SEAQ® Profile

/seaq.qa

SEAQ® Lectures

Session 2024 - 26

AI FOR GREEN INFRASTRUCTURE AND SUSTAINABLE FACILITY MANAGEMENT

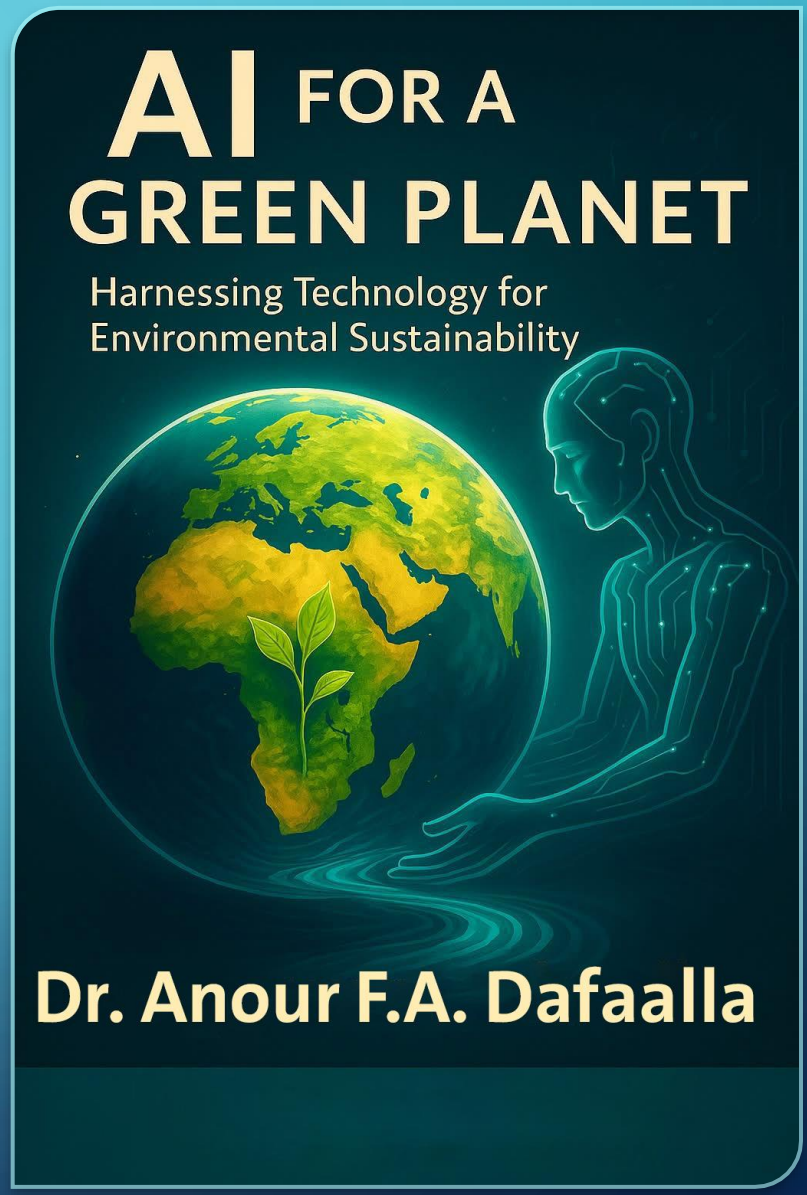
الذكاء الاصطناعي من أجل إدارة مرافق خضراء ومستدامة

