WHY SUSTAINABLE ENERGY MATTERS TO CHILDREN

The critical importance of sustainable energy for children and future generations

unicef

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Foreword

Over the last decades, interest and investments in sustainable energy have increased and, indeed, sustainable energy solutions are increasingly playing an important role in meeting the energy needs of the global community. However, little attention has been paid to the sustainable energy needs of children, despite the fact that sustainable energy solutions can provide major opportunities in terms of improving their health, education, well-being and development. This advocacy paper, jointly commissioned by UNICEF Headquarters and UNICEF United Kingdom, provides an overview of the sustainable energy needs, issues, opportunities and barriers that children are facing and proposes a set of recommendations to address these, illustrated with examples of innovative sustainable energy solutions for children from Bangladesh, Burundi and Uganda.

UNICEF is committed to stepping up its engagement in policy advocacy and programming to provide sustainable energy solutions for all children. As governments, development partners, the private sector, households and academia continue to invest in sustainable energy, we look forward to working in partnership with each of these actors to help children, particularly the most vulnerable and disadvantaged, to benefit from these investments, and to have a voice within this process.

Jeffrey O'Malley
Director – Division of Data, Research and Policy
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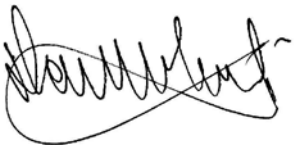

David Bull
Executive Director
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SUSTAINABLE ENERGY

"plays a key role in children's development and well-being"

SAFE LIGHTING

is necessary to do **homework** after dark

&

HEATING & COOLING

to stay **comfortable**

children need safe, clean and affordable

TRANSPORTATION

to school

SCHOOLS

also require **energy**

for lighting, cooking, heating, cooling, and ICT

HEALTH CENTRES

need energy and electricity to provide **proper services** especially at **night time.**

street lighting is important for **children's safety,** especially **girls**

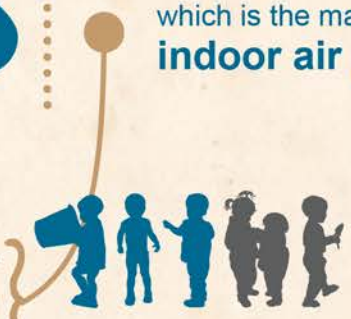
Sustainable energy for children: it is needed for drilling, pumping, transportation and treatment

SAFE WATER

which is the main cause of **indoor air pollution**

CHILDREN'S ENERGY NEEDS

are not met, or they depend on **unsafe** or **unsustainable energy**



contributing to over **half a million children** under 5 **dying annually.**

girls are primarily responsible for **collecting fuel** and **are at** serious **risk of sexual violence**

“Barriers to inclusive decision-making, social barriers and limited public awareness, and institutional barriers need to be addressed. These barriers are not insurmountable and there are clear policy pathways.”

PUBLIC AWARENESS CAMPAIGNS

on the importance of sustainable energy for children and the available options would galvanise broader public support and demand.

SUSTAINABLE ENERGY

should be **an integral part of school life**, national curricula and university programs.

OPPORTUNITIES FOR CHILDREN

should be created

to voice their views

both in policy and technical discussions.

decision makers should have a solid

UNDERSTANDING OF CHILDREN'S ENERGY NEEDS

and the **ability and willingness** to **accommodate these** in decision making processes.

At the institutional level,

systems to collect, process and publicize

DATA RELEVANT TO ENERGY & CHILDREN

should be strengthened, and global knowledge platforms on sustainable energy should pay special attention to children.

1. INTRODUCTION

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Climate change is a reality, and evidence shows that its direct and indirect impacts are already causing widespread devastation and human suffering around the globe. Developing countries and poor people within all countries are disproportionally affected and children are recognized as particularly vulnerable (UNICEF United Kingdom, 2013). The key dominant factor responsible for climate change is greenhouse gas (GHG) emissions from human activity. Energy-related carbon dioxide (CO2) is the most important greenhouse gas, responsible for about 63% of the emissions: increasing amounts of fossil fuels such as oil, gas, and coal have been burnt over the course of the last centuries in order to generate electricity, power machines, facilitate transport of goods and people, and heat and cool buildings. The latest research forecasts that the world's energy demand will further increase by one third between 2011 and 2035 (European Comission, 2014; IEA, 2013). Climate change issues are hence intrinsically tied to the energy sector.

At the same time, energy services are essential for the vast majority of human activity. Access to energy is strongly associated with human and economic development and plays a key role in poverty reduction. There is a significant correlation between energy consumption and the Human Development Index, the gross domestic product (GDP) per capita, and other development measures (GEA 2012 as cited in Scott, 2012). In other words: if energy needs are not met - as is still the case in many developing countries - it poses an issue in itself. It constrains production and hampers the fulfillment of basic human needs such as health, education, and communication (Sagar, Oliver, & Chikkatur, 2006). In

many places, fuel collection also poses major risks to girls and women, who are primarily responsible for securing household energy.

Even where energy services are available, problems can occur: often, the energy is being generated from unsustainable sources, and the technologies applied are largely inefficient. This again leads to waste and pollution and aggravates climate change issues (Sustainable Energy for All, 2013b). Furthermore, air pollution caused by unsustainable energy can have severe health effects - and children are particularly vulnerable to air pollution.

This situation requires urgent action, and the time to act is now. The global community has to embrace low-carbon development pathways that also benefit and address the sustainable energy needs of the poor. Developing countries require technical and financial support for this. It is important that within this transition, the focus is not only centred on energy for the commercial sector but also on energy for disadvantaged children because investing in their sustainable energy needs can create high return on investment as this paper will show. This process bears great opportunities and should be used to utilize the valuable contributions different societal groups can make through inclusive initiatives and decision-making processes.

In addition, other initiatives highlight the strong linkages between energy, climate change, and human well-being. An example is the United Nations (UN) Secretary General's 'Sustainable Energy for All' Initiative, launched in 2011, which aims at maximizing development results and stabilizing climate change through improvements in the energy sector (Sustainable Energy for All, 2013a; see also Box 1). Furthermore, the 2014 – 2024 UN Decade of Sustainable Energy for All, which was unanimously declared by the UN General Assembly, underscores the importance of energy issues for sustainable development and the elaboration of the post-2015 development agenda. It provides a framework for UN Member State engagement on a range of energy issues, including addressing energy poverty.

Targeting mainly governments and development partners, this advocacy paper build on these efforts with the objective to bring forward the work on access to sustainable energy with a focus on children in developing countries. Based on recent literature and research, it first presents children's specific energy needs and the state of the art in meeting these. The publication continues with an analysis of barriers that hamper children's access to sustainable energy. It then provides three examples of successful sustainable energy interventions in Bangladesh, Burundi, and Uganda. The publication concludes with policy recommendations for key stakeholders in the energy sector to address these barriers.

Box 1: Objectives of the UN Secretary General's Sustainable Energy for All Initiative

1. Ensure universal access to modern energy services.
2. Double the global rate of improvement in energy efficiency.
3. Double the share of renewable energy in the global energy mix.

These interlinked objectives are to be achieved by 2030. The initiative also acts in support of the 2014-2024 Decade of Sustainable Energy for All as declared by the UN General Assembly.

Source: (Sustainable Energy for All, 2013a)

2. ENERGY NEEDS OF CHILDREN

Evidence shows that energy at household level, in the education, health and water sectors as well as for infrastructure services has a great influence on development results among children.

