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UNESCO Chair in
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Guidance Note 8
Resilient and sustainable energy solutions

From the Report: Education for the most marginalised post-COVID-19: Guidance for governments on the use of digital technologies in education

ACT THREE (OF THREE): GUIDANCE NOTES

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Clear evidence, better decisions, more learning.

Report homepage https://edtechhub.org/education-for-the-most-marginalised-post-covid-19/

Guidance Note: Resilient and sustainable energy solutions[1]

Context

All digital technologies require reliable and stable electricity for them to be used effectively. However, far too often initiatives designed to use ICTs to support marginalised people and communities over the last 20 years have failed to pay this crucial issue the attention that it deserves. As *Table 1* (*Act Two, Part 1*) reminds us, less than 70% of primary schools across the world had access to electricity in 2018. Any initiatives designed to use digital technologies in these schools will therefore be impossible unless electricity in some form is provided to them; electricity provision and Internet connectivity must go hand in hand. Moreover, many of the most marginalised, those who do not go to school or live in isolated areas, simply do not have access to any form of electricity, but can nevertheless benefit hugely from its provision in ways that go far beyond merely formal education. Electric light can not only extend the time people have to learn, but it also enables them to work longer hours, to enjoy entertainment together, and even improve their health.

Where grid electricity solutions are not available, alternative smaller scale, or even micro-solutions can play a very important part in enabling digital technologies to be used effectively. Solar and wind-turbine solutions are the most frequently promoted, but alternatives such as micro-hydro, or even simple bicycle dynamos or handheld charging devices, especially when combined with low-cost radios and tiny solar panels, can make a huge difference to people's abilities to learn through digital technology. For many of the most marginalised and isolated, interactive radio instruction (IRI) remains a vitally important means through which they can learn.

Much of the digital technology sector, though, is based on business models that are fundamentally unsustainable. Mobile devices often only last for a couple of years before needing to be replaced, new software sometimes requires a hardware upgrade (and vice versa), the Internet creates about as much CO_2 emissions as does the airline sector, some companies make it extremely difficult for people to repair their devices, and the use of scarce minerals means that considerable environmental damage is caused by the mining associated with their extraction.[2]

These challenges are particularly pressing for Small Island Developing States (SIDS), especially as they face challenges from rising sea levels, and the apparently increasing frequency of violent storms which have a significant impact on infrastructure, notably digital connectivity and electrical power (see also *Guidance Note on SIDS*). It is especially pertinent for them to strive for maximum possible energy self-sufficiency and resilience given inherent logistical complexities associated with island clusters, which are aggravated during and after extreme weather events, and the high financial and environmental costs of fossil fuels.

1 Lead authors Javier Rua and Tim Unwin.

2 For a wide-ranging review, see Unwin, T. (2020) *Digital technologies and climate change*, https://unwin.wordpress.com/2020/01/16/digital-technologies-and-climate-change/.

As with so many connectivity and infrastructure challenges relating to provision for the most isolated and marginalised, there is also a fundamental equity issue that needs to be addressed: providing electricity to low density isolated, and especially mountainous areas is generally much more expensive than it is to deliver it to people living in high-density, low-lying cities. It is therefore not just a question of having the technology to supply the energy, but it must also be delivered affordably and reliably. Although solar power and a new telecentre have, for example, been provided in the Kelabit Highlands of Sarawak, there remain real challenges in ensuring that electricity and connectivity are not disrupted during heavy rainstorms, and solar panels must always be tightly secured to rooves.Likewise challenges with supply chains to remote schools mean that replacing expensive lithium batteries can take several months, during which time connectivity for learning through digital devices will be disrupted.

Guidance

Relevant guidance for governments on delivering affordable, reliable and sustainable electricity to power digital technologies includes:

1. **Reliable electricity must first be provided to any educational establishment** before digital technologies are introduced.
2. **Governments must be prepared to help finance electricity provision in isolated and marginalised areas;** this may well require charging urban consumers more for their electricity.
3. **Context appropriate sustainable technologies** (such as micro-hydro or solar) **should be used for off-grid electricity provision for learning in isolated areas.**
4. **Consideration should be given to construction of appropriately secured rooftop photovoltaic cells on school buildings**, and supporting this with the latest battery technologies.
5. **Holistic and integrated approaches must be adopted to provide context specific education, electricity and digital technology** for the most marginalised. This will often imply using old but available technologies in appropriate new ways for learning.
6. **Emphasis should also be placed on delivering appropriate and integrated electricity solutions across all public sector services in remote areas,** thus combining electricity and connectivity supply to co-located schools, health clinics and local government offices.

Examples

Examples of innovative and creative provision of electricity solutions include:

- Solar energy for ICT in Bangladesh (see Uddin et al. 2019 below).
- Micro-hydro and solar power in Kelabit Highlands, Sarawak, Malaysia (see Kuok and Chan, 2012, and Sarawak Energy, 2016, below).
- M-KOPA Solar, http://www.m-kopa.com.
- Mission Innovation — a global coalition of 24 countries with the Europe Commission, http://mission-innovation.net/our-work/innovation-challenges/off-grid-access-to-electricity/.
- Burgess, C., Locke, J. and Stone, L. (2020) *Solar under storm for policymakers: Select best practices for resilient photovoltaic systems for Small Island Developing*

States, Basalt CO: Rocky Mountain Institute, Clinton Foundation and UN-OHRLLS, https://rmi.org/insight/solar-under-storm/.
– Village Infrastructure Angels, http://www.villageinfrastructure.org.

Suggested further reading

– Armey, L.E. and Hosman, L. (2015) The centrality of electricity to ICT use in low-income countries, *Telecommunications Policy*, *40*: 617–627, https://www.sciencedirect.com/science/article/abs/pii/S0308596115001251.
– Bunker, K., Gumbs, D., Locke, J. and Torbert, R. (2020) *Green stimulus in the Caribbean*, Basalt, CO: Rocky Mountain Institute, https://rmi.org/wp-content/uploads/2020/06/Green-Stimulus-in-the-Caribbean-June-2020.pdf.
– Kuok, K.K. and Chan, C.P. (2012) *Micro hydro potential in Sarawak: the case of Bakelalan*, *International Journal on Hydropower and Dams*, *19*(2): 80–84.
– 2019 SDG Tracking Report, https://sustainabledevelopment.un.org/content/documents/2019_Tracking_SDG7_Report.pdf.
– Sarawak Energy (2016) *Electrification of Bario Highlands via solar hybrid power system*, https://www.sarawakenergy.com/media-info/media-releases/2016/electrification-of-bario-highlands-via-solar-hybrid-power-system.
– UN (no date) Caribbean Center for Renewable Energy and Energy Efficiency (CCREEE) and The Partnership for SIDS: https://sustainabledevelopment.un.org/partnership/?p=7504.
– Uddin, N.M. Faisal, H.M. and Zannat, R. (2019) Solar energy for ICT advancement: An empirical study in coastal areas in Bangladesh, *Asiascape: Digital Asia*, 6(1–2): 35–57.
– Unwin, T. (2017) ICTs, sustainability and development: critical elements, in Sharafat, A. and Lehr, W. (Eds.) *ICT-Centric Economic Growth, Innovation and Job Creation*, Geneva: ITU, 37–7.
– Zajicek, C. (2019) *How solar mini-grids can bring cheap, green electricity to rural Africa*, ODI blogs, https://www.odi.org/blogs/10730-how-solar-mini-grids-can-bring-cheap-green-electricity-rural-africa.

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