. Available at <http://www.districtenergy.org/blog/2013/01/18/district-energy-system-in-anshan-china-to-be-fueled-with-waste-heat-recovered-from-steel-plant/>.
[b] Danish Board of District Heating. Available at <http://dbdh.dk/district-heating-history/>.
[c] United Nations Environment Programme. 2015. District Energy in Cities: Unlocking the Potential of Energy Efficiency and Renewable Energy. Available at <http://www.unep.org/energy/portals/50177/Documents/District%20Energy%20Report%20Book_RZ_singlepage.pdf>.
[d] Presentation made by Paris at the Ad Hoc Working Group on the Durban Platform for Enhanced Action technical expert meeting on energy efficiency in June 2015.
[e] C40 Cities Climate Leadership Group. Lake Water Air Conditioning Reduces Energy Use by 90%. Available at <http://www.c40.org/case_studies/lake-water-air-conditioning-reduces-energy-use-by-90>.
[f] Presentation made by Catalonia at the Ad Hoc Working Group on the Durban Platform for Enhanced Action technical expert meeting on energy efficiency in June 2015.
[g] C40 Cities Climate Leadership Group. The World's Largest Geothermal Heating System Saves up to 4M Tons CO2 Annually. Case study. Available at <http://www.c40.org/case_studies/the-worlds-largest-geothermal-heating-system-saves-up-to-4m-tons-co2-annually>.
[h] International Energy Agency. 2009. Cogeneration and district energy. Available at <https://www.iea.org/publications/freepublications/publication/CHPbrochure09.pdf>.

Chapter V

NON-STATE ACTORS

106. This chapter discusses recent developments in multilateral cooperation on climate action and engagement of non-State actors such as cities, private sector and other stakeholders facilitated by international cooperative initiatives.

A. Multilateral cooperation on climate action

107. Multilateral cooperation in the context of sustainable development plays a critical role in advancing global climate change agenda and in particular RE and EE deployment. Building on the momentum gained at the United Nations Climate Summit in September 2014, the role of cooperation continues to grow and evolve to address new challenges and capture new opportunities. As cooperation is enhanced, collaborative success stories are inspiring action around the world. As a notable example of multilateral cooperation, the EE accelerators were launched during the United Nations Climate Summit as part of the Global Energy Efficiency Accelerator Platform (see spotlight box 3).

Spotlight box 3

United Nations Climate Summit: Global Energy Efficiency Accelerator Platform

Building Efficiency Accelerator: A global network of businesses, non-governmental organizations and international organizations, in collaboration with civil society and subnational government leaders, will provide advisory tools and financial support to help accelerate building energy efficiency policy and project initiatives in certain cities. Five cities, Copenhagen (Denmark), Toyama (Japan), Mexico City (Mexico), Lima (Peru) and Milwaukee (United States of America), have signed up to the initiative.

Efficient Appliances Accelerator: The Global Partnership on Appliances and Equipment, led by the United Nations Environment Programme (UNEP), helps countries to put in place norms and policies, leading to the deployment of highly efficient air conditioners, refrigerators, fans, electric motors and distribution transformers. A total of 16 countries in Latin America and the Caribbean and 12 countries in Southern Africa have expressed their intention to join. Partners of the initiatives include members of the private sector, the Inter-American Development Bank and the World Bank, as well as international organizations and other energy efficiency initiatives, such as the Energy Efficient End-Use Equipment initiative of the International Energy Agency and the Super-Efficient Appliance Deployment initiative.

Lighting Efficiency Accelerator of the Sustainable Energy for All initiative is based on the UNEP/Global Environment Facility en.lighten initiative, a public–private partnership that accelerates the global transition to the use of efficient lighting by phasing out inefficient incandescent lighting by 2016. The en.lighten initiative currently supports 73 developing and emerging countries in transitioning to using efficient lighting technologies through its Global Efficient Lighting Partnership Programme. A total 11 countries joined the effort via the Accelerator Platform.

District Energy Accelerator: The Global Initiative on District Energy Systems coordinated by UNEP aims to help cities and subnational/national governments to develop, retrofit or scale

up district energy systems. A total of 18 cities, seven private-sector partners, two international networks and five international partners joined the initiative. Five of those cities are already using district heating, cooling or combined systems and have already achieved a combined emission reduction of 1.4 Mt CO2 eq per year. This initiative will receive support from international and financial partners and the private sector.

Transport and Motor Vehicle Fuel Efficiency Accelerator: The Global Fuel Economy Initiative aims to reduce emissions and at least double the efficiency of the global vehicle fleet from an average of 8 l/100 km in 2005 to 4 l/100 km by 2050. It also aims to halve new light-duty vehicle fuel economy (in l/100 km or grams of carbon dioxide (g CO2)/km) by 2030. Even if vehicle kilometres driven will double by 2050, efficiency improvements on this scale would effectively cap CO2 emissions from cars at current levels. It is estimated that CO2 savings would exceed 1 Gt CO2 annually by 2025, increasing to 2 Gt CO2 annually by 2050.

Sources:
United Nations Environment Programme. 2015. Climate commitments of subnational actors and business: a quantitative assessment of their emission reduction impact. Available at <http://apps.unep.org/publications/pmtdocuments/-Climate_Commitments_of_Subnational_Actors_and_Business-2015CCSA_2015.pdf.pdf>.

108. In addition, the United Nations Climate Summit spearheaded three more initiatives led by IRENA on the promotion of RE use in developing countries (see spotlight box 4).

Spotlight box 4

United Nations Climate Summit: Renewable Energy Accelerator Initiatives

The **Africa Clean Energy Corridor** (ACEC) aims to accelerate the expansion of renewable energy (RE) through a regional approach to the planning, development and management of the power system, driven by regional and national stakeholders. A total of 19 African countries in the eastern and southern power pools and 32 partners from governments, regional organizations, development institutions and private investors have committed to accelerating the development of RE potential and the cross-border trade of renewable power through the creation of a clean electricity corridor from Cape to Cairo. By creating a larger regional electricity market, ACEC could meet up to 50 per cent of the region's power needs by 2030 by scaling up RE, while leapfrogging towards a low-carbon future.

The **Global Geothermal Alliance** is a partnership platform for dialogue, cooperation and coordination among governments, international and regional organizations, international financing institutions, private-sector investors and other stakeholders to provide customized support in addressing key challenges hindering the accelerated deployment of geothermal energy, particularly in developing countries. Areas of support would include: the creation of enabling regulatory and institutional conditions for investment; the promotion of innovative

financing and risk mitigation mechanisms for geothermal drilling; the creation of enabling conditions for the timely and efficient development and operation of geothermal resources and associated network infrastructure; capacity-building and technical assistance for the construction and operation of geothermal energy systems; and outreach and awareness-raising to achieve greater visibility of geothermal energy in the global sustainability debate.

The **Small Island Developing States (SIDS) Lighthouses Initiative** enables sustainable energy transformation for people on the front line of climate change on small islands around the world and enhances the energy independence and economic prosperity of SIDS. The initiative will provide a framework of action and support to enable the strategic and expanded deployment of RE in SIDS. By 2020, Lighthouses Initiative aims to mobilize USD 500 million to support the deployment of 100 MW new solar photovoltaics, 20 MW new wind power and significant quantities of other RE technologies and RE road maps for all participating SIDS. As at 3 June 2015, 26 SIDS and 18 development partners had joined the initiative from a total of 27 partners at the Climate Summit.

Sources:
United Nations Climate Summit. 2015. Summary of outcomes and conclusions. Available at <http://www.un.org/climatechange/summit/action-areas/#energy >.

109. Through awareness-raising, peer learning, capacity-building, direct investment and other activities to scale up RE and EE, multilateral initiatives are supporting a collective vision aligned with critical sustainable development goals and emission reduction pledges. The UNFCCC provides a strong catalytic platform for cooperation and information exchange across such multilateral initiatives through the technical examination process under the ADP. Key initiatives are highlighted in spotlight boxes 5–9, organized by the following focus areas: cross-cutting initiatives aimed at improvements in the energy sector, RE, EE, and city- and business-led initiatives.