Household level

In developing countries, energy for household purposes frequently makes up the biggest part of national energy consumption, whereby most of this energy is needed for cooking, followed by space heating (OECD & IEA, 2006). In these countries, most people rely on biomass such as firewood, dung, crop residues or the fossil fuel coal for cooking and heating (WHO, 2011). This poses three key issues: first, girls are commonly involved and responsible for collecting fuel. The enormous time and health burden associated with fuel collection limits their ability to participate in safer, more productive activities, including education. Particularly in emergency contexts, girls are often at great risk of sexual violence when collecting fuel. Second, the inefficient combustion associated with traditional cook stoves, combined with insufficient ventilation leads to very poor indoor air quality in rural homes. Indeed, as estimated by the World Health Organization (WHO), such indoor smoke can exceed the acceptable levels for small particles 100-fold (WHO, 2011). Third, the unsustainable harvesting of biomass has adverse environmental effects such as deforestation, forest and soil degradation, as well as landslides, and contributes to climate change due to GHG emissions.

A large body of literature exists exploring the links between indoor air pollution and human health, and research results leave no doubt that exposure is very dangerous (The World Bank & The International Bank for Reconstruction and Development, 2011; WHO, 2014a). This is particularly true for women and children who traditionally spend a relatively large amount of time indoors. In addition, children's immature respiratory tract system makes them particularly vulnerable to pollution. For instance, almost 50% of pneumonia deaths among children under five are found to be due to particulate matter inhaled from indoor air pollution, and there is evidence of linkages to a series of other health issues, including low birth weight, tuberculosis, ischaemic heart disease, as well as nasopharyngeal and laryngeal cancers (WHO, 2011). The latest estimates from WHO associate 4.3 million deaths globally with indoor air pollution, and recent predictions for 2030 show that indoor air pollution will cause even more premature deaths than HIV and malaria combined (IEA & OECD, 2011).

Frequently cited concerns with the use of biomass for household energy relate to fuel collection as a time consuming and exhausting task. It reduces the time available to participate in educational or income-generating activities and puts girls and women who are the primary gatherers of fuel at an increased risk of injury and violence in less secure places or humanitarian settings (FAO, 2013; Matinga, Clancy, & Annegarn, 2014; WHO, 2011). This issue requires further analysis which is beyond the scope of this paper. An initial overview of issues around gender based violence in the context of fuel collection by girls and women is presented in Box 2 on next page.

Box 2: Sustainable energy solutions contribute to the reduction of sexual violence against girls and women.

In nearly all regions of the world, gender roles dictate that girls and women are responsible for collecting cooking fuel, typically firewood. Even in stable environments, firewood collection presents large physical and time burdens. In conflict and disaster settings, however, firewood collection can also put girls and women at great risk of physical or sexual assault and injury due to the distances they must travel in a context of impunity, armed violence and/or increased community tensions. Multiple UNICEF and inter-agency gender-based violence (GBV) assessment findings have demonstrated that across a myriad of emergency-affected contexts – whether in conflict, disasters and/or famines – girls, women and service providers consistently underscore firewood collection as one of, if not the key risk factor, for sexual assault.

The root causes of violence related to firewood collection in emergency contexts are many. In addition to globally-pervasive gender norms as noted above, the need for wood generally (and therefore pressures on wood collectors, risk of deforestation and increased distances to collection locations) is further amplified by the mass construction of small dwellings in displacement contexts, and the collection of firewood is therefore frequently cited as a key source of tension between host communities and displaced populations.

Supporting girls and women to access and use cooking fuel safely, while also reducing household air pollution, deforestation and other critical concerns, is a multi-sectoral issue with wide-ranging impacts on the protection, health and well-being of the populations that UNICEF and its partners serve. However, significant barriers remain to addressing these issues, particularly in emergency contexts. Firstly, this includes promoting gender equality to reduce the burden of fuel collection on girls and women so that it does not fall solely on their shoulders. In addition, however, the issue of safe fuel collection and use must be addressed across all humanitarian response sectors, in a holistic and coordinated manner - necessitating an integrated multi-sectoral approach encompassing protection, health, water, sanitation and hygiene (WASH), education and climate change and resilience-related interventions. It must further combine immediate humanitarian response with the need for a longer-term perspective, engaging families, communities, governments and more.

In 2009 the Inter-agency Standing Committee (IASC) endorsed guidance on Safe Access to Firewood and alternative Energy (SAFE). SAFE programming varies from context to context based on a variety of factors including cultural habits and preferences related to cooking, local manufacturing capacity, availability of raw materials and more. Assessments, based on the IASC SAFE guidance and methodology, must always be undertaken in advance of beginning any SAFE programme; the results of the assessments then directly inform the development of the SAFE programme.

Reducing the risk of gender-based violence is always a key goal of any SAFE programme, and UNICEF's SAFE programming further works in a holistic manner across sectors to reduce negative health impacts associated with cooking fuel, to support resilience and climate change mitigation and adaptation efforts, and to create and promote safe livelihoods activities, particularly for vulnerable populations.

For additional information, see IASC Task Force on Safe Access to Firewood and alternative Energy (2009): Matrix on Agency Roles and Responsibilities for Ensuring a Coordinated, Multi-sectoral Fuel Strategy in Humanitarian Settings Women's Refugee Commission (2006) and Chatham House (2014). Additional resources can be found on the SAFE website, safefuelandenergy.org/resources

The lack of safe access to and/or convenient energy sources in households has also been associated with poor nutrition resulting from improper cooking and microbial diseases such as diarrhea due to drinking unboiled water (Sagar et al., 2006).

Besides cooking and heating, energy is also needed for lighting of homes. At present, an estimated 1.3 billion people globally are still without access to electricity, with over 95% of these living in developing Asia and sub-Saharan Africa (Sustainable Energy for All, 2013c).[1] Households in these settings mainly use fuel-based sources for lighting, such as kerosene. Similarly to the burning of biomass and other fossil fuels, such traditional fuel-based lighting is not only inefficient and costly, it also produces GHG emissions and exacerbates indoor air pollution.

In addition, lighting with kerosene exposes people, specifically children, to serious fire hazards and distinct health issues (Jacobson, Bond, Lam, & Hultman, 2013). For instance, a series of studies reports that the primary cause of child poisoning in developing countries is accidental kerosene ingestion, burns are identified as one of the leading causes of child injury, and compromised visual health is a common result of poor lighting from fuel-based lanterns (Harvey, Towner, Peden, Soori, & Bartolomeos, 2009; Mills, 2012).

Another distinct concern associated with poor lighting at home is the reduced time available for education of children (UNICEF, 2007). In depth research on the extent to which electrification at home really improves children's education and life chances is scarce. Yet, the positive correlation between lighting and improved education is widely acknowledged across the international community, and the limited number of studies undertaken confirms the hypothesis: for instance, research in Bhutan showed that children in electrified households enjoy a total of 274 more days of schooling than those living in households without access to electricity (Kumar & Rauniyar, 2011). Similarly, research in rural villages in Madagascar demonstrates that the electrification of households affects children's ability to keep up with school and helps reduce gender inequalities by providing girls, who are traditionally more engaged in housework than boys, opportunities to study after sunset (Dakaa & Ballet, 2011).

