

GJU

ESTABLISHED LAB UNIT PORTFOLIO

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1. GJU ESTABLISHED LAB UNIT PORTFOLIO: SUL LAB

This report offers a comprehensive overview of the Sustainable Urbanism Lab (SUL) established at the German Jordanian University (GJU) as one of Pro-green labs Network.

1.1. Mission statement and objectives

This section presents the foundational mission and primary objectives of the Sustainable Urbanism Lab (SUL) at the German Jordanian University (GJU). These elements reflect the Lab's strategic alignment with the Pro-GREEN-LABS initiative and its commitment to transforming architectural education through sustainability innovation.

Mission Statement: The mission of the Sustainable Urbanism Lab is to enhance the competencies of architectural education in the Southern Mediterranean region by fostering sustainable development through experiential, lab, active learning methodologies. The Lab aims to provide transformative educational experiences that equip future architects with the technical, ecological, and social competencies needed to address environmental challenges and contribute to the socio-economic development of their communities.

Vision Statement: The Lab envisions itself as a pioneering hub within GJU, integrating advanced technologies and interdisciplinary learning to empower students and faculty in addressing both local and global urban challenges. Through its collaborative platform, the Lab seeks to foster excellence in sustainable urbanism by linking theoretical foundations with applied practice and community collaboration.

Objectives: The Sustainable Urbanism Lab pursues a range of objectives designed to advance sustainability in architectural education:

- **Curriculum Enhancement:** To modernize educational offerings by integrating Sustainable Development Goals (SDGs) and green competencies across teaching modules and academic programs.
- **Faculty Development:** To provide academic staff with advanced pedagogical strategies and training in emerging sustainable technologies and methodologies.
- **Lab Management and Operational Excellence:** To implement green technologies and efficient resource management, enhancing the functionality and sustainability of lab environments.
- **Stakeholder Engagement:** To strengthen connections between academia, industry, and local communities, fostering applied research and real project collaborations.
- **Continuous Improvement:** To establish a responsive monitoring and evaluation system that supports adaptive learning and alignment with international educational standards.

Overall, the Sustainable Urbanism Lab serves as an educational and research platform that integrates digital innovation, interdisciplinary collaboration, and sustainable development principles. This strategic focus ensures its contribution to regional capacity building and the cultivation of future professionals in sustainable urban design.

1.2. Hard Capacities of Lab Unit

This section outlines the physical and technological infrastructure of the Sustainable Urbanism Lab at GJU. It includes documentation of the premises and a detailed list of equipment and software, reflecting the Lab's capacity to support sustainable architectural education and research.

1.2.1. Documentation of premises

The Sustainable Urbanism Lab is situated within the School of Architecture and Built Environment (SABE) at the German Jordanian University, located on the first floor of the Othman Bdeir Building at the Jabal Amman Campus. The space was strategically selected and upgraded to support interdisciplinary collaboration, digital fabrication, and stakeholder engagement.



Figure 1: Sustainable Urbanism Lab Premises at GJU

The upgraded infrastructure includes:

- A hybrid lab space combining digital modeling, material research, and immersive technologies.
- A dedicated area for community engagement and stakeholder meetings.

These features position the Lab as a dynamic educational environment designed to support active learning and applied research.

1.2.2. List of Equipment and Software

The following table presents the updated list of equipment and software applications installed in the Lab. These tools were selected based on institutional needs, benchmarking feedback, and alignment with sustainability focused learning goals.

Table 1: Equipment Overview for Sustainable Urban Lab at GJU

Category	Equipment/Tool	Included	Priority	Notes
Digital Fabrication	3D Printers (Larger, Smaller, Resin), Mercury Wash & Cure	Yes	●/○	Support urban prototyping and iterative design
Urban Visualization	Hologram Display, Meta Quest Pro, 3D Scanners	Yes	●	Facilitate immersive learning and spatial analysis
Measurement and Monitoring Tools	Energy Logger, Power Analyzer, Thermal Imager, Flow Meter	Yes	●/○	Aid in sustainability metrics, HVAC audits, and simulations
Cutting and Forming Tools	Hot Wire Cutter, CNC Cutter, Vinyl Cutter, Acrylic Bending Machine	Yes	●	Enable model fabrication and sustainable packaging
Sustainable Practices Tools	Cardboard Perforator	Yes	○	Promote eco-friendly reuse in design and prototyping