Spotlight box 5

Selected international organizations, initiatives and networks focusing on cross-cutting actions in the energy sector

The **Clean Energy Ministerial (CEM)**, through a global forum, brings together countries and institutions to support effective clean energy policy development and share good practices and lessons learned based on experience (<http://www.cleanenergyministerial.org/>).

The **Clean Energy Solutions Center** is an initiative of CEM, supporting renewable energy (RE) and energy efficiency (EE) policy design and development around the world. It provides

a no-cost 'ask an expert' service to support effective policymaking, as well as policy training, webinars, briefs and analysis (<https://cleanenergysolutions.org/>). CEM also facilitates the International Smart Grid Assistance Network, which provides a forum for countries and institutions to share lessons learned and good practices related to smart technologies and measures (<http://www.iea-isgan.org/>).

The **International Energy Agency (IEA)** works to ensure reliable, affordable and clean energy for its member countries and beyond. Through the Renewable Energy Division at the Secretariat and the Implementing Agreements on RE technologies (IEA-Photovoltaics power system programme, IEA-Wind, IEA-Bioenergy, etc.) and policies (IEA-Renewable energy technology deployment), it supports the further development of RE technologies, markets and policies and the dissemination of experience and expertise (<http://www.iea.org/>).

The **Low Carbon Finance Group, Chatham House,** bringing together private and public finance leaders from around the world, supports policymakers in catalysing investment (debt, equity and various funding mechanisms) in RE and other low-carbon projects and initiatives (<www.chathamhouse.org>).

The **Low Emission Development Strategies Global Partnership** brings together over 120 countries and institutions to share lessons learned and good practices in order to catalyse low-emission, climate-resilient development. Regional platforms in Africa, Asia and Latin America and the Caribbean are pursuing several clean energy activities and the Energy Working Group has developed various resources and tools to support low-carbon planning for the energy sector (<http://ledsgp.org/sector/energy>).

The **Renewable Energy and Energy Efficiency Partnership (REEEP)**, through collaboration with various institutions and initiatives, supports clean energy development around the world. In addition to direct project support, REEEP has developed several tools, resources and databases to support RE and energy efficiency (EE) policy design and implementation (<http://www.reeep.org/>).

United Nations initiative **Sustainable Energy for All**, through a global network of public and private institutions, has three key goals: providing universal access to modern energy services; doubling the global rate of improvement in EE; and doubling the share of RE in the global energy mix. The initiative supports flagship programmes to advance EE and country-level and high-impact actions. The main EE initiatives are coordinated under the so-called Global Energy Efficiency Accelerator Platform (<http://www.se4all.org/>).

Spotlight box 6

Selected international organizations, initiatives and networks focusing on the promotion of renewable energy supply

The **Global 100 per cent Renewables Campaign** is a global initiative to engage, support and showcase influential companies committed to using 100 per cent of renewable energy (RE). Building on current initiatives, the campaign seeks to raise awareness of success stories, good practices and opportunities for RE deployment through collaboration, education, peer discussion and capacity-building (<http://go100re.net/about-us/>).

Greening the Grid: The United States Agency for International Development's Enhancing Capacity for Low Emission Development Strategies programme is supporting over 20 countries in designing and implementing low-emission development strategies. One key aspect of the programme is support for RE grid integration or 'greening the grid'. The Greening the Grid website and other knowledge products provide guidance, tools and analysis to support RE grid integration through various actions (<http://greeningthegrid.org/>).

The **International Renewable Energy Agency (IRENA)** is a strong leader in supporting the scaled-up deployment of RE around the world. In addition to the REmap 2030 that is a RE road map initiative, IRENA supports knowledge dissemination through the International Renewable Energy Learning Platform and has developed numerous products, resources and programmes to facilitate the expansion of RE. One notable programme is the Small Island Developing States Lighthouses Initiative, which, in alignment with economic development and energy independence goals, supports capacity-building, knowledge-sharing and the transition to RE systems in small island nations (<www.irena.org>).

The **Renewable Energy Policy Network for the 21st Century (REN21)** encompasses governments, the private sector, academia and civil-society leaders in the RE field from around the world. REN21 facilitates knowledge exchange to support RE development globally. Notably, the REN21 Global Status Report provides detailed information on progress in the deployment of RE at the regional level and across technologies, as well as key trends for the future. In addition, REN21 supports a biennial global RE conference, other outreach events and the REN21 Renewables Academy and provides innovative knowledge products, such as the REN21 Interactive Map (<http://www.ren21.net/>).

Spotlight box 7

Selected international organizations, initiatives and networks focusing on the promotion of energy efficiency

The **en.lighten** initiative, implemented by the United Nations Environment Programme (UNEP), aims to phase out incandescent light bulbs in an effort to support a global phase-out by 2016. en.lighten works with its partners to implement an integrated approach that includes: minimum energy performance standards; enabling policies; monitoring, verification and enforcement; and environmentally sound management of disposed light bulbs. en.lighten provides support for the development of national and regional targets, technical assistance, workshops, guidance materials and tools, a web portal, forecasting tools and webinars (<http://www.enlighten-initiative.org>).

The **Global Fuel Economy Initiative**, implemented by the International Energy Agency, UNEP, the International Transport Forum, the University of California-Davis, the International Council on Clean Transportation and the Federation Internationale de l'Automobile Foundation, seeks to create real-world improvements in fuel economy through global outreach, an in-country capacity-building toolkit and research (<http://www.fiafoundation.org/our-work/global-fuel-economy-initiative/about-gfei>).

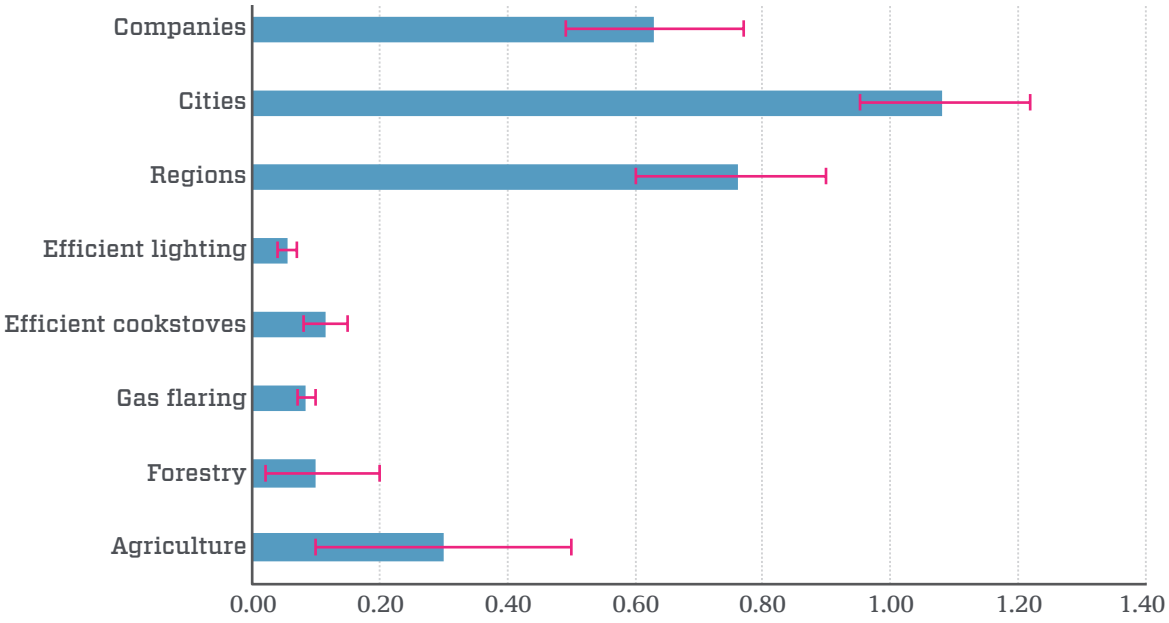
The **International Partnership for Energy Efficiency Cooperation** is a global platform supporting the implementation of energy efficiency policies and measures around the world through technical assistance, sharing of lessons learned and good practices and capacity-building activities (<http://www.ipeec.org/>).