Health sector

Energy also plays a key role in the health sector and significant improvements are associated with reliable access. For instance, electrified hospitals and other health facilities can perform better services, including at night time, which can be live-saving. This has been identified as particularly important in the context of

[1] Note that the definition of regions cited in this publication may be different depending on the respective source. For information on the definition of regions, revert to the original source.

child delivery. A study undertaken by Solar Aid found a positive correlation between electric lighting during delivery and improved detection of tears, postpartum haemorrhage and fewer problems with the new-borns compared to traditional fuel-based lighting (Solar Aid 2011 as cited in Mills, 2012). Experts label the results of night-time deliveries that take place in health facilities without electricity access as 'often tragic' (Dr Stachel as cited in Humphreys, 2014), and evidence shows that fewer women visit clinics in the first place when electricity access is absent (Mills, 2012). External security lighting in a clinic context is also important in that it enhances safety for women and children who need to visit the facility at night.

But lighting is not the only important factor. Also, medical equipment can be better sterilized and hygienic standards maintained more easily when energy is provided. Energy also facilitates laboratory work and hence supports diagnosis of patients. It renders steady cooling of medical products possible, including blood donations, drugs, and – of utmost importance in the context of child health – vaccines. As estimates show, almost half of the vaccine deliveries to developing countries are going to waste due to unreliable electricity connections and poor maintenance of existing solutions (Vaxess 2012, as cited in Practical Action, 2013). Severe health consequences are the result, because vaccines are a very powerful tool in reducing the number of 1.5 million children that die yearly from preventable diseases such as polio and measles (United Nations Foundation, 2012).

Information and communication technologies (ICTs) which require electricity also contribute positively to the health sector. Mobile phones that can be recharged as required facilitate communication between staff and patients which can save lives. The same applies for referrals between clinics and the locating and ordering of medical products such as blood donations or drugs. Computer based patient registration and records also contribute to strengthening health services. Finally, cooking, heating, and cooling also play an important role in the context of health centres in terms of providing food and safe water to the patients and reducing heat and cold-related diseases.
Like in the home, it is important that sustainable energy is used in clinics to avoid dangerous indoor air pollution and other problems associated with unsustainable energy (Practical Action, 2013). Furthermore, it is vital to bear in mind that additional measures, such as the provision of laboratory equipment and training of staff, are needed in order to reach the health sector's full potential (Practical Action, 2013).

Education sector

Since energy at the household level has a positive impact on children's education, it is not surprising that energy at schools and vocational institutions is associated not only with a better experience for pupils, but also with great benefits for future employment options and income generation (Practical Action, 2013). Again, lighting is an important factor which allows for extended operating hours of schools after sunset, which may be used by pupils for studying, teachers for preparing, or to facilitate trainings for community members. Lighting also has an influence on school attendance, specifically in areas such as the rainforest where penetration of sunlight is poor and lighting required during the day. As qualitative research in Bangladesh shows, teachers consider it almost impossible to teach under conditions of low light (Mr Mollah as cited inPractical Action, 2013; The World Bank, 2013).

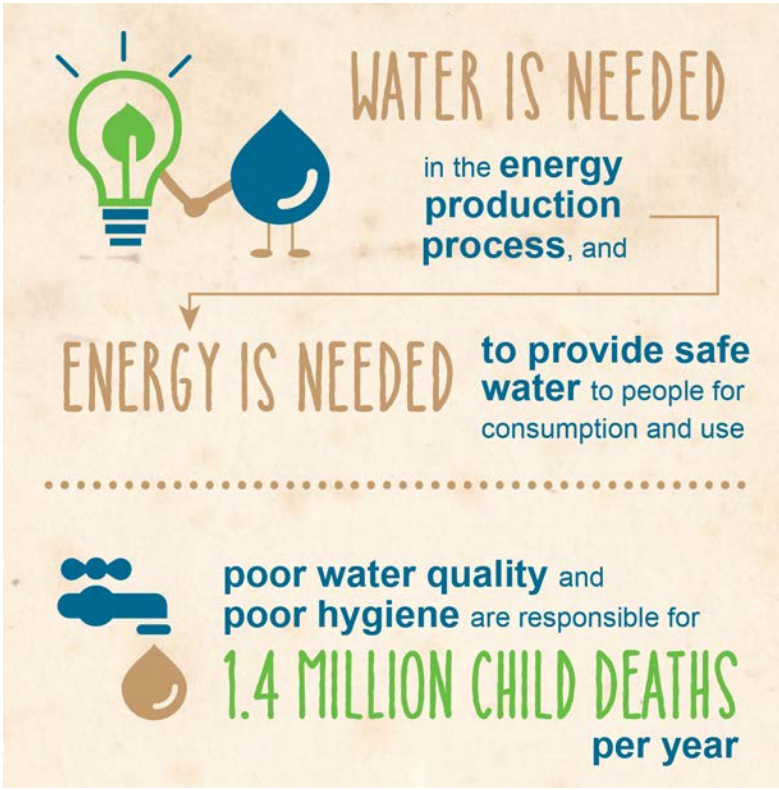
The provision of cooked meals is not only a strong incentive to send children to school, but also to enhance their learning (WFP, 2009). Reliance on biomass or fossil fuel for cooking in schools, however, causes problems with indoor air quality and reduces the time available for classes, as

firewood is usually gathered by students and staff. In some contexts, children and their families have cited security concerns associated with firewood gathering for school feeding programmes as a reason for not being able to attend school (WFP and WRC, SAFE assessment Uganda 2009). The same is true for heating of classrooms, which is required in colder regions to prevent disease. Again, applying sustainable energy solutions prevents this problem. Specifically in schools, energy is also needed for cooling: for both students and teachers it is hard to stay focused during hot summer months without any form of cooling, as evidence from Bangladesh confirms (Practical Action, 2013).

Energy access also provides a series of benefits to the education sector and facilitates the utilization of potential that otherwise would be lost: the application of ICTs such as laptops, internet, and music players facilitate higher quality education for children and may even boost their abstract reasoning. For instance, recent research undertaken in Ethiopia shows that pupils in grade 6 and 7 using laptops scored significantly higher in finding analogies and categories than those without (Hansen et al., 2012). Computer literacy opens the door to higher-level jobs in the labour market and vocational trainings for mechanics, carpenters, and electricians benefit particularly from reliable energy supply. At the same time, ICTs provide opportunities to enhance teachers' skills, including through long-distance learning, help to attract and retain qualified staff, and can simplify and strengthen administrative, logistical and managerial tasks such as grading, recording attendance, and keeping files (Practical Action, 2013).

Water sector

Life without water is not possible, and energy and water are also intrinsically linked: water is needed in the energy production process, and energy is needed to provide water to people for consumption and use, for instance through drilling, pumping, transporting, and treatment to make it safe (UNDESA, 2014a). Water is essential for human health, and children's well-being in particular is heavily dependent on the availability of safe water. Poor water quality and poor hygiene are responsible for over 1.4 million child deaths per year and diseases transmitted through water or human excrement are – after respiratory diseases – the second leading cause of death among children globally (UNDESA, 2014b).



In addition to these direct health impacts and similarly to collecting fuel, the hours spent fetching water take away valuable time from girls and women that could otherwise be spent on education or income generation, and puts them at risk of injury or other harm. Water also impacts on other important sectors that affect children's wellbeing, such as food security. The installation of energy-based pumps and disinfection measures help a great deal in addressing these issues.