ANOUR F. A. DAFAALLA, PHD

DOHA, QATAR | QATAR INTERNATIONAL FACILITY MANAGEMENT CONFERENCE & EXHIBITION (QIFMCE 2025) OCTOBER 2025

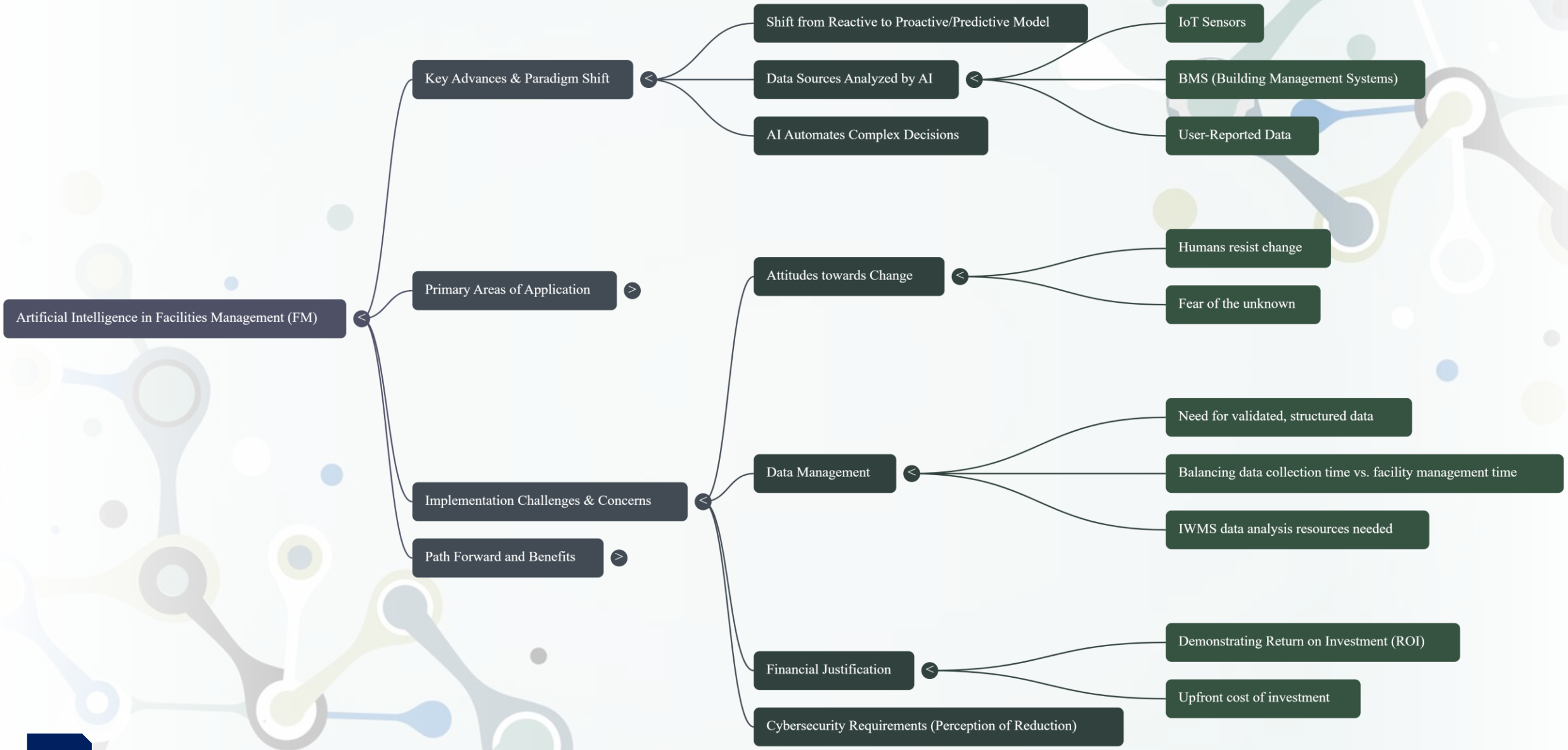
INTRODUCTION

- This session explores how Artificial Intelligence is transforming facility management into a driver of environmental sustainability. Drawing from Dr. Anour Dafaalla's forthcoming book *AI for a Green Planet: Harnessing Technology for Environmental Sustainability*, it highlights real examples such as The Edge Building in Amsterdam and DeepMind's renewable-energy forecasting. Attendees will learn how cognitive buildings, AI-enabled predictive maintenance, and smart-grid integration can reduce energy use by up to 70 %, cut operational costs, and accelerate Qatar's journey toward Net Zero 2050. The talk bridges technology, sustainability, and policy — offering a roadmap for turning facilities into intelligent ecosystems that think, adapt, and sustain.

