ACCELERATING SDG 7 ACHIEVEMENT

POLICY BRIEF 4
ENERGY AND SDG 4
QUALITY EDUCATION

POLICY BRIEF #4

ENERGY AND SDG 4 (QUALITY EDUCATION)

Developed by

United Nations Children's Fund (UNICEF)

In collaboration with

UN DESA, ENERGIA, The World Bank, and the International Energy Agency (IEA)

Key Messages

Educational facilities require energy for lighting, cooking, heating, cooling, water delivery and purification, and information and communication technology (ICT), including for disaster and medical emergency situations. Lack of access to sustainable energy forces schools, dormitories, kitchens, and staff facilities to rely on unsustainable sources such as biomass, charcoal, or kerosene for lighting and cooking purposes. This exposes students and staff to indoor air pollution, creating health risks ranging from headaches to respiratory disease, which compromises health and learning abilities. Low levels of electricity access are correlated with poor educational performance, lower attendance, and a decreased ability to attract and maintain teachers.

Globally, over 230 million children go to primary schools without any electricity, 217 million of them in sub-Saharan Africa, South Asia, and Latin America. While overall electrification rates have reached 87 per cent globally, electrification at primary schools lags behind, reaching only 69 per cent. This leaves millions of children without access, thus compromising educational and development outcomes—most prominently in disadvantaged and rural communities.

There is a positive correlation between access to electrification, particularly for lighting, and improved education. For instance, research in Bhutan indicated that rural electrification contributed to 0.65 additional years of schooling for girls and 0.41 additional years for boys. Similarly, research in rural villages in Madagascar demonstrated that the electrification of households affects children's ability to keep up with school and helps reduce gender inequality by providing girls, who are traditionally more engaged in housework than boys, with opportunities to study after sunset.

However, about 63 million children still do not go to school, half of them in sub-Saharan Africa. School attendance and performance levels have been shown to increase with higher electrification rates—especially for lighting and equipment (including ICT). Electrification allows schools to stay open for a better learning environment, extended operating hours of study, and teacher preparation and training after hours.

Schools with better access to sustainable energy can also be used to provide other community services, such as clean water, hygienic sanitation, and health and emergency services.

Efforts towards achieving the SDG 7 target of universal access to affordable, reliable, modern energy services also contribute to the sustainable development goal of ensuring inclusive and quality education for all (SDG 4), and, moreover, can help inculcate a mindset of low-carbon development for future generations, contributing to the urgent action required to combat climate change and its impacts (SDG 13).

Priority actions

- Increase efforts and coordination among different stakeholders to gather quantitative and qualitative data and information on energy access in educational facilities, to drive evidence-based decision making.
- Adopt enabling policies that incentivise and prioritise investment in energy access in the education sector and, reinforce existing policies that facilitate a more coordinated approach in the public sector for collaboration on the provision of energy and education infrastructure and services.
- Build support for these policies through stakeholder engagement, public advocacy, and outreach to influence decision makers.
- Enhance public awareness and education for adults and children about sustainable energy, in order to facilitate necessary behavioural changes, build a technical skill base, and encourage youth innovation to advance sustainable energy solutions.

Energy in education in the context of the Sustainable Development Goals

Access to modern, reliable, and affordable energy is critical for development and contributes directly to achieving positive educational outcomes. Education facilities require energy for lighting, cooking, heating, cooling, water delivery and purification, and information and communication technology (ICT), including for emergency and medical situations. Lack of access to sustainable energy forces schools, dormitories, kitchens, and staff facilities to rely on unsustainable sources such as biomass, charcoal, or kerosene for lighting and cooking purposes. This exposes students and staff to indoor air pollution, creating health risks ranging from headaches to respiratory disease, which compromises health and learning abilities.

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Access to reliable and sustainable energy allows educational facilities to maintain and extend operating hours and improve the quality of education by providing a place for teachers to prepare lessons or receive training, which contributes to teacher retention by improving their quality of life. For example, in rural areas of Kenya, 75 per cent of head teachers reported that recruiting and retaining teachers was a problem and 60 per cent said better lighting would encourage teachers to work in remote regions. Over a third of teachers said that they use a solar light for marking, lesson planning, and extra classes (Smart Villages, 2017).

