NET ZERO NEWS

Resource Data Management

ANALYSIS
Reducing Energy Use for Schools & Creating Ideal Learning Environments

SOLUTIONS
Integrating HVAC Equipment into One System

INTERVIEW
Increasing A University's Green Credentials

DECEMBER

FOREWORD

Schools and universities educate the next generation of sustainability advocates, climate change researchers, and bright minds to help us reach net zero with innovative technologies. We need to make sure that school buildings provide adequate comfort and learning conditions in a warming climate to give the next generation the best chances for academic success. University students are providing crucial research in our fight against climate change but many campuses currently contribute to the rising temperatures.

In this edition of Net Zero News, we cover news from around the world including new sustainability courses that incorporate ancient teachings and we present research and initiatives from around the world to increase universities' green credentials and the unexpected benefits this brings. We also interviewed a building controls expert who gave practical, actionable tips for universities looking to reduce their energy use, specifically focusing on linking existing HVAC systems to increase energy efficiency.

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NEWS

CLIMATE CHANGE PROMPTS AC REFIT QUESTIONS IN PORTLAND SCHOOLS

Usually, the Pacific Northwest temperatures during the school year are mild and no cause for concern for teachers and students. In recent years, rising temperatures brought on by climate change have turned decade-old school buildings in this area into ovens, with temperatures reaching beyond 30°C (90°F).

Since cooling has not been a major concern until recent years, only 15 schools in Oregon's largest school district have air conditions, which leaves 66 schools sweltering in the heat. School districts had to let students go home early in those schools to prevent the negative health impacts of heat. Schools are now looking to retrofit air conditioners to ensure that schools can stay open during the expected increasing number of hot days. Funds have been awarded that can be used for retrofitting older schools with ACs, installing energy efficient technology and solar panels, or increasing the tree canopy in school yards.

But the available money won't cover all expected costs and with extreme heat now part of their school year, planning will need to be increased to ensure all schools will eventually incorporate heat reducing measures.

Sources:
https://tinyurl.com/ysy3abad

CALLS FOR COMPASSION TO BE INCORPORATED INTO ESD TEACHINGS AS UNESCO ADVOCATE FOR CURRICULUM CHANGES

23 UNESCO member states from the Asia Pacific region have confirmed the integration of ESD into their educational systems. Sustainability challenges are impacting countries across the region and the effects of climate change are expected to get worse. But a survey from 2021 revealed that 70% of young people in the region were unable to explain the basic principles of climate change and only 23% of teachers felt confident to address the climate change in classrooms.

At a UNESCO summit in Kuala Lumpur in July this year, plans for teacher training were announced to equip teachers with the knowledge and the skills for delivering lessons on climate change and sustainability.

When it comes to teaching students, the contemporary subject of climate change will be aligned with traditional madani principles: sustainability, care and compassion, respect, innovation, prosperity, and trust – as announced by Fadzilah Fadzil, Secretary-General of the Malaysian National Commission of UNESCO.

Academics from the region call for a similar approach. They are asking officials to incorporate 'compassion' formally into university curricula to fully realise the UN's SDGs. Compassion, they state, is essential for understanding others' points of view to help future leaders create a peaceful and just world. Leadership infused with compassion will be essential in an AI, knowledge-driven world to shape the "collective effort towards global cooperation that is crucial for a prosperous, peaceful, and sustainable world" as stated by Tshering Tobgay, prime minister of the Himalayan Kingdom of Bhutan.

Sources:
https://tinyurl.com/73dfzprw
https://tinyurl.com/3xbvscu8

UK UNIVERSITIES FACE LONG-TERM FUNDING CRISIS DESPITE TUITION FEES RISING

The increase in the undergraduate tuition fee cap announced by the UK government was welcomed as positive news by institutions. However, the National Centre for Universities and Business (NCUB) stated that while it is a step in the right direction, funding challenges will still seriously threaten the sustainability and impact of UK universities.

Dr Joe Marshall, Chief Executive of the NCUB has stated that more action is needed to help universities financially who are "the foundation of the UK's research and development system, performing and producing research, creating skills for the future, and facilitating knowledge exchange between academia, industry, and civil society."

An immediate cause of concern for universities are increased employer National Insurance contributions which will raise staffing costs by £372 million per year for the sector.

