Preflet

Documentation

Know Your Performance

Methodology

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Document Control

Document History

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Document Approvals

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Index

1. Introduction

This document provides an overview of the methodology developed by Preflet for calculating the Know Your Performance (KYP) Score, which measures a building's energy efficiency and sustainability. It offers a comprehensive assessment of a building's current state and potential future performance, utilizing empirical techniques published in peer-reviewed academic literature.

Along with the present KYP score, key performance indicators such as energy usage intensity, carbon emissions intensity, and cost index are also measured. With its data-driven approach, KYP provides not just present and future score, but actionable steps to save energy, reduce emissions, and achieve significant financial returns.

Last, a financial analysis report includes metrics such as costs, calculated benefits, Return on Investment (ROI), Net Present Value (NPV), and payback period. This makes it a valuable tool for anyone looking to enhance the sustainability and efficiency of the buildings.

1.1 Definitions

KYP: Know Your Performance

EUI: Energy Use Intensity, measured in kWh/m2

CEI: Carbon Emissions Intensity, measured in kgCO2e/m2

ECI: Energy Cost Index, measure in Currency (EUR)/m2

AI: Artificial Intelligence

CAPEX: Capital expenditure

OPEX: Operating expenses

KPI: Key Performance Indicators

BACS: Building Automation and Control System

TGM: Technical Building Management

1.2 Benchmarking data

This KYP methodology was developed from anonymous buildings energy consumption data, collected from various sources including the European projects, publicly available indices and pilot building customers, together over 700 buildings so far. The acquired data gone through our quality control process and annually updated (up to date as of July 2024).

The data is categorized by building type, where the building floor area in square meters (m^2) includes only those areas with available utility data. Areas without data coverage, or those measured by exterior meters and/or common space meters, are excluded from the total building floor area.

The Annual Energy Use Intensity (EUI) is calculated by summing the energy usage over a 12-month period at the space level and then dividing by the floor area in square meters (m^2). This provides a measure of energy consumption per unit area, allowing for comparisons across different building types and sizes.

Emissions factors, which are published annually in official EU publications, are used to determine the carbon intensity (CEI) of the energy consumed. These factors are specific to electricity and gas. To calculate the CEI, the energy usage is multiplied by the corresponding emissions factors, resulting in the total carbon emissions associated with the energy consumption.

For calculating the cost index, official EU energy price statistics from Eurostat are utilized. These statistics include for both, electricity prices (households and non-households) and gas prices (households and non-households). By applying these prices to the energy usage data, divided by floor area, we can determine the cost index, which reflects the financial impact of energy consumption for different building types.

This data is grouped into benchmarking cohorts with at least 10 buildings, subject to availability, and then prioritized across different building types and geographic levels (country/region). This hierarchy of benchmarking cohorts ensures that the most relevant data is used first, moving to more general data as needed.

2. KYP Methodology

Enter the URL https://www.preflet.com/kyp/ to access the KYP Assessment that makes it possible to understand the current state of a building's energy efficiency quickly, while also offering insights into how to improve it. With its data-driven approach, KYP provides not just a score, but actionable steps to save energy, reduce emissions, and achieve significant financial returns. This makes it a valuable tool for anyone looking to enhance the sustainability and efficiency of their building.

2.1 KYP Assessment

It gathers information about building information, energy systems and energy consumption. There are 8 questions in total, and 2 of them are conditional.

Building Information:

- **Type:** Commercial, Service, Transportation, Public, Industrial, Residential, or Other.
- **Location:** Search location or enter coordinates.
- **Size:** Square meters or square feet.
- **Construction Year:** Year of construction.

Energy Systems:

- **Clean Energy Systems:** Photovoltaic, EV charging, heat pumps, district heating/cooling, or none.
- **Heating/Cooling Systems:** Natural gas boilers, electric heating, biomass/pellet, air conditioning/chilled water systems, VRF, evaporative cooling, central HVAC systems, RTUs, geothermal systems, or don't know.
- **Degree of Automation:** 4 levels, high efficiency (BACS and TGM), advanced, standard, and inefficient BACS.

Energy Consumption Data:

- **Billing Frequency:** Monthly or annually.
- **Energy Cost:** Total energy cost in euros.
- **Energy Use:** Total energy use in kilowatt-hours.
- **Bill Upload:** Option to upload an energy bill for more accurate analysis.

2.2 KYP Score

The present KYP Score is calculated using the energy consumption and building information provided. First, we determine three key metrics: Energy Usage Intensity (EUI), Carbon Emissions Intensity (CEI), and the Energy Cost Index (ECI), where lower values indicate better performance.

The benchmark data of other buildings is transformed into intensity quartiles or percentiles. The 1st Intensity Quartile (Q1) represents the 25th percentile, the 2nd Intensity Quartile (Q2) is the 50th percentile or median, the 3rd Intensity Quartile (Q3) is the 75th percentile, and the mean intensity is the average value of the intensity distribution (usually for

comparison). We use these percentiles to identify the minimum (Q1) and maximum (Q3) values for each.

Using this range, we calculate standardized indices for each metric: SI_EUI, SI_CEI, and SI_ECI (Actual Intensity- Q1/Q3-Q1). These standardized indices are then averaged, and the average is subtracted from 1 to invert the score.

The final result is multiplied by 100, producing a score between 0 and 100. The formula is: KYP = (1 - (SI_EUI + SI_CEI + SI_ECI) / 3) * 100. A higher score means a more energy-efficient and cost-effective building. The score is grouped into three levels: >90 (excellent), 80-90 (good), 60-80 (moderate), and <60 (poor).