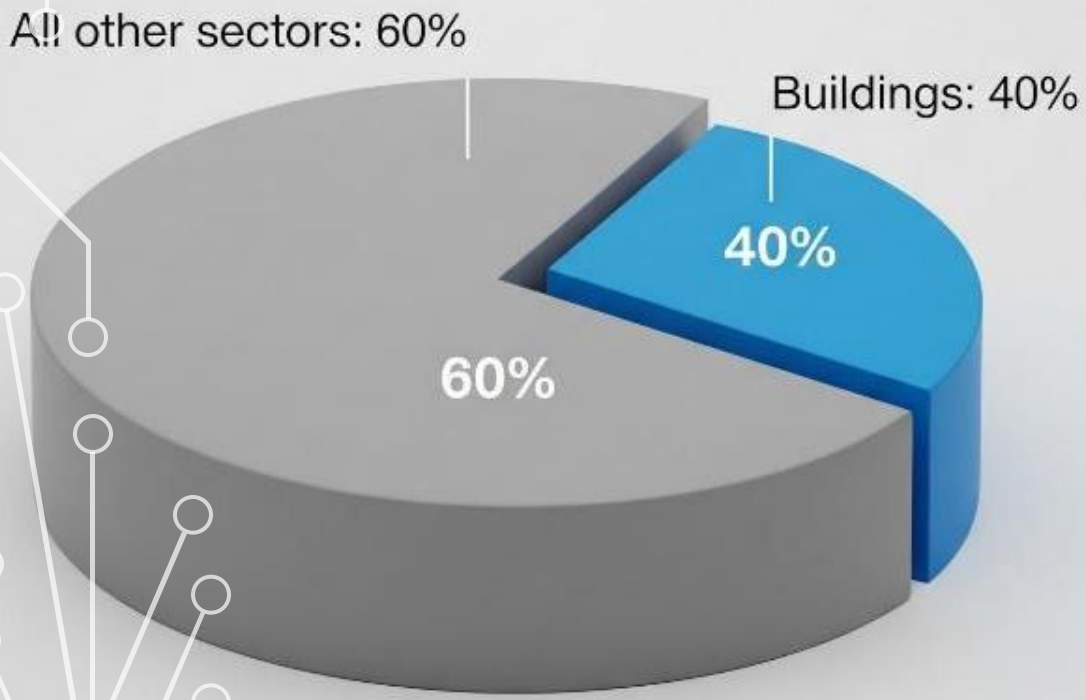


AI FOR SMART AND SUSTAINABLE FACILITIES

- Aligning with *Qatar National Vision 2030 – Environmental Development Pillar*
- Focus: bridging facility management, AI innovation, and sustainability



