



TRAINING MODULE 4

Gender and sustainable energy

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1

Purpose of the training module

1A *Rationale*

As the United Nations' lead development agency with extensive field experience, the United Nations Development Programme (UNDP) has implemented numerous innovative initiatives that support national-level work on gender equality and women empowerment. UNDP's work on gender is guided by the Beijing Platform for Action (BPFA), Convention on the Elimination of All Forms Discrimination against Women (CEDAW) and frameworks provided by the Sustainable Development Goals (SDGs).

UNDP Gender Team presents updated versions of 10 training modules and policy briefs on gender dimensions of climate change covering a range of themes and sectors. An additional set of knowledge products has also been added covering the gender and REDD+ interface. These knowledge products are designed to build capacity in member countries with respect to gender and climate change within the context of sustainable development. Their preparation has been made possible by contributions from the Government of Finland.

This fourth module in the series deals with gender aspects of sustainable energy.

Icon Key



*Activity
or Exercise*



*Link to other
Modules*



*PowerPoint/video
presentation*



Readings



*Important
information*



*Timing
indication*



*Internet
link*

1B *Module structure and method*

This module provides basic information and learning tools needed to understand and advocate for the integration of gender perspectives into the energy sector. It covers the following topics:

- The role of energy within the context of sustainable human development
- Gender dimensions of energy production and use
- The need and options for gender responsive sustainable energy policy

Part II of this module outlines learning objectives and presents what users can expect to know when the training concludes. Part III presents the key take-away messages, followed by Part IV, which presents the role of energy in advancing sustainable human development, and Parts V and VI, which address the gender component of energy use and production and options for making the energy sector gender-responsive. At the end of the training, users will have a strong understanding of the role of sustainable energy access, production and distribution in the promotion of sustainable human development as well as climate change mitigation and the vital roles that women (could) play in sustainable energy production and access.

The module also presents case studies and other learning tools (e.g., hand-outs and group activities) to think through issues when designing gender-responsive responses to sustainable energy and to help facilitate use of the module. In addition, the module employs seven pictures and icons to help make it user-friendly (see Box 1). The module includes several cross-references in order to encourage facilitators and participants to consult the other modules in this series.

Training based on this module could be delivered in three sessions:

- Session 1: Parts II and IV (1 hour)
- Session 2: Part V (1 hours)
- Session 3: Part VI (1 hours)

Total estimated session time: 3 hours

See Appendix B, Learning Tools, for a breakdown of time for different activities.

2

Objectives

- *Understand the relationship among access to affordable, sustainable and modern energy and sustainable development goals, including gender equality and women's empowerment as well as climate change mitigation.*
- *Understand the gender dimensions of energy access and use, including the ways in which improved gender inclusion would benefit the energy sector and help address energy poverty, a challenge that continues to burden legions in the developing countries, especially women.*
- *Identify entry points for gender responsive energy use and access and action that empower women and other marginalized groups.*



3

Key messages



Energy is a critical input to economic development, essential for poverty alleviation and an important sector for climate change mitigation. Sustainable energy is not only a stand alone Sustainable Development Goal (SDG), but also a precondition for success across the SDGs.

Climate change impacts the energy sector, including supply, demand, energy endowment, infrastructure and transportation. On the other hand, the sector is also responsible for a significant share of historic and current greenhouse gas emissions (GHGs).

Many rural communities in the developing world, especially sub-Saharan Africa and Southeast Asia, still do not have access to basic energy or energy services. Millions still rely on solid fuels, and their collection and management is generally women's responsibility.

Women and men play very different gender-defined roles in energy production, distribution and utilization in households, communities and the market.

Women are time-poor and disproportionately exposed to the health risks associated with some forms of energy production.

Climatic stresses on biomass resources are increasing the burden on many women, forcing them to travel even longer distances and spend more time in fetching fuel wood, water and fodder.

Improved, modern energy services can improve women's socio-economic status by reducing the time and effort involved in household chores and alleviating the health risks associated with current energy practices. Renewable sources of energy, such as solar, especially provide promising potential.

There are several small-scale clean technologies that can improve safety, efficiency and cleanliness of energy production, distribution and use.

Introducing cleaner, more efficient and renewable energy sources can bring training, employment and entrepreneurial opportunities for women.

Empowering women and girls and drawing on their unique needs, skills and knowledge is necessary for energy development, energy security and reducing emissions.

Incorporating gender perspectives into energy projects, policy and planning is essential to ensuring their effectiveness and sustainability.



4

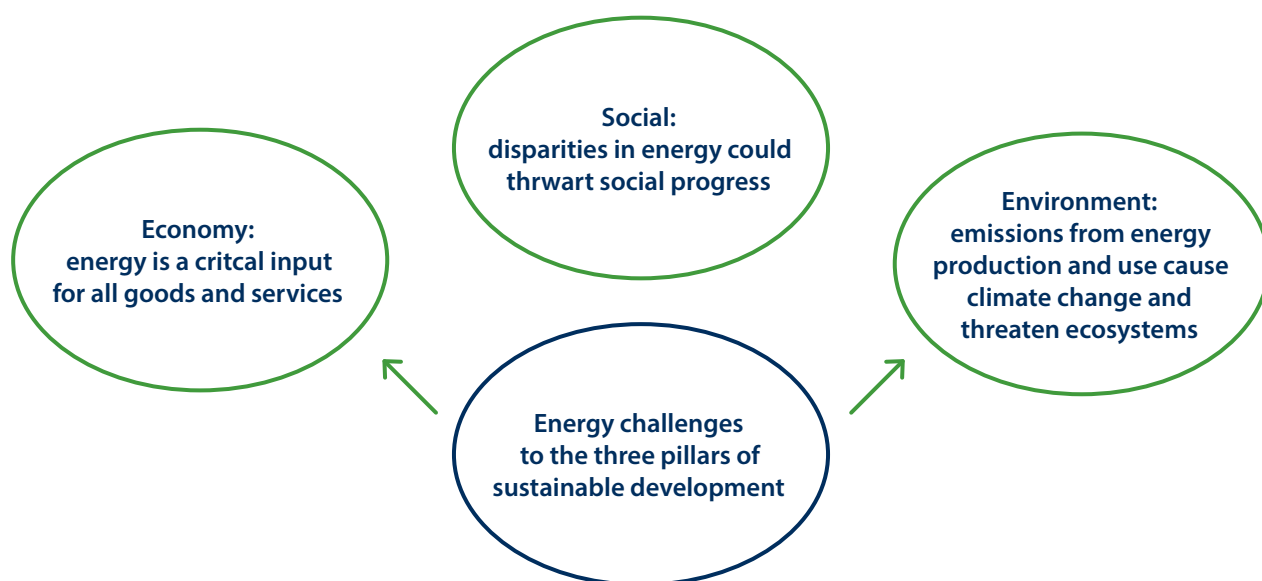
Sustainable energy is a human development enabler

Learning objective:

Understand the role of sustainable energy in climate change mitigation and achievement of sustainable development goals

1. Energy is arguably the single most important prerequisite for success of the three pillars of sustainable development – economic, environmental and social development (see Figure 1).
 - Energy is the blood vein of the economy. Most economic activity would be impaired without energy, which is a key input for nearly all goods and services. Modern energy services play a critical role in facilitating access to clean water, sanitation and health services and help advance development by providing reliable and efficient lighting, heating, cooking, mechanical power, transport and telecommunication services (IEA 2010). Conversely, lack of adequate access to affordable, reliable and modern energy services ensnares people in a vicious circle of ‘energy poverty’ (see Box 1 for relevant definitions). In developing countries, energy access is a major issue at the national and individual levels. Millions of people still do not have access to modern energy services. Where such services exist, they are often characterized by interruptions and high-cost relative income (UNDP 2016a).
 - Energy production and use lead to significant greenhouse gas emissions (GHGs). According to the International Energy Agency (IEA), two thirds of global greenhouse gas emissions are from the energy sector alone, which makes the energy sector a major culprit in climate change (IEA 2015). Biomass, a significant source of energy in many developing countries, (e.g., charcoal and fuelwood), also contributes to degradation of land and forests and to black carbon.
 - Asymmetries in power related to energy access, use and distribution at the national, community and family levels often result in social inequities. Women often bear the brunt of energy poverty, often with harsh implications to their health and well-being. Rural women also tend to devote a disproportionately large portion of their time on other heavy burdens such as gathering fuel wood and water, cooking and agro-processing (see Part VI).

FIGURE 1 Energy and the three pillars of sustainable development



Box 1 Understanding energy poverty and access to energy

Energy poverty: “The concept of ‘energy poverty’ has arisen from the definition of poverty itself. The World Bank study *Listening to the Voices of the Poor* concludes that poverty is a complex, multidimensional phenomenon—gendered, dynamic, complex, institutionally embedded and location-specific. It is routinely defined as ‘the lack of what is necessary for material well-being’—particularly regarding food, but also housing, land and other assets. Poverty is the lack of multiple resources leading to physical deprivation. This definition is consistent with the more recent notion of the Multidimensional Poverty Index as advocated in the 2010 Human Development Report, which relates poverty to overlapping deprivations suffered by households in areas of health, education and living standards. The dimensions of poverty go beyond inadequate income, encompassing poor health and nutrition, low education and skill levels, inadequate livelihoods, bad housing conditions and social exclusion.”

Energy access: “Making modern energy available and affordable. Over the years, energy access and energy poverty have been defined in many ways. These definitions converge in highlighting the role that modern energy services can play in reducing poverty and achieving the MDGs. As the perspective of poverty is becoming multidimensional, energy poverty is described as a lack of access to resources, denial of opportunities and choice in access to energy that is adequate, safe and reliable for economic and human development. Access is then a function of availability and affordability, where energy is considered available if the household is within the economic connection and supply range of the energy network or supplier and affordable when the household is able to pay the up-front connection cost (or first cost) and energy usage costs.”



Box 1 Understanding energy poverty and access to energy

Minimum energy access thresholds: “There is no universally accepted minimum threshold for energy access. Poor households spend a large portion of their incomes and human resources on energy because it is essential to meeting basic needs such as cooked food and transport. Using this as the starting point, the International Energy Agency proposed 100-kilowatt hour (kWh) of electricity and 100 kilograms of oil equivalent of modern fuels per person per year as a minimum threshold for defining energy access. The high-level Advisory Group on Energy and Climate Change states that access must be reliable, affordable (the cost to end-users compatible with their income levels and no higher than the cost of traditional fuels), sustainable and, where feasible, from low greenhouse gas-emitting energy sources. At the same time, it contends that expanding energy access must go beyond meeting the basic needs: it should aim to create improved conditions for economic take-off, contribute to attaining the MDGs and enable the poorest to escape poverty.”

Note: The 17 Sustainable Development Goals (SDGs) build on the successes of the Millennium Development Goals (MDGs), while including new areas such as affordable and clean energy, climate change, economic inequality, innovation, sustainable consumption, peace and justice, among other priorities. Thus, all references to MDGs in Box 1 are still applicable in the context of SDGs.