2.3 Higher your performance

Based on the projected KYP Score in 3 years, considering the present state, benchmark data, and the potential of implementing an AI-powered energy management system with recommended efficiency actions, several insights can be drawn. However, the KYP Score has a limitation: to reach true efficiency, the building manager may need to procure clean energy equipment and may require retrofitting. The optimisation algorithm considers expected economic benefits and expenses (CAPEX and OPEX) split monthly over a period of 3 years. It then calculates cash flow and cumulative cash flow. This helps in measuring three main benefits:

- **Reduced Energy Consumption**: Potential reductions in energy use (in kWh/year), with tailored energy-saving measures powered by AI to optimize energy management at the system or area level, adapting to specific climate and occupant.
- **Lower Emissions**: Reduction in CO2 emissions (in kgCO2e/year) by optimizing energy consumption and adopting green initiatives.
- **Financial Savings**: Estimated cost savings (€/year) through demand control, optimized energy use, and peak-hour tariff reductions. These savings are further distributed into energy costs, time saving and avoid emission saving.

2.4 Financial Analysis Report

KYP's analysis goes beyond energy performance to provide a detailed Financial Analysis Report for implementing AI-powered energy management system.

- **Costs**: Includes one-time setup costs (CAPEX), annual software fees (OPEX), and cost of ownership in first year and total in 3 years.
- **Benefits**: Summary of benefits KPIs on energy and emissions reductions, financial savings, and time-saving efforts.
- **Financial metrics:**
    - **SPP:** Time (in years & month) it takes to recover the initial investment
    - **ROI:** Percentage of return on investment relative to the initial cost
    - **NPV:** Positive NPV means profitable while Negative NPV it isn't
    - **IRR:** A higher IRR indicates a more attractive investment (at least >10%)
    - **SIR:** A higher SIR indicates a more favourable investment (at least >1)

3. Appendix

3.1 Building Types

- **Commercial**: Offices, Retail chains, shopping malls, Data centers, Restaurants, Cafes, Mixed-use
- **Service**: Healthcare facilities, Educational, Hospitality, Banks/Insurance, Professional Services
- **Transportation**: Airports, logistics hubs, stations,
- **Public**: Government, post offices, Cultural centres
- **Industrial**: Warehouse, Logistics, Manufacturing
- **More**: Condominiums, Residential

3.2 Heating & Cooling Systems

Heating: Natural Gas Boilers, Electric Heating, Biomass/Pellet
Cooling: Air Conditioning/ Chilled Water Systems/ Variable Refrigerant Flow (VRF)/Evaporative Cooling
Both: Central HVAC Systems/Packaged Rooftop Units (RTUs)/Geothermal Systems

6. Validation and Continuous Improvement
Validation is crucial to ensure that the KYP methodology accurately reflects real-world energy efficiency and sustainability improvements. Given the complexity of measuring building performance, rigorous validation processes are essential to maintain the credibility and effectiveness of the KYP Score.
Peer Review and Academic Collaboration
Preflet welcomes peer review of our methods and actively publishes literature on our methodology. Collaborations with academic institutions and industry experts help validate our approach and ensure it aligns with the latest research in building energy efficiency and sustainability. For example, studies on energy efficiency in buildings highlight the importance of empirical validation and continuous improvement[1][2].
Empirical Validation
Our methodology is grounded in empirical techniques published in peer-reviewed academic literature. We continuously update our models based on new data and insights from the field. This iterative process ensures that our KYP Score remains accurate and relevant. For instance, the use of regression-based modeling and other statistical methods helps refine our predictions and improve the accuracy of our assessments[3].
External Validation and Best Practices
We collaborate with other organizations to validate their emissions datasets and share best practices. By participating in working groups and task forces, such as those focused on validating emissions rates, we aim to advance the techniques for measuring and improving building performance. This collaborative approach helps us stay at the forefront of the field and ensures that our methodology benefits from the latest advancements in energy efficiency research[4].
Continuous Improvement
The KYP methodology is continuously improved based on feedback from users and new research findings. We regularly update our data sources and validation techniques to reflect the latest developments in the field. This commitment to continuous improvement

ensures that the KYP Score remains a valuable tool for enhancing building sustainability and efficiency[5].

Academic References

1. **Building Energy Efficiency and Sustainability**: This chapter discusses the role of architects and engineers in transforming the building sector towards energy efficiency and climate change mitigation[1].
2. **Energy Efficiency and Sustainability**: This reference work entry provides an overview of energy efficiency and sustainability, highlighting the importance of empirical validation and continuous improvement[2].
3. **Factors Influencing Energy-Efficiency Retrofits**: This article synthesizes recent academic publications on factors influencing stakeholder decisions to implement energy-efficiency retrofits[3].
4. **Green Building Practices**: This article reviews emerging practices of integrating renewable energies in the construction sector, emphasizing the importance of empirical validation[4].
5. **Energy-Efficiency Standards and Green Building Certification Systems**: This reference discusses the standards and certification systems used to validate energy efficiency in buildings[5].

By incorporating these elements, the KYP methodology can be validated and continuously improved, ensuring its effectiveness in promoting energy efficiency and sustainability in buildings.

[1]: Building Energy Efficiency and Sustainability [2]: Energy Efficiency and Sustainability [3]: Factors Influencing Energy-Efficiency Retrofits [4]: Green Building Practices [5]: Energy-Efficiency Standards and Green Building Certification Systems

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