

A satellite night view of the African continent, showing city lights and coastlines against a dark blue background. A large yellow circle is centered over the continent, containing the text "MORE LIGHT!" in bold, black, uppercase letters.

**MORE  
LIGHT!**

*Upgrading lighting systems with LED  
in developing countries*



**Nordic Folkecenter**  
for Renewable Energy

## Little Help, BIG IMPACT

Electricity is, sadly, still a luxury in many countries around the world. Thinking of electricity, computers, TV screens, washing machines and many other useful but not necessary appliances come to mind.

Many forget about the most basic use of energy: lighting. Most of Africa and other developing countries still do not have proper access to lighting, as it can be seen from night satellite images. Days are long, but life should continue also after sunset. Often, the only possibility for people to get an education is in the evening, after work. For this reason, Folkecenter launched the project "Light over Africa", with the aim to bring renewable energy-powered lighting in 10 000 villages in Mali, Uganda and Burkina Faso.

Now we bring the project on an entirely new level: by conducting studies on LED technology, we aim to achieve the same illumination levels with a lower electricity consumption, based on the principle that more efficient equipment requires fewer batteries; therefore the installations can be cheaper.

The potential of this research is enormous: suddenly, installations become much more affordable, making it possible to obtain light also for the poorest realities.



### DID YOU KNOW?

Currently kerosene lamps are used for lighting purposes. Their light is weak (13-17 lux at 0.3 m of distance), meaning that children need to get closer to it and risk to get burned.

### How to Build a LED Light?



Step 1: Take 3 diodes, cable, resistors and battery



Step 2: Put them together

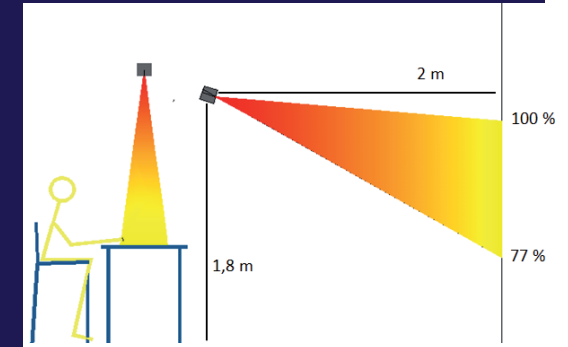
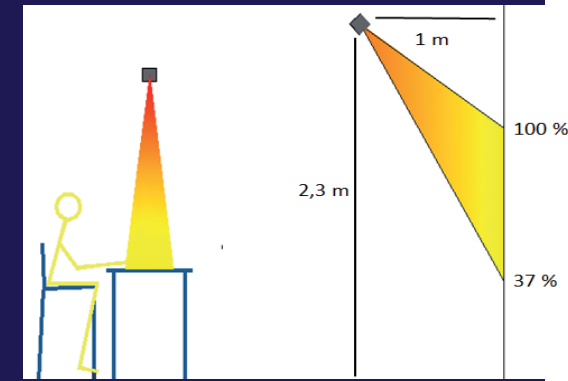


Step 3: Now you can read!

To better understand the challenges, we built a prototype of a classroom, where all the light experiments could be conducted. The space is  $\frac{1}{4}$  of a standard classroom in Africa.

The light illuminating the blackboard is provided by diode units combined together. Distance and height are crucial, as it can be seen in the figures. The original design placed the diodes at a distance of 1 m from the blackboard and at a height of 2,3 m.

The results showed a massive decrease in light intensity – from 100% in the top to 37% in the bottom, making reading difficult. By putting the diodes at a distance of 2 m and a height of 1,8 m, the light becomes weaker, but more diffused across the blackboard - 100% to 77% of intensity... MUCH BETTER!



0,36 W  
1,34 € +  
battery

Result: Little cost, little consumption, high value!



The light emitted by the 3 diodes is enough to provide light with intensity of 228 lux at 70 cm of distance (As reference, 200 lux is a requirement for a Danish workshop). However, it is already possible to read with 20 lux, as it can be seen from the blackboard.



Our studies show that just by playing with distance and angles of light it is possible to achieve sufficient illumination to read comfortably. When placed in the proper position, one diode can provide enough light for a student already at 90 cm of distance. According to our calculations, a whole class with 72 LED lights would consume only 9 W (40 W needed in the Light over Africa project), which means that a small portable battery (12 V, 2 Ah) could provide light for up to 4 hours without significant loss in quality! So far we focused only on schools, but imagine what could the impact of this solution be if applied to individual homes...

Community power plants could also be built, powering a whole village with just a car battery... a small step for research, a giant leap for developing countries!



**DID YOU KNOW?**  
Small portable batteries are affordable (30-50 € in Denmark) and can be used for a variety of tools (drilling machines, saws, etc.), making the investment and payback more affordable.



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Scan the QR code for more information on the study.

