KFUPM Campus Sustainability Report

Campus Development and Transformation 2025–2026

Projects Department

Executive Summary

During 2025–2026, KFUPM advanced a broad programme of campus development, rehabilitation and infrastructure renewal. The programme combines new student housing, renovation of existing residential student housing, faculty-housing rehabilitation, academic and research facilities renovations, digital infrastructure, water-system modernization, service-tunnel rehabilitation and wastewater-network improvement.

Together, these projects demonstrate a practical sustainability model: construct new high-performance facilities where additional capacity is required, while renovating and extending the life of existing assets wherever possible. The result is a safer, more efficient, more resilient and more people-centred campus environment.

The performance figures in this report are indicative engineering-based estimates derived from the replacement of conventional systems with modern efficient systems. They should be verified through post-occupancy monitoring and commissioning records.

The reporting period represents an important stage in KFUPM's physical transformation. The projects described in this report are not isolated interventions; together, they form a coordinated programme of asset renewal, capacity expansion, operational improvement and sustainability integration. They support the University's educational and research mission while improving the experience of students, faculty, researchers, staff and visitors.

1. Sustainability Context and SDG Alignment

This report presents selected campus projects between 2025-2026 and explains their contribution to the United Nations Sustainable Development Goals, Saudi Vision 2030 and the long-term sustainability direction established through the KFUPM Campus Master Plan 2050.

The Master Plan positions KFUPM as a benchmark sustainable campus and a global reference point for sustainable smart campus development. Its direction is based on a resilient, resource-efficient, low-carbon and people-centred campus supported by water stewardship, energy efficiency, smart infrastructure, climate action, biodiversity, research and innovation.

This report therefore interprets sustainability in a broad institutional sense. It includes environmental performance, but also considers health and safety, inclusion, quality education, decent work, research capability, infrastructure resilience, responsible asset management, biodiversity and partnerships. This approach reflects the interconnected nature of the SDGs and the role of a university campus as both a place of learning and a living environment.

SDG	Relevant project contribution
SDG 3	Health, safety, comfort and well-being in residential and service environments
SDG 4	Improved student housing and facilities supporting learning and research
SDG 5	Safe, inclusive and high-quality academic, residential, recreational and support facilities for female students

SDG 6	Efficient fixtures, RO systems and wastewater-network modernization
SDG 7	Efficient HVAC, LED lighting, BMS controls and reduced pumping demand
SDG 8	Decent, transparent, collaborative and productive work environments supporting institutional and economic value
SDG 9	Resilient data infrastructure and modernized campus utilities
SDG 11	Reliable, inclusive and people-centred campus development
SDG 12	Renovation, asset reuse, reduced material replacement and maintenance
SDG 13	Lower energy demand and improved climate-action readiness
SDG 15	Biodiversity conservation, natural-habitat protection and resource-efficient campus landscapes

2. Campus Transformation at a Glance

Project area	2026 achievement	Indicative benefit
Female housing	12 buildings completed; approximately 2,040 student places	25–35% improved energy performance and inclusive campus access
Male housing	9 buildings completed and 9 under renovation	20–30% potential energy reduction
Faculty housing	50 of 131 villas renovated	20–30% potential energy and water improvement
Business School	Academic facility included in campus transformation portfolio	Supports inclusive, collaborative and productive education environments
Research Institute	Major renovation with estimated 21.6 million kWh/year energy saving	Estimated 11,383 tCO_2/year avoided and improved research workplace
Data centre	New 5,000 m^2 modular facility under construction	Improved resilience and scalability
Water infrastructure	RO and pumping system modernized	Improved control, pressure and leakage management
Service infrastructure	Service tunnel rehabilitated	Improved safety and reliability
Wastewater infrastructure	Sewer rerouted to NWC; lift station cancelled	Reduced pumping and maintenance requirements

3. Female Student Housing Development

Phase 1 was fully completed in 2026, with seven buildings occupied. Five buildings from the ten-building Phase 2 programme were also completed in 2026. Each building provides approximately 3,300 m^2 of gross

floor area, about 85 rooms and accommodation for approximately 170 students. The 12 completed buildings therefore represent approximately 39,600 m^2 of gross floor area and approximately 2,040 student places.

The development includes new HVAC systems with advanced controls and centralized building management, LED lighting, sensor-operated water fixtures, roof and wall insulation, low-E glazing and tinted windows. These measures improve thermal comfort, reduce solar heat gain, support operational monitoring and reduce energy and water demand.