A fall in student application numbers adds to the concerns. The UK's Universities and Colleges Admissions Service (UCAS) released figures that show that despite a rising population of 18-year-old in the UK, there was a 1.6% decline of domestic applications and a fall of 2% in international applications by the end of June. As international fees are higher than domestic fees, the impact of this 0.4 discrepancy will be felt even worse.

Sources:
https://tinyurl.com/45a52vu6
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REDUCING ENERGY USE FOR SCHOOLS & CREATING IDEAL LEARNING ENVIRONMENTS

While some schools in the UK struggle to keep their classrooms warm during the winter, newly built, energy-efficient schools struggle with heat in the summer. Repairing the building fabric and incorporating HVAC strategies for optimum comfort and air quality are essential for creating ideal learning environments.

Some school buildings in the UK are in dire conditions. Crumbling, freezing, unusable – that's how a recent report by the BBC described the detrimental state of various school buildings across the country.

First and foremost, school buildings need to be fixed so that they are in an adequate state for students to receive their education. Any leaks need to be stopped, crumbling or dangerous building materials replaced with safe options. But while schools are being repaired, the focus also needs to be on indoor air quality and temperatures.

The condition the schools are in directly impacts learning outcomes for students: studies have shown that heat reduces

performance by up to 14%[1]. The negative effects on cognitive abilities if too much CO_2 is present in a room have been known for over 100 years, and have received increased attention since the pandemic[2]. Particulate matter is another area of concerns, especially for primary schools near roads, as high levels can lead to asthma, especially in younger children whose lungs are still developing[3].

New HVAC systems and optimised HVAC controls can deliver optimal comfort conditions in schools and ensure that the air quality is ideal for learning and not damaging to health.

Energy Efficiency Results in Overly Heated Classrooms

It is estimated that UK school buildings contribute 15% to the total energy consumption of public and commercial buildings. Recent guidelines for building new schools have focused on energy efficiency. Given that in those buildings we are educating the future generation that will suffer the worst from climate change, it is crucial that guidelines for lowering emissions are in place.

But unfortunately, those new regulations don't consider indoor air quality and temperatures. New school buildings that have been built according to those new regulations are more energy efficient but are also at risk from overheating in the summer and breeching the threshold of safe CO_2 and $PM_{2.5}$ levels[4].

Researchers have assessed the indoor air quality and overheating levels of classrooms in new low-carbon primary schools during heating and non-heating season[4]. The results show that the classrooms have overheating issues in the summer: for over 40% of school hours most of the classrooms were too hot. In addition, the maximum levels of CO_2 concentrations were surpassed for more than 60% during heating and non-heating season and $PM_{2.5}$ reached levels higher than 20 µg/m³ during the heating season which suggests that individuals were exposed to levels higher than the recommended levels.

While the newer buildings lowered energy use, their airtight construction reduced comfort and air quality. An improvement in ventilation and control of the entire HVAC infrastructure will be needed to improve air quality and prevent overheating during the warmer months while keeping the energy usage low.

Sources:
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THE UNEXPECTED BENEFITS OF REDUCING EMISSIONS FOR UNIVERSITIES

If universities reduce their carbon emissions to lower their contribution to climate change and decrease their operational costs, they will have another advantage: they will become more attractive to prospective students. As 40% of UK universities are expected to run at a deficit this year, having the opportunity to attract new students at the same time as reducing energy spend are excellent news.

Universities throughout the UK are suffering financially. A decrease in international students over the last few years has hit the sector as have rising costs to run buildings amidst increasing energy costs. Institutions throughout the country have had to cut staff. While the recently announced rise in tuition fees for undergraduate courses in England will help, the long-term funding crisis will remain and it is predicted that 40% of universities will run at a deficit this year, according to the National Centre for Universities and Business[1].

Green Credentials Essential to Attract Students

In this challenging environment, it is a crucial moment to attract more students. Those who are starting university have always faced a tough choice of where to go, taking into account multiple factors to ensure that they make the right decision. But in recent years, an additional factor has been added to the mix: 79% of students[2] have reported considering a university's green credentials when making their decision on where to study.

In this context, being able to report a reduction in carbon footprint will be beneficial for recruitment efforts. Heating and cooling buildings, including those that are centuries old, is responsible for a large part of the campus's emissions.

