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Energy for development

Ten years left to achieve SDG 7

DISCUSSION PAPER

This publication is part of our Development Policy Forum (DPF), which brings together a number of important development actors, including the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ), the Japan International Cooperation Agency (JICA), the European Investment Bank (EIB), the United Nations and the World Bank. Reflecting the growing role of the private sector in development, the DPF has now welcomed Coca-Cola and Eni to the forum. The DPF contributes to the global and European conversation on inclusive development. Through its activities and publications, the DPF reflects the rapidly-changing global debate on growth and development and seeks to encourage a multi-stakeholdered, fresh, up-to-date thinking on the multiple challenges facing the development community.

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Publisher: Geert Cami
Director: Shada Islam
Programme Managers: Raphaël Danglade, Augusta Ramaccioni
Programme Assistants: Rahul Chawla, Gareth Whalley
Editors: Robert Arenella, Arnaud Bodet, Eleanor Doorley, Indrė Krivaitė, Zachary McGuinness, Angela Pauly
Design: Lucien Leyh, Elza Lőw

Table of contents

Foreword

Shada Islam, Director of Europe and Geopolitics at Friends of Europe

Developing and emerging economies face a complex challenge when it comes to their energy infrastructure: they must meet the needs of growing populations that still lack access to basic services like water and electricity but they must also be part of the solution by answering the global climate emergency through innovative efforts to ensure a low-carbon future.

The Paris Agreement, which will officially enter into force in 2020, asks that each country contribute to mitigating and adapting to climate change. Setting it in motion requires collaborative efforts in the field of social, technological and financial innovations as well as the strong commercial development and application of solutions. In this regards, Sustainable Development Goal 7 (SDG 7) aims to ensure access to affordable, reliable, sustainable and modern energy for all, and while the number of people without access to electricity fell to below 1bn in 2017, there is still a long way to go.

In September 2019, UN Secretary-General António Guterres convened the Climate Action Summit to mobilise political leaders, economic actors, and climate activists around the implementation of the Paris Agreement. With only ten years left to achieve the SDGs, and national governments offering less-than-inspiring solutions to a global crisis, Friends of Europe has brought together some of the key actors from the private sector, think tanks, development agencies, and supranational organisations, to highlight some of the stories of progress on the provision of clean sources of electricity, and the effect it has had on living conditions in a number of economies.

Articles in this discussion paper have been published online on a weekly basis, beginning on the day of the United Nations Secretary-General Summit on Climate Action and ending at the time of COP 25 in Madrid. The articles, and the recommendations from the publication, aim to demonstrate that it is possible to achieve SDG 7 well before 2030, and inform the next EU mandate on actions to take. The European Green Deal has a duty to go beyond Europe, and help nations around the world to transition towards sustainable economic and energy growth.

Recommendations

Drawing on the viewpoints and ideas presented by the authors of the articles in this discussion paper, these 10 recommendations aim to ensure a faster transition to clean and renewable energy for an inclusive, sustainable and just growth – both in developing countries as well as within the EU.

1. Strengthen Public–Private Partnerships (PPPs) to help unleash more resources, knowledge and expertise required to ensure the transition to low-carbon energy;

2. Seek out new and innovative sources of funding to achieve Agenda 2030 (including SDG 7) to help compensate for the stagnating levels of Official Development Assistance (ODA);

3. Create the right fiscal, regulatory and legal framework for the energy transition by, among other actions, de-risking investment, leveraging new development finance models and products, and providing direct incentives;

4. Reinforce regional connectivity, integration, and infrastructure to enhance energy access for remote communities and boost economic resilience;

5. Lower the cost of clean energy by reducing manufacturing costs and implementing energy taxation;

6. Invest in research and innovation in developing countries to ensure technological leapfrogging as opposed to attempting to mirror the industrialisation process of developed nations;

7. Scale-up innovative 'last mile' energy access financing and business models such as clean and efficient cooking solutions, as the least-cost options to reach most people living in energy poverty;

8. Take the cultural and local element into account when implementing energy policies to ensure their acceptance and ownership by local communities and to foster gender equality and women's empowerment;

9. Push for development policies' shift towards strategies and frameworks that focus on productivity as opposed to those that deal exclusively with the consequences of poverty;

10. Think of the 'energy issue' as part of an ecosystem by establishing mutually reinforcing partnerships among stakeholders and embedding it in all economic and social policies.

Africa's opportunity for a bright and sustainable future

Africa's population is expanding and urbanising at an unprecedented rate. Whether demographic changes pay dividends will largely depend on the availability of reliable and sustainable energy to support development, and the expansion of modern energy services to those currently lacking such access. Unsustainable use of wood dominates sub-Saharan Africa's energy use today; less than one-in-two people have access to electricity, and less than one-in-five have access to clean cooking solutions. Yet Africa's energy future is not tied to its past: the objectives of Sustainable Development Goal 7 (SDG 7) – to "ensure access to affordable, reliable, sustainable and modern energy for all" – are within reach, and renewables offer the least cost pathway for most.

"Tapping Africa's potential for energy efficiency, renewables and domestic use of natural gas is crucial to put all African countries on track for universal access to reliable electricity by 2030

Timothy Goodson, Energy Analyst at the International Energy Agency (IEA)

Arthur Contejean, Energy Access Analyst at the International Energy Agency (IEA)

Laura Cozzi, Chief Energy Modeller at the International Energy Agency (IEA)

The International Energy Agency (IEA) has long monitored Africa's energy sector closely. Throughout the past two decades, it has tracked energy access, notably through its World Energy Outlook series. The recently released, Africa Energy Outlook 2019, explores possible energy futures for Africa, with a particularly granular focus on sub-Saharan countries. Africa stands on the cusp of a unique opportunity to become the first region in history to develop its economy primarily by combining energy efficiency, solar, wind and natural gas. Supported by the right policies, the vast potential of these resources could underpin achievement of universal access to modern energy by 2030.

Africa has seen impressive progress in improving access to energy in recent decades. Supported by robust national electrification plans, access rates across North Africa now exceed 99%, while in sub-Saharan Africa the share of the population with access to electricity has nearly doubled from 25% in 2000 to around 45% today. Two decades of effective policy measures in South Africa and Ghana have increased electricity access rates to some of the highest levels in the region.

However, in many other African countries, access to electricity has struggled to keep pace with population growth. The number of people without access across the region has increased by almost 100 million since the year 2000. As a result, residential electricity demand in sub-Saharan Africa outside of South Africa averages less than 100 kWh per person per year, compared to well over 2,000 kWh in advanced economies.

Looking forward, the access challenge becomes even more acute. With over 40% of Africa's population under the age of 15 and the world's fastest population growth rate, one-in-two people added to the global population between today and 2040 are set to be African. By 2023, Africa's population is on track to surpass that of both India and China. Urbanisation in Africa is also proceeding rapidly. It is estimated that the population of Africa's cities will increase by more than half a billion people by 2040, a number that exceeds the scale of urbanisation in China during the last two decades of its massive economic and energy expansion.

Access to reliable and sustainable energy to feed, power, house, move and cool Africa's expanding population is the foundation stone for Africa's sustainable development. Yet the momentum behind today's policy and investment plans is not enough to meet the energy needs of Africa's population in full. Without further action, 530 million Africans will remain without access to electricity in 2030, and the number of people relying on inefficient and polluting cooking solutions could increase to almost 1 billion.

Yet the picture is not uniform and universal access to electricity is in reach for several countries. Detailed national electrification plans coupled with adequate funding see Kenya, Ethiopia and Rwanda achieve universal access before 2030, with Ethiopia alone providing access to 70 million by 2030. Outside of East Africa, South Africa, Ghana and Senegal are all on track to achieve universal access

before 2030. While achieving universal access to electricity for Africans by 2030 requires considerable additional effort, these examples highlight that SDG 7 remains achievable.

Africa is the first continent with the possibility to apply clean energy solutions to underpin access to energy and economic development. Falling technology costs, local resource endowments and the success stories of African peers provide the opportunity for Africa to leapfrog to a reliable and sustainable energy system accessible for all. Energy efficiency is the first port of call, helping to improve the affordability of energy services and increasing the competitiveness of local industries. A handful of countries in sub-Saharan Africa are already leaders in energy efficiency when it comes to the residential appliances that accompany decentralised models of electricity access.