Infrastructure and transportation

Infrastructure is dependent on energy, and the availability of street lighting has a significant impact on children's lives. Overall, the lack of street lighting is more prevalent in rural areas as compared to urban settings (Practical Action, 2013). Yet, the urban poor who live in informal settlements are not to be forgotten: slums are often deprived of basic services, including street lighting (The Cities Alliance, 2014). In areas without street lighting, women and children face a heightened risk of gender-based violence or robbery if they leave their homes after sunset, including to access basic needs such as using a latrine. Not being able to safely be outside after dark deprives them of options to engage in educational and vocational activities or income generation. At the same time, it is widely acknowledged that if street lighting is available, women make use of the additional time and opportunities, for instance by selling goods at the community markets for extended hours, which benefits the entire household.

Additionally, health personnel can reach homes and clinics faster and safer when streets are well lit (Practical Action, 2013). It is also frequently cited that street lighting significantly reduces the share of road accidents and injuries. However, evidence remains scarce and further research is required to validate this (B. Jones, 2011).

Energy is also needed in the transport sector. If transportation is affordable, clean, and safe, it can help increase school enrollment rates, specifically in remote areas where walking distances to the next school are very far or commuting would otherwise be insecure for children. Further, a safe pedestrian infrastructure contributes to decreasing the incidence rates of traffic accidents. Transportation generates opportunities for women who can travel more safely and easily to fulfill their productive and reproductive tasks[2], which again is expected to benefit all household members (UNCRD, n.d.). Finally, a well-functioning transport system saves time in the delivery of medical equipment, drugs, vaccines, and blood donations, and facilitates movement of specialized staff; both contribute to saving lives.

Infrastructure and transport based on sustainable energy is just as important as in all other sectors. In particular, emissions from road, rail, air and water transport contribute significantly to climate change and cause high levels of ambient air pollution, particularly in urban areas of developing countries where the number of vehicles is steadily increasing, yet emission standards are lax or non-existent. Here, ambient air pollution poses a particularly substantial health threat and is responsible for 1.3 million deaths worldwide per year. Children in middle-income countries are particularly affected (WHO, 2014b). Combining urban and rural sources and based on latest data for the year 2012, ambient air pollution is associated with 3.7 million premature deaths globally (WHO, 2014a).

[2] Productive tasks refer to activities that generate income. Reproductive tasks refer to care and maintenance of the household and family, including activities such as cooking, fetching water, collecting fuel, cleaning etc. In many countries these tasks are typically undertaken by women.

3. STATE OF THE ART: DEFICITS AND ISSUES IN MEETING CHILDREN'S ENERGY NEEDS

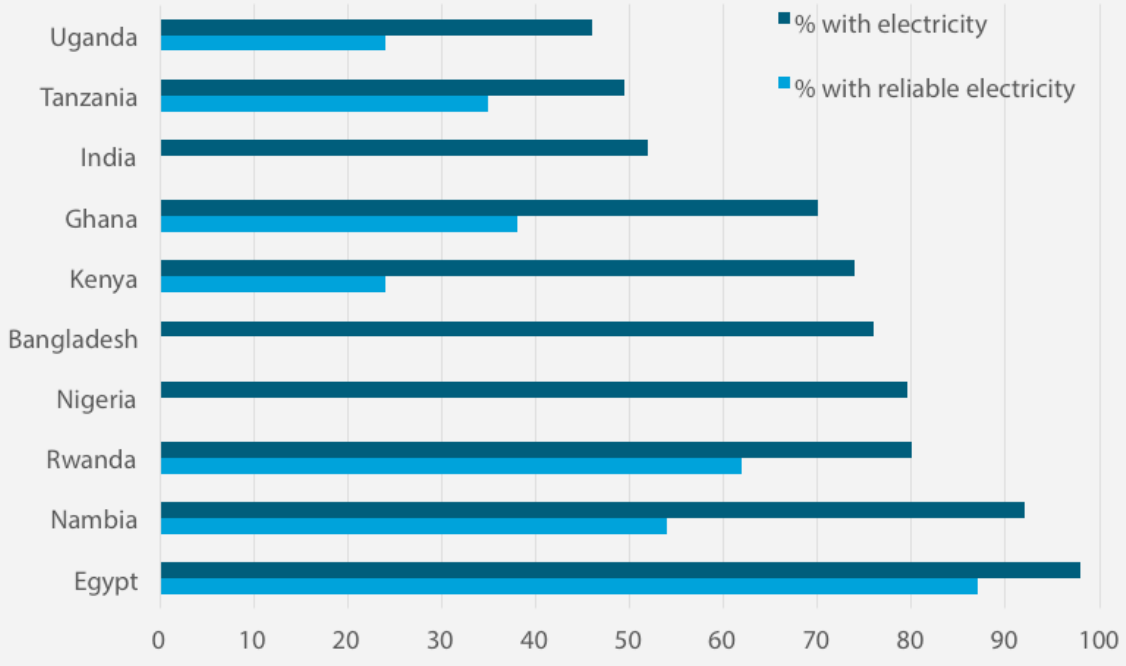
Amounting to 10% of the world's GDP, countries spend a significant amount of money on energy and due to its importance, the sector plays a prominent role in national and international politics (Desbrosses, 2011; Sagar et al., 2006). Nevertheless, the energy needs of many people, including those of children, remain unmet. The summary below presents (to the extent possible) the state of the art in quantitative terms:

- **Energy poverty of households** remains wide-spread: as of 2014, 1.3 billion people – one in five globally – are still without access to electricity and 2.6 billion people – nearly 40% of the world's population – continue to rely on wood, coal, charcoal, or animal waste to cook their food. More than 95% of these people live either in sub-Saharan African or in developing countries in Asia and 84% are in rural areas (IEA, 2014). In total, 4.3 million deaths in 2012 were attributable to indoor air pollution, and much of this pollution was energy-related. Developing countries suffer most: indoor air pollution caused 1.69 million deaths in South East Asia; 1.62 million

in the Western Pacific; 600,000 in Africa; 200,000 in the Eastern Mediterranean region; 99,000 in Europe and 81,000 in the Americas. By comparison, the annual deaths attributable to indoor air pollution in high-income countries add up to only 19,000 (WHO, 2014a).

- Only very limited data exists on **energy and the health sector** in developing countries. USAID's Demographic Health Surveys provide information on 10 countries[3], showing that in Uganda the situation is worst with only 42% of the health facilities having access to electricity; Egypt on the other hand has the greatest number of electrified facilities with over 90% having some type of electrical supply (USAID Demographic Health Survey's Service Provision Assessments as cited inPractical Action, 2013) (see Figure 1). In terms of reliable energy access, the situation is even worse (Practical Action, 2013). Reviewing the limited amount of more specialized research available, a study on sub-Saharan Africa concludes that in 11 surveyed countries, 74% of health facilities (including hospitals and 'other' health facilities) had access to electricity. Among these, however, only 28% had reliable access to electricity (Adair-Rohani et al., 2013). Information on the share of sustainable energy in the health sector has not been found.