The **Partnership on Sustainable, Low Carbon Transport (SLoCaT)** is a partnership of more than 90 organizations, including United Nations agencies, multilateral and bilateral development banks, non-governmental organizations and the private and academic sectors. SLoCaT's Bridging the Gap programme connects UNFCCC Parties with transport expertise, provides a website and information resources and organizes Transport Day at sessions of the Conference of the Parties as well as related side events (<http://www.slocat.net>).

B. Contribution of non-State actors in supporting multilateral cooperation

110. The contribution of non-State actors in supporting multilateral cooperation on climate action is unprecedented. UNEP found that over 180 initiatives conducted by non-State actors have brought together over 20,000 organizations to commit to climate action. UNEP estimates that those initiatives could save between 2.5 and 3.3 Gt CO2 eq by 2020 across all mitigation technologies (UNEP, 2015). It is important to note that these potential emission reductions are not necessarily additional and may partly overlap with the emission reduction pledges made by Parties under the Cancun Agreements. The diverse group of non-State actors and stakeholders engaged in collaborative climate initiatives is inspiring national governments to implement the emission reduction pledges under the Cancun Agreements. Figure 5 presents the emission reduction impact of initiatives implemented by various non-State actors across a variety of sectors.

Figure 5
Emission reduction impact of climate initiatives conducted by non-State actors

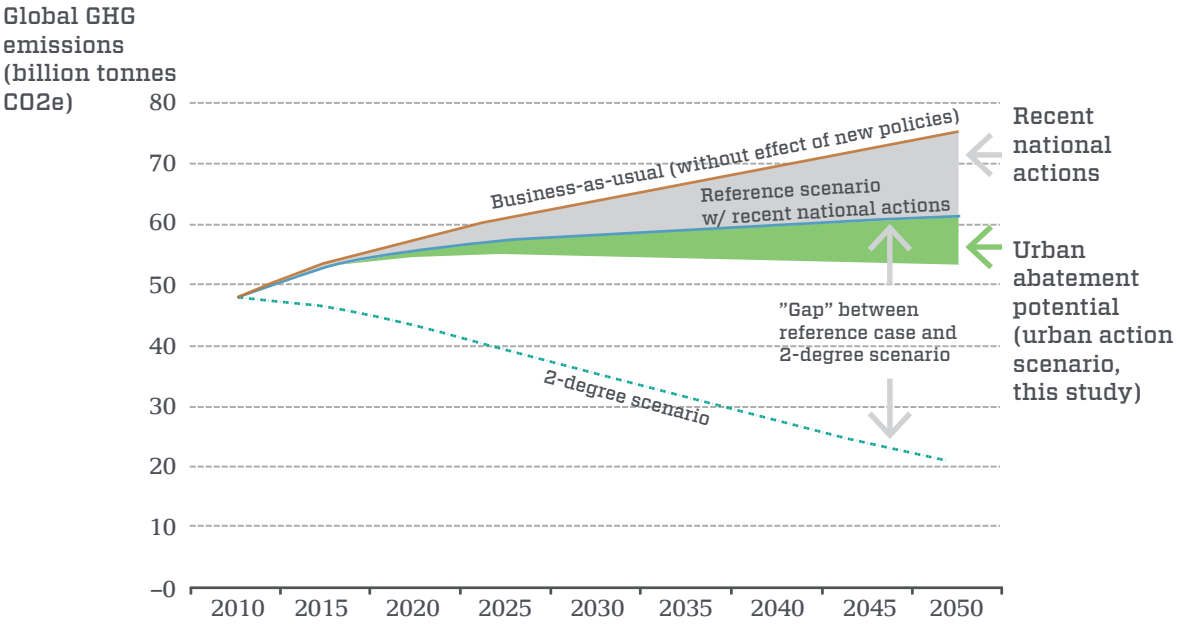


Source: United Nations Environment Programme. 2015. Climate commitments of subnational actors and business: a quantitative assessment of their emission reduction impact.
Note: These emission reductions are not necessarily additional and may partly overlap with the emission reduction pledges under the Cancun Agreements.

111. Cities can provide significant contributions to multilateral efforts to bridge the global emissions gap through ambitious and deeper GHG emission targets. The impact on emissions of new city-led climate actions can, therefore, be largely considered to be additional to national emission reduction pledges. An analysis undertaken by C40 Cities Climate Leadership Group, Bloomberg and the Stockholm Environment Institute quantifies the global emission reduction potential of urban action in three core

sectors: buildings, transport and waste. Aggressive urban action could close the emissions gap by at least 10 per cent by 2030 and by approximately 15 per cent in later years. This represents a reduction in global emissions of 3.7 Gt CO2 eq by 2030 and 8.0 Gt CO2 eq by 2050 (see figure 6).

Figure 6
How urban action could help to deepen the aggregate global ambition of current national emission reduction pledges



Source: C40 Cities Climate Leadership Group, Stockholm Environment Institute and Bloomberg. 2014. A report to the UN Secretary-General from the UN Secretary General's Special Envoy for Cities and Climate Change, in partnership with the C40 Cities Climate Leadership Group.
Note: The 'business as usual' (BAU) and reference scenarios differ only in their assessment of energy-related carbon dioxide emissions: BAU uses the International Energy Agency's 6-degree scenario, while the reference scenario uses the 4-degree scenario; for other gases, both scenarios use the average of BAU scenarios from the Intergovernmental Panel on Climate Change Fifth Assessment Report scenario database.
Abbreviation: GHG = greenhouse gas.

112. Non-State actors such as cities, the private sector and civil-society actors are playing a crucial role in catalysing the deployment of RE and EE by: informing policy design as part of broader stakeholder engagement processes; drawing attention to the need for mitigation in the energy sector; participating as RE and EE project investors; and investing in RE and EE for direct use. Furthermore, subnational authorities, policymakers and business leaders continue to demonstrate strong models of local climate action to support the effective implementation of RE and EE policies and measures, as elaborated in spotlight boxes 8 and 9.

Spotlight box 8

Selected city-level and regional initiatives related to renewable energy and energy efficiency

The **carbonn Climate Registry** is a platform for reporting on climate action, including for the Global Cities Covenant on Climate – The Mexico City Pact. The registry enables local governments to report on emission reductions, emission inventories and climate mitigation and adaptation actions (<http://carbonn.org/about/>).

The **C40 Cities Climate Leadership Group** is a network of over 75 of the largest cities, which conducts research, develops case studies and connects city leaders in an effort to facilitate local action on climate change (<http://www.c40.org/>).

Compact of Mayors is a partnership led by C40 Cities, ICLEI Local Governments for Sustainability, United Cities and Local Governments, and the United Nations Human Settlements Programme. It provides a common platform to gather information on cities' collective actions and to report consistently on impacts (<http://www.c40.org/compact_of_mayors>).

Covenant of Mayors is an initiative of the European Union (EU) and seeks to secure voluntary commitments to implement sustainable energy plans that exceed the EU 20-20-20 emission reduction targets. A wide range of stakeholders are engaged, including the private sector, national coordinators at ministries, territorial coordinators, local and regional energy agencies and the signatories (such as villages, towns, cities and counties). Signatories are provided with administrative, promotional, institutional, implementation, technological, scientific and methodological, financial and networking support (<http://www.covenantofmayors.eu/index_en.html>).