Table 2: Overlaying of List of Equipment and Software Applications for GJU

BE nr	Beneficiary Name	[E] Equipment - [S] Software		Name	Estimate Purchase Cost	Item incorporation based on recommendation of:			Will the Equipment be included in the final list	Financial Means			Priority	Comments Justification modification	/ of
						Propo	Needs	Bench		EU	Co-	Other			
6	GJU	E		Interactive Flat Panel	6,000				Yes	✓			○		
6	GJU	E		Audio Video Devices	4,000				Yes	✓			○		
6	GJU	E		Video Conference Camera	2,000				Yes	✓			○		
6	GJU	E		Creality K1 3D Printer	2,000				No					Changed to a model that meets higher speed and precision requirements for creating accurate, large-scale urban design prototypes.	
6	GJU	E		3D Printer (Larger)	1,500				Yes	✓			●		
6	GJU	E		3D Printer (Smaller)	1,120				Yes	✓			●	Added to support increased prototyping capacity.	
6	GJU	E		Resin 3D Printer	540				Yes	✓			○	New addition for high-detail prototypes essential for precise urban design modeling.	
6	GJU	E		Mercury Plus V3.0 Wash & Cure Plus Machine	170				Yes	✓			○	New addition to improve the quality and durability of urban design prototypes.	
6	GJU	E		3D Scanner	1,720				Yes	✓			●	2 pieces	
6	GJU	E		Hot Wire Cutter	240				Yes	✓			●	2 pieces	
6	GJU	E		Acrylic PVC Hot Bending Machine	1,500				Yes	✓			●	Important for 360 Camera	
6	GJU	E		Hologram Display	4,000				Yes	✓			●	Added to enhance visualization for design	

														and architectural education.
6	GJU	E		Meta Quest Pro	3,915			Yes	✓			●	Increased quantity to facilitate immersive learning experiences.	
6	GJU	E		Energy Logger	500			Yes	✓			○		
6	GJU	E		Power Quality Analyzer	300			Yes	✓			○		
6	GJU	E		Thermal Imager	250			Yes	✓			○		
6	GJU	E		Air Quality Tools	250			Yes	✓			○		
6	GJU	E		Flow Meter	700			Yes	✓			○		
6	GJU	E		Infrared Thermometer	100			Yes	✓			○		
6	GJU	E		Power Meter	500			Yes	✓			○		
6	GJU	E		Airflow Measurement Devices	200			Yes	✓			○		
6	GJU	E		Vinyl Cutters	1,500			Yes	✓			○		
6	GJU	E		CNC Cutters	3,500			Yes	✓			●		
6	GJU	E		Cardboard Perforator	1,500			Yes	✓			○		
6	GJU	E		Laser Cutters	€6300			No					Item removed, as the university has one and no need for additional laser cutter.	

This comprehensive infrastructure enables a high degree of flexibility in teaching, experimentation, and interdisciplinary research. The Lab also integrates Building Information Modelling (BIM), GIS tools, and energy modelling software to facilitate data-driven sustainability analysis.

1.3. Soft Capacities of Lab Unit

This section outlines the non-material assets that underpin the functioning of the Sustainable Urbanism Lab at GJU. These include the administrative structure, academic and non-academic partnerships, and strategies designed to ensure the lab's long-term sustainability.

1.3.1. Administrative Hierarchy of Staff - Contact persons

The Sustainable Urbanism Lab operates under a structured governance model that promotes evidence decision-making and collaborative management. The governance follows a bottom-up structure, involving multiple stakeholders within the academic hierarchy.