Figure 1. Electricity access rates in health facilities for the few developing countries with available data (from: Practical Action, 2013)



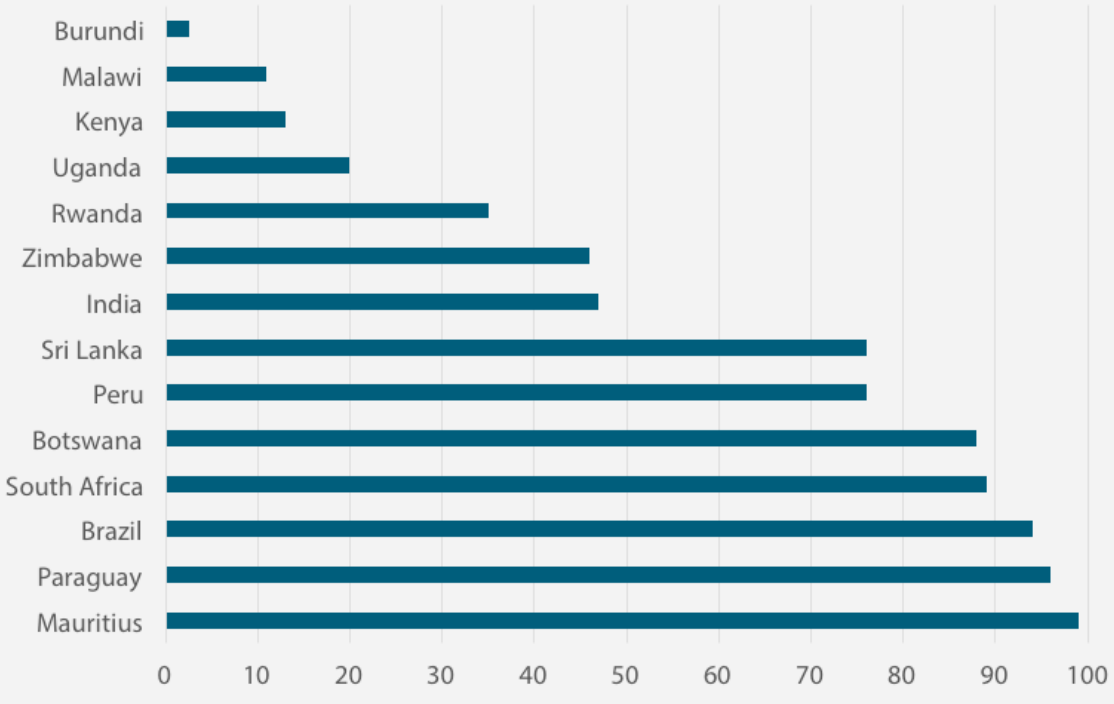
3 Uganda, Tanzania, India, Ghana, Kenya, Bangladesh, Nigeria, Rwanda, Namibia, and Egypt.

- Data on **energy access in the education sector** is also very scarce. Looking at primary school access to electricity, sub-Saharan Africa has the lowest rate with 35%, followed by South Asia with 48%, and Latin America with 93%. This leaves 90 million pupils in sub-Saharan Africa, 94 million in South Asia, and 4 million in Latin America who attend schools that have no access to electricity (Practical Action, 2013) (see Figure 2). Again, information on the share of sustainable energy in the health sector has not been found.

- Data on **water** suggests that more than 780 million people still lack access to improved sources of drinking water and 2.5 billion people are without access to improved sanitation facilities. Across regions, urban areas are better off than rural areas, where about 84% of those without access to improved water sources live. In sub-Saharan Africa, 40% of the population rely on unimproved water sources, followed by 13% in South Asia and 7% in Latin America and the Caribbean (Practical Action, 2013).

- It is unknown how many communities in developing countries are without **street lighting**; reliable statistics could not be found. However, it is reasonable to assume that most of those 1.3 billion people who have no access to electricity in their homes are also deprived of street lighting (Practical Action, 2013). Quantifying the access to affordable, safe and clean **public transportation** in developing countries is equally difficult. However, the health impacts attributable to ambient air pollution, which are closely linked to unsustainable energy policies including in the transport sector, are estimated to have caused 3.7 million premature deaths globally

Figure 2. Percentage of primary schools with access to electricity in selected countries (from: Practical Action, 2013)



in 2012. With 88% of these deaths occurring in low- and middle-income countries, these countries, which represent 82% of the global population, bear the brunt of the problem. More precisely, 1.67 million deaths were recorded in the Western Pacific; 936,000 in South East Asia; 236,000 in the Eastern Mediterranean region; 200,000 in Europe; 176,000 in Africa; and 58,000 in the Americas. The remaining deaths occurred in high-income countries (WHO, 2014a).

Interlinked with these deficits and problems is the major issue of insufficient attention being paid to the specific needs and vulnerabilities of children in **climate change and energy-related negotiations and discussions**. This is particularly concerning as children are heavily affected by limited access to clean energy and, as the next generation, will bear the brunt of climate change impacts. It is their lives that are determined most by the decisions made today. At the same time, however, children are not only vulnerable; they are important agents of change. They are aware and care about what is happening to their world, and bring valuable insights and perspectives to the negotiation table (UNICEF United Kingdom, 2013). Both the concept of intergenerational justice as well as child rights recognize the concern for future generations and acknowledge their valuable contributions and hence call for the inclusion of children in decision-making processes. Despite this, children up to this date barely get the opportunity to contribute and have a say in one of the most important decision-making processes determining their future (Walden, Hall, & Hawrylyshyn, 2009). This is also generally true for the inclusion of children in climate change and energy-related decision-making processes at national and local levels.

4. BARRIERS TO ACHIEVING ACCESS TO SUSTAINABLE ENERGY

Based on the previous analysis and presentation of data, it is clear that the energy needs of children in general, and sustainable energy needs in particular are in many places insufficiently met, or not at all. Inevitably, this leads to the question: why is this the case and what causes the (sustainable) energy problem in developing countries?

This section focuses on barriers that hamper children's access to sustainable energy as the ultimate goal. In addition to these child- specific barriers, there are more general barriers to achieving access to sustainable energy. These ultimately affect the population as a whole and are summarized in table 1 at the end of this section.

Barriers to inclusive decision-making

Inclusive decision-making is indispensable to achieve maximum development results. If children are included, policy-makers will be more aware of the severe impacts and specific issues that unmet energy needs cause for this societal group and beyond, and how these could be addressed. Although the need for and benefits of inclusive decision-making are widely acknowledged, specific research pinpointing reasons for the shortcomings in the energy sector is still limited. Reviewing the existing literature, information is mostly available on women, usually under the umbrella of climate change and gender equality and women's empowerment. The most commonly cited issues that hamper women's participation in decision-making processes at all levels include: **1.** limited awareness and/or recognition of unequal gender relations in the energy sector, including women's distinct needs associated with their reproductive and productive roles, **2**. their limited access to and control over financial resources and ownership of assets such as land, **3.** women's educational status which is oftentimes lower than men's, **4.** limited training opportunities and access to information, and **5.** a tendency among women to underestimate their own contributions (EuropeAid, 2012).

Information on children's participation in the energy sector in developing countries is barely available. A UNICEF report on the related topic of climate change adaptation in five developing countries concludes that children are mainly cited in policy frameworks only in the context of being a vulnerable group. Their potential to contribute is mostly neglected, which hints at a lack of awareness of the benefits of including children and young people among national policy-makers. Further reasons for children's limited inclusion that are cited in the report include the slow process of funding and implementing climate change initiatives and the frequent neglect of social sectors in climate change funding such as health, education, and social welfare (UNICEF, 2011). On a more general level, a synthesis report on children's

participation in decision-making in the UK identifies three key determinants for limited inclusion: first, organizations rarely proactively measure children's participation; second, the awareness of the benefits of including children in decision-making is insufficient within organizations; and third, insufficient senior management commitment to children's participation (Davey, 2010). It is reasonable to assume that these aspects are also valid in the context of the energy sector.