ICLEI Local Governments for Sustainability provides subnational governments with technical assistance and training on a variety of climate-oriented initiatives, including several that are relevant to energy efficiency in cities:

- The Transformative Actions Programme (<http://tap-potential.org>);
- The Green Climate Cities Programme (<www.iclei.org/gcc>);
- The Global Protocol for Community-scale GHG Emissions (<www.ghgprotocol.org/city-accounting>);
- The Urban Low Emission Development Strategies project (<www.urban-leds.org>);
- The Procura+ Campaign for Green Public Procurement (<www.procuraplus.org>);
- Case studies (<http://www.iclei.org/activities/resources/publications/iclei-case-studies.html>).

The **100 per cent Renewable Energy Cities and Regions Network** was launched by ICLEI in 2015 as part of the Global 100 per cent Renewables Campaign and brings together cities and regions through peer learning, workshops, expert engagement and local recognition of inspiring progress to support the scaled-up deployment of RE (<http://www.iclei.org/details/article/iclei-signs-mou-with-the-global-100-renewable-energy-campaign.html>).

113. Many multinational business organizations consider climate change to be an important consideration within their company's overall strategy and expect to be affected by some form of climate change regulation in the coming years (OECD, 2009). Businesses' attitude towards climate change is driven by a variety of factors, including government policies, regulations and pressure from consumers and other stakeholders. In recent years, the evolving mitigation policies implemented across a political spectrum of countries, including market-based instruments, such as taxes and cap-and-trade systems, and regulations and information campaigns, have involved many business organizations. While companies are facing increasing government measures, an important component of the business answer to climate change is also driven by private initiatives to respond to societal expectations communicated through non-legal channels (consumer associations, the press, international organizations, etc.). Some prominent examples of business-focused initiatives are provided in spotlight box 9.

Spotlight box 9

Selected business-focused initiatives related to the promotion of renewable energy and energy efficiency

The **We Mean Business Coalition** brings together more than 6,000 businesses from various sectors and countries around the world. It encourages businesses to take direct action to reduce emissions and support climate resiliency and collaborates with governments and other key stakeholders to meet critical climate and development goals. Key high-level goals include encouraging policymakers to support the private sector by "increasing the level of urgency and ambition in government action to stabilize global emissions before the end of this decade, and continuing to implement domestic policies through to 2030 that support bold business action to cut emissions", among others (<http://www.wemeanbusinesscoalition.org/>).

The **World Business Council on Sustainable Development (WBCSD)** brings together over 200 members across regions and sectors and is a key player in ensuring the active and engaged role of the private sector in climate change action. Building on a longer-term WBCSD Vision 2050 study, the WBCSD Action 2020 initiative provides a forum for private-sector support of sustainable development up to 2020 and beyond. In relation to the topics covered in this technical paper, WBCSD supports action in relation to sustainable cities, electrifying cities towards zero emissions, energy efficiency in buildings, low-carbon electrification of remote areas and resilient power systems (<http://www.wbcsd.org>).

The **World Green Building Council** is a network of 100 national green business councils that supports national renovation strategies and stakeholder engagement. The initiative also consists of an innovation incubator to address financial, business model, public-sector and behavioural solutions. The BUILD UPON initiative is an innovative two-year Horizon 2020 project aimed at helping European countries to design and implement strong, long-term national strategies for the renovation of their existing buildings. Deep building renovation represents one of the single most critical tools to massively lower Europe's carbon dioxide emissions, create jobs in the construction sector and improve the quality of the existing built environment for the good of European citizens (<http://www.worldgbc.org/>).

Chapter VI

MEANS OF IMPLEMEN-TATION

114. This chapter summarizes the information provided by participants at the TEMs and at relevant briefing events related to the thematic areas covered in this technical paper as well as in Parties' submissions on the mobilization and provision of means of implementation. It also summarizes the considerations related to institutions, arrangements and approaches to the provision of finance, technology development and transfer, and capacity-building critical in scaling up RE and EE deployment, building on the information contained in chapters III and IV above.

A. Role of UNFCCC institutions

115. At the briefings held in June 2015 as part of the TEMs, participants discussed options for bringing action to fruition and for mobilizing finance, technology development and transfer, and capacity-building, as well as ways to overcome barriers in order to tap the sizeable potential for RE- and EE-related improvements, especially in urban environments.

116. The integration of the recommendations arising from the TEMs into the operations of UNFCCC institutions (such as the Technology Mechanism and its Technology Executive Committee (TEC), the Climate Technology Centre and Network (CTCN), the GCF, the Global Environment Facility (GEF) and the Durban Forum on Capacity-Building) and the mainstreaming of the discussion on access to means of support in the dialogue between governments and support institutions were highlighted as potential ways to move to the implementation phase of the technical examination process. UNFCCC institutions demonstrated their readiness to support Parties and other stakeholders, such as cities, in promoting EE and RE. Further details on UNFCCC institutions are highlighted in spotlight box 10.

Spotlight box 10

UNFCCC institutions

The **Green Climate Fund** (GCF) is a recently operationalized fund with a current funding level of USD 10.2 billion that is actively developing a roster of accredited entities to support mitigation and adaptation projects as well as transformational policies and programmes in developing countries. The first seven entities were accredited in March 2015, with additional entities to be continuously added. It is hoped that the first approvals of project proposals will occur before the twenty-first session of the Conference of the Parties (COP). The GCF is currently supporting readiness funding and capacity-building for local project developers and other domestic entities to set the stage for fully fledged funding proposals in line with its investment framework (which highlights aspects such as transformation, paradigm shift potential, systemic change, sustainable development co-benefits, country ownership, direct access and economic efficiency) (<http://news.gcfund.org/>).

The **Global Environment Facility (GEF)** supports the deployment of renewable energy (RE) and energy efficiency globally by addressing critical barriers, designing and implementing innovative financial instruments and demonstrating early-stage technologies. For example, the GEF has supported 6 GW RE capacity additions by investing USD 1.3 billion in critical actions and measures in 160 countries. Those investments led to USD 10 billion in co-financing for RE-related action and significant emission reductions (<https://www.thegef.org/gef/>).

The **Climate Technology Centre and Network (CTCN)**, in response to requests from developing country national designated entities, provides targeted technical assistance to support climate-resilient, low-emission development. A consortium of technical institutes and a broader network of experts work closely with country partners to develop tailored assistance in response to critical needs. Currently, the CTCN is working with developing countries to design proposals for submission to the GCF and partnering regional development banks (<http://ctc-n.org/>).

The **Technology Executive Committee**, alongside the CTCN, has been mandated by UNFCCC Parties to implement the Technology Mechanism by: analysing technology needs and issues and recommending actions, policies and programmes; facilitating collaboration between stakeholders; and catalysing the development and use of technology road maps and action plans (<http://unfccc.int/ttclear/templates/render_cms_page?s=TEC_mandates>).

The **Durban Forum on capacity-building** provides a platform for stakeholders engaged in climate-related capacity-building to discuss progress, share lessons learned and good practices and understand critical gaps in capacity-building to support key climate goals (<http://unfccc.int/cooperation_and_support/capacity_building/items/6802.php>).

The **Executive Board of the clean development mechanism (CDM)** supervises the CDM under the authority and guidance of the COP serving as the meeting of the Parties to the Kyoto Protocol. Its roles are to: develop procedures for the CDM; approve new methodologies; accredit designated operational entities; register projects; issue certified emission reduction credits; and make information on proposed projects publicly available via a public database and maintain a project registry (<http://cdm.unfccc.int/public_inputs/EB/index.html>).

The **Non-State Actor Zone for Climate Action**, launched at COP 20, provides a space for non-State actors at the subnational and city levels and within the private sector to showcase inspiring actions and commitments (<http://climateaction.unfccc.int/>).