Renewable Energy Projects to Meet Net Zero Goals

Many universities have already started to make sustainable changes such as introducing solar panels or using heat pump technology[3,4]. But those upgrades can cost millions of pounds and most universities rely on government grants to carry out the project. The investment is necessary to help the institutions reach their net zero targets.

Reducing Energy Use & Improving Sustainability Practices

Millions of pounds are needed to install clean energy technology. While this will be the ultimate goal for all institutions, what happens until these can be installed? Are there other ways to lower the carbon footprint to reduce the impact on the environment, decrease operational costs, and attract more students? And what about other sources of carbon emissions and unsustainable practices?

If universities don't have funding approved yet, there are options to increase the energy efficiency of the existing buildings with a quick return on investment. Upgrading HVAC controls and implementing new strategies can reduce energy use in a variety of building types. Refined strategies paired with a centralised control and monitoring system can ensure that a building's HVAC infrastructure runs as efficiently as possible. This cost-effective solution provides a good option for universities to reduce their energy and carbon footprint, increase their green credentials, while reducing operational costs.

It is also important to not just consider the buildings on campus when looking to reduce emissions, but how staff and students operate within them. In dining halls, the University of Cambridge tackled its carbon emissions and raised its sustainability credentials by replacing ruminant meat options on its menus with plant-based food[5].

Using a community-led approach, involving the chefs in the creation of new food, and combined with a clever approach in presenting the new food options on the menu, the changes were well received. These changes, together with offering biodegradable containers, eliminating single-use plastic bottles, and a new system for demand forecasting to reduce food waste, led to an estimated reduction of 500 tonnes of CO_2.

Overall, it's important to take a holistic approach when tackling this challenge and while big projects such as installing renewable energy sources will deliver a big impact, it is still necessary to look at the smaller details, and the processes of the building occupants.

Sources:
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https://tinyurl.com/yc2zpzra

Peter Ingram - Head of Sales BEMS UK
Peter Ingram has 20 years of experience reducing energy use for all types of buildings. His team was recently involved in creating new HVAC strategies that successfully reduced the energy use of student accommodations.

INCREASING A UNIVERSITY'S GREEN CREDENTIALS

Replacing traditional energy sources on campuses entirely with renewable options is the ultimate goal to ensure university buildings achieve net zero. But this relies on funding and is a long-term project. What can be done in the meantime to reduce a university's carbon footprint, decrease running costs, and improve the green credentials for prospective students?

In this interview, we spoke to Peter Ingram, Head of Sales BEMS UK, at Resource Data Management (RDM) who has over 20 years of experience in devising strategies to reduce a building's energy use. He gave us insights into the practicalities of reducing the energy use of university buildings and actionable tips that institutions can use to reduce their carbon footprint.

What are some of the challenges universities face when looking to save energy?
University campuses are very complex. They include many different types of buildings such as lecture halls, gyms, labs, student housing, and dining halls. Those buildings were often built at different times using different materials, they serve different functions and need to cater to different occupancies.

When it comes to the building

management systems (BMS) that controls and monitors the HVAC infrastructure, there are often different BMS in each building that work with different strategies. Each building usually has a different rate of success in terms of energy efficiency and providing optimal comfort conditions to occupants.

Another challenge is the perceived cost of increasing a building's energy efficiency. When looking at updating the HVAC system or BMS, costs may seem larger than they actually are. Upgrading the HVAC system can be seen as a large investment which is why it's often not considered as an option. But costs can be much lower than anticipated and often be recuperated by a quick return on investment.

Let's take a look at the challenge of having many different buildings on campus that were built at different times. How can universities incorporate them all into one energy saving strategy?

First, it's important to review the existing HVAC controls building by building to assess the costs and benefits of upgrading versus replacing devices. Older HVAC systems are often inefficient compared to newer ones, so it is important to assess if it will be cost-effective to replace them.

It's then essential to look at the strategy in place for controlling the HVAC system and review if it is effective so that changes can be made if needed. Things to consider here are if any systems, such as heating and cooling, are competing with each other, if setpoints are set correctly, or if any sensors can be added to the system to supply additional data.

If universities are looking to create one overarching energy saving strategy, it is important to choose one central front-end device or graphical user interface (GUI). If one central front-end is in place, all the different HVAC systems in each building can be controlled and managed from one login. This helps ensure that the different systems are working with rather than against each other and it provides energy data for the entire system in one central location. It's also very easy for facility managers to review settings, and monitor the systems for faults to ensure they are fixed before they cause issues.