However, the issue is not only one-sided. Based on another UK-based review of recent literature on children and young people's views on sustainable living, climate change and other environmental issues, it turns out that while many children feel empowered to take action and believe that they can contribute to addressing environmental challenges, a significant share also had doubts on their ability to contribute to change (Zoë Renton, Davey, & Lea, 2011). This lack of confidence may lead to limited action and pro-active engagement from children and young people themselves.

Social barriers and limited public awareness

Social barriers in the context of the energy sector are not particularly well researched yet and hence face the constant risk of being neglected in global and national negotiations and decision-making, as well as in programme/project planning that is intended to benefit local populations, including women and children. Nevertheless, it is widely acknowledged that factors such as rules and norms within societies, and beliefs and behaviours of individuals or groups are very important determinants of whether change takes place and reforms are implemented or not, specifically at the end-user level (L. Jones, 2010). Other important factors are the level of awareness among the local population, specifically the understanding of current issues and their root causes, as well as information on expected benefits through change, and guidance on how to achieve such change.

For instance, behavioural barriers were found to be responsible for the limited uptake of installed, improved cook stoves in India. Studies in other countries confirmed the significance of behavioural barriers in the use of such new stoves (Sathaye et al., 2011). Furthermore, uptake of newer solar powered lights may be slow where poor quality products that do not conform to existing global best practices are introduced, causing market 'spoilage' and a lack of trust in solar more broadly as a source of sustainable energy (Leeuwen, 2014). In general, resistance towards improved technologies is found to be largest when extensive changes in consumption and behaviour are required by the local population. On the other hand, as long as the transition to sustainable energy, including improved technologies, is smooth and new technologies emulate existing practices and respond directly to the needs and preferences expressed by users, opposition is less frequent (Sathaye et al., 2011).

Another example of social barriers and the problem of limited public awareness comes from South Africa, where research revealed that health care providers identified the health effects of cooking smoke and carrying heavy loads of firewood as minor. Reasons include the customary neglect of work-related health and non-communicable diseases, cultural interpretations of womanhood, inadequate access to relevant information, and limited interactions between health and energy sector professionals (Matinga, Annegarn, & Clancy, 2013). The introduction of new, improved technologies that seek to address health issues resulting from such work may therefore be more difficult.

Finally, social aspects also play a role in large-scale projects such as hydropower and geothermal developments. These interventions commonly affect communities, including population resettlement.

Equity and fairness considerations are important and influence the uptake or abandoning of such initiatives (Sathaye et al., 2011).

Institutional barriers

Another key obstacle that hampers children's access to sustainable energy is the concerning situation regarding data availability. This problem is mainly caused by weak institutions in developing countries, but also insufficient activity by stakeholders of developed countries. As previous sections of this publication revealed, energy-related data in developing countries is scarce in general. This includes information on the sectors most relevant to children, specifically the health- and education sectors as well as infrastructure and transport. Disaggregated data on children and their access to and benefits from energy is even sketchier, which also applies to specific data on access to sustainable energy. In addition, data on children's participation in energy-related decision-making at all levels is rare.

Where data is available, it cannot be taken for granted that it was collected under high quality standards or through sound methodologies. Further, accessing collected data is often challenging. Yet, both quantitative and qualitative data are the basis for any informed decision-making and hence urgently needed. This includes historical data, information on the state of the art, and future projections alike. Data facilitates the identification of progress and challenges, and enables sustainable planning, while its absence presents an obstacle for informed action by any stakeholder (Bhattacharyya, 2011).

Table 1. General barriers to safe, consistent access to and use of sustainable energy

Barrier	Issue
Financial barriers	• Public funds and development aid together are insufficient to cover the required funding for the energy sector (IEA & OECD, 2011; The World Bank, 2013). Hence, private sector investments in sustainable energy are urgently needed to meet global demands. These depend on a set of conditions, in particular the availability of appropriate policy frameworks and supportive institutional environments (Glemarec, 2011; UNEP and partners, 2009). Even now, developing countries often do not fully comply with these conditions and investments are associated with a high level of risk. • Public sector finances are key in leveraging private investments and activity through creating attractive environments characterized by decreased risks and enhanced rewards and returns. However, to date, public spending has not attracted as much private investment as expected (Heinrich Böll Stiftung North America, 2013).
Legal and policy barriers	• Fossil fuel subsidies are widespread, despite increasing recognition that significant quantities of known fossil fuel reserves will need to remain in the ground to avert dangerous climate change (C. McGlade & P. Ekins, 2015), and despite the burden they impose on national budgets, and their role in encouraging wasteful consumption and undermining the competitiveness of renewable energy sources. Indeed, it is estimated that fossil fuel subsidies amount to $600 billion per year, six times the amount invested in renewable energy (New Climate Economy Report, 2014). . They also fail in one of their core objectives, namely helping poor households: in 2010, only 8% of fossil fuel subsidies reached the poorest 20% of the population (IEA, 2011). Tailor-made subsidy reforms are required to address this dilemma and to ensure that measures are put in place to protect vulnerable groups from rising energy prices as subsidies are phased out. More research is needed to identify how to best go about this process (Hamilton, 2010; UNEP, 2008). • Intellectual property rights (IPRs) impact on the development and transfer of environmentally sound technologies (ESTs), which are a pre-condition for the supply of sustainable energy. In developing countries, IPRs are often absent or deficient. The on-going debate is controversial: for private companies, the lack of IPRs presents a barrier to technology transfer. Developing countries consider IPRs as a risk that may restrict their access to ESTs. More research is needed to draw informed conclusions on linkages and impacts of IPRs on technology development and transfer (Abdel-Latif, 2013; Gattari, 2013; Zhuang, 2011).
Institutional barriers	• Access to sustainable energy depends on the strength of national institutions. For instance, institutions are responsible for implementing international agreements, formulating national policies and guidelines, or undertaking long-term strategizing, including investments. In developing countries, institutions often lack capacity to do this (Chandrasekharam & Bundschuh, 2002; IPCC, 2007). • Consequences of weak institutions are manifold and include improper implementation of reforms, limited inter-institutional cooperation, poor planning, high transaction costs due to frictions in economic exchange processes, and the complete hindrance of much needed private operations in the energy sector (IPCC, 2007; Zhang, Parker, & Kirkpatrick, 2006).

SUCCESS STORIES FROM THE FIELD

Improved cook stoves in Bangladesh

The issue

Bangladesh is one of the countries that is highly vulnerable to the adverse effects of climate change. At the same time, 95% of the population continues to rely on biomass for cooking and only 1.7% of these use fuel-efficient stoves. About 46,000 Bangladeshis per year die prematurely from respiratory infections and disease caused by solid fuel use, and women and children are disproportionally affected. Improved cook stoves have been identified as one of the interventions that can help tackle dangerous indoor air pollution.

Project set-up and expected outputs:

The carbon offset project started in early 2014 and is a joint initiative of the UK Committee for UNICEF and the UNICEF Bangladesh Country Office (CO), with the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH being the main implementing partner. Set up for a period of ten years, the project brings together businesses and the international development sector, through purchasing of carbon credits. Marks & Spencer (M&S) is the first major company that has signed up for this new financing for development scheme.