Africa has the richest solar resources of any region, yet today is home to only 5 gigawatts of solar photovoltaic (PV) capacity, less than 1% of the global total. With the right policies and financing, solar PV could become the continent's top electricity source by capacity. While solar PV is set to expand most rapidly, all renewable technologies are needed to support energy access and development, especially an expansion of hydroelectric capacity. Over 40% of global gas discoveries in recent years were in Africa and, if used locally, this gas has the potential to complement electricity generation from renewables and support industrialisation. All such resources could help bring about a much less carbon intensive development trajectory compared to other developing regions.

Tapping Africa's potential for energy efficiency, renewables and domestic use of natural gas is crucial to put all African countries on track for universal access to reliable electricity by 2030. To achieve this goal, over the next 12 years, the average number of people gaining access to electricity each year would need to triple from around 20 million today to over 60 million people. More decentralised and modular technologies, mainly based on renewables, are now available and they are reducing the length of time it takes to provide access to electricity and cutting the costs of doing so.

According to the IEA's latest geospatial analysis (developed in collaboration with the KTH Royal Institute of Technology), while grid expansion and densification will remain essential, mini-grids and stand-alone systems could provide power to more than half of the population who need to gain access by 2030, or almost 450 million people.

A reliable electricity supply for all would require an almost fourfold increase in power sector investment, averaging around $120bn a year to 2040, half of which is needed for networks. Mobilising this level of investment is a significant but achievable undertaking. It will require policy and regulatory measures to improve the financial and operational efficiency of utilities and to facilitate a more effective use of local and international public funds to catalyse private capital.

Investment needs go hand in hand with the need for clear electrification planning and regulation adapted to national specificities and constraints,

allowing in particular grid and decentralised-based infrastructure to complement each other. Long-term comprehensive strategies have already been designed in many countries, such as Ghana, Senegal, Ethiopia, Nigeria and Rwanda. Supporting and implementing similar initiatives in other countries across the diverse African landscape will be the cornerstone of the efforts to reach universal acce access by 2030.

The public wants climate action, private-public partnerships can give it to them

We need climate action now. But how can we do this in a fair way that benefits all communities, nations and businesses alike? How do we address all 17 of the Sustainable Development Goals (SDGs) while creating meaningful solutions to climate change? How can this lead to effective implementation?

These are not just questions for the United Nations Office for Project Services (UNOPS) to address. These are the questions that everyone on this planet must find answers to. Of course, the simple answer is 'change'. We must change how we live our lives, how we move around, how we power our machines, how we heat our homes and how we cook our food.

While there are many contributors to climate change, one of the most prevalent is how we generate and use energy. Even in 2019, despite all of our technological advances, we remain far too reliant on fossil fuels to generate electricity.

This reliance is inexorably tied to the continuing growth in energy demands. The global population is growing and the number of machines and devices which need energy is increasing every day. In this modern age, access to energy is now nearly as important as access to food and water.

"Today, it's understood that around 80% of the $7tn needed to achieve the SDGs will have to come from private sources. This is how we can instigate change

Grete Faremo, Under-Secretary-General and Executive Director of the United Nations Office for Project Services (UNOPS)

Today, the number of people without access to power has dropped below 1bn. With global commitments to the completion of SDG7 – ensuring access to affordable, reliable, sustainable and modern energy for all – it is reassuring to see this number moving in the right direction. However, there is still plenty more work to be done.

Cities are considered to be the world's engines for economic growth. Unfortunately, a lot of energy is required to power these engines. On average, cities consume about two-thirds of the world's energy, emitting more than 70% of global CO_2 emissions.

These bustling centres of economic activity are rapidly growing. A recent UN report estimated that by 2050 an extra 2.5bn people will live in urban areas – the majority of them in Africa and Asia. This trend will be accompanied by a much greater demand for energy, and the monumental task of delivering that access while reducing greenhouse emissions. It is easy to commit to 'change', but is much harder to implement.

But change isn't only on UNOPS' agenda. Now, more than ever, people across the world are demanding it too. Recent elections in Europe saw political parties focused on climate-related issues significantly increase their vote share. In Denmark, home to UNOPS' headquarters, the environment was a key focus in debates.

Outside of formal politics, 2019 has also seen citizens organising and participating in mass marches for climate action the world over. The most famous examples have been the weekly school strikes for climate initiated by the young Swedish activist Greta Thunberg. To date, more than 1mn school students have skipped a day of school to demand stronger action on climate.

With the public clamouring for climate action, governments at all levels and international organisations must leverage this demand to increase their efforts. UNOPS has seized the initiative by helping governments, the UN and its partners implement around 1,000 projects, worth approximately $2bn, in more than 80 nations across the world every year.

As infrastructure specialists, improving access to sustainable and renewable energy is one of the areas in which UNOPS works. In Sierra Leone, for instance, this UN body has spent the last three years developing a renewable energy system in the country's most remote and rural areas. Funded by the British government, this project provides clean energy to hospitals and schools using a mini-grid system that harnesses solar energy.

On the day the lights were switched on in one local school, pupils and teachers stayed in class long into the night. They had never had the opportunity to do so before the grid's installation. Soon, electricity access will be extended to private households. Communities across Sierra Leone will be able to cook, heat their homes and light up their rooms with clean, renewable energy at a fair and controlled price. This new energy source will change lives for the better and provide new opportunities well into the future.

In Mexico, UNOPS stepped further into the renewables sector as it undertook the revitalisation of a struggling wind farm near Monterrey. The facility had been operating 8 turbines, producing 22 megawatts of renewable energy, for 5 years. For various reasons, the project was in danger of closing down, putting people's jobs at risk and potentially forcing local residents to shoulder increased energy cost. Losing such an important source of green energy would have had a negative environmental impact, leaving the population even worse off.

The solution was to work with partners to redevelop the plant's business model and help generate new investment in the facility. In a landmark move, this included UNOPS investing some of its own financial reserves into the project, via its Social Impact Investing Initiative.

Since then, the wind farm has recovered and is now in a healthy financial position. So much so that an expansion into solar energy is now being planned on the same site. This environmental benefit is clear: it has kept a wind farm going that otherwise faced closure. It was also beneficial for the local municipalities that now pay less for energy. The site now operates as a free learning centre for school children, who travel from all over Mexico to learn about the benefits of renewable energy.

Investing in a project like this is just one example of the value of such cooperation. Private-public partnerships clearly help unleash more resources, knowledge and expertise in development projects. This is how we can ensure the success of the SDGs.

To implement the SDGs, the world needs investments in the order of $7tn globally, every year. At the moment, official development assistance (ODA) generates a mere $153bn annually for the cause. This amount did not increase between 2017 and 2018.

Today, it's understood that around 80% of the $7tn needed to achieve the SDGs will have to come from private sources. This is how we can instigate change. It is up to all of us – from policymakers to profit creators – to work together while investing both our time and our money to tackle this issue together.

New sources of investment into sustainable development will help close this gap. There are risks that come with committing to these projects, especially in emerging economies. However, if that risk is shared, those barriers that prevented the private sector from investing in the past will be broken down. Private firms should be invited to help create a better world and be entitled to compensation, as it is inevitably for the greater good. This is what social impact investing is all about.

We need to change as a society. We need to rethink how we generate and use energy. We need to work together to make the changes needed to achieve it. We need to engage important private sector partners in this imperative effort. We need to get started now. The journey will be difficult, but we will pay an even greater price if we do not move quickly.

How clean cooking stoves could save millions of lives

Some 3bn people around the world, mostly in low- and middle-income countries, cook their food using biomass in inefficient open fires or with traditional stoves in poorly ventilated rooms. They often rely on heavily-polluting fuels like charcoal, kerosene, wood and animal dung. Cooking this way is not only costly, but the cause of more than 4mn deaths annually. This exceeds the number of those who die from HIV, tuberculosis and malaria combined.