117. The strengthening of institutional arrangements could ensure closer ties, deeper synergies and stronger cooperation under the Convention. It was noted by Parties that national strategies, regulations and plans are instrumental in facilitating the work of international support institutions, in particular UNFCCC institutions, and the engagement of the private sector in facilitating financial support, technology development and transfer, and capacity-building. Proposals were made to enhance collaboration at the national and global levels by having the same government focal points for different issues under the Convention. The nationally appropriate mitigation actions (NAMAs) that developing countries prepare in the relevant thematic areas could constitute a first step in identifying their needs and requests for adequate and targeted financial support for climate policy implementation. It was suggested that NAMAs could be used as the basis for the coordination of support efforts. Moreover, the coordination experience leveraged in preparation of NAMAs by developing countries after the

Copenhagen Accord could be used as a starting point and the basis for preparation of intended nationally-determined contributions (INDCs), which could contain enhanced mitigation ambition. In terms of its mitigation component, INDCs could be aligned with the NAMAs and form an umbrella for NAMAs when they are used as policy instruments and implementation tools to achieve the set mitigation targets.

118. Highlighting the importance of a country-driven approach, the CTCN provides support through technical assistance, sharing of knowledge and information related to technology in response to country requests only. It is also looking for ways to strengthen collaboration at the national level. Some ongoing examples of collaboration were presented, such as the CTCN working closely with ICLEI Local Governments for Sustainability and using lessons learned from the clean development mechanism (CDM).

119. As a key climate financing institution, the GCF aims to provide financial support for scaling up RE and EE deployment. In addition, and to lay the groundwork for successful investment, the GCF also focuses on supporting effective legal frameworks and building the capacity of project developers and other local financial actors to support effective investment in RE and EE. To ensure the provision of targeted assistance by the GCF, Parties proposed considering financing national CDM projects under the GCF and providing result-based finance to implement the recommendations arising from the TEMs.

120. The TEC highlighted that many countries in a large number of technology needs assessments considered the provision of technological assistance for RE and EE to be one of their priorities in the area of mitigation and that support for distributed RE was considered to be one of their highest priorities. To address that need, the TEC commissioned a background paper on distributed renewable electricity generating technologies (DREGTs), which provides an overview of policies, barriers, solutions and case studies in relation to DG. The TEC also prepared a policy brief on facilitating technology deployment for DREGTs, to be officially launched at the twenty-first session of the Conference of the Parties (COP). The work of the TEC in this area is intended to assist countries in facilitating and enhancing the deployment of distributed RE. In its findings, it was noted that enhanced collaboration and partnerships among a wider range of stakeholders and financial support at an early stage of development are much needed for initiating projects and further deploying DREGTs.

121. In addition to the importance of the right technology 'hardware' for renewables, the importance of the 'software' component, including capacity-building, for successful RE deployment should not be underestimated. The recently established Durban Forum on capacity-building could serve as a forum to support the exchange of knowledge and good practices on RE and EE between developing countries and among other stakeholders globally. It could be used as a platform specifically focused on capacity-building for RE and EE and showcasing successes could add great value to the global efforts to exchange knowledge. Such work could strengthen the efforts of developing countries by providing additional opportunities for participation in forums, meetings and platforms to share lessons learned and good practices.[24]

122. There is great interest among Parties in engaging in a discussion on cooperative partnerships and in gaining more clarity on what type of resources those partnerships could make available to Parties. Exchange of information and experience between various partnerships, as well as among the UNFCCC support institutions, could help to stimulate the deployment of RE supply and EE on a global scale (see chapter V above).

[24] ADP briefing on support to increase RE supply by UNFCCC institutions and other international organizations.

B. Role of other institutions providing means of implementation

B.1. Financial resources

123. To support critical climate and sustainable development goals, there is an urgent need to mobilize finance for RE and EE. In fact, according to The 2015 New Climate Economy Report, to sufficiently scale up and catalyse RE and EE deployment to a level that reduces annual emissions to 5.5–7.5 Gt CO2 eq by 2030, an estimated annual investment of USD 1 trillion is required by 2030.

124. Robust legal frameworks, stable long-term policy signals and effective finance incentives and mechanisms to de-risk investments are required to mobilize investment in RE and EE in all countries. In particular with regard to RE, support for the design and implementation of power purchase agreements, the development of regulations to incentivize the full suite of options for RE in various contexts, and support for companies to explore and assess the feasibility of such options can catalyse investment. As regards lessons learned, financial institutions emphasize that stable and reliable regulatory frameworks and environments are critical to attract private investment and that effective project planning requires considerable time and effort.[25]

125. Scaling up investments in EE will require market reformation, new financing models and, in some cases, incentives to address upfront costs. Removing fuel subsidies and developing robust carbon pricing schemes will enable the accurate valuation of investments in EE, thus attracting additional capital to an increasing number of EE projects without incentive.

126. It is important that the value and benefits of RE and EE are reflected in the energy market tariffs. Although EE projects are often cost neutral or involve cost savings, there are usually additional upfront costs associated with installation and, in the case of transport sector, operation and maintenance of public services and infrastructure. Loans offset upfront costs and can be repaid using energy cost savings. Loans can be provided directly by banks, although residential and small business borrowers, especially in developing countries, may find it more difficult accessing finance. Governments and development banks can also provide loans, including concessional finance, either independently or in partnership with local banks.

127. ESCOs are one successful model of private-sector companies financing EE upgrades that are repaid via energy cost savings. Another significant opportunity for mobilizing financial resources for EE improvements is to develop unique financing models that address the issues of split incentives between landlords and tenants.

128. Multilateral development banks play a key role in supporting scaled-up investment in RE and EE.[26] Selected examples of activities undertaken by multilateral development banks are provided in spotlight box 11.

[25] Presentation made by Global Energy Efficiency and Renewable Energy Fund at the ADP TEM on RE in June 2015.
[26] Presentations made by We Mean Business and the GCF at the ADP TEM on RE in June 2015.

Spotlight box 11

Selected national and multilateral banks that support the promotion of renewable energy and energy efficiency

The **Asian Development Bank (ADB)** plays an important role in leading the region on a green growth path through financing and innovative technologies. From 2011 to 2014, ADB approved over USD 13 billion in climate financing, with USD 12.6 billion in loans, grants, guarantees and equity investments and USD 438 million in technical assistance. Its own resources equalled USD 11.2 billion, while external resources contributed a little over USD 2.0 billion. Through mechanisms such as the Climate Investment Funds, multilateral development banks have mobilized USD 6.5 billion for climate action in developing countries, with USD 2.5 billion earmarked for Asia and the Pacific.

The **African Development Bank** promotes climate-resilient and low-carbon development within African countries. Its Climate Change Action Plan (CCAP) puts in place activities designed to achieve climate-related objectives and mobilize resources at scale. The bank has made a commitment to invest USD 9.6 billion between 2011 and 2015 to finance its CCAP activities. Having made investments of USD 5.2 billion between 2011 and 2013, it is on target to meet, if not surpass, that commitment, with an increasing number of climate-smart investments.

The **Banco de Desarollo de America Latina (CAF)** provides financing support for energy efficiency (EE) to urban communities in the region as well as integrated technical assistance support. Specifically, CAF works with governments on formulating policies, strengthening institutions and building capacity. The support enables sovereign borrowers to overcome barriers, including a lack of finance guarantees and credit rating, poor governance, weak institutions, low technical capacity and a lack of information. Examples of projects include pre-feasibility studies to introduce deep seawater air conditioning systems in coastal areas (<http://www.caf.com/>).

The **European Bank for Reconstruction and Development (EBRD)** under the Sustainable Energy Initiative supports EE- and climate-related activities through: technical assistance (energy audits, feasibility studies, project implementation, etc.); incentives and grants; market rate and concessional financing; and enabling policies and regulations. Thus far, EBRD has invested EUR 950 million in EE or buildings since 2006 and intermediated the financing of 83,000 buildings through 107 local finance institutions in 20 countries (<http://www.ebrd.com/home>).