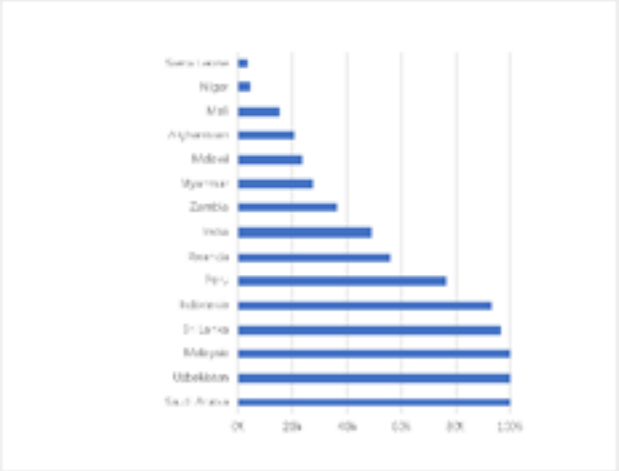
Overall, efforts in achieving the SDG 7 target of universal access to affordable, reliable, modern energy services also contribute to the sustainable development goal of ensuring inclusive and quality education for all (SDG 4).

Current status

More data needs to be collected on energy access in the education sector, but available research shows clear trends and correlations between electrification and education. Studies have shown that there is a strong correlation between electricity consumption per capita and higher scores on the education index, which is a proxy for the mean years of schooling a student receives (Kanagawa, 2008). Other studies have shown that lower levels of electricity access are also correlated with a decreased ability to attract and maintain teachers; a study on South African "mud schools" noted that "extremely poor infrastructure has an effect on teachers, as well as pupils" (Skelton, 2014), while another study on sustainable energy for children in Zimbabwe notes that "teachers and nurses have been known to shun rural schools without access to electricity" (UNICEF, 2015a).

In terms of primary school access to electricity, sub-Saharan Africa has the lowest rate, with 35 per cent, followed by South Asia with 51 per cent and Latin America with 87 per cent (UNESCO, 2019). Globally, over 230 million children go to primary schools without access to any electricity, and 217 million of these pupils live in the regions mentioned above (UNESCO, 2019). It is worth noting that not only does sub-Saharan Africa have the lowest levels of electricity, it is also the region with the lowest levels of learning (UNDESA, 2014).

Figure 1: Percentage of primary schools with access to electricity in selected countries



Source: UNESCO, 2019

A quality education is instrumental in improving a person's life. Throughout the years, there has been tremendous progress towards increasing access to education and raising enrolment rates in schools. Enrolment in primary education in developing countries is currently at 92 per cent, yet about 63 million children still do not go to school (UNESCO, 2019). Over half of those children live in sub-Saharan Africa.

Access to sustainable energy can help advance the education sector in numerous ways. Electrification at schools is associated with a better experience and opportunities for children, as lighting allows for better learning environment, extended operating school hours used for studying, better teacher preparations, and the facilitation of training for community members. School attendance also increases with lighting, especially in regions that face poor sunlight penetration. Qualitative research in Bangladesh demonstrated that teachers consider it almost impossible to teach under conditions of low light (Practical Action, 2013). In the Philippines, teachers have reported cancelling schools in rainy weather when classrooms are not adequately lit for teachers and students (Valerio, 2014).

Teachers have also reported cases during school days where, to be able to print teaching materials and test papers, they have had to travel as long as an hour to get to the nearest city. Facilitating the use of ICT—possible only through access to electrification—therefore provides for a more effective use of time and resources for teachers and students, heightens the quality of education, combats the widening digital divide, and builds essential skills for the modern economy. For example, middle school children in Ethiopia who use laptops scored significantly higher in identifying analogies and categories than those who do not (Hansen et.al., 2012). Another example comes from India, where a computer-assisted learning programme offering customised learning to children produced significant improvements for scores in math and Hindi, with the most gains found among the weakest students (IBB, 2018).

Electrification of educational facilities can bring overall benefits to the community too, as schools can be used as integrated service platforms for children, where clean water, nutritious meals, and primary health services can be provided in a safe environment. Electricity can be used for water delivery and purification systems, emergency radio or disaster warning alarms, and the refrigeration of both food and vaccines. A recent example can be found in Lagos, where a solar-powered floating school was built in the Makoko water community, providing education for more than 100 children (UNEP, 2017). Innovative approaches like this one can make solar energy more accessible and affordable, especially in countries like Nigeria that possess great solar energy potential (RECP, 2016).