Source: UNDP 2011:19

2. Energy poverty, which may be understood as the absence of adequate modern energy services to meet basic household needs (e.g., cooking, lighting) and the lack of basic energy for essential services (e.g., health care, schooling, income generation), is one of the most daunting challenges facing the international community today. “The hidden crisis of energy poverty condemns billions of men, women and children in the developing world to continue to live in absolute poverty because they have no access to modern energy services; energy which is taken for granted in the developed world at the flick of a switch or the press of a button” (Practical Action 2009). The number of people who have no access to modern energy is inexcusably high - one in five people in Africa, Southeast Asia and South Asia (close to 1.3 billion people) do not have access to electricity and close to 3 billion people (40 percent of the global population) burn solid fuels such as wood, charcoal, animal waste or crop residues in open fires or inefficient stoves for their daily cooking and heating (UN 2011; IEA, 2014a; see Tables 1 and 2 for regional aggregates on biomass energy and access to electricity in 2014). Energy poverty is intimately linked to general poverty. With the absence of significant political commitment and investment in addressing equity issues in energy supply and demand, energy poverty is projected to increase further over the next 20 years (Danielsen 2012).

TABLE 1 *Population relying on traditional use of biomass for cooking in 2014*

Region	Population relying on traditional use of biomass (millions)	Percentage of population relying on traditional use of biomass (%)
Developing countries	2,742	49%
Africa	793	69%
North Africa	1	0%
Sub-Saharan Africa	792	81%
Developing Asia	1,875	50%
China	453	33%
India	819	63%
Latin America	65	14%
Brazil	10	5%
Middle East	8	4%
World	2,742	38%

Source: IEA 2016

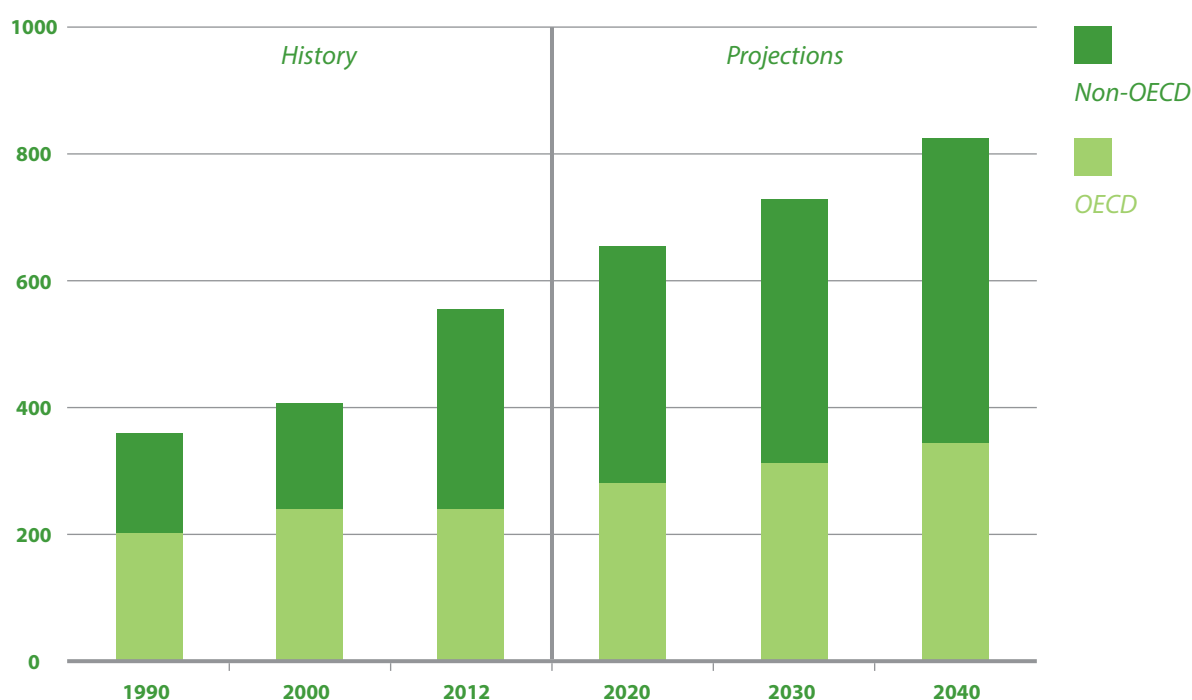
TABLE 2 *Electricity access in 2014 - Regional aggregates*

Region	Population without electricity (millions)	Electrification rate (%)	Urban electrification rate (%)	Rural electrification rate (%)
Developing countries	1,185	79%	92%	67%
Africa	634	45%	71%	28%
North Africa	1	99%	100%	99%
Sub-Saharan Africa	632	35%	63%	19%
Developing Asia	512	86%	96%	79%
China	0	100%	100%	100%
India	244	81%	96%	74%
Latin America	22	95%	98%	85%
Middle East	18	92%	98%	78%
Transition economies & OECD	1	100%	100%	100%
World	1,186	84%	95%	71%

Source: IEA 2016

3. Climate change impacts affects, or is affected by, energy production and use in at least three ways. First, because reduction of the carbon intensity of energy is imperative in the fight against climate change, the energy sector is key in climate change mitigation (IEA 2011; see Para 5-8). Second, climate hazards can also directly disrupt existing energy systems (e.g., hydropower facilities built in vulnerable space) (see Para 9; Table 3). Third, energy poverty is likely to get worse as a result of climate change (see Para 10; Part V).
4. The energy sector - responsible for almost two thirds of global GHGs - presents monumental challenges for the future of the planet. Energy sector carbon dioxide emissions are more than 40 percent higher now compared with 1997 levels (UNDP 2016b). Curbing global greenhouse gas emissions is critical to mitigating climate change. Because energy demand is growing (48 percent increase from 2012 to 2040 (USEIA 2016)), the attendant increase in energy-related emissions is a cause for great concern. According to the International Energy Agency, world energy-related carbon dioxide emissions could rise from 30.2 billion metric tonnes in 2008 to 35.2 billion metric tonnes in 2020 and 43.2 billion metric tonnes in 2035 - an increase of 43 percent over the projection period (IEA 2011).

FIGURE 2 World energy consumption 1990-2040 (quadrillion btu)



Note: Figure 2 shows that the "total world energy consumption rises from 549 quadrillion Btu* in 2012 to 815 quadrillion Btu in 2040, an increase of 48%. Most of the world's energy growth will occur in the non-OECD nations, where relatively strong, long-term economic growth drives increasing demand for energy. Non-OECD energy consumption increases by 71% between 2012 and 2040 compared with an increase of 18% in OECD nations."

* "A British thermal unit (Btu) is a measure of the heat content of fuels. It is the quantity of heat required to raise the temperature of 1 pound of liquid water by 1 degree Fahrenheit at the temperature that water has its greatest density (approximately 39 degrees Fahrenheit)." http://www.eia.gov/energyexplained/index.cfm/index.cfm?page=about_btu

Source: USEIA 2016

5. Biomass is a significant source of energy in many developing countries, particularly for cooking and heating, but is often harvested and used unsustainably, leading or contributing to land and forest degradation. Specific to solid fuels (biomass energy production), residential solid fuel burning accounts for 25 percent of global black carbon emissions, with about 84 percent emanating from the developing world. In South Asia alone, more than half of black carbon particles emanate from inefficient cooking, possibly contributing to the melting of Himalayan ice at high elevations as well as having adverse environmental effects on water quality and damaging crops (Ramanathan, V. and Carmichael 2008). Black carbon and other aerosols also play a major role in regional climate patterns (Menon et al. 2002).

6. Climate change (e.g., high temperatures, drought and changing precipitation) could lead to erode fertile soils and lead to land degradation, which in turn could lead to release of large amounts of carbon, which contributes to climate change (Reed and Stringer 2016). This iterative negative feedback loop can have a devastating effect on communities who rely (sometimes exclusively) on ecosystem goods and services for their energy needs.

1. This is an average estimate – emissions related to Agriculture, Forestry and Other Land Use (AFOLU) could actually be much bigger (or smaller), depending on the importance of the sector in a country's economy. For example, AFOLU emissions represent 63 percent of total national emissions in Indonesia (Republic of Indonesia 2015).

7. In most parts of the world, large-scale agriculture and the accompanying land cleaning is the major driver of tropical deforestation, which represents 20 percent to 24 percent of total emissions globally¹ (Smith et al. 2014). While there is little empirical data to suggest that fuelwood collection has resulted in large-scale deforestation around the globe (Cooke, Köhlin and Hyde 2008), burning trees to produce electricity is still dirty (results in black carbon) and can result in environmental and health perils. Further, in certain parts of the world (e.g., Sahelian Africa), fuelwood collection and charcoal burning affect land use change and often have adverse (local-level) environmental and health effects (May-Tobin 2011). This is all the more concerning, given the fact that charcoal use is expected to increase in the future (May-Tobin 2011). Relatedly, climatic stresses on natural resources such as fuelwood could also encourage a switch to 'cheaper and inferior fuels', which tend to have higher carbon intensity and health risks (UNDP 2011).

8. Other 'formal sources of energy are also expected to be more and more impacted by climate change, both on the supply and demand sides (Ebinger, J. and Vergara 2011; see Table 3) The severity of such impacts will be a function, in part, by the current state of the specific energy sector, system or plant at a particular time (e.g., inefficiencies in energy and water use or siting of energy plants in vulnerable spaces) (Ebinger, J. and Vergara 2011). Thus, climate change can have an indirect impact on energy systems – climatological hazards (e.g., tropical cyclones) could trigger power failures by physically destroying energy infrastructures sited in coastal areas (Karekezi et al. 2009). For example, in the Gulf Coast, which hosts nearly 30 percent of the crude oil production in the United States, hurricanes Katrina and Rita destroyed more than 100 oil platforms and damaged 558 pipelines in 2005 (USGCRP 2009).

TABLE 3 *Energy sector vulnerability to climate change*

Item	Relevant climate impacts			Impacts on the energy sector
	General	Specific	Additional	
Climate change impacts on energy supply				
Hydropower	Water availability and seasonality	Water resource variability Increased uncertainty of expected energy output	Impact on the grid might overload transmission capacity Extreme events	Increased uncertainty Revision of system reliability Revision of transmission needs
Wind power	Alteration in wind speed frequency distribution	Increased uncertainty of energy output	Short lifespan reduces risk associated with climate change extreme events	Increased uncertainty on energy output
Biofuels	Reduced transformation efficiency	High temperatures reduced thermal generation efficiency	Extreme events	Reduced energy generated Increased uncertainty
Solar power	Reduced solar cell efficiency	Solar cell efficiency reduced by higher temperatures	Extreme events	Reduced energy generated Increased uncertainty
Thermal power plants	Generation cycle efficiency Cooling water availability	Reduced efficiency	Extreme events	Reduced energy generated Increased uncertainty
Oil and gas	Vulnerable to extreme events	Cyclones, floods, erosion and siltation (coastal areas, on land)	Extreme events	Reduced energy generated Increased uncertainty
Impact on energy demand				
Energy use	Increased demand for indoor cooling	Reduced growth in demand for heating Increased energy use for indoor cooling	Associated efficiency reduction with increased temperature	Increasing demand and peak demand taxing transmission and distribution systems
Other impacts				
Cross-sector impacts	Competition for water resources Competition for adequate siting locations	Conflicts in water allocation during stressed weather conditions Competition for good siting locations	Potential competition between energy and non-energy crops for land and water resources	Increased vulnerability and uncertainty Increased costs

Source: Adapted from Ebinger and Vergara 2011

9. Climate-induced pressures on ecosystems could diminish the availability of much-needed livelihood resources (e.g., fuel wood for energy) for many rural communities. As discussed above, electricity is still a luxury for more than 1 billion people around the developing world, who rely on biomass energy for their daily energy needs (FAO 2010; see Tables 2 and 3). Thus, any climatic stress on adjacent natural resources is bound to exasperate the already rampant energy poverty of millions of people and communities, especially the forest-dependent communities. Energy poverty tends to be more burdensome on poor and marginalized groups, especially women (Part V addresses the gender aspect in greater detail).