Different buildings might include HVAC systems from different manufacturers. How can they be integrated into one central front-end system?
If the central front-end system communicates via open protocols, existing HVAC devices can be linked to this central front-end even if they are from different manufacturers. This can offer huge cost-savings during the install and as a result a quick return on investment. When organisations look into using open protocol front-end devices, this is where they realise that project costs are smaller than first anticipated.

INTERVIEW

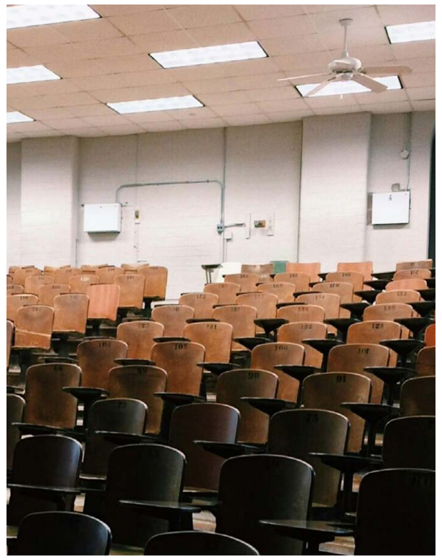
Why do organisations find that costs are smaller than they initially thought when they're using open protocols?
Because it's not necessary to replace the whole HVAC infrastructure. It's possible to only replace the equipment that is underperforming or has failed and leave the well-functioning equipment in place. That way, universities can reduce the capital outlay but improve their efficiency and indoor comfort conditions. The equipment that is kept in place only needs to be replaced if and when it fails.

Costs can also be kept low because sometimes all that's needed to increase a building's efficiency is linking two perfectly functioning systems. If a lighting system in a meeting room has a presence detector (PIR), this can be linked to the room's AC to ensure it's not running when the room is unoccupied. Lighting PIRs can also be linked to cleaning schedules to ensure that rooms are only cleaned if they were in use instead of basing cleaning rotas on a time schedule. Linking different systems together is again enabled by a front-end device based on open protocols.

Are there any other energy-saving measures that can be taken without a big investment?
When upgrading the HVAC control strategy, very simple changes can make a huge difference in cost savings. Installing additional sensors and then incorporating them into the BMS strategy can be a cost-effective way to reduce energy use and increase comfort levels.

For example, adding door and window sensors can signal the HVAC system to stop running if either are opened. Occupancy sensors can ensure that lights are turned off if rooms are unoccupied.

It's also possible to create a 'last person out' strategy which can have huge energy saving effects. The idea behind this strategy is that once the last person leaves a building, all non-essential equipment can be switched off. Using a BMS automation software, this process can be automated.



This type of strategy can be very useful for staff-occupied areas such as kitchens in the dining halls, labs, or gyms, where specific instructions can be given to employees as part of their end-of-day procedure.

For example, when the last employee leaves the building and switches on the intruder alarm, this will signal the BMS to turn off all non-essential equipment. Anything that is deemed non-essential can be switched off once the building, or a specific area in the building, is unoccupied including all lights apart from emergency lighting, gym equipment, and ovens.

The heating can also be tied into the 'last person out' strategy. When this strategy is triggered, it can lower the heating setpoints to ensure the heating is not running at full power while no one is in the building.

Updating the heating and cooling strategy to be demand-led, instead of set to 'always on' will lead to energy savings and the comfort levels will increase.

Can universities make use of district heating on their campuses to lower energy costs?
Yes, they in fact have multiple options to do so. They can either tap into one huge energy source from their local community or create building-by-building district heating systems. Either way, effective control is key to ensure it works as efficiently as possible. This means adding demand-led control strategies and sensible set points, as well as measures to eliminate energy waste. One example of preventing energy waste would be adding sensors and strategies to ensure the heating is turned off when windows are opened.

What are some of the first steps universities can take to implement a new, energy-saving BMS?
First, it's essential to review the current HVAC control system and infrastructure to determine where the problems lie. Then, it's important to install a single front-end device to oversee all HVAC systems.