Indicative estimate: approximately 25–35% improved energy performance and 20–30% lower water consumption compared with conventional student housing of similar use. These figures are preliminary estimates pending measured operational data.

Beyond its environmental performance, the project has important social and institutional significance. It supports KFUPM's continued development as an inclusive campus by providing female students with safe, high-quality academic, residential, recreational and support environments. The project consequently contributes not only to SDGs 3, 4, 5, 7 and 11, but also to the University's wider aspiration to create an integrated campus community with equitable access to opportunity and high standards of student well-being.

4. Male Student Housing Renovation

The male student-housing renovation programme upgrades the existing residential portfolio through phased rehabilitation. Six of the 46 buildings were completed in 2026 and six additional buildings were under renovation. The remaining buildings will be renewed in subsequent batches.

Architectural and electro-mechanical systems are being replaced, including piping, while suitable existing wiring is retained. Works include replacement of fan-coil units and accessories, LED lighting, sensor-operated water fixtures, roof insulation and waterproofing, and low-E tinted windows. Chilled-water pipes are retained as part of the renovation strategy.

The programme extends the useful life of existing assets while improving comfort, water efficiency, energy performance and maintainability. Indicative estimate: approximately 20–30% potential reduction in building energy use after completion of the upgrades.

The phased implementation model allows the University to renew the housing portfolio progressively while maintaining continuity of residential services. This approach reduces the need for wholesale replacement, preserves the value of existing structures and enables lessons learned from completed buildings to inform subsequent renovation batches.

5. Faculty Housing Rehabilitation at Al-Farouq Courts

The Faculty Housing rehabilitation programme covers 131 villas in Al-Farouq Courts. Fifty villas were renovated in 2026, including single-, double- and triple-bedroom units. Architectural, electrical, mechanical and plumbing systems were renewed, together with DX package air-conditioning units, piping, ducting and accessories.

LED lighting, sensor-operated water fixtures, roof insulation, roof waterproofing and low-E tinted windows improve the efficiency, comfort and long-term maintainability of the homes. The project demonstrates the sustainability value of retaining and rehabilitating existing residential assets.

Indicative estimate: approximately 20–30% potential energy improvement and 20–30% potential water reduction, subject to final equipment specifications and operating patterns.

The project also improves the quality and dignity of the residential environment for faculty and their families. By combining internal refurbishment with site-development improvements, the programme strengthens community livability and demonstrates how existing residential neighbourhoods can be renewed through targeted, resource-conscious investment.

6. Prefabricated Data Center

The new prefabricated data center is being developed at KFUPM East Park to migrate critical IT infrastructure from Building 14, address existing space, power and cooling limitations, and provide scalable capacity for information technology, high-performance computing and telecommunications.

Parameter	Reported information
Facility type	Prefabricated modular data center
Gross area	Approximately 5,000 m^2
Reliability objective	Tier III
Initial IT load	Approximately 0.63 MW
Future IT capacity	Approximately 1.05 MW
Status	Under construction

The project strengthens digital resilience and supports continuity of critical university services. Its modular approach allows future expansion. Final energy performance should be assessed after commissioning using operational data, including power usage effectiveness where available.