For more information on the gender – REDD+ interface, see TM 6

10. While energy poverty is discussed in this module primarily in the context of rural poverty, a big percentage of the urban population in developing countries also suffers from the malaise. Enhanced access to sustainable energy services is still wanting in most developing countries (see Box 2).

Box 2 Energy challenges among the urban poor

“The urban poor in many developing countries who typically have some access to energy also face a number of challenges. They often experience irregular electricity supply, frequent blackouts, and quality problems associated with the grid electricity such as low or fluctuating voltage. Affordability is another key aspect, which may force households to remain without electricity due to high connection fees and tariffs. Informal or illegal connections are also a common practice in many urban centres that can impact the overall supply of electricity to the city. These illegal connections also often pose a significant safety hazard due to poor wiring and absence of safety devices.”

Source: UNDP 2016b

11. Climate change reveals the two interconnected challenges related to the energy sector. On the one hand, energy services, where they exist, present a daunting challenge to the extent that they contribute to greenhouse gas emissions (GHGs). On the other, lack of modern energy is a huge human development challenge. The solution to both challenges is to ensure the existence of sustainable energy – energy that is accessible, cleaner and more efficient (UNDP 2016a; UNDP 20116b). Numerous recent global processes and initiatives, described below, have recognized and elevated the role of energy as a catalyst in promoting human development:

Recent energy related global initiatives

- **SE4ALL Initiative:** In 2011, the Secretary-General launched Sustainable Energy for All (SE4ALL) as a global initiative to accelerate the transformation of the world's energy systems, pursue the elimination of energy poverty and enhance prosperity. The initiative provides a global, multi-stakeholder platform for scaling up efforts to deliver on three critical SE4All objectives: (1) ensuring universal access to modern energy services; (2) doubling the global rate of improvement in energy efficiency; and (3) doubling the share of renewable energy in the global energy (UN 2011).
- **The Decade of Sustainable Energy for All:** On 21 December 2012, the UN General Assembly unanimously declared the decade 2014–2024 as “the Decade of Sustainable Energy for All”, underscoring the importance of energy for sustainable development and for the elaboration of the post-2015 development agenda (UNGA 2012).
- **The 2030 Sustainable Development Agenda:** The seventh Sustainable Development Goal (SDG 7) in the 2030 Sustainable Development Agenda aims to “ensure access to affordable, reliable, and sustainable modern energy for all”. Energy is also a crucial enabler of other SDGs. Box 3 explains the energy – SDG nexus (UN 2015a).

Box 3 Energy and the Sustainable Development Goals

SDG 1 – Poverty

End poverty in all its forms everywhere

Despite the important role that sustainable energy plays in poverty reduction, about 1.2 billion people still lack access to electricity and nearly 40 percent of the world's population still relies on solid fuels for cooking and heating. Poor people also pay a high price – in cash or in labour – for the energy they use. Moreover, they spend a much greater share of their household income on energy than do wealthy people – not only because their incomes are so much smaller, but also because the fuels they use are so much less efficient than modern fuels. No country has managed to substantially reduce poverty without greatly increasing the use of energy.

SDG 2 – Food

End hunger, achieve food security and improved nutrition and promote sustainable agriculture

Despite the important role that sustainable energy plays in poverty reduction, about 1.2 billion people still lack access to electricity and nearly 40 percent of the world's population still relies on solid fuels for cooking and heating. Poor people also pay a high price – in cash or in labour – for the energy they use. Moreover, they spend a much greater share of their household income on energy than do wealthy people – not only because their incomes are so much smaller, but also because the fuels they use are so much less efficient than modern fuels. No country has managed to substantially reduce poverty without greatly increasing the use of energy.



Box 3 Energy and the Sustainable Development Goals

SDG 3 – Health

Ensure healthy lives and promote well-being for all at all ages

Modern energy helps improve health in many ways. By powering equipment for pumping and treating raw water, it helps ensure a clean water supply, reducing the incidence of waterborne diseases. By boosting agricultural production and household incomes, it helps reduce the malnutrition that is a big factor in child mortality. And by allowing households to switch to modern fuels, it enables the poor to avoid cooking with biomass fuels like wood and dung, whose emissions cause respiratory ailments that are a major health risk in developing countries. Modern energy also helps improve health indirectly. For example, electricity enables health clinics to refrigerate vaccines, operate medical equipment and provide treatment after sunset. It allows the use of modern tools of mass communication needed to fight the spread of HIV/AIDS and other preventable diseases. And, through its benefits for education, it leads to higher literacy among women, which translates into better health for children.

SDG 4 – Education

Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all

For poor people everywhere, access to modern energy services frees time for education, time that would otherwise be spent collecting traditional fuels or performing other menial work. It also frees children to attend school by boosting productivity and thus allowing adult labour to substitute for child labour. Electric lighting in homes enables adults and children to study after their daytime activities. And, in rural areas, modern energy helps retain teachers by improving their quality of life.

SDG 5 – Women

Achieve gender equality and empower all women and girls

Energy access is critical for women's health, education and productive activities, since, in many parts of the world, women spend more time than men cooking and collecting water and fuel. Modern cooking fuels free women from the burden of collecting and carrying large loads of fuelwood and from exposure to smoke from primitive cooking stoves. Modern energy for lighting and motive power enables women to develop businesses – such as in agro-processing industry – that can increase their incomes. Indoor air pollution due to toxic smoke from burning of traditional and solid fuels kills over 4 million people a year, most of them women and their children.

SDG 6 – Water

Ensure availability and sustainable management of water and sanitation for all

Energy and water are intricately connected. All sources of energy (including electricity) require water in their production processes: the extraction of raw materials, cooling in thermal processes, in cleaning processes, cultivation of crops for biofuels, and powering turbines. Energy is itself required to make water resources available for human use and consumption (including irrigation) through pumping, transportation, treatment and desalination.



Box 3 Energy and the Sustainable Development Goals

SDG 8 – Economy

Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all

Modern energy has the biggest effect on poverty by boosting poor people's productivity and thus their income. Most economic activity would be impossible without energy, even the small and medium-scale enterprises that are the main source of jobs for the poor. The kind of economic growth that creates jobs and raises incomes depends on greater and more efficient use of energy. Energy security and resilience against economic shocks due to volatile fuel prices are also key to sustained economic growth.

SDG 9 – Infrastructure

Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation

Expanding energy infrastructure and upgrading technology to provide clean and efficient energy services are crucial and can encourage economic growth, save on costs and help the environment.

SDG 10 – Inequality

Reduce inequality within and among countries

Reducing the global disparity in energy is key to reducing income inequalities, gender inequalities and inequalities in other dimensions such as rural/urban income disparities. A lack of adequate, reliable and affordable supplies of modern energy disproportionately impacts women and children. It is also more severe in rural communities and limits their productive opportunities, enterprise growth and employment and exacerbates income inequality and persistent poverty. In addition, some regions with the lowest energy consumption and greenhouse gas emissions, for example countries in sub-Saharan Africa and South Asia, are the most vulnerable to climate change impacts and will suffer the most. Sustainable energy can help build resilience of these communities against climate change impacts and reduce inequality between and among nations.

SDG 11 – Cities

Make cities and human settlements inclusive, safe, resilient and sustainable

About two thirds of the global primary energy supply is consumed in cities and over 70 percent of the global energy-related carbon dioxide emissions are generated from cities. As urbanization accelerates, demand for energy services will drastically increase. Therefore, providing clean, reliable and affordable electricity, heating and cooling and other sustainable energy services will be critical. Sustainable energy can also contribute to other urban issues such as air quality, waste management, sustainable and more efficient transport, safety and resilience against climate and natural disasters.



Box 3 Energy and the Sustainable Development Goals

SDG 12 – Consumption

Ensure sustainable consumption and production patterns

The production, distribution and consumption of energy have environmental implications. At the global level, the choice of fuels in energy systems is a major determinant in the generation of greenhouse gas (GHG) emissions. More efficient energy production and reducing energy consumption across sectors and appliances such as in buildings, industries and households will not only have benefits for the global environment, but also save on costs and benefit the economy.

SDG 13 – Climate

Take urgent action to combat climate change and its impacts

Energy production and use account for two thirds of the world's greenhouse gas (GHG) emissions, so reaching the global goal of the Paris Agreement must include deep cuts in these emissions and using energy more efficiently. Modern energy and clean energy technology also contribute to adaptation. They enable many productive use activities; diversification of livelihoods away from vulnerable activities is a key factor in building resilience to adverse events, including the impacts of climate change. Energy also allows access to knowledge and information technology, which powers innovation and enables experimentation and testing of different adaptation options.

SDG 15 – Ecosystems

Protect, restore and promote sustainable use of terrestrial ecosystems

A substantial share of today's energy consumption for cooking and heating comes from the use of wood and charcoal by households in the developing world, which can be associated with unsustainable forestry practices and deforestation. This often has knock-on effects such as loss of wildlife, soil erosion and increased flooding.

Source: Extracted from UNDP 2016a

- **Paris Climate Agreement:** Most of the Intended Nationally Determined Contributions (INDCs) submitted thus far as part of the Paris Climate Agreement include country-level actions on mitigation that includes the energy sector. According to the IEA, all INDCs thus far consider emissions from the energy sector emissions and many include energy sector-related targets or actions. Properly implemented, the INDCs will lead to “an improvement of global energy intensity at a rate almost three times faster than the rate since 2000. Emissions will either plateau or decline by 2030 in countries accounting for more than half of global economic activity at present. Of new electricity generation through 2030, 70 percent will be low-carbon” (IEA 2016; see UN 2015b).
- **Sendai Framework for Disaster Risk Reduction:** The energy sector is also relevant for the success of the 15-year international blueprint on disaster risk reduction adopted as part of the Sendai Framework on Disaster Risk Deduction, a successor instrument to the

Hyogo Framework for Action 2005–2015. Sustainable energy is key to building disaster preparedness, response and recovery (UNDP 2015a; see UN 2015c)

- **Addis Ababa Action Agenda:** The Addis Ababa Action Agenda of the 3rd International Conference on Financing for Development, later endorsed by the UN General Assembly, provides a new global framework for financing sustainable development by aligning all financing flows and policies with economic, social and environmental priorities. The Addis agenda has made sustainable energy a key theme – among others, it includes a call for promotion of public and private investment in energy infrastructure, and clean and efficient energy technologies (UNDP 2015a; see UN 2015c, see Para 49).
 - **New Urban Agenda:** The Quito Declaration on Sustainable Cities and Human Settlements for All, also called the New Urban Agenda, urges cities to adapt to climate change but minimize their harm to the environment and move to sustainable economies. As cities increasingly become the sources of major emissions (67 percent to 76 percent of global energy use and 71 percent to 76 percent of global CO₂ emissions from final energy use), the need for increasing energy demand (to accommodate urban population growth) while ensuring sustainability and resiliency of energy systems and supply will be increasingly a key urban challenge.
12. Despite the challenges it poses, climate change also presents opportunities for accelerating access to modern and clean energy. For example, the annual estimated greenhouse gas emission reductions through the installation of biogas plants in Nepal (through the Biogas Support Programme) are about 613,000 tonnes of CO₂ (UNDP 2011a). In addition to expanding energy access, this process reduces methane emissions from anaerobic degradation of cow dung and other biomass material, thereby reducing greenhouse gases. This programme testifies to the fact that creative policies and programmes can produce solutions that address environmental sustainability and equity (Fernando 2008; UNDP 2011a).
 13. Sustainable energy will no doubt require action at all levels, including through the international initiatives listed above. Sustainable energy appears to be the sweet spot for addressing these challenges. Properly implemented, sustainable energy could help improve economies, people’s livelihoods, conserve biodiversity and mitigate climate change while also helping to promote social progress. Part VI addresses the gender aspects of energy.