The adoption of cleaner and more efficient cookstoves and fuels can dramatically reduce exposure to harmful cooking smoke, reduce fuel costs for most families and cut down on forest degradation.

The Global Alliance for Clean Cookstoves was set up in 2010 to address these challenges through the creation of a global market for clean and efficient household cooking solutions. While most of the companies formed out of this process took to distributing stoves to consumers in developing countries, companies like BURN Manufacturing adopted a different model. Instead of focusing on distribution, they

"This new method of cooking should not be framed as a challenge to local cultures, but rather as something that offers the same advantages of cooking on biomass, only more efficient

Peter Scott, CEO and Founder of BURN Manufacturing

invested in manufacturing locally – in Kenya – enabling communities to take ownership and allow BURN to modify the process to reflect these communities' needs.

In Kenya, around 60% of the population continues to rely on solid fuels to cook their food. The average household of five people spends approximately $2 per day on fuel, making cooking an expensive affair. A traditional stove is the cheapest option available to most, though many remain unaware of the financial drain and health implications of cooking in this way.

The company's stoves are designed and engineered to reduce harmful carbon dioxide emissions from burning biomass fuels such as charcoal and firewood. Since the establishment of the BURN Manufacturing's plant - Sub-Saharan Africa's first solar powered, modern clean cookstove plant - more than 3mn tonnes of wood have been saved. These cookstoves have also been instrumental in reducing over 5.3mn tonnes of harmful carbon dioxide emissions. Furthermore, their consumers' fuel consumption decreased by 56%, saving them about $150-300 annually.

Companies looking to invest in developing clean stoves in countries that need them also have an opportunity to help local communities by promoting gender equality. Appointing more women in manufacturing roles – as BURN Manufacturing has done - can help shift perceptions about what women 'can' do and provide a way in for women can take the lead in delivering energy to their own communities.

Despite all of these benefits, obstacles to widespread adoption do remain. On a market level, the cookstove industry aims to address barriers that impede the production, deployment, and use of clean, efficient stoves and their fuels in developing countries. Local authorities can help by providing manufacturers with tariff exemptions for assembling materials. This would allow the industry to reduce manufacturing costs and lower costs for consumers.

There is also a cultural element that needs to be addressed: traditional cooking practices tend to promote open fire cooking. Public awareness of the benefits of switching to cleaner, safer stoves will help encourage behavioural change. It is important to frame this transition not as one that challenges local culture, but as being beneficial to both health and economy while allowing cooking traditions to be maintained. Manufacturing locally supports this process, bolstering a sense of ownership and increasing usage within these communities.

The International Energy Agency predicts that 2.2bn people will still be without access to clean cooking facilities in 2030 and experts estimate that over the next 30 years, biomass will continue to supply between 70-80% of all household energy needs in sub-Saharan Africa. It is clear that a great deal more must be done to ensure the widespread adoption of clean cooking stoves across Africa and the wider developing world.

A broad marketing strategy can help in this regard. By connecting corporate and product brands to climate action, consumers recognise the benefits of purchasing a clean cookstove beyond their own needs. This creates added value to products and a unique selling point.

Sustainable funding is also needed to help the sector grow and meet its goal of a world where cooking does not kill. Access to sufficient funding allows a company to establish itself and mature. This growing stability gives a recipient business the opportunity to carve out a market for its product while also enabling it to innovate and expand.

Greater investment from public and private sector organisations would go a long way in supporting innovation and manufacturing in the cookstove sector. A steady flow of funding could allow clean stoves to reach a wider market, increase manufacturing capacity and at the same time subsidise the cost of stoves.

Creating partnerships with different financial institutions and 'pay-as-you-go' companies, which BURN Manufacturing has done, provides an opportunity to reduce costs for consumers feeling the pinch. These companies offer credit, in some cases even allowing customers to pay as low as $1 a week for an agreed period of time. Having an array of credit lines also allows a company to extend credit to small-scale distributors and in turn increase their product's reach, in this case stoves.

Finally, investing in research and development to develop low-cost but fuel-efficient stoves would also help increase their adoption in Kenya and beyond. There is still ample room for innovation in this area – and companies like BURN Manufacturing will have to continue to play a greater role in ensuring that affordable and clean cookstoves are available to households across sub-Saharan Africa.

Challenges for international cooperation in the Asian power sector

Since the international community agreed to the Paris Agreement in 2016, development discourse in the energy sector has drastically changed. Though the three 'pillars of energy policy' – environment, efficiency and security – remain the same, the environmental pillar has taken on renewed importance. For instance, while Goal 7 of the Sustainable Development Goals (SDGs) targets energy specifically, it has become clear that it spills over into development activities not related exclusively to energy, such as water and sanitation, industry and infrastructure, cities and communities and production and consumption.

"As an economic powerhouse, striking the right balance between development and emissions reduction is of great interest, not only for Asia, but for the world as a whole

Susumu Yuzurio, Director of the Energy and Mining Group at the Japan International Cooperation Agency (JICA)

Asia has a crucial role to play in promoting development policies pertaining to the environmental pillar. The International Energy Agency (IEA) forecasts that global emissions are likely to increase 1.4-fold by 2040. Asian countries account for 60% of this increase, given the significant presence of coal-fired power plants in the region. As an economic powerhouse, striking the right balance between development and emissions reduction is of great interest, not only for Asia, but for the world as a whole. Effective development policy can catalyse energy sector transformations towards low-carbon approaches.

Traditionally, the intended objectives of power development and power system structures were rather straightforward. For urban or industrial centres, the aim was to supply power by building large-scale generations and network systems. For rural areas, it was to enhance electrification by grid extension or small-scale hydropower development with public utility companies.

For the past 40 years, the Japan International Cooperation Agency (JICA) has worked side by side with countries in Asia to strategise how best to adapt their institutional capacity and physical infrastructure for sustainable economic development. The development intervention of JICA worked quite effectively. Long-term power development plans were created using 'least cost' methods. They managed to improve operational efficiency through loss reduction and the introduction of technical standards, and helped build infrastructure through concessional loans.

JICA projects have also turned utilities, such as the Electricity Generation Authority of Thailand (EGAT), into invaluable partners through its provision of technical trainings across Asia. This enhances not only mutual interactions and trust among utilities in the region but also facilitates regional integration. Relations built upon historical cooperation represent not only invaluable assets for the region as a whole, but also encourage an embrace of future challenges.

Indeed, recent years have seen a drastic paradigm shift in the power sector. Three elements are at the heart of this: i) the shift towards lower carbonisation brought on by the Paris Agreement and SDGs, along with a rapid cost decline in renewable energy (RE) and energy management system (EMS); ii) regional integration; and iii) the importance of private partners' participation.

To achieve the goals set out by the Paris Agreement, the power sector, which accounts for around 30% of emissions, will need to reduce its emissions by 80%. This requires a comprehensive 'disruptive' shift in power systems. Some countries, particularly small Pacific island nations, have led the way in this regard.

The Solomon Islands provide an illustrative example. They have set an ambitious target of 100% RE by 2030. The decreasing costs for photovoltaic generation (PV) and batteries could prove useful in this endeavour. However, an increase in RE risks making measures against power fluctuations and electrical

inertia prohibitively expensive. Thus, JICA will start a study with Solomon Power to produce an implementable road map for the islands' ambitious goal, and to facilitate building consensus on the future directions of the country's energy, economy and society as a whole.

In some cases, this kind of policy stirs up divisions among political parties. To take another example, Sri Lanka saw prolonged policy debates on RE and thermal power after the government and JICA developed a plan together. The study in question offered a long-term generation development plan that simulated various scenarios for utilities in accordance with different policy priorities.

Historically, Japan's official development assistance (ODA) has been cautious about getting involved in domestic politics of partner countries. However, recent experience suggests that, though it strives to maintain impartiality and provide rigorous scientific studies in policy planning processes, it needs to take heed of political forces to achieve policy goals.

One political consequence of energy cooperation is enhanced regional integration. Indeed, under certain circumstances, the expansion of power network systems beyond borders provide opportunities for enhancing efficiency, stability and CO_2 reduction. One visible example is the Association of Southeast Asian Nations (ASEAN). Since the 1990s, heads of ASEAN power utilities gather periodically to formulate 'master plans' and to take action towards stronger regional integration.