Buildings' Share of Global Energy Consumption



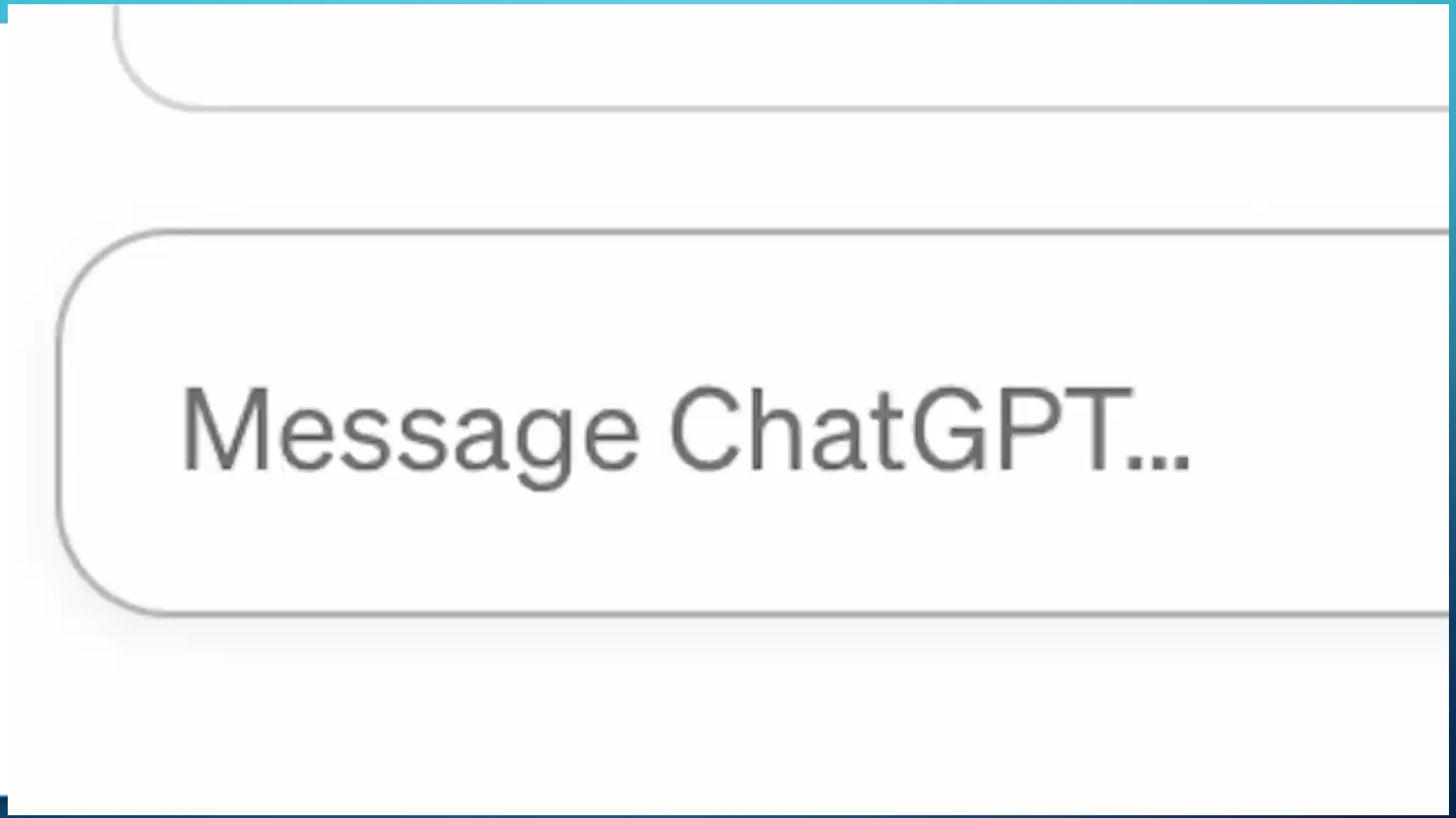
INTRODUCTION: WHY SMART BUILDINGS MATTER?

- *Your phone is smart — why not your building?*
- AI already optimizes our daily lives; it can do the same for buildings.
- Buildings = ~40 % of global energy consumption.
- AI transforms them into *adaptive, efficient, self-learning systems.*

FROM REACTIVE TO PROACTIVE

- Traditional FM = “Fix it when it breaks.”
- Example: the *Ohio State House flood.*
- **AI enables predictive and prescriptive maintenance** → prevents failures.
- Result: reduced downtime (–70 %) & lower maintenance cost (–30 %).