For background on the gender-climate change linkages, see TM 1

Summary questions

- *What is the role of energy in the achievement of SDGs? Give examples.*
- *What is energy poverty?*
- *How are climate change and energy interrelated? How does climate change affect biomass energy production and vice versa?*

The gender face of energy

5

Learning objective:

Understand the gender dimensions of energy access and use, including the ways in which improved social inclusion would benefit the energy sector and help address energy poverty, a challenge that continues to burden legions in the developing countries, especially women.



My wife does not work – group discussion



Appendix B: Learning tools

14. Energy is a means to an end – it is not an end in and of itself. As discussed in Part IV, sustainable energy provides the means for addressing the complex challenges and opportunities associated with the three pillars of sustainable development (social, economic and environmental). Part VI zeros in the ‘social’ pillar and discusses the ways in which energy can promote (or thwart) social development by exploring, among others, the question of how women interact with energy, in terms of their contribution in energy production and access and in terms of how energy poverty has a particularly detrimental impact on them.
15. Women and men are key agents of change whose unique but often differentiated knowledge, skills, and experience are central to economic development as well as environmental sustainability. There is strong empirical evidence establishing that gender equality and women’s empowerment are key for the achievement of the Sustainable Development Goals. The following are some illustrative statistics:
 - Recent research from the McKinsey Global Institute finds that, if women were to participate in the economy “identically to men”, they could add as much as US\$28 trillion, or 26 percent, to annual global GDP (roughly the combined size of current US and Chinese economies) by 2025 (MGI 2016).

Box 4 Powerful women in the power sector

The Chief Executive Officer of Solar Power Company Group (SPCG) (Thailand's biggest solar power operator), Ms. Wandee Khunchornyakon, is credited for starting Thailand's pivot towards clean energy. Ms. Khunchornyakon's plans for a solar revolution in Thailand began in 2008, when the Thai Government announced its plans to reduce its emissions by 20 percent over the next 15 years and double its renewable energy production by 2040. As a woman, she overcame many obstacles to secure loans for her business plan and even had to sell her house and land for use as a collateral to secure the initial loan. In 2010, with support from the 'green' Kasikorn Bank, Ms. Khunchornyakon began with a small solar farm, producing 7.35 MW. SPCG currently operates 36 solar farms, totalling 260 megawatts (MW), lighting some 24,000 homes in Thailand. It plans to double its solar power generating capacity to 500 MW in the next three years and expand its solar farm and rooftop operations in Japan, the Philippines and Myanmar.

Sources: Adapted from Aguilar et al. (2015); TCN (2016)

- As primary users and managers of biomass products in many communities, women play an essential role in natural resources management as well as in other productive and reproductive activities at the household and community levels. This puts them in a position to contribute to livelihood strategies adapted to changing environmental conditions, including climate change. Review of 17 studies in natural resources management demonstrates that increased participation by women lead to improvements in local natural resource governance and forest (and fisheries) conservation efforts in India and Nepal (Leisher et al. 2016). For example, one study examined found that women's participation is associated with a 28 percent greater probability of forest regeneration (Agrawal 2006).
- Strong evidence (e.g., India and Nepal) shows conservation outcomes were improved in forest projects by providing women with more powers in decision-making (World Bank 2012).
- A study of 61 countries cited in 'UNDP's 2011 Human Development Report' showed that the per capita number of women's and environmental NGOs is negatively correlated with levels of deforestation, which demonstrates that women's participation in decision-making is key to dealing with structural inequities as well as and environmental degradation (UNDP 2011).

16. Despite the positive role that women play in development, ecological conservation and energy production, illustrated above, women are still disproportionately energy-poor. The effects of energy poverty on women and girls are harsh and far-reaching and include the physical and time effects of drudgery in travelling long distances for fuel-wood, health effects of indoor pollution and decreased school attendance (Danielsen 2012; see Box 5).

Box 5 The gender face of energy poverty

“As a result of time-consuming and physically draining collection of biomass fuels, women and girls’ health conditions are poor, their options to earn additional income are minimal, the opportunities to improve their labour productivity are low, the options for social and political interaction outside the household are restrained, the chances of benefitting from training and extension are limited, and schooling carries high opportunity costs often making it inaccessible (especially for girls). Moreover, these conditions create further barriers to women’s ability to voice their energy concerns and claim rights, reinforcing women’s exclusion and exacerbating the problems. All other members of the household, including men, are negatively affected when women have limited access to modern energy services.”

Source: Danielsen 2012

17. While gender inequities and the gender dimensions of energy access vary across social, cultural, economic and political contexts, in many developing countries, energy is generally the primary responsibility of women, especially in rural areas, where most energy is derived from traditional biomass fuels such as wood, charcoal and agricultural wastes (Carr and Hartl 2010; Karlsson 2007). Women face a range of gender-specific challenges in relation to their roles in energy production and use, which can be summarized as follows:
- A higher percentage of women than men live in poverty (UNECA 2010). Poverty affects women and men differently, with women often experiencing the most severe levels of deprivation. Energy poverty may in many ways be seen as one facet of economic poverty that could be demonstrated by the fact that women generally tend to have disproportionately lower access to cleaner energy options (Karekezi et al. 2002).
 - Socially constructed and gender-defined roles and responsibilities on energy production and use (e.g., cooking, cleaning, food drying and preparation) make women and girls bear the main burden of biomass energy collection. While it is true that energy poverty is a burden for all poor populations, women are excessively impacted since their access to energy resources and to benefits is further limited by gender disparities (Danielsen 2012). Energy use and collection subject women to ‘time poverty’ (a lack of time for rest and leisure after taking into account the time spent working, whether in the labour market or at home) (see Box 6). They are also injurious to their health and well-being (see Para 19).

Box 6 Time poverty

The concept of time poverty has been developed to analyse time allocations of individuals and the opportunity cost of the same for their welfare. Time poverty can be understood as the fact that some individuals do not have enough time for rest and leisure after working in the labour market, at home or at other activities such as fetching water and wood. Put differently, those who work long hours have to make hard choices about what they allocate their time for, which has implications for the welfare of individuals and households. Unlike consumption or income, where economists assume that 'more is better', time is a limited resource — more time spent working in paid or unpaid work-related activities entails less leisure and therefore higher time poverty.

Source: World Bank (2006: 6)

- Women generally face gender-based discrimination (in law and practice) in terms of land ownership, access to land, natural resources, credit, information and decision-making (see Dankelman 2010; FAO 2011a; Box 7 for illustrative statistics on gender disparities in the energy sector). Increasing commercial demand on land is also creating challenges for secure and equitable access to land for poor women (UNEP 2016). These limitations also impact accesses to necessary resources, such as collateral, technology, education and information to benefit from, start and/or participate in energy services, projects and/or initiatives.
18. Indoor pollution from the burning of solid fuels is a serious health problem for women and girls (Smith, K. et al. 2014). Every year, 4.3 million people—mainly women and children—die as a result of indoor air pollution (WHO 2016a). In 2012 alone, 7 million people died—representing one in eight of total global deaths—as a result of exposure to indoor air pollution, making air pollution the world's largest single environmental health risk. Women are also exposed to other health risks likened to the toilsome work of energy collection. They carry greater loads compared to men, but have a lower intake of calories, as most customs dictate that men receive more food and water. Women's poor nutrition vis-à-vis their workloads increases their susceptibility to anemia and perinatal mortality, while the drudgery of energy collection could entail postnatal complications and takes a toll on women's well-being (WHO 2014).
 19. Energy poverty affects women and girls by virtue of the toll it takes on their time, resulting in time poverty (see Box 6). Women spend considerable time gathering biomass for energy. Because they undertake these activities largely on foot, climate-induced scarcity of natural resources can exacerbate their time poverty, as women are forced to travel and spend more time collecting these resources, thereby causing them to lose out on other, self-nurturing activities such as education. To illustrate, a study in India, Bangladesh and Nepal found that women in South Asia spend up to 20 or more hours per week in energy collection (Practical Action 2015). Better access to modern energy can help alleviate some of these challenges. Research in Brazil also shows that girls in rural areas with access to

electricity are 59 percent more likely to complete primary education by the time they are 18 years old than those without (O'Dell et al. 2014). Similarly, improved cookstoves can reduce cooking time by 50 percent and increase fuel efficiency by 30 percent—high efficiency cookstoves lead to even larger benefits in time and energy savings, hence also contributing to emissions reductions (Shankar 2015). Incidentally, a preliminary analysis of mitigation pledges under the Paris Climate Agreement shows that some 32 countries have included efficient cooking initiatives in their INDCs (CCAC 2016).

Box 7 Gender facts and figures around the energy sector

- *1.1 billion people do not have access to electricity.*
- *2.9 billion people use solid fuel (wood, coal, charcoal, agricultural residues or animal waste) to cook their food and heat their homes.*
- *Solid-fuel use exacerbates income and gender inequality by forcing users, mostly poor women and children, to spend long hours collecting biomass energy and to be exposed to its grievous health effects.*
- *Data from 13 countries showed that girls in sub-Saharan African homes with polluting cookstoves spend about 18 hours a week collecting fuel or water, while boys spend 15 hours. In homes mainly using cleaner stoves and fuels, girls spend only 5 hours a week collecting fuel or water, and boys just 2 hours.*
- *Household air pollution globally leads to 4.3 million premature deaths on average each year (with 1.7 million of those in South Asia). In 2012, 7 million people died—1 in 8 of total global deaths—as a result of exposure air pollution.*
- *Fifty-eight percent of health care facilities in sub-Saharan African countries have no electricity—in 2010, there were 287,000 deaths among women as a result of complications from pregnancy and childbirth, many of which could have been averted if more medical facilities had access to electricity.*
- *Research from Brazil shows that rural women and men with access to energy are 10.2 percent more likely to be employed than their counterparts without access.*
- *There is a lot of potential in rural electrification by renewable technologies—89 million people in Africa and Asia already have improved access to energy by using off-grid solar products and there is a US\$3.1 billion market opportunity for the off-grid solar industry to reach 99 million households by 2020.*

Sources: IEA/World Bank 2015; UN 2011; WHO 2016b; O'Dell, K. et al. 2014; Cameron, C. et al. 2016; Glemarec et al. 2016

20. While the gender aspects of energy poverty are more acute in the informal sector (see Para 16-18 above), women also face gender-based constraints in the formal sector. Many societies consider electrical energy for use in households and public facilities to be dangerous. Electrical installation, plumbing and installation of heating systems are by and large male domains. Boys are expected to face and master these dangers; girls are encouraged to acquaint themselves with the basics, but do not have access to advanced knowledge on the subject (Karlsson 2007). In the private sector, women-headed businesses generally face more impediments in accessing grid electricity compared to men. Studies from Africa, for example, show that women-headed businesses generally face more impediments than men in accessing grid electricity. Experiences in Ethiopia, Ghana, Kenya, Tanzania and Zambia suggest that women entrepreneurs also face greater discrimination than men in the form of delays in obtaining electrical connections and the expectation that they will pay bribes for these services (Alstone et al. 2011). More broadly, women are often excluded from discussions about energy plans and policies across scales, despite being primary household-energy managers, which limits their entry into the energy industry (UNDP 2004) and results in gender-blind energy project planning, financing, execution and implementation (Glemarec et al. 2016).
21. Lack of recognition of women's role in the energy sector often leads to financing and executing gender-blind energy policies. For example, the Clean Development Mechanism, one of the major global climate finance mechanisms, has been subjected to criticism for de-emphasizing investments in small-scale projects that benefit women and poor communities (Karlsson 2010; UNDP 2010a). Nevertheless, there has recently been steady progress in the adoption of progressive gender plans and frameworks within the existing global funds. This should be encouraged.