Another example is the Greater Mekong Subregion (GMS), which came into being in 1992 after the Asian Development Bank (ADB) brought together six states: Cambodia, China, Laos, Myanmar, Thailand and Vietnam. Recently, countries from the GMS have made efforts to accelerate power exchange in cooperation with international development partners such as the ADB and JICA.

So far, power transactions have mainly taken place through dedicated transmission lines between independent power producers (IPPs) and off-takers in neighbouring countries. However, now they are gradually moving towards a 'system-to-system' regime whereby connected countries can exchange power through various means.

A great deal of technical and political effort must be undertaken to achieve this 'system-to-system' process. Coordinating mechanisms for power exchange is still in its primitive stage. As a result, JICA is working with power utilities in the GMS to develop their institutional capacities in power system planning, coordination and the enforcement of grid codes. The aim is to eventually create an integrated region-wide power network system. The political will of constituting countries will be a key to success.

While political actors have an important role to play, the private sector should also be involved. In most Asian countries, private entities account for the majority of investment in power generation. In Cambodia, the Philippines and Laos, they are even authorised to participate in investment and the operation of power network systems.

The coming decades will see several changes for businesses. Variable renewable energy (VRE) – such as wind or solar power – will play a much larger role in power generation. Moreover, various types of private 'prosumers', who produce and consume power on demand sides represented by virtual power plants, will play a substantial part in power systems.

These new businesses are already in operation – albeit on a small scale – in Thailand and some Pacific island nations. Expanding these will require effective yet flexible governance and regulatory frameworks as well as technical breakthroughs. This is an unprecedented challenge for development institutions like JICA as, unlike its past cooperation programmes, it has little experience to draw from and, therefore, needs to co-create knowledge and solutions from scratch with partners.

We are entering uncertain frontiers both in energy and development. Though the road ahead may be bumpy, it will lead us to a new stage where development partners and private entities in both recipient and donor countries can work together to produce innovative solutions. This is the way forward to achieve global sustainable development.

Catalysing socio-economic change through the productive uses of widened energy access

Enabling energy access for productive uses in the developing world is key to harnessing energy's full developmental potential. This means facilitating its use for agricultural, commercial, and industrial activities. At the crux of this argument is the notion that, in order for energy access to catalyse real economic growth and socio-economic development, the right wider economic conditions – combined with a healthy financial, entrepreneurial and investment ecosystem – must exist. Developmental efforts must aspire to create deeper societal and economic change.

Development policy should therefore be highly coordinated if it is to be impactful. The United Nations has established programmes that seek to achieve such a paradigm shift – namely the Private Financing Advisory Network (PFAN) and the Global Cleantech Innovation Programme (GCIP). These can provide means through which this change is realised.

It is well established that energy access is vital for achieving basic levels of development. Provision of electricity is needed for lighting, health, education, communication and

"Developmental efforts must aspire to create deeper societal and economic change

Patrick Nussbaumer, Industrial Development Officer at the United Nations Industrial Development Organization (UNIDO)

Eleanor Vickery, Intern in the Department of Energy at the United Nations Industrial Development Organization (UNIDO)

community services, not to mention modern fuels and technologies for cooking and heating. Furthermore, fuelling modern energy needs is key for the international community.

However, societies do not magically jump from meeting their basic developmental needs to being fully industrialised and developed. An intermediary level of access to energy services, notably for productive uses, is vital for socio-economic development.

Historically, innovation in energy technology has been an important driver of economic development, as exemplified by the widespread use of steam and internal combustion engines throughout the West in the 19th century. Similarities can be drawn between countries currently undergoing industrialisation and those who went through it centuries ago, when the transformative potential of energy for economic growth first came to light.

Collectively, electricity, modern fuels and other energy services demonstrate considerable promise when it comes to the challenge of improving productivity. In the agricultural sector, it provides means such as water pumping for irrigation, fertiliser and mechanised tilling. When it comes to commercial activities, it can help with agricultural processing and cottage industries. And finally, in the transportation sector, it can offer crucial modernisation.

If the focus of widening energy access is confined to meeting basic human needs, then the indicators of poverty are merely mitigated while the structural causes of poverty remain unaddressed. On a structural level, a more drastic paradigm shift in the economies of poverty-stricken communities must occur in order for change to be self-sustaining and meaningful. Perhaps the age-old parable, “Give a man a fish, and you feed him for a day. Teach a man to fish, and you feed him for a lifetime,” is relevant here. Energy-related developmental efforts should aim higher and seek to transform the underlying socio-economic conditions that keep communities stuck in a vicious cycle of poverty.

Energy access can generate tangible growth by catalysing small business activities in local communities. Even for activities that outwardly do not require energy, such as leather manufacturing or wood carving, a small energy supply can greatly improve productivity through measures that include the extension of the working day or the enabling of partial mechanisation.

Furthermore, in countries that are late to industrialisation, energy access grants the possibility of technological leapfrogging. Where in the past un-electrified communities may have automatically been connected to conventional grids powered by fossil fuels, innovative mini-grids that run on renewable energy are increasingly becoming the go-to option throughout the developing world.

PFAN has worked with several inspiring projects that do exactly this. For example, Okra Solar, an Australian start-up operating out of Cambodia, has developed a unique Internet of Things (IoT) device that enables homes to be integrated into

a fully modular solar micro-grid. The system uses off-the-shelf parts, meaning that anyone can set it up.

Given the understanding that industrialisation is now occurring in a different context than in past decades, a developmental strategy that focuses on productivity as opposed to one that deals exclusively with the consequences of poverty, will allow the full potential of modern industrialisation to be realised.

The assumption that has thus far been made is that socio-economic development is contingent on access to reliable, affordable energy services. However, if increased energy access is to successfully stimulate an increase in productivity, other relevant economic conditions must be satisfied. Ultimately, energy access remains the binding constraint to development.

To determine whether or not firms are competitive in domestic and international markets, a number of factors must be taken into account. These include the structure of technical and managerial skills among a population, the levels of transaction costs for production and related services, and the depth and outreach of financial systems. It is also essential to have well-defined property rights, economic stability and healthy public finances. These favourable macro- and micro-level variables need to be promoted in parallel to energy-related projects for positive socio-economic outcomes to be adequately realised.

Arguably, both PFAN and GCIP embody an approach that aims to ensure that widening energy access leads to meaningful socio-economic development. PFAN draws on its expertise to support early stage clean energy projects become investment ready, thereby bridging the gap between investors, clean energy entrepreneurs and project developers. GCIP identifies and accelerates climate technology enterprises and supports national policymakers in enhancing policy frameworks for SMEs and entrepreneurship, therefore improving local access to modern energy and climate technologies and creating new green industries as a result. Both programmes go further than simply widening energy access, seeking to build healthy economic ecosystems within which development can occur.

To conclude, the set of conditions needed for energy access projects to catalyse systematic and sustainable economic growth is very complex, thus great coordination is needed among actors pursuing developmental initiatives. Ultimately, a narrow focus on energy resources exclusively is not enough.

An essential puzzle piece: electromobility's role in decarbonising energy and transport

After the Paris Agreement was signed in 2016, the transport sector came to realise the full scale of the challenge it faced in fulfilling its climate targets. Although the energy transition has achieved considerable international success, the transport transformation is lagging behind. In many developing countries and emerging economies, increasing motorisation has led to a sharp rise in greenhouse gas emissions.

Certain countries have recorded significant increases in CO_2 emissions. Between 2001 and 2013, China's emissions went up by 191%, Ghana by 140% and Peru 111%. At the same time, many cities are currently looking for solutions to reduce air pollution and noise, thereby improving the quality of life and health of their inhabitants.

To achieve global climate targets, the use of renewable energies (RE) in the transport sector will be inevitable in the long run. Moreover, priority will have to be given to traffic avoidance, efficient traffic management and a modal shift towards public transport. While motorised means of transport will continue to play an important role, a greater emphasis needs to

"Electric vehicles present a unique opportunity to reduce the environmental impact of the transport sector while at the same time shrinking dependence on fossil resources

Dennis Knese, Energy and Transport Advisor at the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH

be placed on non-motorised transport and shared vehicles.