THE USE OF GENERATIVE AI IN FM

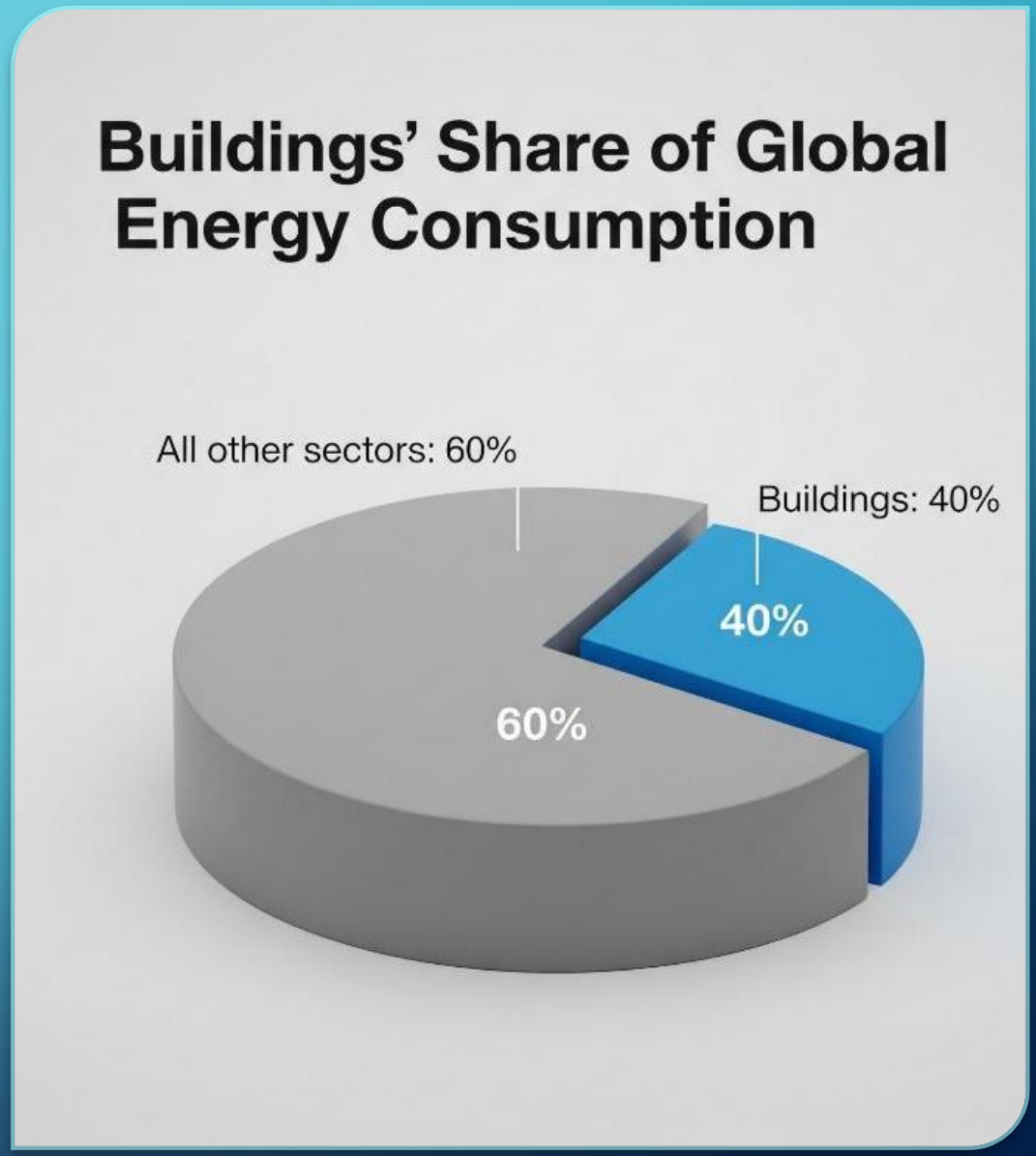


THE BUILDING'S BRAIN

- 🧠 AI + IoT = Cognitive Building
- Sensors act as eyes, ears, and nerves.
- AI analyzes conditions, predicts anomalies, adjusts systems automatically.
- Example: The Edge Building – Amsterdam
  - 28 000 sensors + AI → 70 % energy reduction.
  - A model for future sustainable urban design.