For more information on the nexus between gender and climate finance, see TM 5

22. The story of Ms. Wandee Khunchornyakon (see Box 4 Powerful women in the power sector) and the success of the women-owned and -run social enterprise Solar City (see Task 2 – Appendix 2) illustrate that sustainable energy projects that are run and maintained by women can provide clean, renewable and affordable energy while improving women's incomes. Small-scale, off-grid renewable energy technologies can contribute to income-generating opportunities and the overall economic empowerment of women, most notably in areas such as agriculture, fisheries and textile processing. In Bangladesh, Grameen Technology Centres are training poor women as solar technicians to scale up solar home systems across the country. Once certified, female technicians sign annual contracts with clients for ongoing maintenance these systems. In a similar initiative in India, the Barefoot College, in collaboration with the GEF Small Grants Programme (SGP), teaches rural women solar engineering, including how to build, install and maintain solar panels. These solar engineers can then install solar power systems in villages, which previously had no energy access (Lal 2008).² The EmPower project in India builds women's capacity to maintain small energy service units and associated technologies and services such as briquette machines and tree planting. In Rwanda, a group of women gar-

2. In 2008, the GEF Small Grants Programme (SGP) entered into a partnership agreement with Barefoot College and supports Women Solar Engineer pilot projects across Africa's and Asia's poorest countries. The Barefoot College, a pioneer in demystifying complex technological processes for illiterate students, offers a six-month training to the women beneficiaries of the GEF SGP on its campus in Tilonia, India.

bage collectors began producing biogas from the garbage they collected by compressing and selling briquettes. The cooperative they formed for this enterprise now employs 110 members to collect the garbage from 3,000 households and turn it into an energy source (ENERGIA 2011; UNCTAD 2011).

Summary questions

- *What are the socio-cultural and legal impediments women face in the context of energy access and production?*
- *How would women benefit the formal and informal energy sectors?*
- *What is 'time poverty'? How does energy poverty contribute to time poverty in women?*

6

Towards engendering the energy sector

Learning objective:

Identify policy responses and entry points to address the various gender barriers in the energy sector and for gender-conscious energy use and access and action that empower women.



Solar sister entrepreneurs



Appendix B: Learning tools

23. Sustainable energy, as discussed in Part V, is the sweet spot in terms of increasing energy access in a sustainable manner. Properly developed and deployed, sustainable energy technologies and options, including renewable energy, could provide effective climate change responses (mitigation and adaptation) and improve livelihoods of the rural poor. Increasing access to clean and reliable off-grid energy sources is an alternative way to improve the lives of millions, although this depends on the expansion of grids and the quality of grid-based electricity access (e.g., improved reach, fewer service interruptions and better quality power) (Alstone et al. 2011) (see Karekezi et al. 2009; Karlsson et al. 2011). Examples of low-carbon energy technologies that can modernize rural energy include solar photovoltaic panels, small hydro systems, wind turbines, generators fuelled by plant oils or biofuels (including biogas, biodiesel and bioethanol) and improved cooking stoves. These technologies can provide electricity in off-grid or underserved areas (Karlsson et al. 2010; see Box 8). Other simple yet consequential off-grid lighting devices such as pressure lamps and candles, along with the latest advances in clean energy technology (such as solar, LED and advanced batteries), could also provide safe, efficient, affordable alternatives to fuel-based lighting (Alstone et al. 2011).

Box 8 Modern fuels and sustainable energy technology options

Cooking, heating, food processing

- *Liquefied petroleum gas (LPG) or kerosene*
- *More efficient stoves or solar cookers*
- *Biomass briquettes*
- *Biogas or bioethanol produced in biomass digester*

Mechanical power for water pumping, household and commercial enterprises, and transportation

- *Windmills, water mills or solar pumps*
- *Electrical grid*
- *Motors run on liquid fuel (gasoline, diesel or biofuel)*

Lighting, communications, refrigeration, and health, education and social services

- *Electrical grid*
- *Diesel generators*
- *Wind turbines*
- *Hydroelectric generators*
- *Solar photovoltaic panels*
- *Hybrid generating systems*

Source: ENERGIA 2011

24. Women's energy poverty can be considerably improved by access to modern forms of energy. Reliable and efficient energy sources are essential for basic household needs such as lighting, cooking and heating, clean water and sanitation, and for other national development goals including mechanical power, transport and telecommunication services (Ouédraogo 2011). Although access to more modern energy alternatives will not necessarily lead to greater equality in gender roles, it can at least relieve some of the most burdensome and unhealthy aspects of their daily lives and expand the development options available to women, their families and their communities (ENERGIA 2011).

“Access to better energy services can improve women’s social, economic and political status — reducing the time and effort involved in household chores, providing better health and educational conditions, expanding income-generating opportunities, and easing their participation in public affairs. At the same time, greater sensitivity to gender issues increases the effectiveness of energy programmes and policies, as well as other types of development activities that involve energy use, by ensuring that the needs and concerns of both men and women are taken into account. Availability of kerosene or liquefied petroleum gas, improved stoves, electricity, and mechanical power significantly improves the quality of life for women in rural areas and relieves them of much of the difficult, unpaid work currently required to care for their families.”

Source: ENERZIA 2011



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25. Gender equality and women's empowerment within the context of sustainable development have received increasing attention in many platforms across scales and sectors (see Part V). Table 4 provides key areas for gender-conscious energy programming at the global and national levels.

TABLE 4 Key areas for gender-sensitive energy programming

National government level	
Government sector	<ul style="list-style-type: none"> • Make gender and rights concerns an integral part of energy sector policy dialogue. • Support capacity-building on gender and rights concerns. • Support the design and implementation of regulatory processes that enhance access to energy in unreached areas and to groups whose needs are insufficiently met (focus on gender concerns related to accessibility and affordability). • Support the establishment of energy sector information management systems and make collecting and analysing sex-disaggregated data a major focus. • Support openness, transparency and the participation of stakeholders in policy processes, particularly women's rights constituency. • Support the setting up of accountability systems (e.g., gender budgets), oversight processes (e.g., gender audits) and channels for rights claiming. • Promote women's meaningful participation and representation in the energy sector.
Private sector	<ul style="list-style-type: none"> • Make gender and rights concerns an integral part of public-private partnership arrangements. • Support the establishment of an enabling policy environment for women energy entrepreneurs (focus on access to credit and financial services).
Civil society	<ul style="list-style-type: none"> • Support civil society organizations initiatives that raise awareness about gender and energy rights. • Develop civil society capacity to engage in energy policy dialogue at national level to advocate for the realization of women's energy rights. • Involve civil society organizations in efforts to set up or expand national accountability mechanisms to hold the state as the primary duty-bearer accountable to women's energy rights. • Support energy rights claims to promote gender equality and women's rights.
Global governance level	
UN processes	<ul style="list-style-type: none"> • Support the recognition that access to energy is a human right. • Promote (and fund) the establishment of an international monitoring system to assess the progress towards eliminating energy poverty that explicitly includes gender and rights concerns.
International CSOs and networks	<ul style="list-style-type: none"> • Develop capacity of civil society organizations and international network/alliances that work on gender rights and energy to engage in energy policy dialogue at international levels. • Support energy rights claims to promote gender equality and women's rights.

Source: Danielsen 2012

26. Because there is usually ‘implementation gap’ in policy and practice (at all levels), it is also crucial to take a look at project- and activity-level application of gender imperatives. Box 9 provides strategic entry points for integrating gender considerations at the project level in Global Environment Facility (GEF) projects.

Box 9 Strategic entry points for integrating gender considerations at the project level

The GEF project identification form (PIF) must document whether issues on gender equality and women’s empowerment have been taken into account, and if so, requires a description of how they will be mainstreamed into the project development stage. The PIF also requires an overview of key stakeholders and how they will be engaged in the project as well as a discussion of risks that might prevent project objectives from being achieved. To ensure that the project fully integrates gender concerns, it is important to begin the process to review qualitative and quantitative data (to be discussed and elaborated on) to better understand:

- *The gender-specific context of the project and how integrating gender considerations supports project success and sustainability*
- *Any potential gender-based project risks and consideration of how the project may impact women and men differently*
- *Potentially different opportunities for women and men to participate as stakeholders and decision-makers in the project planning and design phase, with consideration of barriers for women and other marginalized groups to contribute to and make decisions on project design*

The checklist below provides strategic entry points for integrating gender considerations in the PIF.

Guiding questions for including gender in the PIF

Gender equality and women’s empowerment:

- *What is the potential impact of the project on women and men? Will women and men be impacted differently?*
- *Considering the project’s area of focus and geographical area, what are women’s and men’s respective dependence and needs (health, livelihood, income, etc.) related to the resources/issues?*
- *What barriers could disadvantage women/girls or widen gender inequality issues?*
- *What are the general areas of concern for men and women in relation to the project, particularly around needs, capabilities and opportunity to contribute to the project?*
- *What are potential barriers and constraints to women and men participating and benefiting from the project?*
- *What gender and development policies at the national level could promote gender within the proposed project?*



Box 9 Strategic entry points for integrating gender considerations at the project level

Stakeholders:

- Are women's organizations or women/gender units within larger institutions included among the stakeholders?
- How are women stakeholders included?
- Who are the implementing partners? Do they have experience/competence in implementing gender-responsive programmes?

Checklist for a gender-responsive PIF

- Includes the gender-specific context of the project and how integrating gender considerations supports project success and sustainability
- Discusses any potential gender-based project risks, including consideration of how the project may impact women and men differently
- Discusses different opportunities for women and men to participate as stakeholders and decision-makers in the project planning and design phase, with consideration of barriers for women and other marginalized groups to contribute to and make decisions on project design
- Notes that a gender analysis will be carried out during the project development stage
- Notes that project development activities include a baseline analysis of women's participation in [relevant organizations, sector]
- Notes that the project development will take into account the needs of women and details activities that address [project focal area] [e.g., gender differentiated needs and impacts of climate change on women]

Source: UNDP 2016c

27. Mainstreaming gender into energy projects and energy planning process requires an appreciation not only of the different energy needs of women, but also of the contributions of women to climate change responses. It would lead to high quality, effective, gender-responsive energy project planning processes. Women should be involved in the design and production of locally appropriate energy technologies (Karlsson et al. 2011). There are two aspects of project planning where gender concerns can be incorporated: 1) energy technology projects that specifically promote a particular type of technology and 2) integrated projects that include energy as a component of a larger development process. Box 10 discusses these two areas in more detail.