Over the course of its lifespan, the project will provide 40,000 low-income households in Bangladesh with an improved cook stove that is technologically similar and uses the same fuel as the traditional ones, but which is much more efficient. These improved stoves use nearly half the amount of fuel needed by traditional stoves and they have chimneys. They produce one ton less of carbon per year than a traditional stove, and reduce the amount of toxic smoke and particulates in homes. Community entrepreneurs are being trained in how to make the stoves from locally available materials, to sell them at a subsidized affordable rate, and to provide maintenance and user support. Cooperation with local and international universities is being established to advance the research on indoor air pollution in Bangladesh and the effectiveness of improved stoves, respectively.

In summary, the expected outputs are as follows:

- Better health of children and mothers due to reduced exposure to harmful indoor air pollution;
- Less time spent collecting fire wood and cooking by women and girls;
- Prevention of 361,000 tons of carbon from being emitted (equivalent to over 60,000 return flights from the UK to Australia);
- Decrease in local environmental degradation and deforestation;
- Data on indoor air pollution in the country and new knowledge on the effectiveness of improved cook stoves;
- Savings to household incomes of nearly 50% on current fuel costs;
- Creation of 200 new jobs for local entrepreneurs;
- Verification of 361,000 Gold Standard carbon offsets.

Key barriers to sustainable energy addressed:

- **Social barriers and public awareness:** Thanks to the specific design of the improved cook stoves which is technologically very similar to the traditional stoves used in Bangladesh, resistance is obviated and the long-term uptake by the local population much more likely. Sticking with the same type of fuel is another supporting factor, as the behavioural change required by consumers is minimal. Further, the training of local entrepreneurs includes information on the benefits of using the improved stoves, which additionally encourages uptake and contributes to public awareness raising.

- **Financial barriers:** The project attracted private sector finance through its innovative carbon-offset scheme. These resources, leveraged through selling carbon credits, will allow financing of the entire project over the course of ten years. As the first major private sector partner to have signed up, M&S will actively encourage other businesses to support the project during its life span.

- **Institutional barriers:** Through training entrepreneurs, the project strengthens local capacities. The envisioned cooperation with universities and planned research on indoor air pollution and the effectiveness of improved cook stoves will provide more information on adverse effects and address the persisting lack of energy-related data. The project also addresses institutional barriers through development of networks, as well as coordination of a variety of relevant stakeholders, including from the private and public sector, and development partners.

SUCCESS STORIES FROM THE FIELD

Project Lumière in Burundi

The issue

With only 3% of its population being connected to the central electricity grid, Burundi's electrification rate is among the very lowest in the world. Due to the limited availability of alternatives in the country, Burundi's population mainly uses kerosene and candles for lighting. The lack of electricity access hampers development, and kerosene use causes adverse health effects for the population, with children and mothers facing a heightened risk.

Community groups play a critical role in addressing this and other gaps in Burundi's public sector, delivering frontline services for children and women living in isolated communities and communicating important information back to central-level service-providers. Yet the impact of these groups remains limited. To support the work done by community groups, a savings and credit scheme (Nawe Nuze) was put in place to help them access credit and improve income generating activities.

Project set-up and expected outputs:

Project Lumière started in mid-2013. Through collaboration between stakeholders including UNICEF, the private sector partner Nuru Energy, the local NGO FVS, community volunteers, the University of Brussels and local academic institutions, the project aims to strengthen services for children at the community level and help deliver sustainable energy solutions.

Over the course of the pilot phase, 16 community

groups from three different provinces with varied geographic and economic profiles will participate in the project. These community groups purchase a PowerCycle (pedal-powered generator) and rechargeable LED lights to be sold within their communities. Each group, comprised of up to 45 members, makes an initial payment towards the purchase of the generator, and pays down the balance over a fixed period of time through revenue generated from the sale and re-charge of the LED lights. In parallel, UNICEF works closely with the local NGO, which serves as micro-finance partner, to support the development of a community-owned social enterprise to oversee management, procurement and distribution of additional lights and other affordable off-grid energy solutions.
In order to evaluate impact of the new energy product, the University of Brussels will perform an energy baseline study around household consumption prior to implementation of the second phase, which will be followed by a 1-year randomized control trial (RCT).

In summary, the expected outputs are as follows:

- Provision of lighting to 16 communities (approximately 400 households per village);
- Improved security and health, specifically of children and mothers, including through portable lighting, better indoor air quality and reduced risk of injuries and burns;
- Improved capacities and creation of income-generating opportunities for local population through rural energy entrepreneurship;
- Savings to household incomes through less spending on traditional energy sources such as kerosene;
- Improved child well-being through targeted community group activities financed through revenue generated from selling and charging LED lights and mobile phones
- Reduced carbon emissions through use of renewable energy sources
- Data on household energy consumption and the impact of safe, affordable energy products on this

Key barriers to sustainable energy addressed:

- **Social barriers and public awareness:** The community groups inform the local population about LED light technology and its benefits which prevents potential skepticism and resistance. Community group members also raise awareness of the local population on climate change and energy-related issues and how to address these.

- **Financial barriers:** The project creates a market for sustainable energy products, and potential financing risks are addressed by dedicated community-level internal savings and loan groups. In addition, investing in off-grid energy solutions through this unique business model increases purchasing power at the community and household level.

- **Institutional barriers:** Cooperation with the University of Brussels undertaking the energy baseline study and assessment addresses the lack of data. Collaborating with such a renowned institution has also resulted in the interest of other public and private actors who may engage in Project Lumière and related activities. Institutional barriers are further addressed through the pro-active building of networks and cooperation, as well as coordination of a variety of relevant stakeholders.

SUCCESS STORIES FROM THE FIELD

‘Youth Kiosks’ and ‘MobiStations’ in Uganda

The issue

Although Uganda has comparatively high primary school enrollment rates, the country’s education system faces challenges such as teacher absenteeism, poor quality of instruction, overcrowded classrooms, and a lack of textbooks. At the same time, not all children in Uganda have access to education in the first place: some families live too far away from schools or lack money to purchase teaching material. Without education, children’s future career chances are very limited. This poses a threat to their well-being and the development of the society as a whole.

Project set-up and expected outputs:

UNICEF Uganda's Innovation Lab worked with local experts to develop two key products to address these issues: so-called 'Youth Kiosk' - and the 'MobiStation':

Youth Kiosks are robust computers, usually consisting of a set of three low-energy laptops which are mounted in a metal housing to a wall. They are loaded with a large variety of educational material, including Uganda's national school curriculum in video format. Currently, 37 of these mobile school labs are located in youth centres in poor rural and urban areas. Installing the Youth Kiosks in public spaces is particularly important in providing access to information and education to children that have dropped out or never attended school in the first place. In addition to the educational information children receive through operating the Kiosks, they acquire basic computer literacy as a practical skill that can be of great advantage in their future work-life.

The Youth Kiosks are powered through solar energy. The system is not only reliable but consumes low-levels of energy. Further, the Kiosks are mainly manufactured using standard equipment that is already available in country. Combining technical know-how and creativity, the Innovation Lab adapts this material so that it can be used for educational purposes by children, including those who have never worked with a computer before. Among other things, this requires an intuitive design that is easy to handle, highly automated, withstands all kinds of user behaviour and does not require specialized training.

The Youth Kiosks are very popular among children in Uganda; it is an exciting experience for them to work with these computers, and they have proven to be a very effective tool in improving their level of education.

