SDG 11: Sustainable Cities and Communities

Overview

The University of Science and Technology – Yemen (UST) actively contributes to **Sustainable Development Goal 11 (Make cities and human settlements inclusive, safe, resilient and sustainable)** through teaching, research, infrastructure management, and community engagement.

Amid Yemen's challenges of rapid urbanization, internal displacement, and infrastructure fragility, UST has positioned itself as a **leader in sustainable urban development, resilience research, and community services** that support more inclusive and sustainable cities.

UST's contributions focus on:

- Promoting **sustainable architecture and urban design education**.
- Conducting **research on urban resilience, housing, and public services**.
- Implementing **community development and reconstruction projects**.
- **Engaging students and staff in social innovation** to improve urban life quality.
- Advancing **digital and smart infrastructure** for more resilient city systems.

1. Learning and Student Experience

UST embeds the values of sustainability, safety, and community engagement in its teaching and learning environment.

Its curricula in **architecture, civil engineering, environmental design, and urban studies** integrate the principles of sustainable cities, disaster resilience, and inclusive planning.

Educational and student engagement highlights (2024):

- **Bachelor of Architecture and Urban Design Programme** integrates modules on *urban resilience, green building, and climate-adaptive design.*
- **Civil Engineering Department** applies *sustainable construction technologies* and *infrastructure resilience* studies in project-based learning.
- **Student Environmental and Innovation Clubs** organise campus awareness events titled *"Our Sustainable Yemen"* and *"Rebuilding Cities Responsibly."*
- **Field Training Programmes (2024):** Architecture and civil engineering students participated in *urban rehabilitation projects* in Sana'a and Ibb, focusing on low-cost housing and sustainable materials.

Community Safety and Disaster Preparedness Seminars conducted in partnership with local municipalities and NGOs to train students on urban risk reduction.

a. Education for Sustainable Urban Development

UST embeds sustainability principles into its academic curricula across faculties such as **Architecture, Civil Engineering, Environmental Engineering, and Urban Planning**.
Courses focus on:

- Sustainable building materials and green construction practices.
- Smart infrastructure planning and environmental impact assessment.
- Waste management and urban sanitation design.
- Community-oriented planning for post-conflict reconstruction.

Students are encouraged to design solutions addressing **housing challenges, public-space regeneration, and climate adaptation** within Yemeni cities.

b. Architecture and Urban Planning Studio Projects

The **Faculty of Engineering and Architecture** integrates real-world community challenges into its design studios.
In 2024, over **120 student projects** addressed urban sustainability themes, including:

- Low-cost housing for displaced families.
- Solar-powered community centers.
- Urban gardens and waste-recycling systems in Aden and Sana'a.
  These projects are often showcased in public exhibitions and used to inform municipal planning discussions.

2. Research and Innovation

UST researchers have published multiple studies in 2023–2025 focused on **urban sustainability, environmental health, and resilient infrastructure**.
Key examples include:

- *"Sustainable Housing Strategies for Low-Income Urban Communities in Yemen"* – UST Journal of Engineering and Architecture (2024).
- *"Assessment of Urban Waste Management Practices in Aden City"* – Environmental Studies Research Group, UST (2023).
- *"Digital Mapping and Smart Infrastructure Solutions for Post-Conflict Reconstruction"* – UST Innovation Lab (2024).
- *"Climate-Resilient Urban Design in Arid Regions"* – Joint research with University of Malaya (2024).

These studies provide data-driven insights into urban challenges and contribute to **policy dialogues on rebuilding Yemen's cities** sustainably.
Research at UST directly supports SDG 11 through innovation in **urban sustainability, infrastructure resilience, waste management, renewable energy integration, and housing solutions** adapted to Yemen's economic and environmental conditions.

Year	Research Project / Publication	SDG 11 Relevance
2024	*Sustainable Urban Reconstruction in Post-Conflict Yemen* — UST Journal of Architecture and Planning	Framework for rebuilding war-affected cities using local materials and community participation.
2024	*Assessment of Building Safety and Seismic Vulnerability in Sana'a* — Faculty of Civil Engineering	Promotes safer urban infrastructure and retrofitting of existing structures.
2023 – 2025	*Urban Waste Management Systems and Circular Economy Approaches in Yemen* — Environmental Engineering Research Unit	Introduces solid-waste reduction models and sustainable municipal solutions.
2024	*Affordable Green Housing Models for Low-Income Communities* — Faculty of Architecture	Supports inclusive housing design aligned with SDG 11.
2024	*GIS-Based Mapping of Urban Expansion and Environmental Risks* — Faculty of Engineering	Enables better urban planning and hazard management.

These research outputs illustrate UST's scientific and technical leadership in **urban sustainability and infrastructure resilience**, addressing both global sustainability goals and Yemen's urgent urban challenges.

3. Community Engagement and Development Initiatives

a. Post-Conflict Reconstruction and Housing Support

UST has played a consultative role in several community projects addressing the reconstruction of damaged neighborhoods in Aden and Taiz.

The **Civil and Architecture Faculties** collaborate with local authorities and NGOs to provide:

- Technical design support for low-cost housing.
- Structural assessments of damaged public buildings.
- Student volunteering for surveying, design, and field support.