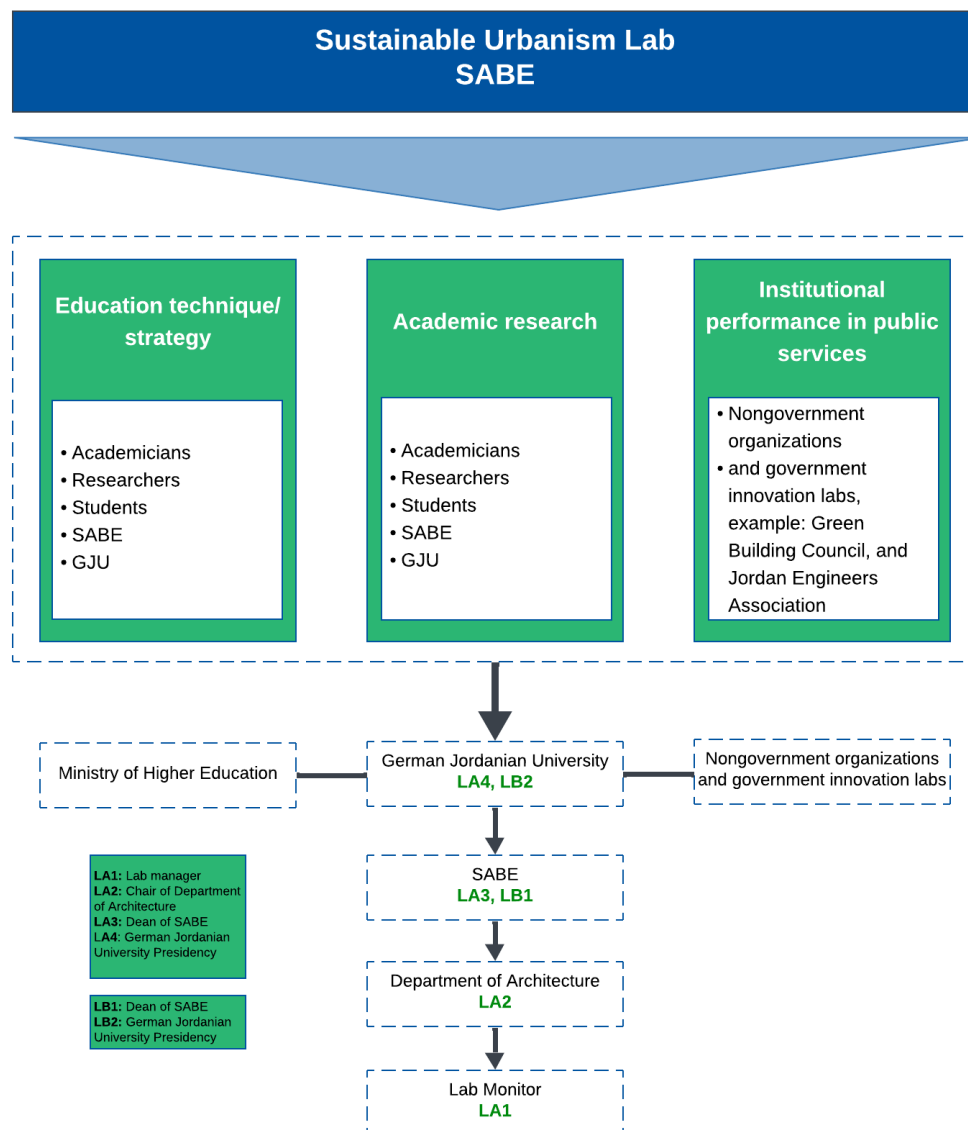


Figure 2: Administrative and Decision-Making Hierarchy

Table 3: Administrative Layers and Roles within the Sustainable Urbanism Lab Governance Structure

Layer	Role	Affiliation
LA1	Lab Manager	SABE - GJU
LA2	Chair of Department of Architecture	SABE - GJU
LA3	Dean of SABE	SABE - GJU
LA4	University Presidency	GJU

Table 4: Key Personnel and Contact Information for the Sustainable Urbanism Lab at GJU

Name	Position	Email	Office Location
Arch. Mohammad Khaled	Industrial Professor	mohammed.zaghmouri@gju.edu.jo	Darat Othman Bdeir
Dr. Maram Tawil	Associate Professor	maram.tawil@gju.edu.jo	
Dr. Raed Altal	Associate Professor	raed.altal@gju.edu.jo	
Fadi Amer	Content Admin & Editor	Fadi.amer@gju.edu.jo	

These individuals are responsible for lab operations, content development, curriculum integration, and strategic planning.

1.3.2. Partners (Academic and Non-Academic)

The Lab has established a robust network of academic and non-academic partners to support its interdisciplinary focus and applied research approach.

ProGreen Lab Academic Partners:

- Bauhaus-Universität Weimar (Germany)
- Chalmers University of Technology (Sweden)
- Politecnico di Milano (Italy)
- Cairo University
- Petra University
- Alexandria University
- Arab Academy University

Non-Academic and Local Partners

- Jordan Green Building Council (JGBC)
- Adaa Consultants
- Greater Amman Municipality (GAM)
- UN HABITAT Amman
- Cities and Villages Development Bank (CVDB)

- Technical and Vocational Skills Development Commission (TVSDC)
- Jordan Engineers Association

These partnerships facilitate co-teaching, research collaboration, student internships, and planned living lab activities.

1.3.3. Strategies for sustainability

The long-term success of the Sustainable Urbanism Lab is underpinned by two strategic dimensions: financial and governance sustainability.

1.3.3.1. Financial Sustainability Strategies

To ensure operational continuity beyond the project's initial funding phase, the following strategies have been developed:

- **Diversified Funding Sources:** Combining Erasmus+ grants with contributions from government agencies, municipal entities, and future funded projects.
- **Public-Private Partnerships:** Collaborating with industry actors to co-finance equipment and infrastructure.

1.3.3.2. Governance Sustainability Strategies

A multi-tiered governance system supports institutional accountability, stakeholder participation, and continuous evaluation:

- **Bottom-Up Planning:** Engaging students, faculty, and external actors in lab operations and feedback mechanisms.

