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DISCLAIMER

The **International Multidisciplinary Scientific GeoConference SGEM (Survey, Geology, Ecology, and Management)** serves as a global platform for pioneering research and scientific dialogue across the diverse fields of geosciences. It is dedicated to advancing interdisciplinary solutions for the most pressing environmental challenges of our time and includes research studies on nano-materials for sustainability, biotechnology and bioengineering for eco-innovation, sustainable construction and eco-materials, climate-responsive architecture, nature-based solutions for cities, renewable energy infrastructure for green mobility, and applications of advanced space and planetary exploration technologies. **These thematic areas directly support the United Nations Sustainable Development Goals: SDG 7 (Affordable and Clean Energy), SDG 9 (Industry, Innovation and Infrastructure), SDG 11 (Sustainable Cities and Communities), SDG 12 (Responsible Consumption and Production), SDG 13 (Climate Action), and SDG 15 (Life on Land).**

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FOREWORD

SGEM Conference Proceedings - Nano, Bio, Green, And Space Technologies For A Sustainable Future, Vol 25 / Issue 6.2

Biotechnology for Sustainable Solutions and Bioengineering · Green Design, Sustainable Cities and Smart Infrastructure

It is a pleasure to present this special selection of papers in **Nano, Bio, Green, And Space Technologies For A Sustainable Future, Vol 25 / Issue 6.2** of the *SGEM GeoConference Proceedings 2025* - an interdisciplinary volume that reflects one of the most decisive directions in contemporary green sciences: the convergence of **biotechnology, sustainable design, and smart infrastructure**. In today's sustainability landscape, environmental progress increasingly depends on two complementary capacities: (1) the ability to innovate at the level of biological systems and materials, and (2) the ability to translate that innovation into healthier, more resilient, and more intelligently managed human environments.

Issue 6.2 of the 25th edition of the conference proceedings embodies this dual focus. It brings together research that ranges from bioengineering and functional biomaterials to urban climate adaptation, circular design strategies, and AI-supported planning tools. The result is a scientifically diverse yet conceptually unified collection: solutions for sustainability are not single-domain outcomes—they emerge through interactions between biology, technology, design, and governance.

Biotechnology for sustainable solutions and bioengineering

The first major section highlights **biotechnology and bioengineering** as practical engines of sustainability—especially in the domains of food systems, health-related environments, biomaterials, and natural-product research. Contributions address themes such as alternative formulations and functional substitutions in food products, antioxidant potential in natural materials, physico-chemical and quality indicators in honey and traditional foods, oxidative stability of oils, and the role of bio-based approaches in engineered surfaces and carbon materials. This section also reflects the growing importance of environmental health at the micro-scale, including research on microbiological air quality in healthcare facilities and related risk awareness.

Collectively, these works demonstrate how sustainability increasingly depends on understanding—and responsibly guiding—biological processes, whether through improved nutrition, safer indoor environments, natural bioactive compounds, or bioengineered material performance. In this sense, bioengineering is not merely a laboratory discipline; it is a pathway toward measurable improvements in health, efficiency, and ecological compatibility.

Green design, sustainable cities, and smart infrastructure

The second major thematic axis advances the volume into the built environment: **green design, sustainable cities, and smart infrastructure**. Here, the contributions address urgent urban challenges such as heat-risk exposure, green infrastructure needs,

vegetation's role in urban heat island mitigation, noise pollution and housing quality, and the evaluation of sustainable recovery of cultural and urban assets. The research emphasizes that sustainability in cities is not only a matter of technology - but also of planning intelligence, adaptability, and long-term resilience.

A substantial set of papers further explores **advanced diagnostics, digital tools, and AI-supported methods**: GIS-driven environmental assessment, micro-photovoltaic analysis for urban buildings, non-destructive measurement and UAV-based diagnostics, and path-planning strategies evolving from classical algorithms to AI-based approaches. Importantly, the volume also includes contributions that address the ethical and social dimensions of AI in sustainability, including disaster risk reduction and citizen awareness—highlighting that innovation must be guided not only by capability, but by responsibility and public trust.

From biological innovation to resilient urban futures

The combined scope of this collection of papers (Issue 6.2) underscores a central scientific truth: sustainability is an integrative project. Healthier food and bioactive compounds, improved indoor environmental quality, smart materials and engineered surfaces, and resilient city infrastructures are all part of a single systems challenge. This volume contributes to that challenge by presenting research that is not only descriptive, but increasingly solution-oriented - bridging laboratory insights with real-world applications and decision-making frameworks.

Editorial standards and academic integrity

All manuscripts included in this published edition underwent **rigorous peer review** conducted by independent specialists. The editorial process prioritized scientific integrity, methodological clarity, originality, and relevance. The resulting volume aims to support long-term academic traceability and practical usefulness through structured publication standards and durable scientific record-keeping.

On behalf of the Editorial Board and the scientific community supporting SGEM Vienna Green, we express our sincere appreciation to all authors for their scholarly contributions and trust. We also thank the reviewers for their careful evaluations and for safeguarding academic quality. The work presented in this conference proceedings strengthens interdisciplinary dialogue and supports the shared mission of advancing sustainability through knowledge, innovation, and responsible practice.

We wish readers an inspiring and productive engagement with the research presented in conference proceedings - **Nano, Bio, Green, And Space Technologies For A Sustainable Future, Vol 25 / Issue 6.2**, and we hope the findings and approaches collected here will contribute meaningfully to scientific progress and practical impact across biotechnology, green design, and sustainable urban development.

Sincerely,

Prof. Dr. hab. oec. Baiba Rivza
Editor-in-Chief of XXV SGEM GeoConference Proceedings
Member of the Presidium of the Latvian Academy of Sciences, LATVIA
President of the Latvian Academy of Agricultural and Forestry Sciences

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