In 2024, UST assisted in **four reconstruction initiatives**, helping rebuild schools and community centers that had been destroyed by conflict.

b. Green Campus and Urban Sustainability Practices

UST's main campuses in Aden and Sana'a incorporate **sustainable campus management** aligned with SDG 11 principles:

- **Energy-efficient buildings** and solar panel installations on select facilities.
- **Waste separation and recycling programs** led by student environmental clubs.
- **Landscaping and green-space initiatives**, creating healthy micro-urban environments on campus.

c. Cultural Preservation and Community Awareness

UST hosts public lectures and exhibitions promoting **Yemeni cultural heritage** and **urban identity preservation**.

In 2024, the Faculty of Architecture organized the **"Cultural Heritage and Sustainable Cities Week"**, drawing over **300 participants**, including municipal officials, architects, and students, to discuss heritage-based urban planning and post-war reconstruction.

4. Innovation and Digital Infrastructure

a. Smart and Sustainable Cities Research

Through the **Innovation and Technology Center**, UST explores how digital technologies can improve urban resilience:

- Smart water and electricity monitoring systems.
- GIS-based urban mapping for waste collection routes.
- Remote sensing and drone-based assessments of damaged infrastructure.

b. The 2024 Conference on Learning and Distance Education

The **International Conference on Learning and Distance Education (المؤتمر الدولي للتعلم والتعليم عن بُعد)** held in 2024 also contributed to SDG 11 by:

- Discussing **digital infrastructure** that enables inclusive access to education in urban and rural communities.
- Showcasing technological innovations that support **smart and resilient learning environments**.
  This event demonstrated UST's leadership in digital capacity building — essential for sustainable, knowledge-based urban development.

5. Partnerships and Policy Collaboration

UST engages with local and international partners to strengthen urban development initiatives:

- **Ministry of Public Works and Highways – Yemen**: collaboration on urban infrastructure standards and training workshops.
- **Aden Municipality**: technical partnership for waste management and green-space planning.
- **UN-Habitat (via local cooperation)**: policy consultations on sustainable reconstruction frameworks.
- **Local NGOs** (Yemen Urban Forum, Resilient Cities Network): collaborative pilot projects on housing and water management.

UST's expertise in engineering and architecture makes it a trusted academic partner for **urban regeneration projects** and **sustainable city design** in Yemen.

6. Performance Indicators (2024)

Indicator	2024	Progress / Description
Research publications on urban sustainability	**13**	Includes topics on housing, climate, waste, and smart infrastructure.
Student projects addressing community or city sustainability	**120+**	Architecture and civil-engineering studio outputs.

Indicator	2024	Progress / Description
Urban development partnerships or community projects	**6**	Collaboration with local authorities and NGOs.
Public events / exhibitions on urban sustainability and culture	**5**	Includes “Cultural Heritage Week 2024”.
Renewable energy systems on campus	**9**	Solar panels and efficiency systems.
Community beneficiaries from reconstruction projects	**2,500+**	Local residents in Aden and Taiz supported.

7. Case Studies

Case Study 1: Community-Based Housing Design for Displaced Families

UST architecture students, supervised by faculty experts, developed **modular, low-cost housing prototypes** for displaced families in southern Yemen.

The designs focus on:

- Locally sourced, sustainable materials.
- Solar energy integration.
- Scalable community layouts.

These models are currently being evaluated by NGOs for pilot construction in 2025.

Case Study 2: Smart Waste Management in Aden

A UST research group conducted a feasibility study on **smart waste collection systems** using GPS and data tracking, proposing a low-cost system adaptable to Aden’s urban infrastructure. Findings were presented at a national symposium on environmental management (May 2024).

Case Study 3: Green Campus and Urban Biodiversity

UST’s green-campus project (2023–2024) transformed previously underutilized areas into eco-friendly zones with native plants, water-saving irrigation, and shaded study areas — promoting biodiversity and sustainable design practices applicable to wider urban spaces.

8. SDG Linkages

Linked SDG	Connection
SDG 6 – Clean Water and Sanitation	Water management and sanitation design in cities.
SDG 7 – Affordable and Clean Energy	Solar energy projects in urban and campus facilities.
SDG 8 – Decent Work and Economic Growth	Construction and innovation-related employment.
SDG 9 – Industry, Innovation and Infrastructure	Smart systems and resilient infrastructure research.
SDG 13 – Climate Action	Climate-adaptive urban design projects.
SDG 17 – Partnerships for the Goals	Collaboration with government and NGOs for city development.

9. Outlook for 2025

UST plans to:

- Establish a **Sustainable Cities Research Cluster** integrating engineering, ICT, and social sciences.
- Launch a **Graduate Diploma in Urban Sustainability and Resilience**.
- Expand cooperation with **UN-Habitat** and **local municipalities** for data-driven urban reconstruction.
- Develop a **national database on post-conflict urban recovery projects** led by academic institutions.
- Increase student participation in **service-learning programs** linked to real community challenges.

10. Conclusion

The University of Science and Technology – Yemen has demonstrated a **multidimensional commitment** to SDG 11 through education, research, innovation, and community partnerships. In 2024, the university not only enhanced urban sustainability research but also engaged directly with local communities to **rebuild infrastructure, design sustainable housing**, and **preserve Yemen's urban heritage**.

Through its green-campus model, applied research, and digital innovation, UST stands as a **national hub for sustainable development and urban resilience**, directly contributing to Yemen's path toward inclusive and sustainable cities.