Electric vehicles (EVs) present a unique opportunity to reduce the environmental impact of the transport sector while at the same time shrinking dependence on fossil resources. Various studies have shown that EVs significantly lower CO_2 emissions in regions with a high proportion of RE when compared with petrol or diesel vehicles. In addition to this, they are generally more energy-efficient than internal combustion and fuel cell vehicles.

As the energy transition progresses, emissions produced in the manufacturing process and vehicle operation will decrease. However, it is not advisable to wait until the energy sector has been decarbonised before renewing the fleet. Rather, the transport sector should move away from dependence on current technologies. To help decision-makers in identifying appropriate measures, the basis for a uniform determination of climate-impacting emissions must be created.

Of course, the introduction of electromobility will have to be adjusted to fit the local context. In some cases, electric bicycles, scooters and motorcycles could lead to a significant emissions reduction effect, as was the case for Vietnam. In other regions, where their driving framework allows for it, electric taxis or commercial vehicles could prove more economically viable (such as high mileages, well-planned journeys, along with vehicle and battery size). In cities where air pollution is an issue, electric buses could play a key role in improving air quality.

A requirement for all cities and regions introducing electromobility should be a climate-friendly transport policy, a clean electricity grid, ambitious RE expansion targets and a formalised bus system. A cooperation agreement should also be arranged between manufacturers, operators, utilities and other relevant stakeholders to develop a sustainable business model.

Santiago de Chile provides an excellent example in this regard. In 2018, they introduced 200 electric buses using a leasing model to minimise the risks involved in having high upfront costs for the vehicles. The buses were purchased from different manufacturers by two utility companies and were then leased to the bus operators. They were partially paid for with user fares and partially covered by existing public transport subsidies.

Similar business model approaches will be implemented with the support of GIZ in different countries, among them Brazil (funded by the German Federal Ministry for Economic Cooperation and Development, BMZ) and Costa Rica (funded by the German Federal Ministry for the Environment, Nature Conservation and Nuclear Safety, BMU).

However, certain challenges that will have to be addressed beforehand. For instance, the growing number of EVs will create higher demand for electricity. A study carried out by the German Öko-Institut shows that an ambitious long-term scenario with electric cars, accounting for 75% of the total car fleet in Germany, would increase demand for electricity

by 80 to 100 TWh per year. This is roughly equivalent to the overall electricity generated by wind energy in Germany in 2015. At the same time, the expansion of charging stations for EVs could affect grid infrastructure and lead to a temporary overload of distribution grid elements in certain regions. It is therefore important to expand the infrastructure accordingly.

There are possible ways to mitigate these risks. Smart charging can help to control the charging processes, which is particularly important for centrally managed fleets. Additionally, new business models are emerging to shift the charging processes over time, for example by offering flexible tariffs.

EVs can further serve as power storage devices and contribute to grid stabilisation for the fluctuating RE. Through bidirectional charging (also called vehicle-to-grid), energy can be temporarily stored in the vehicle battery in order to compensate for power peaks. Conversely, the energy can be fed back into the grid from the vehicle when demand is high. Such solutions would be especially suited to those areas which are highly dependent on diesel imports but have a lot of wind and solar potential (e.g. the Caribbean Islands, where GIZ supports national and regional e-mobility activities, funded by the BMU).

Introducing and implementing electromobility will also require the creation of appropriate framework conditions. The European Union has already begun to support such efforts. This will have to address fiscal, regulatory and legal issues. National roadmaps can be helpful in creating a strategic conceptual framework, ideally keeping in line with the country's Nationally Determined Contributions (NDC).

For example, Costa Rica has adopted a National Electric Transport Plan 2018-2030 with clear targets and actions towards zero-emission transport, in line with its National Decarbonisation Plan 2018-2050. GIZ supports Costa Rica in the implementation of both plans. Some European countries as well as North American states and provinces have set ambitious targets for phasing out fossil fuels by 2040 or earlier (e.g. Norway, Netherlands, France, United Kingdom, British Columbia, California).

In addition to the reduction of acquisition costs by financial subsidies and the introduction of fuel efficiency standards, incentives such as parking privileges or support in setting up a charging infrastructure have also proved to be decisive success criteria for the rise of e-mobility, as seen in Norway. In that country, EVs had a market share of almost 50% in the first quarter of 2019. In any case, due to the higher upfront costs of EVs, it is necessary to create appropriate financial instruments and mechanisms where funding makes sense.

At the international level, new import dependencies combined with the social and ecological effects of increased raw material extraction (e.g. lithium, cobalt) play a crucial role. GIZ is part of the Global Battery Alliance, a public-private coalition set up to catalyse, accelerate and scale up action towards an inclusive, innovative and sustainable battery

value chain. Likewise, national recycling standards can prevent the improper disposal of batteries and thus counteract negative environmental effects, given that around 95% of the batteries are recyclable. China, for example, has introduced a battery recycling scheme for EVs in 2018, including a set of industry guidelines and tax incentives. GIZ supports Chinese partners with feasibility studies and industrial dialogue, funded by the BMU and the German Ministry for Economic Affairs and Energy (BMWi).

Due to the challenges and potential opportunities highlighted above, the introduction of electromobility, the RE expansion and the grid integration of EVs must be considered in conjunction with one another. With a growing share of variable RE in an electricity system, questions of efficient and effective grid integration are coming to the fore. EVs offer an opportunity to make the electricity system more flexible and stable by temporarily storing electricity and then feeding it back into the grid when it is needed.

In certain cases, however, the question arises as to whether charging is technically controllable and, for example, controllable by means of appropriate price incentives. Digital technologies and regulatory framework conditions should have a supportive effect here. ‘Second life’ applications also play a role in this context and require integrated, systemic consulting approaches.

At the same time, distribution networks may have to be expanded in order to meet the additional demand for electricity. The planning approach should be designed in such a way that the complementarity of electricity demand from EVs and the supply of variable RE reflects the advantages of the coupling of sectors. Then the expansion of electromobility can support the energy system transformation.

Overall, sustainable transport, especially e-mobility is characterised by dynamic technological and organisational developments. Further innovations, such as connected and automotive vehicles, could disruptively change the mobility of the future. It is essential to jointly consider the opportunities and risks arising from those developments and to follow integrated, cross-sectoral approaches for a decarbonised future in Europe and around the world.

The journey towards universal electrification in India

In 2015, Sustainable Development Goal 7 was set, calling for universal access to sustainable energy by 2030. In 2019, India widely outperformed this target, achieving near-universal electrification a whole 10 years ahead of schedule. Only a few hundred households are still in need of an electricity connection, while around half a billion people have gained access to electricity in India during the last decade. Given India's geographical size and diversity of terrain, this is a remarkable achievement. There are clearly some lessons to be learned.

"Whether electricity is from the grid or from DRE systems, it does not matter to [villagers]. What matters most is that it should be readily available when it is required, and that is reliable and affordable

Debajit Palit, Director of Rural Energy and Livelihoods at The Energy and Resources Institute (TERI)

The blueprint for electrifying India dates back to the early 1940s. Since then, the electrification of rural areas was taken up by successive governments. However, it gained impetus after the passage of the Electricity Act in 2003. For the first time, the act obligated both the federal and provincial governments to enable rural electrification. To speed up the rural electrification efforts as a 'political goal', the then-government declared the objective of 'Power for All by 2012'.

As part of this large-scale electrification effort, 2005 saw the launch of the 'Rajiv Gandhi Grameen Vidyutikaran Yojana' (RGGVY). This programme sought to create electricity infrastructure in all villages and provide free connections to households below the poverty line. In terms of financing, RGGVY provided a mix of grant and concessional financing to the states. It moved away from the traditional execution model towards turnkey project execution, including involving the central sector power enterprises. This approach aimed to provide faster delivery and prevent other departmental implementation issues. Distributed renewable energy (DRE) was included to cover villages where extension of central grid was economically daunting.