The **Global Energy Efficiency and Renewable Energy Fund (GEEREF)** was established in 2009 by the European Investment Bank (EIB) with initial funding from the European Union and the Governments of Germany and Norway. GEEREF provides funding for privately managed renewable energy (RE) and EE funds at the regional and global levels. Through this effort, the fund's country teams invest in commercially sustainable projects supported by public–private partnerships with domestic and international public and private financiers. EIB provides support to attract private capital by reviewing and providing input to the

fund's strategies, including legal input, technical assistance to the country teams and fund managers, and fundraising. (<http://geeref.com/>).

The **Inter-American Development Bank** has two programmes that are of particular relevance to EE in urban environments: (1) the Emerging and Sustainable Cities Initiative, which works with cities on integrated approaches to environmental sustainability, climate change mitigation and adaptation, fiscal sustainability and good governance; and (2) the Regional Environmentally Sustainable Transport Strategic Area, which works with cities in Latin America and the Caribbean (<http://www.iadb.org/>).

The **Kreditanstalt für Wiederaufbau (KfW)** development bank is a German bank that provides grants, loans and technical assistance to developing countries to support the procurement of EE, RE and energy access projects. KfW also offers credit lines for investment in EE by local financing institutions in buildings and other EE projects (<https://www.kfw-entwicklungsbank.de/International-financing/KfW-Development Bank/Topics/Energy/>).

The **World Bank** supports clean energy development around the world through various programmes and initiatives. Key efforts include Readiness for Investment in Sustainable Energy, which sets out RE investment climate indicators to compare countries globally. As another notable example, the World Bank supports scaled-up finance and risk mitigation for RE projects, such as political risk insurance guarantees through the Multilateral Investment Guarantee Agency (<http://www.worldbank.org/>).

129. While developed countries need to allocate the required financial resources for measures, incentives and other enabling activities to attract investments in RE and EE relying on their own financial means, developing countries require considerable support from international sources of public climate finance (in accordance with the principle of common but differentiated responsibilities and the provision of incremental costs under Article 4, paragraph 3, of the Convention). As a result of such climate finance, developing countries, including the least developed countries and countries most vulnerable to climate change, will be able to transform their energy systems for the use of RE and EE improvements in a more ambitious way that serves their populations and avoids future emissions.

130. The transfer of such financial support may be pursued in different ways, through bilateral channels and existing multilateral and UNFCCC institutions, including the GCF. The African Group of Negotiators has been calling for a concerted ambitious RE support partnership (see spotlight box 12) that would enable developing countries to leverage needed financing for public and private investments, on the basis of their country-specific assessments of appropriate policies and incentive tools. Issues such as how climate financing could be provided and what grant and other types of financing, in combination with the contributions from developing countries, are needed to enable developing countries to embark on near-zero-carbon trajectories require further elaboration.

B.2. Technology development and transfer

131. Technology development, innovation and transfer continue to play a critical role in supporting scaled-up RE and EE deployment. According to IRENA, further technological innovation and progress, such as increased efficiency, cost reductions and new production processes to support key technology inputs (cement, steel, etc.), are needed to exceed a 36 per cent RE penetration globally (IRENA, 2015d). Ambitious research and development policies and funding are required to support the necessary innovations.

132. In this context, there is a continued need to support, facilitate and finance the transfer of sound RE and EE technologies and knowledge to developing countries. Such transfer can be supported in a number of ways and depends on the stage of development of certain technologies. The areas of capacity-building and financial support described in this section offer key approaches to facilitating and promoting technology transfer and building the human capacity necessary to support both hard and soft technologies crucial for RE deployment.[27]

133. Research, development and demonstration (RD&D) is one of the main areas where developed countries can support the uptake of RE and EE technologies critical for market development in developing countries. For example, demonstration projects, often supported by international institutions and development banks, can build up local understanding of technologies and provide critical data and information to support market expansion, such as estimated project timelines and costs and considerations to support grid integration.

134. Strategic partnership on RD&D between the private sector and developed and developing country governments is highlighted in The 2015 New Climate Economy Report as a critical need for accelerating innovation and meeting crucial climate goals (Global Commission on the Economy and Climate, 2015). Such partnerships can also support the evolution of technologies to address technical risks. One notable example is the improvement of solar technologies to enable them to operate under extreme weather conditions, such as sand storms and high temperatures.[28] Collaboration in order to share best practices for technology adoption and to develop robust technology standards can also facilitate global markets and technology transfer (IRENA, 2013).

135. While there is a strong case for enabling technology transfer from developed to developing countries, the value of local and indigenous knowledge available in developing countries should be recognized as well. Many mitigation practices and technologies originating in developing countries are more suited to local conditions, have a reduced impact on the climate and should be considered and shared through both South–North and South–South knowledge exchange channels. Furthermore, not all RE technologies are environmentally sound and socially accepted. This calls for an assessment of the relevancy of RE technologies in certain specific contexts. Such calls are reflected, for example, in the negotiations on the post-2015 sustainable development goals for technology assessment and are relevant to the discussion on RE.

[27] ADP briefing on support to increase RE supply by UNFCCC institutions and other international organizations.
[28] ADP briefing on support to increase RE supply by UNFCCC institutions and other international organizations.

B.3. Capacity-building

136. It is well recognized that capacity-building to support RE and EE deployment is required at various levels, including institutional, organizational and individual, and at all stages of the policy cycle. At the initial stage of policy planning, training in assessing resource potential, modelling, data gathering and technical and economic analysis can enable the robust assessment of opportunities and informed decision-making. Enhancing the institutional capacity to design and implement policies effectively is also a need in a number of national contexts and can be informed by international lessons learned and good practices.

137. Furthermore, to move on from policy planning to implementation, there is a critical need for the organizational and individual training of project developers for them to prepare robust and economically feasible project plans and proposals.[29] Capacity-building to support RE and EE business development can include partnership with the private sector and encompass networking events and trade fairs to facilitate the connection of businesses and entrepreneurs supporting RE and EE deployment.[30]

138. The training of domestic lenders and financial institutions can help to reduce or eliminate misconceptions related to the risks involved in clean energy projects that can lead to high lending rates. Banker training can include detailed project examples, pro formas and feasibility studies from existing projects. Furthermore, bankers and financial institutions can also benefit from introductory training on technologies to ensure adequate technical understanding.

139. To support policy implementation, there is a significant need for scaled-up technical capacity-building on all aspects of the RE technology value chain, from technicians on the ground, through the operation of power plants, to the overall planning of grids and interrelated energy systems. Finally, building the capacity of local communities to understand and support positive outcomes for RE and EE is also essential for sustaining local markets and public support for clean energy initiatives (Cox et al., 2015).

[29] The IRENA project navigator, available at <www.irena.org/navigator>.
[30] ADP briefing on support to increase RE supply by UNFCCC institutions and other international organizations.

Chapter VII

POSSIBLE NEXT STEPS

140. This chapter summarizes the views presented by Parties and other stakeholders on next steps in the technical examination of opportunities for enhanced RE and EE improvements in the period 2016–2020; other views relating to options for enhancing the ambition of emission reduction pledges, mitigation action and support; as well as considerations relating to future political and technical work to enhance mitigation ambition. It encompasses the views expressed at a number of meetings held in 2015, including the dedicated meeting on the technical examination process held during the ADP session in February 2015, relevant meetings held during the ADP sessions in June and August–September 2015 and the two TEMs and related briefings held in June 2015.

A. Overview of next steps for accelerating renewable energy supply and energy efficiency in urban environments

141. The exchange of knowledge among Parties, decision makers and practitioners and showcasing best practice experiences and success stories have proven to be essential for supporting effective RE and EE policy design and scaled-up implementation. Knowledge exchanges can continue and take the form of technical forums, TEMs and workshops, as well as the technical papers and summaries for policymakers that were produced throughout the technical examination process. They could also serve as a platform to further discuss the role of UNFCCC institutions and partnerships and how they can ensure that their activities fully meet Parties' expectations, complement each other and avoid duplication of effort.