COGNITIVE BUILDINGS: THE NEXT EVOLUTION

- **Cognitive = self-learning & adaptive.**
- Responds to occupancy, weather, and energy prices.
- Enhances comfort + efficiency.



ENERGY & COST OPTIMIZATION IN FM

- AI manages HVAC + lighting dynamically.
- Energy savings up to 20 %.
- Participates in *demand-response* programs → stabilizes grid + lowers cost.
- Supports **Net-Zero 2050** commitments.

RENEWABLE ENERGY MEETS SMART BUILDINGS

🌞 How AI enhances renewable integration:

- Forecasting Solar & Wind Output using deep-learning weather models.
- Smart Grids: balance supply & demand; detect faults; re-route power.
- AI-guided Storage: decide when to store / release energy.
- Case: DeepMind Wind Project
- 36-hour forecasts → +20 % economic value, –50 % prediction errors.

GREEN ENERGY MANAGEMENT PLATFORMS

- **Energi.AI (Norway) – real-time carbon analytics → lower corporate emissions. SenseHawk (Solar Farms) – AI drones detect panel defects → +7 % efficiency. Emerging trend: *P2P Energy Trading* via Blockchain + AI pricing.**

Qatar: opportunities for smart-grid integration in new sustainable districts.

SMARTER & FLEXIBLE SPACES

•Hybrid work → space under-utilization.
•AI occupancy analysis → redesign & reduce cost.

•Example Q&A: “Which floor is most underused on Tuesdays?”

AUTOMATION, SAFETY & HUMAN-CENTERED AI

- **Intelligent cleaning** based on sensor data.
- **AI chatbots** manage service requests.
- **AI video analytics** detect hazards in real time.
- Preserves institutional knowledge when experts retire.

RESPONSIBLE & GREEN AI

- ⚡ Challenge: AI's own carbon footprint.
- Use energy-efficient models (TinyML, Edge AI).
- Power data centers with renewables.
- Adopt Responsible AI Principles: Transparency | Fairness | Accountability.

POLICY & COLLABORATION FRAMEWORK

- Governments + Academia + Industry = AI Sustainability Ecosystem.
- Create *Qatar Facility AI Lab* for research & training.
- Require AI-based **Environmental Impact Assessments (EIA)** in major projects.

THE FUTURE: GREEN AI INFRASTRUCTURE

- AI + renewable energy + cognitive design = **living buildings**.
- Buildings that:
- anticipate maintenance
- optimize resources
- minimize emissions
- enhance occupant well-being

