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# From Vision to Impact

## Empowering Smart Education: Cloud-Edge-IoT solutions for Sustainable Energy Management.

### Background

The energy sector is currently undergoing a significant transformation driven by the urgent need for sustainable and efficient energy management. This transition is increasingly dependent on innovative solutions that integrate IoT, cloud, and edge computing to optimise energy consumption and enhance operational efficiency. In educational environments, where energy use is both intensive and essential for maintaining conducive learning conditions, the adoption of cloud-edge-IoT solutions becomes crucial. These technologies enable real-time monitoring and management of energy resources, ensuring optimal environmental conditions while fostering sustainability and cost-effectiveness. Such initiatives seek to revolutionise how educational institutions understand and control their energy usage, leading to improved well-being and a reduced carbon footprint.

### The Needs

Educational institutions are confronted with the dual challenge of providing environments conducive to learning while managing resources efficiently and adapting to climate change impacts. There is an urgent need for solutions that can dynamically evaluate and optimise indoor conditions to support educational outcomes. The COVID-19 pandemic has further highlighted the necessity of maintaining indoor air quality to reduce the risk of infectious disease transmission. Smarter School's services aim to address these needs by offering a comprehensive, IoT-enabled solution that enhances well-being and educational performance.

### The solution

The centrepiece of this solution is the Optimal Learning Environment Index™, a dynamic, real-time tool powered by proprietary algorithms and supported by IoT, cloud, and edge computing. This index demystifies data and analytics, combining and weighing various Indoor Environmental Quality parameters tailored to the unique characteristics of each learning space. It offers actionable insights, scalable across different time frames and spaces, enabling a range of users, from students to building managers, to make informed decisions regarding their environment. By customising the index for different user demographics, the solution ensures that all participants in the educational process can contribute to and benefit from an optimised learning environment.

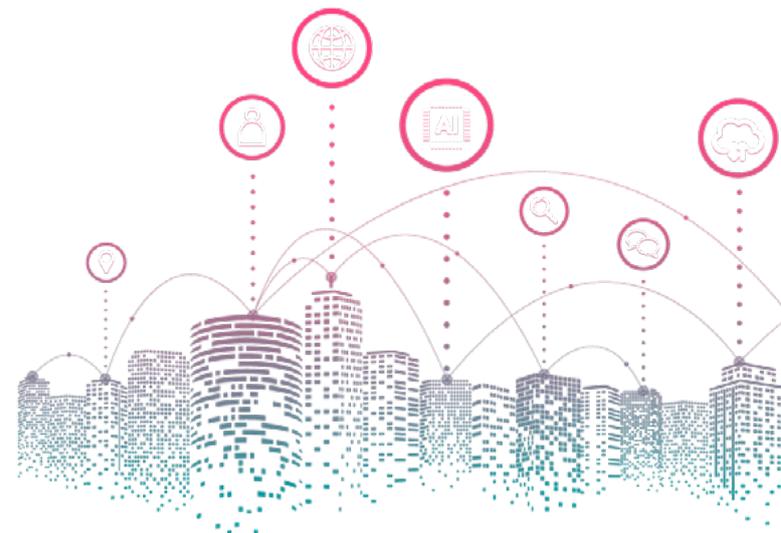
### The Challenge

The implementation of this solution faces several challenges, including the integration of IoT technologies with existing educational infrastructures, ensuring user-friendly interfaces for various user groups, and maintaining data privacy and security. Additionally, the solution must be scalable and adaptable to different educational settings and their respective needs. By tackling these challenges, Smarter School aims to provide a comprehensive system that not only improves indoor environmental quality but also supports the broader objectives of enhancing learning outcomes and well-being in educational facilities.

### The service provider



[Enercoutim](#) has established and manages the Solar Demonstration Platform in the Municipality of Alcoutim, Algarve, Portugal. The platform, with a production capacity of 4 MW from three CPV technologies, is undergoing an expansion. It covers 100 hectares and integrates renewable energy generation with new energy models and agriculture. Enercoutim also leads microgrid pilot projects in the Algarve and supports R&D activities at the NZEB SOLAR LAB and other research facilities. The organisation uses a plug-and-produce approach and is integrating an energy storage system.





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## The Project involved



The Smarter School solution emerged from a four-year scientific research program and is a spinoff of an EU Horizon 2020 project. It was tested in municipal buildings, developed with stakeholder input, and demonstrated in actual settings. The solution was then refined with added functionalities and a platform customised for educational environments.

## Impact

Aside from having several benefits for service providers, far-reaching environmental and societal benefits are brought by Smarter School's advanced IoT-enabled technologies in the energy sector. First, such implementations encourage energy-efficient practices in educational settings, aiding in resource conservation and reducing greenhouse gas emissions, which aligns with broader environmental goals. On a societal level, it helps to create healthier and more equitable learning environments, potentially improving student well-being and academic outcomes. Moreover, the solution's collaborative approach fosters community engagement and heightens awareness regarding sustainable living, promoting a collective responsibility towards a sustainable future

## Recommendations for policymaking

Based on the learnings of this case, the following recommendations are offered for policymaking:

- ▶ **Provide incentives to smart technology adoption:** Provide financial incentives for educational institutions to adopt cloud, edge computing, and IoT solutions for energy management and indoor quality improvement.
- ▶ **Develop IoT education standards:** Establish standards for IoT integration in schools, focusing on energy efficiency, data privacy, and system interoperability.
- ▶ **Support IoT infrastructure upgrades:** Offer technical assistance for upgrading IoT infrastructure in educational settings, facilitating real-time energy use monitoring and management.
- ▶ **Launch Pilot Projects:** Initiate pilot projects to showcase the benefits of integrating cloud, edge, and IoT technologies in educational environments, using the results to guide wider adoption.

## Useful material related to this story

### Smarter School Official website

 [www.smarterschool.eu](http://www.smarterschool.eu)

### ENERCOUTIM Official website

 [www.enercoutim.eu](http://www.enercoutim.eu)

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