It is then important to review which controllers are inefficient or broken, and only replacing those, not the entire systems. If the front-end device is based on open protocols, it will allow universities to replace only the controllers that need to be replaced and leave well-functioning equipment in place.

If any building only has a basic energy saving strategy in place or none it all, it's important to create one as soon as possible and sticking to it, knowing that the savings garnered will pay dividends and increase comfort levels.

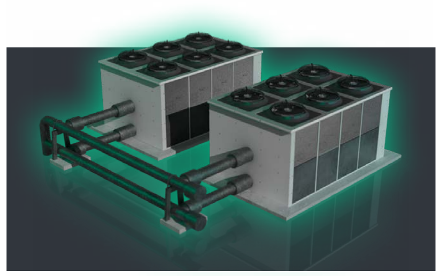
INTEGRATING HVAC EQUIPMENT INTO ONE SYSTEM

SAVE RESOURCES, REDUCE INSTALLATION COSTS & CREATE OPTIMAL COMFORT LEVELS

If all HVAC equipment in one building is integrated into one control and monitoring strategy, the resulting streamlined HVAC infrastructure helps save energy, reduce operating costs, and create optimal comfort levels.

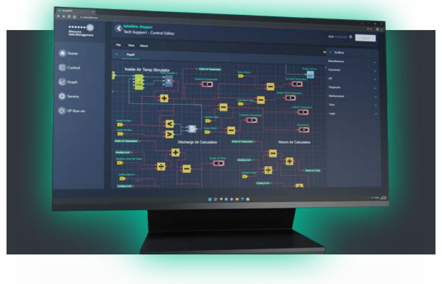
Retrofitting a building's HVAC control and monitoring system and implementing a new control strategy helps ensure that the building's energy use is kept to a minimum. However, if HVAC control and monitoring devices are already in place, it can seem wasteful to discard functioning equipment.

Systems that are based on open protocol communication options offer a solution. These open protocol systems can communicate with third-party equipment, allowing existing, well-functioning equipment to be integrated into the new system.



Creating one streamlined, efficient system

In an integrated system, HVAC equipment, including that from different suppliers, works with rather than against each other to create an efficient facility. If systems such as heating and cooling are competing instead of cooperating, energy use can spiral out of control. In an integrated system, the HVAC devices, such as the heating, cooling, and lighting will work seamlessly together, creating an energy-efficient facility with optimal comfort levels for staff and students.



Centralised Control

The most efficient building infrastructure relies on centralised control. If the entire HVAC infrastructure is controlled by one central front-end device, it's possible to ensure that systems are cooperating with each other for optimum conditions and energy use. If equipment has been fitted at different intervals and is now controlled separately, linking these together can provide crucial energy savings.

Third-Party Integration

If different parts of the system were installed over time, there might be equipment from different manufacturers onsite. It's possible to create an integrated system featuring equipment from different manufacturers when using a control system based on open communication protocols. This allows creating an overarching control and monitoring strategy to ensure that the system works as efficiently as possible.

Identifying Saving Opportunities

If the entire HVAC system is fully integrated and monitored by one central platform, businesses can access quality data. Once businesses have full visibility of all connected devices, they can detect equipment issues, poor running conditions, and even incorrect system designs. With this data insight at their disposal, businesses can identify energy-saving opportunities, optimise their systems, and monitor and record the future performance of all assets.

DMTouch – Control & Monitoring System Facilitating Integration

RDM's control and monitoring system front-end DMTouch allows businesses to integrate their HVAC equipment into a centrally controlled infrastructure. This includes third-party equipment as DMTouch communicates via open protocols and can manage existing third-party devices to create a streamlined building where assets cooperate. RDM's PLC software TDB can be enabled on DMTouch devices, allowing businesses and organisations to create a customised control and monitoring strategy for their buildings.

More Information

More information about third-party integration and DMTouch is available at **www.resourcedm.com**

2024 SUSTAINABILITY HIGHLIGHTS

At RDM, we don't just help our clients achieve net zero, we are also committed to lowering our own carbon footprint. As always, this section provides updates about our own net zero journey and this time we look back over 2024 and the most important steps we've taken that bring us closer towards carbon neutrality.

In February, RDM joined the **Step Up to Net Zero (SUTNZ) programme**, marking a new chapter in our commitment to environmental responsibility and sustainable practices. As part of this programme, we hired a Sustainability Coordinator who has been instrumental to implementing sustainable practices across the business.