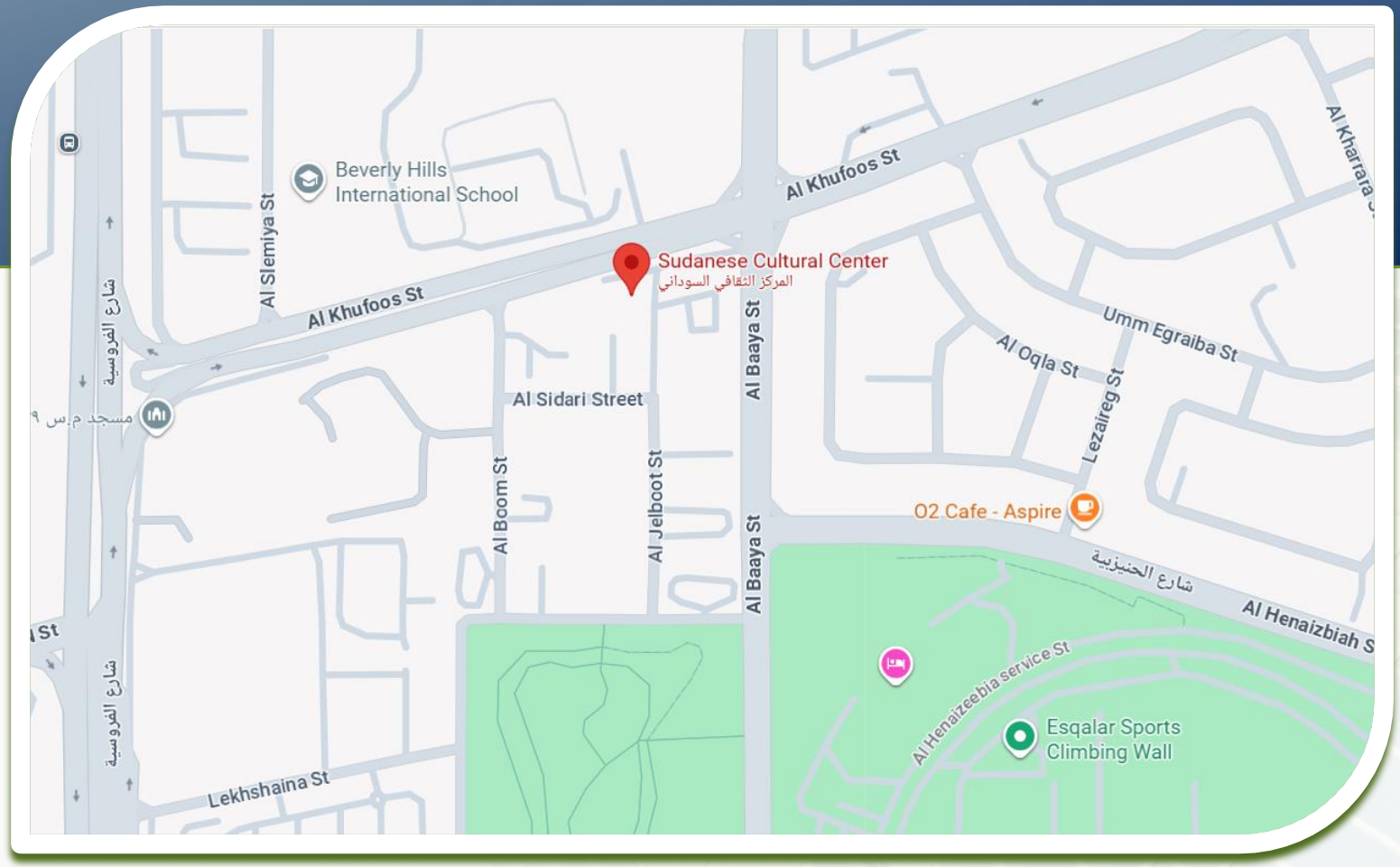
CONCLUSION: "BY GIVING OUR BUILDINGS A BRAIN, WE GIVE OUR PLANET A FUTURE."

- AI empowers facility managers to be *guardians of sustainability*.
- From smart sensors to smart policies… every data point counts.
- Together, we can build a greener, more intelligent Qatar.

THANK YOU

Sudanese Engineers Association رابطـــة المهندسين السودانيين بقطر Qatar

Address:
Sudanese Engineers Association in Qatar
Sudanese Cultural Center in Qatar
Zone:54
Street 715
Building 37
Baaya, Al Rayyan
Doha, Qatar
info@seaq.qa
https://www.facebook.com/seaq.qa/




Sudanese Engineers Association
رابطة المهندسين السودانيين بقطر Qatar
Sudane on
Sudanese Cultural Center in Qatar
Zone 54 – Street 715 – Building 37
Baaya – Al Rayyan – Doha – Qatar
info@seaq.qa – www.facebook.com/seaq.qa/
SEAQ Profile
/seaq.qa