Box 10 Energy project planning situations for gender mainstreaming

Gender, technology and energy can come together in at least two project planning situations:

- 1) energy technology projects and
- 2) integrated development projects in which energy is a component.

Energy technology projects: These projects focus on the dissemination and adoption of one or two particular types of technology, such as solar home systems, improved stoves or decentralized mini-grids. In some ways, such projects can be thought of as supply-driven: their purpose is to promote certain kinds of energy technology for the good of a given population. In this case, the main questions that arise concerning a gender perspective are, "To what extent will this technology, or these technologies, bring about positive gender impacts? How can the project affect household health, decision-making and time poverty? How can women and men benefit from new training, employment, entrepreneurial and community benefit-sharing?" An energy technology project does not necessarily have to be initiated in the energy sector; for example, smokeless stoves could be initiated as a health sector project.

Integrated development projects: Integrated development projects try to assist communities to develop over a broad range of sectors of which energy may be just one and in which energy may be just a component necessary for achievements in other sectors. The gender-energy question then becomes, "What are the energy components necessary to achieve overall goals, including gender goals, and how can these energy requirements best be satisfied?" Variations on this model are women's development projects, where the intended beneficiaries clearly are women. This addresses the extent to which energy hinders the achievement of the gender goals and how energy can be used to further women's development.

Source: Mensah 2006

28. Beyond household energy consumption, there are many examples of women as producers, technicians and entrepreneurs in sustainable energy (see Box 11). However, the traditional (fossil-fuels based) energy sector is still one of the least gender-inclusive sectors. According to one estimate, women represent only 6 percent, 4 percent and less than 1 percent of the technical, decision-making and top management positions, respectively, in the energy sector (BPWF 2009). For women entrepreneurs who would like to thrive within the energy industry, existing structural inequality, which manifests itself in the form of discrimination in law and practice, also poses barriers (Glemarec et al. 2016). For example, a recent report by the World Bank indicates that nine out of 10 economies in the world have at least one law impeding women's economic opportunities, including access to credit (World Bank 2016). There is scope, however, for improvement as the world aspires to pivot towards renewable energy sources in the future. Box 11 shows how new technologies and business models in solar energy could better engender the landscape of energy access in the developing world.

Box 11 Women and the promise of new business models and offerings in energy access

Energy access is still a formidable concern in many developing countries, especially those in sub-Saharan Africa. With the advent of photovoltaic (PV) technologies and decrease in the cost of renewable technologies overall, there is a sense that we may be reaching a tipping point on rural electrification. For example, prices for solar photovoltaic (PV) modules since 2009 have fallen by about 80 percent (and average costs for solar and wind electricity could further decrease by 59 percent by 2025) (IRENA 2011). This cost decrease and trends have provided a space for innovative business models for energy access, such as third-party ownership of solar panels and digitization of payment schemes (e.g., remote monitoring of solar panels and pay-as-you-go payment schemes). As with cell phone usage, a number of companies are now offering consumers the ability to pre-pay for their energy, avoiding (or at least mitigating) one of the main obstacles to providing solar technology to the poor, i.e., the inability to pay for service on an ongoing basis (REMMP 2014).

The diffusion and increased uptake of renewable technologies, coupled with the spread of energy-efficient household practices like the use of improved cookstoves, benefits women on many levels. It reduces drudgery in energy collection and could promote social progress in poor communities by enabling 'green job' opportunities that would allow women to work as energy managers in their communities. For example, Solar sister, a women-led social enterprise, is scaling up use of clean energy technologies with woman-centred direct sales to reduce energy poverty (through solar lights) in remote communities in rural Africa (Solar Sisters 2016).

29. Climate change financing focusing on the energy sector should complement the broader developmental goals that include gender parity, poverty eradication and sustainable development. Existing mitigation financing schemes such as the GCF, GEF and CDM need to focus on projects that benefit poor and marginalized communities, including women. This should be true also for the Nationally Appropriate Mitigation Actions under the UNFCCC process (Schalatek 2009). At the very least, gender and social impact assessments need to be undertaken during programme and project design (UNDP 2011b). At best, existing and future carbon financing possibilities should expand women's access to energy by encouraging small-scale projects (such as improved stoves) to qualify for the Clean Development Mechanism and by streamlining the application process to reduce the associated transactional costs.



For more information on the gender-climate finance nexus, see TM5

30. More effort in the form of context-specific and locally appropriate gender guidelines for gender-conscious design, monitoring and evaluation of energy projects are crucial. These could evolve within the context of existing climate funds as well as global and national initiatives and processes such as the NDCs, NAMAs and Low-Emission Development Strategies (LEDS).

Summary questions

- *What is gender mainstreaming? Provide examples of strategic entry points for integrating gender considerations at the project level.*
- *What are clean energy technologies? Provide a few examples of clean energy technologies.*
- *Explain the benefits of clean energy technologies for women and the mitigation of climate change.*

31. Access to affordable, reliable, sustainable and modern energy is a human development enabler. Basic services such as electricity for lighting and cleaner cooking technologies are still a luxury for many rural women and men, so access to modern energy services needs to be improved. Households will experience livelihood improvements when they gain access to sustainable, clean and affordable energy. Access to modern energy services would go a long way towards alleviating the daily household burdens of the poor, especially women. Because the control of black carbon emissions in developing countries is a potentially cost-effective means of curbing GHGs, while at the same time improving the health and quality of life of those living in solid-fuel-dependent communities, it provides a win-win opportunity for tackling these interrelated development and climate challenges.
32. The new Agenda for Sustainable Development, which aims to end poverty and promote well-being and prosperity while safeguarding ecological systems of the planet by 2030, has placed a much-needed emphasis on energy access and gender equality, elevating them as stand-alone SDGs. Similarly, there is now an increasing appreciation in international development discourses of the role of energy as a conduit for redressing historic gender inequities. As we move into the post-2015 global development agenda, serious effort is needed to move beyond understanding the importance of energy access and gender equality to viewing both as central to questions of sustainability, efficiency and effectiveness in the energy sector.
33. Yet, energy poverty is still pervasive—one in five people in Africa and South Asia do not have access to electricity and close to 3 billion people (40 percent of the global population) burn solid fuels such as wood, charcoal, animal waste or crop residues in open fires or inefficient stoves for their daily cooking and heating (UN 2011).
34. Energy poverty, one aspect of broader economic poverty, has distinct gender characteristics that disproportionately affect women and girls. Women and girls are often primarily responsible for collecting fuel and water at the community level. Also, poor women tend to participate in the informal economic sector (for example, the food sector), which relies strongly on biomass as its main energy source, which, in turn, does not feature heavily in national energy policies and priorities.



35. Gender gaps related to access to energy, finances, training, employment and entrepreneurship need to be redressed. Policies that include women and men in the development stage may help support more equitable access to electricity (grid and off-grid) and deliver more effective and sustainable outcomes. Therefore, more effort is needed to involve women in the design and production of locally appropriate energy technologies. Infrastructure projects designed to promote cleaner, more efficient forms of fossil fuels and renewable energy can offer new skills training and increased employment and entrepreneurship opportunities for women as well as more equitable benefit-sharing at the community level.
36. Climate change financing geared towards the energy sector should complement broader developmental goals, including gender equality, poverty eradication and sustainable development. Public and private mitigation financing schemes, including for those within the INDCs, need to ensure that projects benefit poor and marginalized communities in a gender-responsive manner. At the very least, gender analysis and social impact assessments need to be carried out during the stages of programme and project design. Where feasible, carbon-financing options should ensure more equitable benefits for men and women by helping to expand women's access to and control over energy. This includes efforts to qualify small-scale projects (such as improved stoves) for financing and then streamlining the application process.
37. Incorporating gender perspectives into energy projects, policy and planning is critical in ensuring the effectiveness not just of energy programmes and policies, but of all development activities that involve energy use.

A

Appendix A: Case studies

CASE 1 *NGO promoting clean energy bags UN climate solutions award (India)*

An Indian NGO, Swayam Shikshan Prayog, has bagged a UN climate award for 2016. The NGO, which trains women to become clean energy entrepreneurs across Maharashtra and Bihar, was one of the 13 projects recognized at the UN climate summit in Marrakesh, Morocco, in November 2016.

In an official release, the UNFCCC, the nodal UN climate body, has applauded the project for building a rural distribution network of 1,100 women entrepreneurs facilitating access to clean energy, water and sanitation products and services in several communities.

Prema Gopalan, co-founder of Swayam Shikshan Prayog, who has worked for 10 years in the clean energy sector, told *The Hindu* that many of the women in her NGO hail from the Marathwada drought-hit areas and have attained a new identity as a result of their entrepreneurial work.

“They have learnt to be better community leaders. The initiatives they have undertaken are both sustainable and scalable,” she said. The NGO, founded in 1989 in Mumbai, has received financial support from the Maharashtra Government, USAID, Misesor and Europe and CSR funds from HSBC and Alstom, until now.

With India ratifying the Paris Agreement in 2016, Ms. Gopalan highlighted the importance of micro-level, scalable initiatives to help the rural population contribute to India’s ambitious renewable energy target. India’s Intended Nationally Determined Contribution (INDC), submitted to the UNFCCC, speaks of increasing the share of renewable energy in India’s energy mix to 40 percent by 2030.

“While the government only eyes big-ticket projects when it comes to renewable energy, it should also look at the potential of reaching out to the vast rural population through small initiatives such as these. It requires marrying the government’s livelihood missions with that of new and renewable energy,” Ms. Gopalan, who has also been an Ashoka Fellow since 2003, said.

Easy access

Nita Tanwade, 36, one of the rural entrepreneurs who work with the NGO, told *The Hindu* that over 2,000 families in her village of Sawargaon in Tuljapur Taluka have purchased solar lights and cook stoves from her. “For several hours in a day, people in my village suffered power cuts. Many couldn’t afford to get an electricity connection,” she said and recalled that villagers had contributed funds to install solar lights at the home of an elderly couple.

For those who cannot afford to buy the solar lamps, priced between Rs. 500-700 and the cook stoves that cost between Rs. 2,500-3,000, Ms. Tanwade said she sold it to them on credit and the villagers paid her back in monthly instalments.

The use of woodfire for cooking in rural areas has been identified as one of the primary causes of indoor air pollution, which contributes to global warming and causes respiratory illnesses. According to the International Energy Agency's World Energy Outlook 2015, 67 percent of the population in India depends on traditional biomass for cooking, which, in absolute numbers, works out to 841 million people.

Ms. Gopalan said that the UN climate award is a global recognition for replicable models on clean energy that can help end India's biomass dependency. The UNFCCC release cites how, through the promotion of clean cook stoves by women entrepreneurs, over 200,000 women and households now save almost 100 tonnes per day of fuel wood. "Maharashtra has started allowing women to even supply excess solar energy to the grid. If all Indian states adopt such enabling policies, India can soon become self-sufficient in energy, the clean way."