7. Research Institute Renovation

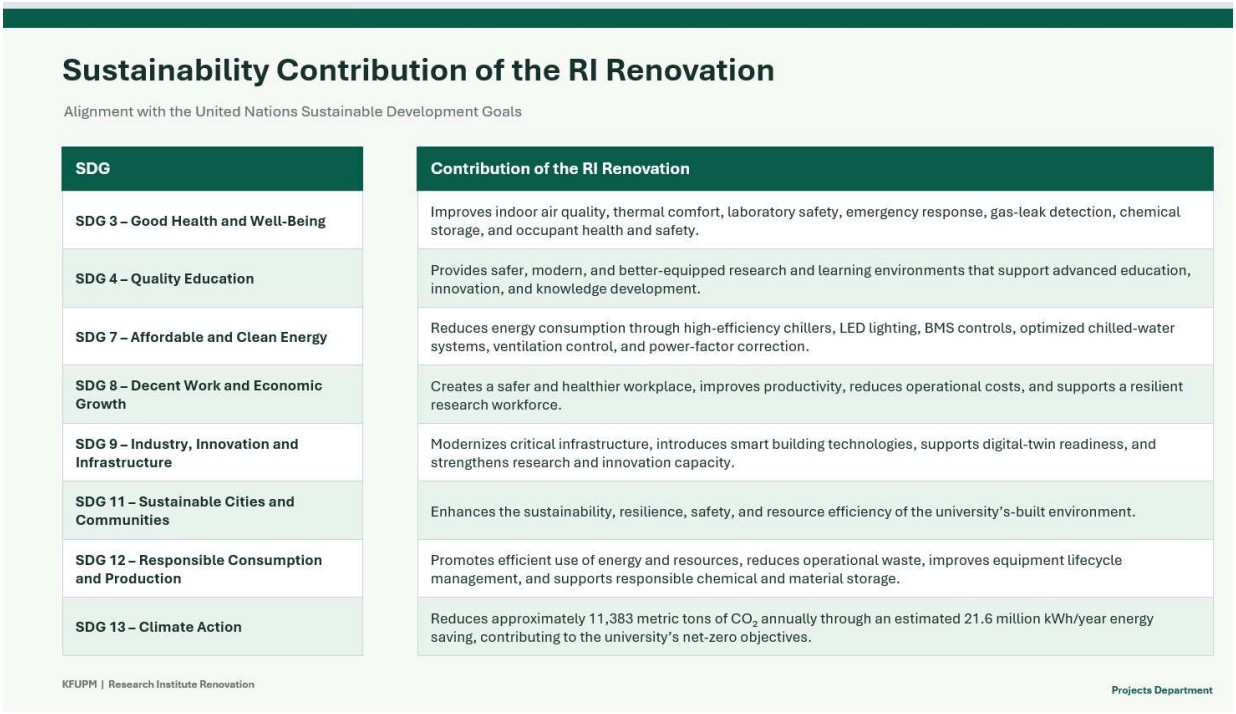
The Research Institute renovation transforms an aging research facility into a healthier, safer, smarter and lower-carbon environment for advanced research and knowledge development. The project modernizes critical building systems while maintaining the operational requirements of research facilities and laboratories.

Key interventions include high-efficiency centrifugal chillers, LED lighting, building management controls, variable-frequency-drive pumping, optimized chilled-water systems, demand-based ventilation, Venturi valves, plume fans, power-factor correction, gas-leak detection, emergency shutoffs, improved chemical storage, laboratory safety systems and strengthened commissioning controls.

RI renovation indicator	Reported estimate
Annual energy saving	Approximately 21.6 million kWh/year
Annual carbon reduction	Approximately 11,383 metric tons CO_2/year avoided
Target energy intensity	160 kWh/m^2/year, improving from approximately 240 kWh/m^2/year
Estimated annual total savings	Approximately SAR 7.33 million/year

The renovation supports SDGs 3, 4, 7, 8, 9, 11, 12, 13, 16 and 17. It improves indoor air quality, thermal comfort, laboratory safety, emergency response, work efficiency, collaboration, research continuity and responsible facility governance. It also establishes a foundation for future digital-twin integration and more advanced performance monitoring.

Figure 1. Sustainability contribution of the Research Institute renovation.



Sustainability Contribution of the RI Renovation

Alignment with the United Nations Sustainable Development Goals

SDG	Contribution of the RI Renovation
SDG 3 – Good Health and Well-Being	Improves indoor air quality, thermal comfort, laboratory safety, emergency response, gas-leak detection, chemical storage, and occupant health and safety.
SDG 4 – Quality Education	Provides safer, modern, and better-equipped research and learning environments that support advanced education, innovation, and knowledge development.
SDG 7 – Affordable and Clean Energy	Reduces energy consumption through high-efficiency chillers, LED lighting, BMS controls, optimized chilled-water systems, ventilation control, and power-factor correction.
SDG 8 – Decent Work and Economic Growth	Creates a safer and healthier workplace, improves productivity, reduces operational costs, and supports a resilient research workforce.
SDG 9 – Industry, Innovation and Infrastructure	Modernizes critical infrastructure, introduces smart building technologies, supports digital-twin readiness, and strengthens research and innovation capacity.
SDG 11 – Sustainable Cities and Communities	Enhances the sustainability, resilience, safety, and resource efficiency of the university's-built environment.
SDG 12 – Responsible Consumption and Production	Promotes efficient use of energy and resources, reduces operational waste, improves equipment lifecycle management, and supports responsible chemical and material storage.
SDG 13 – Climate Action	Reduces approximately 11,383 metric tons of CO_2 annually through an estimated 21.6 million kWh/year energy saving, contributing to the university's net-zero objectives.