142. Looking ahead, in terms of thematic areas, the technical examination process could focus on ways to reduce energy consumption, enhance EE and accelerate RE uptake in both developed and developing countries, in particular to ensure improved access to energy and energy poverty alleviation in developing countries. As such, stronger links could be pursued between the UNFCCC Technology Mechanism and Financial Mechanism, as well as between both the public and private sectors and project developers, to support DG energy access projects. The technical examination process could also look at broader issues, such as ways to support the target of doubling the share of RE by 2030 articulated by IRENA (IRENA, 2014) and the needed fundamental transformation of the electricity and transport sectors. The process could further look into different emission scenarios, transformative actions and scaled-up investments that are needed for the world to stay on track to limiting global warming to below 2 °C above pre-industrial levels.

143. In addition, scaling up means of support through finance, technology transfer and capacity-building, as outlined in chapter VI above, is deemed essential in catalysing RE- and EE-related action in developing countries. The technical examination process could look into the key actions for mobilizing more ambitious support, including: (1) supporting the design of effective incentives to attract private finance; (2) building the capacity of RE and EE project developers and domestic lenders; (3) raising awareness of RE and EE technologies to reduce misconceptions regarding risk and other factors; (4) mobilizing finance through the GCF and other key initiatives; (5) providing early stage/readiness financing to support feasibility studies and project initiation; and (6) de-risking investment through innovative and proven approaches and mechanisms for providing financial support. Parties also suggested to return, in 2016, to the discussion on the progress achieved by the initiatives presented at the TEMs and to conduct more focused discussions at future TEMs on such progress with the engagement of all stakeholders.

144. Enhancing collaboration and partnerships to include more diverse stakeholders will add great value to RE and EE deployment efforts. In addition to new partnerships that could address critical needs, coordination among existing partnerships is crucial in ensuring complementary, focused and non-duplicative efforts. The technical examination process could play a key role in supporting such coordination and the creation of new partnerships and initiatives.

145. The launch after the latest TEMs of two new initiatives in the areas of EE and RE, namely the Africa Group Renewable Energy Partnership Proposal and the Global Alliance for Buildings and Construction led by UNEP demonstrated the potential outcomes of the TEMs (see spotlight boxes 12 and 13). The former initiative is an inspiring example of the power of collaboration among developing countries to support scaled-up RE and transformative RE deployment within the African continent.

Spotlight box 12

Africa Group Renewable Energy Partnership Proposal

Under this proposal, African countries seek to create a global partnership in the UNFCCC context to catalyse clean energy transformation. It highlights the need and promotes support for renewable energy in developing countries through creation of effective incentives, such as feed-in tariffs, international public climate funding through the Green Climate Fund, and other means. As a linked effort, the African countries are forming an Africa Renewable Energy Initiative that will outline how African countries can accelerate efforts towards transitioning Africa to renewable energy powered future, with access for all by 2030. The Africa Renewable Energy Initiative will help to enable at least 10 GW new and additional renewable energy capacity by 2020 and at least 300 GW new renewable energy capacity by 2030 and is intended to inspire and serve as a model for global partnership efforts.

Source: Presentation made by Mali at the Ad Hoc Working Group on the Durban Platform for Enhanced Action technical expert meeting on renewable energy in June 2015.

Spotlight box 13

Global Alliance for Buildings and Construction

The Global Alliance for Buildings and Construction has been proposed to support significant emission reductions, align and coordinate scaled-up action and catalyse strong collaboration among cities, States, regions and countries within the buildings and construction sectors and across sectors. The alliance will facilitate communication, collaboration and implementation of ambitious actions and is proposed to be launched at the first "Buildings Day" at the

twenty-first session of the Conference of the Parties. It will demonstrate and reinforce the impact of stakeholder mobilization on achieving a below 2 °C emission pathway by: regularly convening stakeholders operating in the buildings sector; building capacity and implementing comprehensive building efficiency strategies and policies; creating value chain transformation, including workforce development, skills and training, support for technology transfer and capacity-building; and increasing financing options adapted to accelerate investment and funding for building mitigation projects and programmes.

Source: Global Alliance for Buildings and Construction. Raising the Sector's Huge Climate Action Potential. Available at <http://newsroom.unfccc.int/lpaa/building/global-alliance-for-buildings-and-construction/>.

B. Enhancing the ambition of emission reduction pledges

146. Parties attach great importance to and put priority on the implementation of their pre-2020 mitigation commitments and pledges and the mobilization of related support. Hence, they view the technical examination process as an essential supplement that contributes to increasing mitigation ambition over time. Workstream 2 contributed to creating a momentum for climate action and policy implementation and evolved as an opportunity to set the foundation for post-2020 work on the basis of a solid grounding of trust and confidence in the action taken by all Parties.

147. Some Parties suggested that the ADP should ensure continuous progress and a smooth transition between the post-2020 regime and pre-2020 ambition. They consider that 2020 constitutes an artificial divide on the policy landscape at the national level. Many Parties have adopted or are in the process of preparing longer-term development strategies taking fully into consideration their pre-2020 action. It is already known that the emissions gap is likely to remain even after 2020, so more ambitious and long-lasting solutions enacted and implemented before 2020 should continue into the future and aim to accelerate a downward emission trend consistent with the 2 °C goal.

148. Developing country Parties raised concerns related to the gap in implementation of the emission reduction commitments made under the Cancun Agreements. To that end, several Parties expressed the view that developed countries should take the lead in terms of their existing commitments by 2020 in relation to emission reductions as well as the provision of support to developing countries. Developing countries have called for an accelerated implementation process, mechanism or forum of the Bali Action Plan, which could assist in closing the mitigation gap in a pragmatic way by preparing a plan to guide Parties' actions, identify priorities and potential for enhancing climate action, set a framework for further action and promote information sharing.

149. Several options and ways to enhance the ambition level of the current emission reduction pledges were proposed during the discussions, including those that were already reflected in the previous COP decisions relating to enhancing mitigation ambition in the pre-2020 period and the draft COP decision on this matter currently under consideration by the ADP.

C. Enhancing the ambition of mitigation actions and support

150. During this year of the technical examination process, Parties continued highlighting the need to promote a solutions agenda, which is crucial for the accelerated implementation of climate action and the achievement of existing emission reduction pledges. Workable and scalable policy and technology solutions coupled with regular high-level engagement could galvanize the pre-2020 multi-stakeholder climate agenda. Enhancing the technical examination while building links with the implementation arm of the Convention working on the provision of means of support would set a firm foundation for the post-Paris Conference solutions agenda.

151. Possible actions of the ADP that were suggested by many Parties to enhance the implementation of mitigation action include the following:
(a) Reinforcing the links between the recommendations arising from the technical examination process and domestic climate-related decision-making;
(b) Undertaking analysis and identification of best practice national actions and lessons learned through a process of regular analysis of mitigation actions undertaken by Parties.

152. Many developing country Parties called attention to closing the finance gap, highlighting that the support provided to combat the climate challenge is not sufficient and that additional resources are needed. Establishing a catalytic process to mobilize adequate financial resources could be one way of mobilizing financing for the implementation of NAMAs. To this end, the NAMA Registry should more actively contribute to matchmaking efforts.

153. Possible action related to enhancing financial, technological and capacity-building support includes the following:
(a) Assessing ways to provide enhanced financial, technological and capacity-building support to developing countries for the implementation of their pledges and NAMAs and assessing the adequacy of resource availability;
(b) Inviting multilateral development banks, financial institutions and other players that have not done so to join in the climate change agenda by facilitating the implementation of feasible mitigation solutions and creating innovative financial instruments. The engagement of such institutions could direct financial flows to actions that are conducive to closing the finance gap;
(c)Strengthening synergy and collaborative efforts and engaging the existing UNFCCC support institutions established under the Financial Mechanism and Technology Mechanism in framing their work programmes in line with the outcomes of the technical examination process.