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- Source: Vidya Venkat, "NGO promoting clean energy bags UN climate solutions award", The Hindu, 3 October 2016 – <http://www.thehindu.com/todays-paper/tp-national/ngo-promoting-clean-energy-bags-un-climate-solutions-award/article9177375.ece>

CASE 2 *Gender audit of energy policy in Botswana*

The Botswana Technology Centre, in consultation with the Energy Affairs Division of the Ministry of Minerals, Energy, Water Resources and other stakeholders, executed a gender audit of Botswana's national energy policies. Botswana is the first country where such an audit was held. The audit showed that, although there is a common understanding of the different roles of women and men in Botswana, knowledge of the relationship among gender, energy and poverty was still limited. This has resulted in gender-blindness within the country's energy policies and programmes and a lack of consultation with household residents – and particularly with women in developing energy policy. The audit also showed a lack of sex-disaggregated data and a general lack of association between energy services and the MDGs. Based on this audit and follow-up trainings, awareness within the government and the Botswana Power Corporation staff has increased. The Corporation recently started a ground-breaking gender mainstreaming programme for rural electrification. The audit also led to a pilot project for collecting sex-disaggregated data and strengthening gender expertise in the country's energy sector.

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- Source: Wright and Gueye (2009)

CASE 3 *Barefoot College – India*

Communities in remote, rural areas traditionally lack access to conventional power sources. As these communities rely on kerosene or firewood for basic energy needs, pressure on the local environment has increased dramatically, negatively affecting the global environment. It is estimated that one rural family in Africa typically burns 60 litres of kerosene a year, releasing one tonne of CO₂ in less than 10 years.

Solar energy provides an alternative energy solution while simultaneously spurring progress in human development including poverty reduction, gender equality, education and health. However, there is a need to enhance the capacities of local communities to build, install, maintain and repair solar technologies. Local women could play a significant role in addressing these issues.

For this reason, in 2008, the GEF Small Grants Programme (SGP) decided to enter into a partnership agreement with Barefoot College and support Women Solar Engineer pilot projects across Africa's and Asia's poorest countries. In this collaborative effort, the GEF SGP provides communities with technical support and funding for solar panel kits. The Barefoot College, a pioneer in demystifying complex technological processes for illiterate students, offers a six-month training to the women beneficiaries of the GEF SGP on its campus in Tilonia, India.

Goal

The goal of this Women Solar Engineer initiative is to build local capacity and electrify poor, 'off-the-grid' communities with clean, low-cost solar energy. As such, the project is uniquely positioned to address multiple development goals at once:

- Relieving environmental stress by providing an alternative energy source
- Bridging the gender gap by empowering poor, illiterate women
- Promoting sustainable development outcomes through community ownership
- Enabling improvements in health, education and living standards and quality of life

The GEF SGP also supports awareness-raising, monitoring and evaluation, promotion of the project at the community level and mobilization of other partners to support the projects. Its national coordinators and national steering committees play a fundamental role in each of the country programmes where the partnership operates.

Achievements

The initiative has since expanded to 18 countries. To date, SGP has supported 28 projects, investing USD\$ 1 million and raising over US\$1.5 million in co-financing. As a result, 71 women have been trained as solar engineers who have electrified 3,778 households in 52 villages. This has improved the quality of life for more than 22,700 beneficiaries. Women and girls especially have benefited, as they can now devote more time to education and income-generating activities. As for environmental impacts, the communities have eased pressure on deforestation and air pollution by switching from firewood and kerosene to solar energy.

→ Source: UNDP 2017 https://sgp.undp.org/index.php?option=com_content&view=article&id=105&Itemid=207

B

Appendix B: Learning tools

TASK 1 *My wife does not work (!?)*

Learning objective:

Understand the gender-defined stereotypes, roles and concepts.

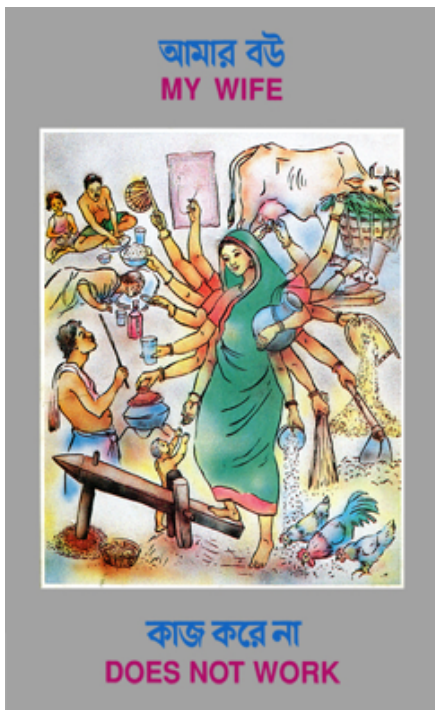


"My wife does not work"

→ Source: <http://blogs.worldbank.org/voices/what-i-learned-bees-about-women-s-empowerment-and-nutrition>



15 minutes (group discussion and reflection)



My Wife DOES NOT WORK!!!

Conversation between husband (H) and a psychologist (P):

P: What do you do for a living, Mr. Bandy?

H: I work as an accountant in a bank.

P: Your wife?

H: She doesn't work. She's a housewife only.

P: Who makes breakfast for your family in the morning?

H: My Wife, because she doesn't work.

P: At what time does your wife wake up to make breakfast?

H: She wakes up at around 5 am because she cleans the house first before making breakfast.

P: How do your kids go to school?

H: My wife takes them to school, because she doesn't work.

P: After taking your kids to school, what does she do?

H: She goes to the market, then goes back home to cook and do the laundry. You know, she doesn't work.

P: In the evening, after you come back home from office, what do you do?

H: Take a rest, because I'm tired due to all-day work.

P: What does your wife do then?

H: She prepares meals, serving our kids, preparing meals for me and cleaning the dishes, cleaning the house, then putting the kids to bed.

Notes to the facilitator

- Encourage a discussion on the take-away message of the cartoon and the ‘conversation’ between the ‘husband’ and the ‘psychologist’.
- Encourage a discussion on gender stereotypes and gender-defined roles in society.
- Encourage participants to discuss gender stereotypes and roles around energy production based on their local experiences.

TASK 2 Solar Sister



Solar Sister entrepreneurs



20 minutes (group discussion and reflection)

Notes to the facilitator

Context:

Solar Sister is African women-led grassroots partnership of non-government organizations, women’s organizations and solar lighting producers that provides women with economic opportunities and access to sustainable energy options and technologies. It uses a unique business model that markets clean energy products to women who also then recruit to sell these products downstream, providing them with entrepreneurial skills. This woman-centred business has brought light, hope and opportunity to communities in rural Africa. Solar Sister was established as an enterprise in 2009 in Uganda (starting with solar-powered technologies and later adding clean cookstoves). The business is being replicated in two other countries in Africa: Nigeria (2012) and Tanzania (2013). Currently, it has empowered 2,500 entrepreneurs and benefits thousands of women and their families. The enterprise is a 2011 winner of the prestigious international SEED Award. (For more information, see <https://www.solarsister.org/>).

- Encourage a discussion on the take-away message of the short video.
- Encourage a discussion on the role of women in energy transformation as well as the role of sustainable energy technologies in addressing energy poverty among rural women.
- Encourage participants to discuss, on the basis of their local experiences, the positive contributions of women to energy production and use.

TASK 3 *INDCs – Gender Analysis (plenary)*

Learning objective:

Understand the gender-mitigation nexus in energy projects.



Gender analysis of INDCs – specifically, sustainable energy plans prioritized in INDCs



20 minutes (group breakout discussions)

20 minutes (presentation of findings - three presentations of five minutes each)

20 minutes plenary discussions



Dominican Republic, Intended Nationally Determined Contribution (2015)

Hashemite Kingdom of Jordan, Intended Nationally Determined Contribution (INDC)

Federal Republic of Brazil, Intended Nationally Determined Contribution Towards Achieving the Objective of the United Nations Framework Convention on Climate Change

Notes to the facilitator

- Divide the participants into three groups; give each group one reading.
- Help the groups identify the relevant sections of the referenced INDCs.
- Ask the groups to use the information on the above-cited materials and do a gender analysis on the INDCs, with specific emphasis on sustainable energy-related sections of the applicable INDC.
- Facilitate a discussion around the question of how much these INDCs incorporate gender perspectives in general and specifically vis-à-vis the energy sector.

Bibliography

- Agrawal A., Yadama G. and Bhattacharya A., "Decentralization and environmental conservation: Gender effects from participation in joint forest management," CAPRI Working Paper No. 53. 2006.
- Aguilar, L., Granat, M. and Owren, C., *Roots for the future: The landscape and way forward on gender and climate change* (Washington, D.C.: International Union for Conservation of Nature [IUCN] and Global Gender and Climate Alliance (GGCA), 2015).
- Alstone, P., Niethammer, C., Mendonça, B. and Eftimie, A., 'Expanding Women's Role in Africa's Modern Off-Grid Lighting Market', Lighting Africa Project, International Finance Corporation, 4 October 2011.
- Business and Professional Women's Foundation (BPW), 'Moving from red to green: Working women in the green economy', 2009.
- Calen May-Tobin, "Wood for Fuel" (Chapter 8) in Doug Boucher, Pipa Elias, Katherine Lininger, Calen May-Tobin, Sarah Roquemore, and Earl Saxon, *The Root of the Problem - What's Driving Tropical Deforestation Today?* Union of Concerned Scientists (UCS). 2011, Cambridge: UCS.
- Cameron, C. et al., 'Policy trade-offs between climate mitigation and clean cook-stove access in South Asia', *Nature Energy* 1, Article number: 15010 (2016).
- Carr, M., and M. Hartl, *Lightening the Load: Labour-Saving Technologies and Practices for Rural Women*, International Fund for Agricultural Development (IFAD), Practical Action Publishing Ltd., 2010.
- Climate and Clean Air Coalition (CCAC), 'INDCs with short-lived climate pollutants (SLCPs)', 25 January 2016, www.ccacoalition.org/en/resources/indc-slcp-summaries.
- Cooke, P., G. Köhlin, and W.F. Hyde. 2008. Fuelwood, forests and community management—evidence from household studies. *Environment and Development Economics* 13: 103-135.
- Danielsen, K., 'Gender Equality, Women's Rights and Access to Energy Services: An inspiration paper in the run-up to Rio+20'. Danish Ministry of Foreign Affairs, Denmark, 2012.
- Dankelman I. (ed.), *Gender and Climate Change: An Introduction*, London: Earthscan, 2010.
- Ebinger, J. and Vergara, W., 'Energy Sector Management Assistance Program (ESMAP) and the World Bank Group Climate Impacts on Energy Systems: Key issues for energy sector adaptation', World Bank, Washington DC. 2011.
- ENERGIA, 'Fact Sheet on Energy, Gender and Sustainable Development', 2011.
- Fernando, N.A., *Rural Development Outcomes and Drivers: An Overview and Some Lessons*, Asian Development Bank, 2008
- Food and Agriculture Organization of the United Nations (FAO). 2010. *Criteria and indicators for sustainable woodfuels*. FAO: Rome.