As part of the SUTNZ program, we received a roadmap of key tasks to help us move towards net zero. One important task involved collaborating with Circular Glasgow and other SUTNZ participants to find creative ways to upcycle our surplus assets. Through this, we've managed to share items like Viking files, pallets, monitors, bulletin boards, and other office supplies with other businesses for reuse or recycling, items that previously would have been disposed of as waste.

After conducting a **waste management audit**, we made strategic changes to our waste processing, now separating waste into general, recyclable, and food categories. These changes were backed by 100% of our employees and have reduced our landfill contributions which lowers our carbon footprint.

This year, we put strategies into place to start our shift towards a **paperless office**. So far, thanks to new digitalisation processes we implemented in different departments we reduced paper use by 30%, with a target of 60% reduction by the end of 2025. A new HR portal will soon help us cut paper use by another 10%.

In October, we hosted our first **"Green Day"**, blending team engagement with learning sessions about circular economy principles, a fantastic day that brought us closer together with a shared purpose.

We also submitted a **sustainability assessment to EcoVadis** and we proudly achieved the bronze recognition. To achieve this rating, we completed a comprehensive evaluation of our sustainability practices. EcoVadis represents an impartial global standard for corporate sustainability ratings. Their evaluation considers 21 sustainability criteria grouped into four main themes: sustainable procurement, labour & human rights, ethics, and environment.

TRADITIONAL TECHNIQUES PROVIDE TEMPERATURE REGULATION FOR SCHOOL BUILDINGS

Even though temperatures during the hottest season in Burkina Faso stay around 40°C, school buildings in the country that were designed to incorporate traditional building methods stay cool throughout that time. Local architect Diébédo Francis Kéré took advantage of ancient knowledge to build education facilities suitable for a warming climate.

The high temperatures weren't the only challenge that made him consider traditional building methods, limited funds, materials, and electricity also fed into the decision.

Since concrete needs to be transported to a building site, is an expensive material to add to the budget, and generates waste, it was deemed unsuitable to rely on for these projects and is only used in very little quantities. Instead, the buildings are constructed using local materials such as laterite stone.

The buildings are permeable which allows the air to circulate. They are built with strong walls and the roofs are light, raised above the walls, and extended out over the walls. The raised extended roofs are an ancient design that is in use in the traditional architecture in the Persian Gulf. They provide protection from the sun and rain, but the gaps at the top allow the cold air from below push out the hot air at the top.

In addition to the ancient techniques, some schools are also equipped with solar panels. In a country where only 23% of the population have access to electricity, the school buildings help students beyond their education. They can visit them in the evenings to charge phones and study thanks to the lights that are powered by the solar panels. And of course, the buildings provide a comfortable place of refuge during hot days.

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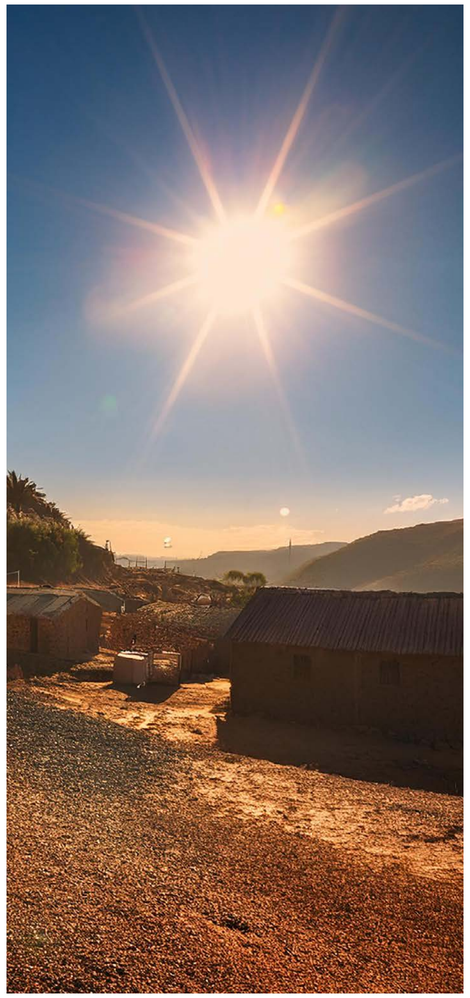

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