In addition, sustainable energy improvements and energy efficiency in kindergartens, schools, dormitories, kitchens, and staff quarters can provide clear benefits in meeting basic energy needs and enhancing the well-being of students and staff alike. Reliable and affordable energy is a prerequisite for accessing clean water and sanitation. Renewable energy for lighting and hot water systems; energy-efficient building designs, space heating, cooling, and appliances; and cleaner cooking fuels in schools, dormitories, and kitchens, go a long way in ensuring a hospitable, comfortable, and safe environment in which students and teachers can study, stay healthy, and be productive. A recent study on the effect of increasing temperatures on learning outcomes, which assessed the relationship between temperature and educational outcomes in the United States, found that that in already warm areas, higher temperatures are strongly related with lower academic performance, with each degree increase in temperature resulting in a 1 per cent decrease in school test results. It also concluded that air conditioning offsets all negative effects of temperature on educational outcomes (Goodman, J. et al., 2018).

Evidence also suggests schools can save on energy expenses by up to 25 per cent through simple behavioural and operational measures alone. The savings can then be utilised in other priority areas in schools (US EPA, 2011). For example, in Kampala, a social enterprise provides eco-stoves to schools, and thus supports the reduction in firewood costs and CO_2 emissions. All earnings acquired through this clean cooking technology are being returned and invested in the schools, supporting their annual maintenance, management, and monitoring (KCCA, 2019).

At the same time, sustainable energy measures provide considerable benefits in reducing indoor air pollution and related health risks, particularly for children. Indoor air pollution, largely caused by the use of solid fuels, contributes to over half a million deaths of children under 5 (UNICEF, 2015). Countries currently suffering from critical air pollution levels, such as China, India, and Mongolia, are gradually making efforts towards adoption of sustainable energy solutions in public service facilities, including in the education sector, to reduce and mitigate children's exposure to air pollution. Incidentally, adoption of energy-efficient building designs in kindergartens in Mongolia has resulted in improved indoor air quality, warmer classroom environments, and better health outcomes for children and staff, with a nearly 30 per cent reduction in absenteeism due to illness (GIZ, 2016).

Essentially, by transitioning towards a more sustainable energy pathway, educational facilities can simultaneously achieve multiple benefits, including improved learning environments, better health, increased energy savings, and positive environmental and economic conditions.

How are we faring—are we on track?

The 2018 Global Tracking Framework report shows that under the current rate of progress, we are not on track to achieve the SDG 7 energy targets globally. With regard to closing the energy access gap, 992 million people still live without electricity (IEA, 2017a).

Some countries have shown positive progress towards increased primary school electrification rates in recent years, including Rwanda, Cabo Verde, and Zambia, which increased primary school electrification rates by 16 per cent, 5 per cent, and 4 per cent, respectively, between 2016 and 2017. However, efforts to electrify schools have mostly been lagging, leaving millions of children without access to electricity, particularly in disadvantaged and rural communities. The lowest levels of access are found in Niger and Sierra Leone, where approximately 5 per cent and 4 per cent of schools have electricity, respectively.

Recent trends in the education sector indicate that basic literacy skills have improved tremendously over the years, but more efforts are needed to achieve universal education goals; 103 million youth worldwide still lack basic literacy skills, of which 60 per cent are young women (UNDP, 2019). Secondary education also remains a huge challenge, and according to projections, by 2035 only 63nper cent of the world's 20 to

24-year-olds will have completed upper secondary school (Smart Villages, 2017). Dropouts are a continuing issue, mostly in sub-Saharan Africa, where at least 20 per cent of children enrolled are not expected to reach the last grade (Smart Villages, 2017).

School performance has also been shown to increase in correlation with electrification rates, with primary school completion rates enhanced due to greater electrification (UNDESA, 2014). Advancing access to energy can therefore play a crucial role by complementing other educational investments with the aim of improving schooling and educational attainment.

Key challenges and recommendations

Barriers that limit access to sustainable energy in educational facilities pertain broadly to (a) weak policy complementarities and coordination across energy and education sectors that meaningfully facilitate access; (b) issues of affordability and high upfront capital costs; (c) technical barriers, including reliability of power supply, maintenance, and after-sales services; and (d) a lack of information and awareness about the multiple benefits of energy and its implications on educational outcomes.

Although energy access has gradually advanced over the years, the number of students globally thatstill lack access highlights the need for carefully targeted measures to address the challenges.

First, sufficient quantitative and qualitative information is required to clearly reflect the magnitude of the challenge and drive evidence-based decision making. As it stands, a lack of data is often a key difficulty and challenges remain in trying to obtain data on energy access in the education sector. Challenges pertaining to limited data then translate into limited information, which in turn undermines evidence-based decision making. Therefore, increased efforts at data generation and analysis are needed for better insights and sound decision-making.