D. Options for work at the political level to enhance mitigation ambition

154. Work at the high level of policymaking is deemed important for sending a political signal to all Parties to increase ambition by 2020 and for building the trust and confidence of Parties and other stakeholders. This is critical for investments in low-carbon, climate-resilient development opportunities so as to avoid locking in carbon-intensive infrastructure and technologies, and to identify approaches, ways and options to enhance ambition as required by science. Parties highlighted that assurance is needed that the global emission pathways could be lowered to become consistent with

having a likely chance of holding the increase in global average temperature below 2 °C above pre-industrial level in the long term and clarity is needed on how early pre-2020 action could contribute to that end.

155. Many Parties seek to involve ministers through regular annual high-level engagement with the inputs from the technical examination process and with the participation of non-State actors, including the private sector and civil society, as reflected in the Lima Call for Climate Action. It was suggested that such engagement would aim to translate technical considerations into concrete action and build a long-term political strategy with milestones for up to 2020. Such engagement would also help to draw a clear link between the technical and political aspects of the work and aim to identify concrete actionable solutions and options for support, mobilize relevant actors, encourage collaborative action and put political pressure and focus on the implementation of actionable solutions.

156. The Lima-Paris Action Agenda (LPAA) and the September 2014 United Nations Climate Summit, as well as previous technical work conducted by the ADP, provided a strong foundation for action. Progress made through those processes and events should be harnessed and built upon to accelerate climate action. LPAA, led by two COP Presidencies – Peru and France, has portrayed workstream 2 as one of four pillars of the action agenda, which is working on bringing political attention and visibility to a diversity of new climate action announcements at COP 21 through the organization of Action Days. It aims to connect the real economy with the UNFCCC process by mobilizing and catalysing work and creating linkages between practitioners and decision makers. Proposals were made to recognize the LPAA experience that could be replicated by new incoming Presidencies, which could join the partnership through a long-lasting institutional arrangement. Such arrangement was suggested to ensure the political continuity of the solutions agenda.

157. It was also proposed to create a platform during the COPs to encourage non-State actors, including the private sector and civil society, to announce major new initiatives and innovative efforts that address climate change. This would allow governors, mayors, representatives of subnational authorities, businesses and others to speak about their efforts in a high-profile setting and receive recognition for the role of climate action in supporting the objective of the Convention. Such platform could be informed by the inputs provided by the Non-State Actor Zone for Climate Action (see chapter VII.F below).

E. Options for technical work to enhance mitigation ambition

158. The Lima Call for Climate Action made it clear that the technical examination process, launched under the ADP, focusing on mitigation opportunities with significant sustainable development co-benefits, is expected to continue up to 2020.

159. The outcomes of the technical work delivered during the period 2014–2015, such as the TEMs and technical papers, have empowered Parties to better understand the benefits of interactive information exchange on national policies, actions, technologies and cooperative initiatives. Such technical papers and expert meetings could continue to highlight key country and city examples, critical lessons learned and enabling practices to support the implementation of effective policies and actions in countries and jurisdictions, while also providing a space for the recognition of notable and innovative multilateral initiatives that should be commended.

160. There is a great deal of information available on mitigation policies; however, distilling that information into products that clearly articulate actions aimed at moving from planning to implementation will continue to be of great value. To that end, the Lima Call for Climate Action already provides a mandate[31] for the secretariat to publish summaries for policymakers[32] on a regular basis as input to the high-level dialogues convened at the sessions of the COP. These summaries for policymakers will be based on the technical papers and the information stemming from the TEMs and other internationally recognized sources of information.

161. Parties would like the continuation of the technical examination process to generate outputs that are more visible, dynamic and easily accessible to Parties and all stakeholders involved in the broader implementation agenda. One means of achieving that could be an online menu of policy options that were examined in the process.

162. Parties emphasized that the TEMs provided an opportunity to clarify the process-related proposals made by Parties and enriched the discussion on ways to advance the work on mitigation ambition. Most of that work could continue through TEMs, which could be used to build Parties' understanding of the options and ways to enhance implementation work and build relevant mitigation toolboxes, which will include various policy and support instruments.

163. There was a proposal for the technical examination process to continue to explore the full potential and impact of opportunities with high mitigation potential and focus on the following topics: transport, including international aviation and maritime transport; fossil fuel subsidy reform; climate financing and the promotion of climate-friendly investment; the role of cooperative initiatives in enhancing national action; and cross-cutting issues relating to domestic processes to facilitate long-term economic transformation, including the institutions and legal settings needed to develop and implement mitigation policies.

164. Many Parties proposed various ways to advance the technical work to enhance the implementation of mitigation actions, initiatives and options with high mitigation potential, covering in a comprehensive manner such aspects as mitigation, adaptation, transparency, and finance, technological and capacity-building support.

165. Some Parties proposed to continue the technical examination process with a focus on regional opportunities to enhance mitigation ambition and the regional dissemination of solutions in collaboration with an external process to gauge political leadership within the regions and harvest the results. Such regional processes could cover the mitigation and adaptation priorities relevant to the national circumstances of the countries in the region and could be organized in conjunction with other relevant activities, for example regional NAMA workshops organized by the secretariat.

166. Many developing country Parties called for a new technical examination process with a focus on adaptation policies, practices and opportunities, which could build on the accumulated lessons learned from and experience of workstream 2. However, to avoid duplication of the efforts of existing bodies such as the Adaptation Committee, the process should have a defined scope and benefit from the accumulated wealth of expert knowledge and ongoing work.

167. One option put forward to support the scaling up of progress in implementation is to design permanent institutional solutions to govern the process and to appoint co-champions to lead the

[31] Decision 1/CP.20, paragraph 19(c).
[32] The summary for policymakers will be published before COP 21.

high-level engagement in the implementation of policy options and actions arising from the technical examination process and to identify viable solutions for support. Those champions could represent developed and developing country Parties and be supported by a small team. The issue of the future institutional home of the technical examination process was much debated and a number of options were put forward, such as to place it under the COP or the Subsidiary Body for Implementation (SBI), or under the SBI and the Subsidiary Body for Scientific and Technological Advice as a joint agenda item. The CTCN was mentioned as an option for a platform for the future technical examination process.

F. Engagement of non-State actors and the role of partnerships

168. Collaboration among Parties, UNFCCC institutions, international organizations and non-State actors will be critical in ensuring the scaling up of efforts and the complementarity thereof, better coordination and synergies, preventing duplication and supporting the effective implementation of the policies and actions and provision of support described in this technical paper.[33] To support that collaboration, the UNFCCC is expected to continue to strengthen cooperation and coordination among all of its institutions. Coherence in the global implementation landscape would streamline many ongoing parallel processes and improve synergy and cooperation among them.

169. To recognize and support ongoing progress, it was proposed to highlight and recognise notable actions, initiatives and partnerships of governments, international institutions and non-State actors. Such announcements could help to inspire replication of successful and innovative initiatives, policies and approaches and provide a forum to share lessons learned and best practices associated with key actions. The Non-State Actor Zone for Climate Action[34] could become a web interface for the visible follow-up and showcasing of new initiatives and announcements made by a multitude of stakeholders.

170. In addition, Parties could nominate relevant experts, international organizations, civil-society institutions, indigenous peoples, women, youth, academic institutions, private-sector entities and subnational authorities to be meaningfully, regularly and effectively engaged in the technical examination process. Going beyond the sharing of information and experiences, this process could provide a possibility for Parties to explore and identify new initiatives and partnerships, which could in turn inform and influence negotiations, mobilize additional means of support and enhance mitigation and adaptation ambition.

[33] Summary by the facilitator of the ADP TEM on RE in June 2015.
[34] Available at <http://climateaction.unfccc.int/>.

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