Web Application on Monitoring the Potential of Sustainable Base Station Locations for Mobile Networks

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1 PROBLEM

The mobile sector faces **low revenue** growth, high **OPEX**, rising **energy** costs, and pressure to meet **ESG** and **Net Zero** targets.

MOTIVATION

To develop more **cost-effective** and **sustainable solutions** for the **mobile communications sector.**

2 BENEFICIARIES

One solution, many gains: **economic**, **environmental**, **social**.

Mobile Network Operators

Network Users

Society

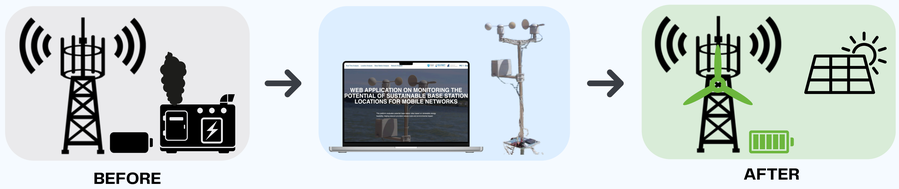
3 CONCEPT

Purpose: Evaluate the **potential of integrating solar and wind energy** in base stations power supply.

How it works: Development of an integrated **hardware/software solution** to measure **solar** and **wind** power and **estimate** the **energy performance** of a hybrid-powered base station (solar, wind and wireline).

FINAL GOALS:

1. **Identify** top solar/wind **locations** for future base stations.
2. **Quantify** hybrid power **gains** (new/existing base stations).
3. **Estimate** financial **savings** from hybrid adoption.
4. **Assess** feasibility of **integrating** solar/wind in operator networks.



BEFORE AFTER

4 SOLUTION: KEY FEATURES

REAL-TIME ANALYSIS

Visualize real-time data from solar and wind measurements.

LOCATION ANALYSIS

Evaluate locations for future base station deployment based on local renewable potential.

BASE STATION ANALYSIS

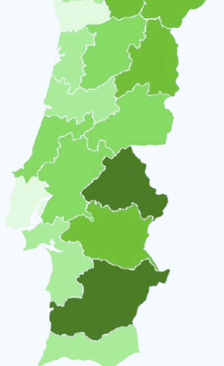
Estimate energy and sustainability potencial of hybrid-powered base stations.

NETWORK ANALYSIS

Extrapolate results (district or national level) to support radio network planning.

5 RESULTS

Total renewable potential per district

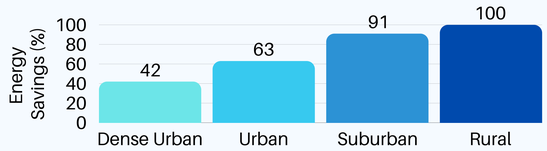


IMPROVED ENERGY STABILITY

Solar and wind complement each other to ensure **continuous power.**

OPTIMIZED BS LOCATION SELECTION

Energy savings reach **100%** in rural areas and **91%** in suburban zones,as shown in the graph below.



SUSTAINABLE INFRASTRUCTURE

Implementing this solution **cuts** base station **energy costs** by up to **1 950 €/year.**

PORTUGAL: DISTRICT ENERGY INSIGHTS

Our analysis reveals **district-level renewable potential** from solar and wind data.

6 CONCLUSIONS

Base stations **stay operational during blackouts**, ensuring service continuity.

Our solution **reduces operational costs** by **24%** and **increases** annual **profit** by **3%** across **4 000** base stations.

CO_2 emissions avoided are **3.2 tons/base station/year** and **12 880 tons tons/year** nationwide (based on 0.23 kg CO_2/kWh).

Aligned with **ESG** and **net zero** targets via **CO_2 reduction** and renewables.

Video Website WebApp

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