Second, enabling policies that incentivise and prioritise energy access in the education sector should be put in place and enforced. Limited quantitative data makes it challenging to authoritatively estimate the financial resources it would take to electrify the education sector. The IEA estimates that a US$ 1 trillion investment is needed to achieve universal access to energy by 2030; this offers a broad signal of the magnitude of investment required to adequately reach out to the education sector (IEA, 2017). Priority actions should focus on identifying factors that have enabled positive progress in school electrification to date and selecting the most appropriate examples to build the investment case for future scale-up for schools with no access.

Leveraging private sector finance is critical, particularly because it can help address some of the barriers listed above through business models that can defray high upfront costs and can address technical barriers too. A policy environment that incentivises private sector financing is needed to promote innovative business and service delivery models for provision of quality energy services—particularly in underserved areas. A suite of public-private partnership (PPP) models have been successfully demonstrated for infrastructure and service provision in the education sector. This can be extended to investments in school electrification programmes, too. Several case studies exist where PPP models have been successfully employed in school electrification programmes, including in Argentina, South Africa, and the Philippines.

It is also imperative to reinforce policies that facilitate a more coordinated approach among public agencies for collaborating in the provision of energy and education infrastructure and services. In terms of ensuring reliability of energy access, technical connection and equipment problems can be offset through the use of strong regulatory frameworks, national standards, quality assurance, and certification systems. In fact, these have been shown to facilitate more reliable local manufacturing and maintenance activities, reduce costs and improve quality of service.

Furthermore, policy advocacy, stakeholder engagement, public awareness, and education are vital not

only in influencing decision-makers but also in facilitating necessary knowledge, attitude, and behavioural changes among children and adults on the benefits of sustainable energy. For example, advocacy for schools to both have an energy management policy or strategy and implement an energy management system based on nationally appropriate standards with monthly updates of energy performance indicators for management can serve to support decision making and long-term investment decisions regarding facility power planning.

Advocacy for an air quality action plan for schools that are exposed to unsafe air quality levels is another area of recommended focus. Such an action plan would minimise children's exposure to air pollution through better waste management systems, improved ventilation, and design/construction to reduce exposure to both indoor and outdoor pollutants, thus ensuring access for all children to a clean, safe, and healthy school environment.

Separately, the incorporation of energy education in curricula has been demonstrated to build a necessary technical skill base from early on, creating a young generation that can act as change agents, while simultaneously allowing greater youth innovation to advance sustainable energy solutions.

Interlinkages with other Sustainable Development Goals

Energy access, energy efficiency, and renewable energy for educational facilities also affects other SDGs besides SDG 4, including good health and well-being (SDG 3), clean water and sanitation (SDG 6), gender equality (SDG 5), and Climate Action (SDG 13), among others. Other than providing lighting, electricity in schools can have a multiplier effect on community services when it is used to access, deliver, and purify water for drinking and sanitation, circulate air to provide a comfortable indoor climate, heat the space during winter, and refrigerate food and medical supplies.

Solar PV systems and solar pumps have been used successfully in educational facilities to provide better access to safe water and hygienic sanitation. UNICEF's Global Solar Water Pumping Programme, for instance, deploys renewable energy to access, treat, and supply safely managed water to children, their families, and communities, prioritising public service facilities such as health facilities, schools, and community centres. In Kenya, before electrification, schools would tend not to clean their toilets due to lack of water, and water-borne diseases such as skin infections, typhoid, and cholera were common, leading to "rampant absenteeism of students and teachers"; electrification was successfully used to rectify these issues (UNDESA, 2014).

With regard to gender empowerment, energy access has been found to directly contribute to time and labour benefits for women and girls. This, in turn, enhances their ability to attend school and educational activities. In Mali, for instance, electrification has increased levels of girls' school attendance, improved performance, and drastically improved girl-to-boy ratios. Similarly, a study conducted in 52 developing countries showed that numerous countries with lower electricity access have lower girl-to-boy ratios in schools. Nepal, for example, showed an increase in girl student enrolment by 23.3 per cent across a sample of villages that received school electrification (UNDESA, 2014).

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HIGH-LEVEL POLITICAL FORUM
ON SUSTAINABLE DEVELOPMENT

7 AFFORDABLE AND CLEAN ENERGY