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8. KFUPM Business School

The KFUPM Business School is included in this report as an important academic component of the University's campus transformation. The facility represents the University's commitment to high-quality academic environments that support education, collaboration, professional development, innovation and future-oriented business learning.

The Business School should be presented within the wider social and institutional sustainability narrative. Its academic spaces can be linked to SDG 4 through quality education, SDG 5 through inclusive access and participation, SDG 8 through productive and decent work environments, SDG 9 through innovation and collaboration, and SDG 11 through the creation of a connected and people-centred campus.

9. RO Plant and Pumping System

The RO Plant and Pumping System modernization replaces manual operation and limited monitoring with automated pumping and centralized SCADA control. The project improves operational visibility, enables alarms and proactive intervention, improves water pressure and flow, and reduces leakage and maintenance associated with old and corroded piping.

Indicative benefit: approximately 10–25% improvement in pumping efficiency and reduced water losses, subject to final flow, pressure and operating data.

10. Service Tunnel Rehabilitation

The service-tunnel rehabilitation project renews a critical campus infrastructure corridor that previously had damaged ceilings and floors, inadequate lighting, limited ventilation, insufficient drainage, weak utility support and inadequate fire-alarm and CCTV systems.

Completed works include ceiling and flooring rehabilitation, pipeline repairs, improved ventilation, lighting, CCTV, signage, drainage and fire-safety measures. The project improves safety, reliability, accessibility and maintainability and reduces the risk of service disruption.

11. Sewer Rerouting and Lift-Station Cancellation

A new sewer line was tapped into the NWC network, allowing the existing lift station to be taken out of service and dismantled. The previous facility was approximately 40 years old and would otherwise have required extensive renovation, retrofit and continued maintenance.

The new arrangement is expected to eliminate wastewater-pumping demand associated with the lift station and reduce electricity use, lighting requirements, manpower, inspection, spare parts, materials, emergency repairs and long-term operation and maintenance costs. It also reduces dependence on aging pumps, valves, controls and electrical equipment, improves wastewater-system reliability and reduces the risk of service interruptions.

12. Preliminary Sustainability Outcomes

The following outcomes are indicative estimates based on the nature of the interventions and the replacement of older systems with modern efficient systems. They communicate the likely direction and scale of improvements and savings. Moreover, all new developments and renovations are going to be fully operational with metering devices that will help in measuring and analyzing the energy and water usage.

Area	Indicative improvement
New female housing	25–35% improved energy performance and water
Male housing renovation	20–30% potential energy and water reduction
Faculty housing renovation	20–30% potential energy and water improvement
KFUPM Business School and Research Institute	40–60% lower lighting energy and water use
RO and pumping	10–25% potential pumping-efficiency improvement
Sewer rerouting	100% energy saving and major reduction in lift-station pumping and maintenance risk
Service tunnel	Improved safety, resilience and reliability
Data center	Improved scalability, resilience and energy-management potential

13. Future Sustainability Direction

The projects completed and initiated during 2025–2026 provide a practical foundation for the ambitions of the KFUPM Campus Master Plan 2050. Future reporting can build on this foundation through campus-wide energy and water monitoring, post-occupancy evaluation, renewable-energy deployment, water reuse, sustainable landscape management, waste reduction, smart infrastructure and climate-resilience planning.

By combining new high-performance construction with systematic rehabilitation of existing facilities, KFUPM is progressing toward a resilient, resource-efficient, low-carbon and people-centred campus. The Projects Department's work contributes directly to the University's aspiration to become a benchmark sustainable campus and a global reference point for sustainable smart campus development.

Conclusion

The 2025–2026 campus development programme demonstrates KFUPM's practical commitment to sustainability through the renewal of its built environment and essential infrastructure. New housing capacity, comprehensive renovations in residential, academic and research facilities, modernized utilities, safer service systems, resilient digital infrastructure and improved research environments are collectively strengthening the campus as a place to live, learn, work and innovate.

The next stage of sustainability reporting should build on these achievements by establishing consistent baselines, metering project performance, tracking energy and water intensity, documenting carbon reductions, assessing user satisfaction and reporting progress against long-term campus targets. This will allow KFUPM to move progressively from project-based sustainability reporting toward an integrated, evidence-based campus performance framework.

Appendices

1. Campus Development Portfolio (Before and After) 2025-2026
2. Campus Master Plan 2050_Sustainability Direction