The RGGVY programme clearly helped speed up electrification, as more than 120,000 villages were connected to the national grid. However, while villages were being electrified, the percentage of electrified rural households did not increase at the same pace. It only saw a slight increase from 43% in 2005 to around 60% in 2014.

In 2014, a new government come to power in India. Regardless, the rate of household electrification continued to lag. Nearly 30mn households still lacked access to electricity connections in 2017. The government responded to this deficiency by launching 'Saubhagya', a scheme meant to connect all un-electrified households by 2019. Saubhagya was a well-conceptualised, first-of–its-kind initiative, focusing exclusively on household electrification on a large scale and had some important features worth noting.

First, the scheme expanded subsidies for electrification to include not only below poverty line households, but also other households that were identified using the 2011 socio-economic and caste census (SECC) data. It provided free connections to households having at least one 'deprivation' (out of the seven listed under SECC). This was significant as the definition of 'deprivation' encompassed several criteria, including parameters such as female-headed households, scheduled caste and tribal households, among other factors.

Second, households that were not eligible for subsidies per SECC data were also connected, but on the condition that they pay a nominal amount of INR 500 to the electricity distribution companies (DISCOMs) in 10 on-bill instalments.

Third, Saubhagya made a provision of solar home systems of 200-300Wp capacity for the households in extremely remote areas. Although most of the earlier programmes had provisions for solar home systems, these were limited to meeting basic lighting needs only.

While Saubhagya was able to achieve near-universal electrification, the next step would be to ensure that all households also get a reliable, round-the-clock power supply in the most affordable manner. The perennial supply side challenges have been resolved to a large extent, and new capacities, especially based on grid-integrated renewable energy sources, including solar rooftops, are being added to the system. This fits with the national goal of having 40% of cumulative electric power capacity generated from non-fossil fuels by 2030, in line with India's nationally determined contribution, that was submitted to the United Nations Framework Convention on Climate Change as part of the Paris Agreement in 2015.

The task for providing a continuous supply of electricity primarily falls on the state-run DISCOMs. They not only have to ensure that they produce/buy and supply electricity, but also that they do so in the most sustainable and efficient manner possible, while recovering revenues. Until such time, DRE systems, such as solar home systems and micro-grids being implemented in many areas, will find favour.

The reliability of electricity in the evening peak hours in rural areas still remains poor in many states. The metering, billing and collection and network maintenance services are also weak. Most villagers have to resort to multiple coping strategies to meet their home lighting needs. This set of access-gap consumers are the potential users of DRE solutions. Whether electricity is from the grid or from DRE systems, it does not matter to them. What matters most is that it should be readily available when it is required, and that is reliable and affordable. The DISCOMs further need to solarise feeders, starting with agriculture feeders, for increased contribution of renewable energy and improving supply quality and revenues.

What is also required is considerably improving the operational efficiency of the DISCOMs by undertaking change management programmes as well as strengthening the electric sub-stations and sub-transmission network. While accrued debt of the DISCOMs has been reduced under the 'UDAY programme' and many DISCOMs are increasingly using IT-based systems for robust monitoring and implementing smart pre-paid meters for revenue sustainability, change management programmes will help to develop the working culture. Furthermore, DISCOMs need to move from purely 'administration' to a mode of 'entreprisation' in decision-making and governance. They also need to go from providing 'public service' to a 'customer-centric service' model. At the same time, electricity must be priced rationally so that DISCOMs find it viable to serve.

While developments in the sector are positive, what is needed to build a new India is to ensure that the remaining challenges are prioritised to achieve round-the-clock power for all in a sustainable manner by 2022, the 75th year of India's Independence.

Energy for Africa – let's put access into perspective

With just over a decade left to the target date, the United Nations Sustainable Development Goals Summit in September marked a turning point for understanding where the world stands in achieving the Agenda 2030. It is apparent that extra efforts should be devoted to Africa, particularly in light of the slow progress seen in providing access to affordable, reliable, sustainable and modern energy for all (SDG7) in the region.

SDG7 will not be reached if Africa is left behind. The progress report on SDG7 shows that, while there is considerable improvement on electrification globally – growing from 78% in 2000 to 89% in 2017 – the world will fall short of meeting the target at its current rate of implementation. Africa plays a considerable role in this possible setback[1]. Out of the 840mn people currently without access to electricity on the planet, short of 600mn live in sub-Saharan Africa. This figure is not expected to improve by 2030[2].

If we broaden the spectrum and look at poverty rates, Africa stands out once again. Out of the 736mn people who lived in extreme poverty in 2015, 413mn were in sub-Saharan Africa,[3] and

"Energy is a fundamental component in the achievement of virtually all development goals, particularly in the areas of poverty eradication, health, gender equality, industrialisation and access to jobs

Lapo Pistelli, Executive Vice President, International Affairs at Eni

this number is expected to continue to rise, despite a decreasing trend in the percentage worldwide.[4]

The special role that energy plays in triggering development and reducing poverty is universally recognised. This notion also has a political bearing: the public policy push needed to support Africa's energy transformation should be rooted in the basic principle that energy can be used as a means of improving people's wellbeing and economic development, and not just be seen as a goal in itself.

Energy is a fundamental component in the achievement of virtually all development goals, particularly in the areas of poverty eradication, health, gender equality, industrialisation and access to jobs.[5] In the context of the entry into force of the African Continental Free Trade Area (AfCFTA) in 2019, African leaders are fully recognising this principle by adopting a continent-wide approach to energy and infrastructure, which aims at having a transformational effect on every aspect of African development and integration.[6]

The concepts of access to energy and electrification warrant clarification. Firstly, from a policy perspective, the binary definition of access to energy (i.e. connected vs. unconnected household) energy does "not help us understand the phenomenon of expanding energy access and how it impacts socioeconomic development".[7] Instead, access to energy should be understood as meaning that energy is affordable, reliable, healthy (for both people and the environment) and that it is safe, legal, and available for households, community facilities and productive uses.

Secondly, the concept of electrification is sometimes used synonymously with energy. Electrification refers to the development of electricity grids, which often leaves out energy used for cooking, heating and transport.

While electricity plays a key role in Africa's energy transformation,[8] cleaner fuels and technologies for cooking are needed to improve public health and avoid environmental degradation.[9] The uptake of clean fuel (such as liquefied petroleum gas [LPG], natural gas and electricity) in Africa has been outpaced by population growth.[10] The data is staggering. It is estimated that over 860mn people are dependent on inefficient and highly polluting cooking systems in sub-Saharan Africa, with very limited progress being recorded.[11]

As for transport, renewable energy penetration is proving extremely slow as a worldwide initiative, let alone in low-income countries. It calls for the adoption of low-emission fuels, such as compressed natural gas (CNG), deriving from domestic African resources and used in conjunction with any other decarbonisation option.[12]

Given the size of the challenge and its multifaceted nature, it is clear that a mix of technology solutions and approaches are needed to make the African energy transformation happen. Eni pursues three main routes in tackling this challenge.

The first component requires the development of domestic energy markets. In terms of its activity and productivity in the continent, Eni is the largest integrated energy company. Giving energy access to the people living in the communities where Eni operates is a key company priority. In sub-Saharan Africa, Eni provides electricity to over 18mn people;[13] in Nigeria, Eni provides 20% of the nation's electricity supply and is working on increasing the country's power generation capacity by 15%[14]. In the Republic of Congo, Eni's 'Centrale Électrique du Congo' power plant supplies over 60% of the country's electricity demand.[15]

Historically, Eni has been active in developing Africa's domestic gas resources. These present the potential to replace highly polluting energy sources such as coal, unsustainable biomass and oil-based fuels. Operations in Egypt (Zohr), Ghana (OCTP) and Mozambique (Coral South) will contribute substantially to the countries' energy stability and revenues. Overall, Eni currently supplies the domestic gas markets in 14 African countries (56 bn cubic metres in 2017), of which 10 receive 100% of the entire production. Supplying domestic markets is instrumental in developing regional value chains and added value production, which creates the demand for high-skilled jobs, generating a virtuous development circle.