- FAO. 2011a. The State of Food and Agriculture: Closing the Gender Gap for Development. FAO. Rome.
- Glemarec, Y., Bayat-Renoux, F. and Waissbein, O., 'Removing barriers to women entrepreneurs' engagement in decentralized sustainable energy solutions for the poor', *AIMS Energy* 4, no. 1 (2016), pp. 136–172.
- Glemarec, Y., Bayraktar, H. and Schmidt, T. S., *Derisking Renewable Energy Investment: A Framework to Support Policymakers in Selecting Public Instruments to Promote Renewable Energy Investment in Developing Countries* (New York: UNDP, 2013).
- International Energy Organization (IEA), UNDP and United Nations Industrial Development Organization (UNIDO), 'Energy Poverty: How to Make Modern Energy Access Universal' (Special Early Excerpt of the World Energy Outlook 2010 for the UN General Assembly on the Millennium Development Goals), 2010.
- International Energy Agency (IEA) and the World Bank, 'Sustainable Energy for All—Progress Toward Sustainable Energy 2015', World Bank, Washington, D.C., 2015.
- IEA, 'World Energy Outlook 2011: Energy for All – Financing Access for the Poor – Special Early Excerpt of the World Energy Outlook', 2011.
- IEA, 2015, Energy and Climate Change, World Energy Outlook Special Report. Paris: OECD/IEA.
- IEA. World Energy Outlook 2014 Electricity access database. 2014a. <http://www.worldenergyoutlook.org/resources/energydevelopment/energyaccessdatabase/>
- IEA, World Energy Outlook 2016 <http://www.worldenergyoutlook.org/resources/energydevelopment/energyaccessdatabase/>
- International Renewable Energy Agency (IRENA), 'The Power to Change: Solar and Wind Cost Reduction Potential to 2025', Abu Dhabi, IRENA, Working Paper, 2011.
- Karekezi, S., G.B. , Khamarunga , and W. Kithyoma , and X. Ochieng,
- "Improving Energy Services for the Poor in Africa – A Gender Perspective". *ENERGIA News* Vol. 5 Nr 4, Energia. 2002
- Karekezi, S., J. Kimani, and O. Onguru. (2009). "Climate Change and Energy Security in East Africa", Policy Paper on Energy, Climate Change and Poverty Alleviation, Global Network on Energy for Sustainable Development (GNESD).
- Karlsson, G. (ed.), 'Where Energy is Women's Business: National and Regional Reports from Africa, Asia, Latin America and the Pacific', *ENERGIA*, 2007.
- Karlsson, G., C. Owren, A. Rojas and H. R. Gender. (2011). "Energy Technologies and Climate Change", *OUTREACH* (e-magazine on climate change and sustainable development).
- Leisher, Craig, G Temsah, F Booker, M Day, L Samberg, D Prosnitz, B Agarwal, E Matthews, D Roe, D Russell, T Sunderland and D Wilkie, "Does the gender composition of forest and fishery management groups affect resource governance and conservation outcomes? A systematic map" *Environmental Evidence*. The official journal of the Collaboration for Environmental Evidence 5:6, 2016.
- Mark Reed and Lindsay Stringer (2016). *Land Degradation, Desertification and Climate change – Anticipating, assessing and adapting to future change*. London and New York: Routledge.

- McKinsey Global Institute (MGI), "The Power of parity: How Advancing Women's Equality Can Add \$12 Trillion to Global Growth". McKinsey & Company, 2015.
- Menon, S., J. Hansen, L. Nazarenko, and Y. Luo. 2002. Climate effects of black carbon aerosols in China and India. *Science* 297: 2250-2253.
- Mensah, S.A. 2006. Gender Sensitive Data Gathering Methods. http://www.un.org/esa/sustdev/csd/csd15/lc/gender_method.pdf
- O'Dell, K., Peters, S. and Wharton, K., 'Women, energy, and economic empowerment: Applying a gender lens to amplify the impact of energy access', Deloitte University Press, 18 September 2014.
- Ouédraogo, N. (2011). "Energy and Economic Poverty: An Assessment by Studying the Causality between Energy Consumption and Economic Growth in the Economic Community of West Africa States", (ECOWAS), United States Association for Energy Economics (USAEE) Research Paper Series.
- Practical Action, 'Energy poverty: The Hidden Energy Crisis', Policy Brief, 2009. http://practicalaction.org/docs/advocacy/energy_poverty_hidden_crisis.pdf
- Practical Action, 'Gender and Livelihoods Impacts of Clean Cookstoves in South Asia', Research Report, Global Alliance for Clean Cookstoves, 5 May 2015.
- Ramanathan, V. and Carmichael, G., 'Global and regional climate changes due to black carbon', *Nature Geoscience* 1 (2008), pp. 221–227.
- Renewable Energy Microfinance and Microenterprise Program (REMMP) "Pay-As-You-Go Technologies in Consumer Energy Finance" 2014 Briefing Note.
- Renewable Energy Microfinance and Microenterprise Program (REMMP)
- Republic of Indonesia, Intended Nationally Determined Contribution, 2015 http://www4.unfccc.int/Submissions/INDC/Published Documents/Indonesia/1/INDC_REPUBLIC OF INDONESIA.pdf
- Schalatek, L. (2009). "Gender and Climate Finance: Double Mainstreaming for Sustainable Development". Heinrich Böll Foundation, Washington DC.
- Shankar L, 'Strategically engaging women in clean energy solutions for sustainable development and health' (2015).
- Smith, K. et al., 'Millions Dead: How Do We Know and What Does It Mean? Methods Used in the Comparative Risk Assessment of Household Air Pollution', *Annual Review of Public Health* 35 (2014).
- Smith, P., Clark, H., Dong, H., Elsiddig, E.A., Haberl, H., Harper, R., House, J., Jafari, M., Masera, O., Mbow, C., Ravindranath, N.H., Rice, C.W., Roble do Abad, C., Romanovskaya, A., Sperling, F. and Tubiello, F. (2014) Chapter 11 - Agriculture, forestry and other land use (AFOLU). In: *Climate Change 2014: Mitigation of Climate Change*. IPCC Working Group III Contribution to AR5. Cambridge University Press.
- Solar sister: WEB: <https://www.solarsister.org/stories> [Nov 2 1016]
- SPCG Plc signs deals with three countries, Thailand Construction News, 31 January 2016. <http://www.thailand-construction.com/spcg-plc-signs-deals-with-three-countries/>
- United Nations Development Programme (UNDP), "Delivering Sustainable Energy in a Changing Climate: Strategy Note on Sustainable Energy 2017 - 2021," 2016a.

- UNDP, 'Gender & Energy for Sustainable Development: A Toolkit and Resource Guide', 2004.
- UNDP (2011b). "Ensuring Gender Equity in Climate Change Financing".
- UNDP (2011) "Towards an 'energy plus' approach for the poor - A review of good practices and lessons learned from Asia and the Pacific" <http://web.undp.org/asia/pdf/EnergyPlus.pdf>
- UNDP-GEF Gender mainstreaming 2016 (forthcoming publication).
- UNDP, 'Towards an "Energy Plus" Approach for the Poor - A Review of Good Practices and Lessons Learned from Asia and the Pacific', 2011a, available at: <http://web.undp.org/asia/pdf/EnergyPlus.pdf>
- UNDP, 'Towards an "Energy Plus" Approach for the Poor – A Review of Good Practices and Lessons Learned from Asia and the Pacific', 2011a, available at: <http://web.undp.org/asia/pdf/EnergyPlus.pdf>
- UNDP, "Affordable and Clean Energy - UNDP Support to the Implementation of Sustainable Development (Goal 7)," 2016b.
- UNDP, "UNDP-GEF Gender mainstreaming", 2016c
- UNDP, 2011. Human Development Report 2011 Sustainability and Equity: A Better Future for All, New York: UNDP.
- United Nations Conference on Trade and Development (UNCTAD), 'Applying a Gender Lens to Science, Technology and Innovation', Geneva, 2011.
- United Nations Economic Commission for Africa (UNECA) 2010: Economic Report on Africa Promoting High-Level Sustainable Growth to Reduce Unemployment in Africa. United Nations Economic Commission for Africa (UNECA), Addis Ababa.
- United Nations Environment Programme (UNEP). 2016. Global Gender and Environment Outlook - The Critical Issues. UNEP: Nairobi, Kenya.
- United Nations (UN), "Transforming our World: The 2030 Agenda for Sustainable Development," 2015. New York [A/RES/70/1] <http://www.un.org/press/en/2012/ga11333.doc.htm>
- UN, 'Sustainable Energy for All: A Vision Statement by Ban Ki-moon, Secretary-General of the United Nations', November 2011.
- UN, Paris Climate Agreement (FCCC/CP/2015/L.9/Rev.1). 2015b
- UN Sendai Framework 2015 - Sendai Framework for Disaster Risk Reduction 2015-2030, <http://www.preventionweb.net/drr-framework/sendai-framework>, (2015c).
- UN, "Draft outcome document of the United Nations Conference on Housing and Sustainable Urban Development (Habitat III)" A/CONF/226/1. 2016d
- UN, UNGA/11333-EN/274 – "United Nations General Assembly Declares 2014-2024 Decade of Sustainable Energy for All (UN Press Release: 21 December 2012)
- UN, "Addis Ababa Action Agenda of the Third International Conference on Financing for Development (Addis Ababa Action Agenda) - The final text of the outcome document adopted at the Third International Conference on Financing for Development (Addis Ababa, Ethiopia, 13–16 July 2015) and endorsed by the General Assembly in its resolution 69/313 of 27 July 2015.) 2015c http://www.un.org/esa/ffd/wp-content/uploads/2015/08/AAAA_Outcome.pdf

- United States Energy Information Administration (USEIA). International Energy Outlook 2016 (IEO2016) [https://www.eia.gov/outlooks/ieo/pdf/0484\(2016\).pdf](https://www.eia.gov/outlooks/ieo/pdf/0484(2016).pdf)
- USGCRP (2009). Global Climate Change Impacts in the United States. "Climate Change Impacts by Sectors: Energy Supply and Use." Karl, T.R., J.M. Melillo, and T.C. Peterson (eds.). United States Global Change Research Program. Cambridge University Press, New York, NY, USA.
- USEIA 2016 [https://www.eia.gov/outlooks/ieo/pdf/0484\(2016\).pdf](https://www.eia.gov/outlooks/ieo/pdf/0484(2016).pdf)
- World Bank Group, Women, business, and the law 2016: Getting to equal (Washington, D.C.: World Bank, 2015).
- World Bank. (2006). "Gender, Time Use, and Poverty in Sub-Saharan Africa", Working Paper no. 73.
- World Bank. 2012. World Development Report 2012: Gender Equality and Development, World Bank: Washington, DC.
- World Health Organization (WHO), 'Gender, Climate Change and Health', 2014
- WHO, 'Household air pollution and health', Fact sheet No. 292, (2016a).
- WHO, Burning Opportunity: Clean Household Energy for Health, Sustainable Energy, and Wellbeing of Women and Children (Geneva; WHO, 2016b).
- World Nuclear Association (2016) Fukushima Accident <http://www.world-nuclear.org/information-library/safety-and-security/safety-of-plants/fukushima-accident.aspx> (accessed 19 October 2016)
- Wright, N. and Gueye, Y. (2009). Gender Audits of Energy Policy in Botswana and Senegal: what has been achieved? Boiling Point, Issue 57. HEDON. <http://www.hedon.info/View+Article&itemId=11121>



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