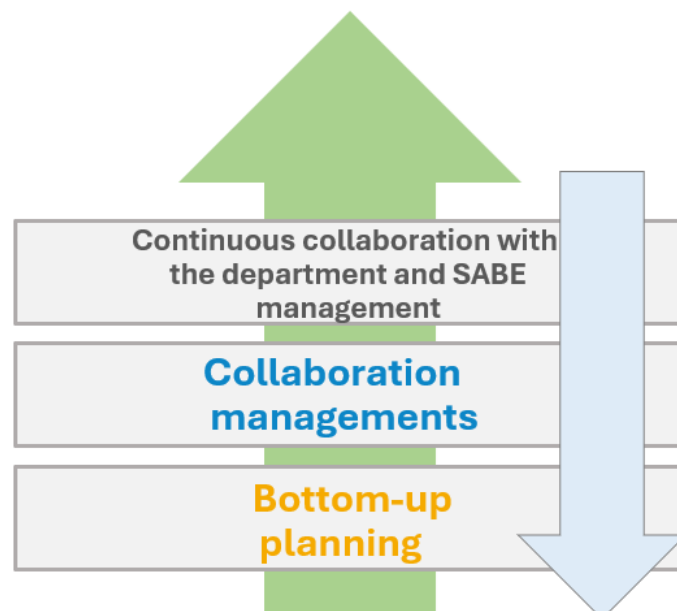


Figure 3: Hierarchical Collaboration and Planning Structure within the Sustainable Urbanism Lab

- **Evidence Based Evaluation:** Utilizing KPIs, accreditation scores, and observational metrics to assess lab performance.
- **Integrated Monitoring Systems:** Periodic review meetings, annual reports, and stakeholder dialogues to ensure transparent decision-making and strategic alignment.

Table 5: Governance Sectors, Stakeholders, and Evaluation Indicators for Sustainable Urbanism Lab Operations

Governance sector	Focus group	Indicator (s)
Education technique/strategy	– Students – Dept. of Architecture – SABE – GJU – Ministry of Higher Education	• Education performances records • Official administrative records combined with facility surveys • Direct continuous observation • national and international accreditation • scores
Academic research	– Academics – Researchers – Students – SABE – GJU	• Education performances records • Official administrative records combined with facility surveys
Institutional performance in public services	– Nongovernment organizations – and government innovation labs ex. Green Building Council, – Jordan Engineers Association	• Interviews with public officials, recipient • institutions • Annual workshops

The soft capacities of the Lab reflect its institutional commitment to collaboration, transparency, and sustainability, factors that are essential for long-term academic and social impact.

1.4. Integration of Teaching and Scientific Research within the Lab Activities

This section outlines the strategic approach adopted by the Sustainable Urbanism Lab (SUL) at GJU to integrate teaching and scientific research. The lab has been designed to function as an academic and practical platform, facilitating the seamless connection between curriculum delivery and applied urban sustainability research.

Purpose

The integration of teaching and research is central to the lab's mission of equipping students with the skills and competencies needed to address contemporary urban and environmental challenges. By bridging theory and practice, the lab fosters innovation, critical thinking, and evidence problem solving.

Content and Applications

To realize this integration, the lab has implemented the following mechanisms and programs:

- **Joint Teaching Modules:** The lab supports the delivery of interdisciplinary and co-taught courses that include practical components such as urban simulation, digital fabrication, and sustainability assessments. These modules are embedded into the existing SABE curricula and are aligned with the Sustainable Development Goals (SDGs).
- **Design Studios and Living Labs:** Project studios engage students in real challenges, encouraging collaborative work on topics such as urban change, co design and co development, and climate-responsive planning.
- **Research-Informed Practice:** Equipment such as the Meta Quest Pro, hologram display, and energy audit tools facilitate data-driven investigations. Students participate in faculty-led teaching and research projects, often collaborating with local municipalities or industry partners to address urban issues through analytical modeling and simulations.
- **Faculty Research Integration:** Academic staff utilize the lab to conduct interdisciplinary research in areas such as sustainable development, integrated planning, and green infrastructure. This research informs course content and provides students with exposure to ongoing scientific inquiry.
- **International Collaborations:** Partner institutions such as the ProGreen Labs network contributes to research and teaching exchanges, offering joint research opportunities and co-developed educational content.

Implication

By embedding scientific research into teaching activities, the Sustainable Urbanism Lab enhances the learning process through experiential methods and real engagement. This integration contributes to the following outcomes:

- Elevating the quality and relevance of architectural education.
- Strengthening students' capacity for applied research and innovation.
- Enhancing institutional visibility through collaborative academic outputs.
- Promoting sustainable urban development through community linked research.