The second route involves investment in renewable energy generation, notably in Africa. Together with Sonatrach, Eni has launched a 10 MW solar plant in Bir Rebaa North in Algeria, to be followed by other projects in 2019. In Tunisia, together with ETAP, the company started construction on a 10 MW photovoltaic plant and a 5MW innovative hybrid system integrating solar PV with storage and gas, powering the Tataouine industrial site.

In addition to these projects, Eni has signed partnership agreements and Memorandum of Understanding (MoUs) with national energy companies and government agencies to develop renewable business in Algeria, Egypt, Angola, Tunisia and Ghana. These are the first steps of an ambitious strategy, which will lead us to reach 5GW of installed capacity by 2025 for a total investment of €1.4 bn for 2019-2022.

Finally, the third method focuses on partnerships to maximise impact. The challenges of the African continent require that the public and the private sector join forces by identifying common priorities and by mutually reinforcing their actions. Embracing this principle, Eni signed a first-of-its-kind MoU with the UN Development Programme (UNDP) in 2018 to maximise the benefits of renewable energy, climate mitigation, forestry, energy efficiency and clean cooking[16] projects in Africa.

In a similar spirit, Eni has just signed a joint declaration with the UN Industrial Development Organization (UNIDO), which focuses on areas of common interest, including renewable energy[17]. As it fully realises the importance of the water, energy and food security nexus, the company also has an established cooperation with the Food and Agriculture Organization of the UN (FAO) on access to clean water in Nigeria[18].

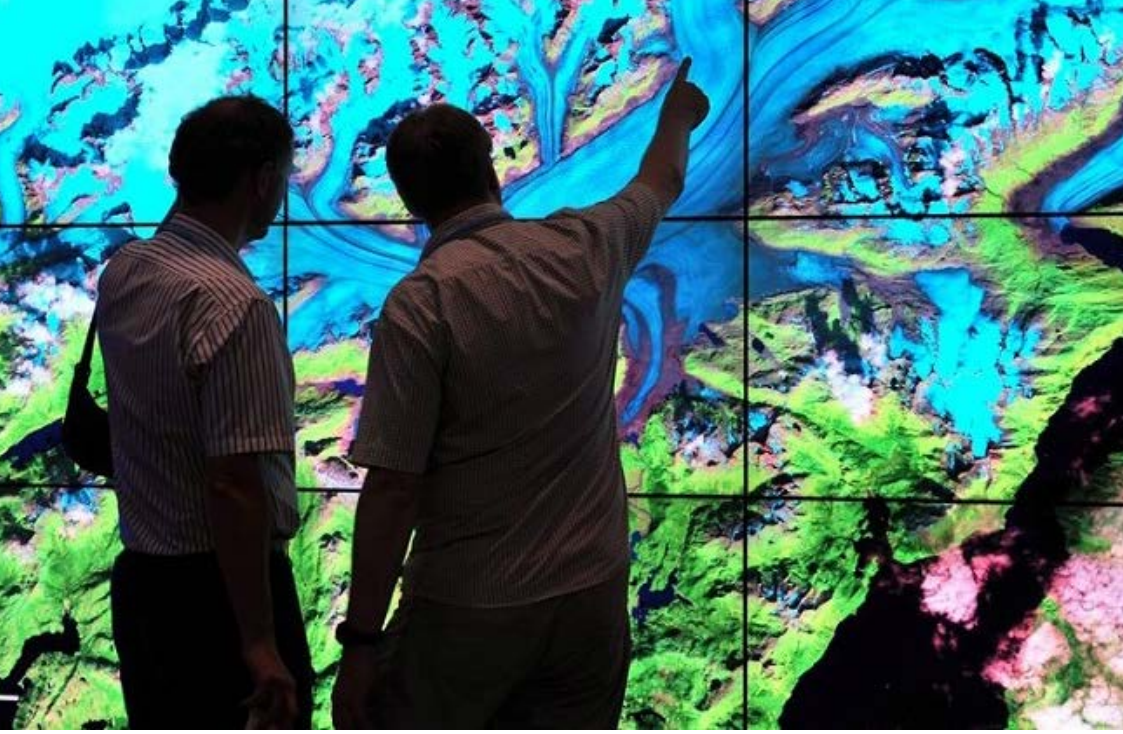
Making the African energy transformation happen requires a holistic approach that takes into account the complexity of the energy system. This approach should also acknowledge the role that sustainable, affordable and reliable energy plays for the achievement of SDGs at large.

Access to energy also means stability of the power grid and adequacy of the supply. Joint development of gas and renewables is the best way forward to replacing highly polluting sources, supporting the integration of variable renewables in the grid and supplying sustainable energy for productive uses. Furthermore, cleaner fuels such as CNG and LPG have an opportunity to reduce emissions and health-related problems linked to the transport and cooking sector in Africa.

Despite SDG7 being deemed 'within reach'[19], it will not be met without a focus on Africa. As Eni strives to develop domestic energy markets, invest in renewables and pursue strategic partnerships with key development players, it puts access to sustainable, reliable and affordable energy at the centre of its strategy and its long-term commitment to Africa.

FOOTNOTES

1. 2019 Tracking SDG7 Report
2. International Energy Agency, "Energy Access Outlook" (2017)
3. The Sustainable Development Goals Report, United Nations, New York, 2019
4. In 2035 there could 170 million additional people living in extreme poverty in Africa compared to 2016. International Futures 2017 modelling tool
5. Accelerating SDG7 – Policy Brief in support of the first SDG7 review at the UN High-Level Political Forum in 2018
6. On April 19th in Cairo a landmark Declaration and Action Plans for the Transport, Energy and Tourism sectors was adopted during the Second Ordinary Session of the African Union Specialized Technical Committee meeting on Transport, Transcontinental and Interregional Infrastructure, Energy and Tourism (STC-TTIIET). Official statement
7. Beyond Connections: Energy Access Redefined (Executive Summary), Technical Report 008/15, Energy Sector Management Assistance Program (ESMAP), 2015
8. The Evolving Transition Scenario of the BP 2019 Energy Outlook projects the electricity demand almost triples by 2040.
9. The Sustainable Development Goals Report, United Nations, New York, 2019
10. The Sustainable Development Goals Report, United Nations, New York, 2019
11. 2019 Tracking SDG7 Report
12. The share of renewable energy in transport increased by 0.1% year on year to reach 3.3% in 2016.
13. The majority of consumption was from biofuels, driven mostly by support policies in the United States, Brazil, and the European Union. (Source: 2019 Tracking SDG7 Report)
14. Access to Energy Initiatives
15. Go, ConGo!
16. Memorandum of understanding between Eni and UNDP
17. Eni and UNIDO sign Joint Declaration to help reach Sustainable Development Goals with pioneering public-private cooperation
18. Eni/NNPC and FAO commission solar-powered water schemes in Northeast Nigeria
19. 2018 HLPF Review of SDG implementation: SDG 7



The role of space programmes in energy and development

In her agenda for Europe, President-elect Ursula von der Leyen committed to the overall implementation of the Sustainable Development Goals. If one reads the United Nation's 2030 Agenda for Sustainable Development from an energy-policy perspective, one thing is clear: urgent action to combat climate change and measures to dramatically reduce emissions must go hand-in-hand with the pursuit of universal access to modern energy. This must be achieved by 2030. Data from Earth observation satellites support all three lines of action.

"Today, Earth's observation satellites – including Europe's Copernicus-dedicated satellites in particular – provide a myriad of observations that help monitor and document sea levels rises, the warming of ocean waters, the demise of the world's ice and more

Josef Aschbacher, Director of Earth Observation Programmes at the European Space Agency (ESA)

20 years ago, the European Commission, in partnership with the European Space Agency (ESA), devised the Copernicus programme to enable evidence-based policymaking and help meet EU policy targets, particularly with respect to climate change and environmental protection. Today, Earth's observation satellites – including Europe's Copernicus-dedicated satellites in particular – provide a myriad of observations that help monitor and document sea levels rises, the warming of ocean waters, the demise of the world's ice and more.

Such information is known as 'Essential Climate Variables' – it informs the Assessment Reports of the International Panel on Climate Change (IPCC). For example, 28 authors directly involved in the ESA's climate change initiative contributed to the IPCC Fifth Assessment Report in 2013, with 15 scientific papers quoted 60 times. They are expected to have a similar impact on the Sixth Assessment Report due in 2021.