MobiStations present a digital version of the 'school-in-a-box' that has been provided by UNICEF as a hallmark disaster response for the last twenty years. These portable technology platforms can be powered through solar energy, generator, or grid. They include a laptop, micro projector, multiple camera devices, speakers, and batteries. MobiStations feature multiple USB ports, extended battery life, and optional solar panels, and can function as content servers and wireless hotspots. They are pre-loaded with free quality educational content and can be used for a variety of contexts such as education and trainings in schools, universities, the health sector, and also in emergency settings. In the latter, MobiStations are usually combined with UNICEF's Rapid Family Tracing and Reunification software, which supports disconnected families in these settings to reunite.

In summary, the expected outputs are as follows:

- Improved education of children through access to Youth Kiosks and/or teaching with MobiStations
- Basic computer literacy among children through operating Youth Kiosks
- Improved provision of health services through training of staff with MobiStations
- Improved disaster response in crisis settings through work with MobiStations and targeted open source software
- Avoidance of emissions through the development and promotion of environmentally friendly technologies

Key barriers to sustainable energy addressed:

Social barriers and public awareness: Specifically with regard to the Youth Kiosks, the project ensures that the majority of material required can be sourced locally. Through in depth analysis of local circumstances, joint work with local experts, and adaptation of the material to the target population's priorities (such as the national educational curriculum), the products are tailor-made and match local needs. This not only counteracts potential resistance, but even attracts children's interest and curiosity.

Financial barriers: Youth Kiosk and MobiStation are cost-efficient innovations thanks to the use of local material, the specific design, which relies on solar power, and the predominant use of open source software which is free of charge.

Legal and policy barriers: The project avoids challenges regarding intellectual property rights and technology transfer through developing innovative products directly in the country, together with local experts.

5. POLICY RECOMMENDATIONS AND CONCLUSION

The generic barriers to sustainable energy are fairly well known and being addressed by a number of stakeholders. Some policy recommendations feeding into this process are presented in table 3 at the end of this section. However, there is a risk that if the child specific barriers are not addressed simultaneously, the global community will miss a major opportunity to maximize development benefits from investments in sustainable energy. Over time, this would likely result in the need to retrofit sustainable energy policies and programmes to support the specific needs and involvement of children. Since work by the global community is still at a relatively early stage regarding sustainable energy, this can be avoided by taking action now.

To remove the barriers that hamper children from accessing and benefiting from sustainable energy, policy recommendations have been formulated for the main stakeholders at the global level, namely governments and national authorities, the donor and development community, universities and research institutions, and the private sector. They are aligned with the ongoing process of formulating sustainable development goals and presented in table 2 on the next page.

- **Raise decision-makers' awareness of children's distinct energy needs, but also knowledge and skills, and advocate for their inclusion in decision-making processes at all levels.** Making decision makers aware of children's needs and the far-reaching consequences of not meeting these is a pre-condition for positive change. At the same time, children have knowledge and skills which can support sustainable energy-related work. Tailored advocacy work, including on the benefits that come with inclusive decision-making, can amplify sustainable energy-related development results.

- **Create opportunities for children to voice their views and strengthen their skills to do so effectively.** Providing children with a space where they can regularly gather, discuss, and exchange their energy-related needs and views helps build confidence in themselves and their abilities. These opportunities can also be used to provide tailored capacity building that enables them to meaningfully contribute in energy-related activities and decision-making. Also, when developing sustainable energy products relevant to children, develop these based on the needs and preferences expressed by children and/or their caregivers.

- **Integrate sustainable energy in school life, national curricula and university programs.** Including this as part of broader education on sustainable development from primary to tertiary level will sensitize children and enhance their knowledge. Education materials should pay specific

Table 2. Child-specific policy recommendations

Barrier	Child-specific policy recommendation	Main responsible stakeholder(s)
Barriers to inclusive decision-making	Raise decision-makers' awareness of children's distinct energy needs, but also knowledge and skills, and advocate for their inclusion in decision-making processes at all levels.	Governments and national authorities; development and donor community
	Create opportunities for children to voice their views and strengthen their skills to do so effectively.	Governments and national authorities; development and donor community; private sector
Social barriers and limited public awareness	Integrate sustainable energy in school life, national curricula and university programs.	Governments and national authorities; universities and research institutions; development and donor community
	Launch public awareness campaigns on the importance of sustainable energy for children's health, well-being, and their future opportunities, and the available options.	Governments and national authorities; development and donor community
Institutional barriers	Strengthen institutional systems to collect, process and publicize data relevant to energy and children.	Governments and national authorities; universities and research institutions; development and donor community; private sector
	Put in place a global knowledge platform on energy and children, and build partnerships and networks with stakeholders that are active in this field of work.	Governments and national authorities; universities and research institutions; development and donor community; private sector

attention to the energy needs of boys and girls themselves, and approach the topic from a holistic perspective that covers the social and cultural aspects, gender, health, education, economy and politics considerations, in addition to technical aspects. Encouraging and supporting girls to take on energy-related studies and pursue careers in the energy sector will further help in addressing the persisting, immense gender imbalance in this domain.

- **Launch public awareness campaigns on the importance of sustainable energy for children and available options.** Campaigns can help make the case for society to invest in sustainable energy solutions for children. An important element of making the case includes generating a common understanding in society about the detrimental effects of the use of polluting fuels, and in contrast, the many benefits that clean fuels and technology can provide in terms of children's health and development, and thus also for children's households and their communities. Awareness campaigns need to be tailored, for example to specific target groups or regions, including concrete examples of relevant sustainable energy solutions.

- **Strengthen institutional systems to collect, process and publicize data relevant to energy and children.** Disaggregated data, for instance on children's access to (sustainable) energy, and the impacts and benefits of improvements in the

energy sector on children, is urgently needed to facilitate informed decision-making and planning. Strengthening institutions, for instance through capacity building of staff and putting in place supportive systems, is indispensable for the regular collection, processing, and publication of reliable data.

- **Put in place a global knowledge platform on energy and children, and build partnerships and networks with stakeholders that are active in this field of work.** The generation, documentation, and dissemination of knowledge and information is essential to facilitate informed decision-making, as well as effective and efficient planning and implementation of any initiative. In order to provide easy access for a variety of different audiences and stakeholders, a global knowledge platform on energy and children is urgently needed. This could take the form of a new platform, or inclusion of children in existing platforms on energy established by e.g. the Global Alliance on Clean Cook Stoves, Sustainable Energy for All and Energia. In addition, close cooperation between stakeholders and the establishment of networks on energy and children would help to utilize comparative advantages, and avoid duplication of efforts.

A summary of policy recommendations with regard to generic barriers (not specific to children) is provided in table 3.

Table 3. General policy recommendations

Barrier	Policy recommendation	Main responsible stakeholder(s)
Financial barriers	Leverage private sector finance and create enabling environments that attract private investments in sustainable energy	Governments and national authorities; development and donor community
	Increase the share of sustainable energy sources and technologies	Governments and national authorities; development and donor community; private sector
Legal and policy barriers	Undertake research on energy subsidies and subsidy reforms, and phase out inefficient fossil fuel subsidies, without compromising energy access of the poor.	Governments and national authorities; universities and research institutions; development and donor community; private sector
	Undertake research on Intellectual Property Rights and their effects on technology transfer, and support the local production and sales of Environment Sound Technologies.	Governments and national authorities; universities and research institutions; development and donor community; private sector
Institutional barriers	Strengthen local institutions and public systems relevant to the energy sector	Governments and national authorities; development and donor community

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