ESG KPIs for Monitoring Water Usage

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Introduction

- ESG (Environmental, Social, and Governance) KPIs help companies measure their performance in sustainable and ethical practices.
- This presentation focuses on water usage as a critical environmental KPI.
- We will demonstrate how AI can be utilized to predict water usage and improve sustainability efforts.

Environmental KPIs

- **Water Usage**
  - Measures the total amount of water used by the company.
  - Example: Track water usage in cubic meters annually and implement strategies to reduce consumption.
- **GHG Emissions**
  - Measures the total greenhouse gases emitted by the company.
  - Example: Reduce GHG emissions by 25% by 2025.
- **Energy Consumption**
  - Tracks the total energy used by the company from all sources (electricity, gas, renewable energy, etc.).
  - Example: Report total energy consumption in MWh annually.
- **Waste Generated**
  - Measures the total amount of waste produced.
  - Example: Report total waste generated in metric tons annually.

Predicting Water Usage with AI

- AI can be used to predict water usage, enabling proactive management and resource optimization.
- Key steps in the prediction process:

Step 1: Data Collection

- Collect relevant data for water usage prediction:
  - Historical water usage data.
  - Environmental data (temperature, humidity).
  - Production data (production levels, operational hours).
  - Workforce data (number of employees, shifts).

Step 2: Data Preprocessing

- Clean and preprocess the data:
  - Handle missing values.
  - Encode categorical variables.
  - Scale numerical features.

Step 3: Feature Engineering

- Create new features to improve the model's accuracy:
  - Seasonal components (e.g., monthly averages).
  - Lag features (e.g., water usage from previous weeks).
  - Interaction terms (e.g., interaction between temperature and production level).

Step 4: Model Training

- Train a neural network model to predict water usage:
  - Define the neural network architecture.
  - Compile the model with appropriate loss function and optimizer.
  - Train the model on the training dataset.

Step 5: Model Evaluation

- Evaluate the model using test data:
  - Calculate metrics such as Mean Squared Error (MSE), Mean Absolute Error (MAE), and R-squared.
  - Plot training history to observe performance over epochs.

Step 6: Prediction and Scenario Analysis

- Use the trained model to predict water usage under various scenarios:
  - Predict future water usage based on planned production increases.
  - Assess the impact of environmental changes on water usage.
- Implement these predictions into the company's resource management strategy.

Conclusion

- Monitoring and predicting water usage is crucial for sustainable resource management.
- AI-powered predictions allow for proactive decision-making and improved efficiency.
- Regularly updating and refining the model ensures it remains accurate and valuable.

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