Data from the dedicated satellites built and operated through the Copernicus programme also provide observations of air quality. Combined with in situ observations and the predictive power of computer models, they benefit millions of Europeans through national air-quality forecasts and smartphone applications. Satellite observations also identify main shipping routes and make possible the estimation of air pollution emitted by marine transport worldwide. International financing institutions, such as the World Bank or the Asian Development Bank (ADB) increasingly use this type of information for their development projects, from the Philippines to Ethiopia to Bolivia.

The international community agrees that burning fossil fuels for energy is one of the principal causes of global climate change. With the threat of peak oil approaching, the use of renewable energies such as solar and wind power are growing worldwide. By 2020, a substantial amount of the EU's energy supply should be provided by renewable sources. The Copernicus Marine Environment Monitoring Service, for instance, provides information relevant to offshore wind farms, such as wind speed, wind fields, and wave size and frequency. These parameters are crucial in determining where wind energy can be generated in the most cost-effective way whilst reducing the risk of damage.

When it comes to generating solar energy, the Copernicus satellites can be used to monitor the highly variable cloud cover and aerosols that affect the availability of solar radiation. This allows for an assessment of Earth's solar resources at a global scale and provides long-term time series of data at high spatial resolutions. Earth observation satellites also provide valuable information to energy grid operators to monitor the state and safety of electric power grids and pipelines.

Von der Leyen has stressed the need to go further and faster if Europe wants to be carbon neutral by 2050. One must be able to monitor greenhouse gas emissions, mainly carbon dioxide and methane, but also fine particles and black carbon, at the city scale and not only in Europe, where emission sources are well documented, but all around the world. Take the case of Africa, where the population is expected

to grow by 800mn inhabitants by 2050 – 600mn of which will be in cities. The African Union has rightly seized the opportunity provided by the Copernicus free and open data policy. Creative local entrepreneurs are developing smartphone-based apps that rely on Copernicus data. The impact of new oil and gas extraction sites must be monitored, as well as new trade routes that are emerging as a result of the fragile Arctic environment becoming less ice-bound.

Land-use, notably forests, will play a key role in carbon capture. Careful decisions in the energy mix must be informed, e.g. balancing the possible expansion of biofuel crops against the need to maintain forests and to feed the growing global human population. If we are serious about de-carbonising our societies, then the global carbon cycle must be much better understood, and here we need more data to advance science – and to understand global processes. These data are best provided by satellites in orbit around the Earth.

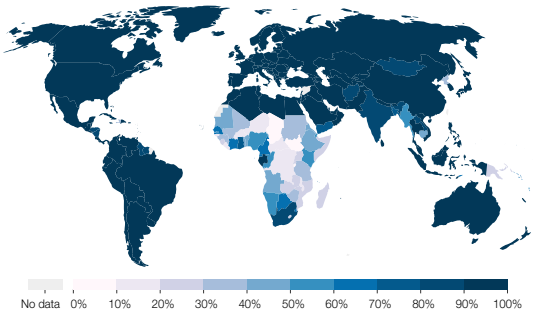
Access to commodities such as electricity must be ensured everywhere, including in developing countries, where satellite-based observations are often the most readily available source of geospatial information. Development projects funded by international institutions such as the World Bank or the ADB, increasingly use Earth observation data for measuring, among other things, environmental change owing to the development of new hydropower plants. This is made possible thanks to the open and free access data policy of Copernicus, fully in line with the EU distinctive approach to open diplomacy and multilateralism.

In order to meet these emerging requirements, new types of satellites are being proposed in the frame of the EU Space Programme and the next financial cycle. They will all support the EU's leading role in climate policies, they will all contribute to the objectives set by the energy union and climate action regulation, and they will all maintain Europe's leadership in Earth observation.

The world in numbers

Share of the population with access to electricity, 2016

Data represents electricity access at the household level, that is, people who have electricity in their home. It comprises electricity sold commercially, both on-grid and off-grid. Countries considered as "developed" by the UN, and classified as high income are assumed to have an electrification rate of 100% from the first year the country entered the category.



+30mn
people in 2014-2019 gained access to affordable, reliable and sustainable energy services

However
1bn
Still have no access to affordable, reliable and sustainable energy services

89%
increase of the global electrification rate in 2017, up from 83 % in 2010

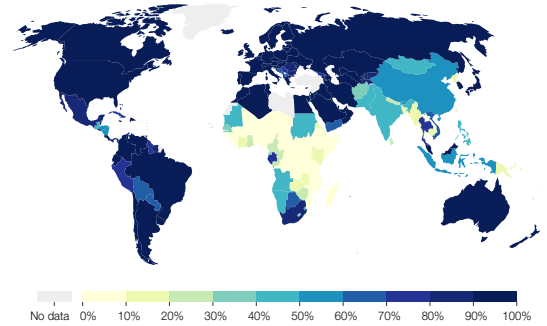
However
840mn
people around the world are still without access to electricity

Access to clean fuels and technologies for cooking, 2016

Share of the total population with access to clean fuels and technologies for cooking. Access to clean fuels or technologies such as clean cookstoves reduce exposure to indoor air pollutants, a leading cause of death in low-income households.

61% global share in 2017 of the population with access to clean cooking fuels and technologies, up from 57% in 2010

Despite this progress **3bn** people still rely primarily on inefficient and polluting cooking systems



17.5%
renewable energy share of total final energy consumption in 2016, up from 16,6 % in 2010
Though much faster change is required to meet climate goals

Renewables

18%
increase in the level of renewable energy consumption **since 2010**

since 2012
the growth of renewables outpaced the growth of total energy consumption

2.3%
rate of improvement, which is still short of the 2.7 % annual rate needed to reach target 3 of SDG 7

The EU in numbers

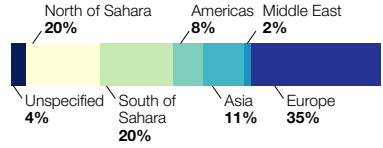
$27tn (2016-2050) – estimated cumulative investment needed in renewable energy to put the world on track with the objectives of the Paris Agreement

$18.6bn (2016) – international financial flows to developing countries in support of clean and renewable energy, up from $9.9bn in 2010

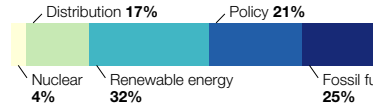
$9.3bn (2010-2016)

EU funding to developing countries to support the energy sector

By region



By purpose



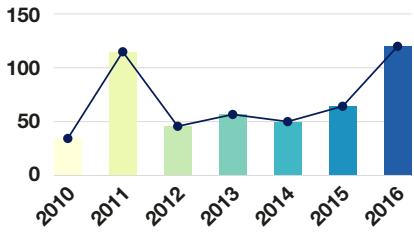
Energy access

By being committed to fully implementing the Agenda 2030, the European Union aims to support the delivery of SDG7 and – identifying the energy sector as a key driver for inclusive and sustainable growth – it has made energy access an increasingly high priority in its development policies.

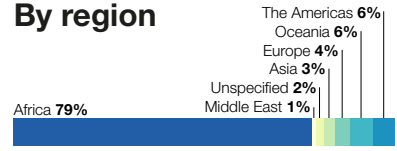
$490mn

EU funding to developing countries for energy access **(2010-2016)**

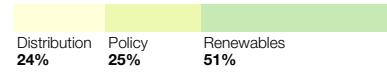
Support for energy access by year (million USD)



By region



By purpose



Almost **0%** went to fossil fuel generation

Sources and further readings

UN / SGD knowledge platform
Eurostat / SDG 7 - Affordable and clean energy (statistical annex)
World Bank / Country classifications by income level: 2019-2020
SGD Tracker / SGD 7
EU delivers
IRENA / Global energy transformation: A roadmap to 2050 (2019 edition)
EU / Empowering Development
EDI / EU support for energy in developing countries
CISDE / Is EU support for energy in developing countries fully aligned with its climate and sustainable development objectives?

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+32 2 300 29 92
info@friendsofeurope.org
friendsofeurope.org

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