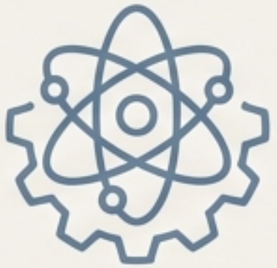
Mapping the Frontiers of Sustainability

Insights from the 2025 SDGs Studies Review

Three Frontiers Shaping Our Sustainable Future



The Technological Frontier

Harnessing artificial intelligence and robotics to optimize systems, from renewable energy to academic research.

The Human Frontier

Understanding the values, behaviors, and psychological drivers that shape sustainable consumption.

The Strategic Frontier

Examining the high-level governance, policies, and educational frameworks required to steer collective action.

The Technological Frontier: AI as a Force for Sustainability

Artificial Intelligence and Robotics Technologies Applied to Offshore Wind Energy

AI and robotics are not just theoretical; they are creating tangible efficiencies across the entire lifecycle of offshore wind projects, from wind prediction to decommissioning.

Pussaignolli de Paula, M. (Universidade Federal do Paraná), Noronha, M. (ESPM), Valente, U. G. (RWTH Aachen University), et al.

Perspective/Theory

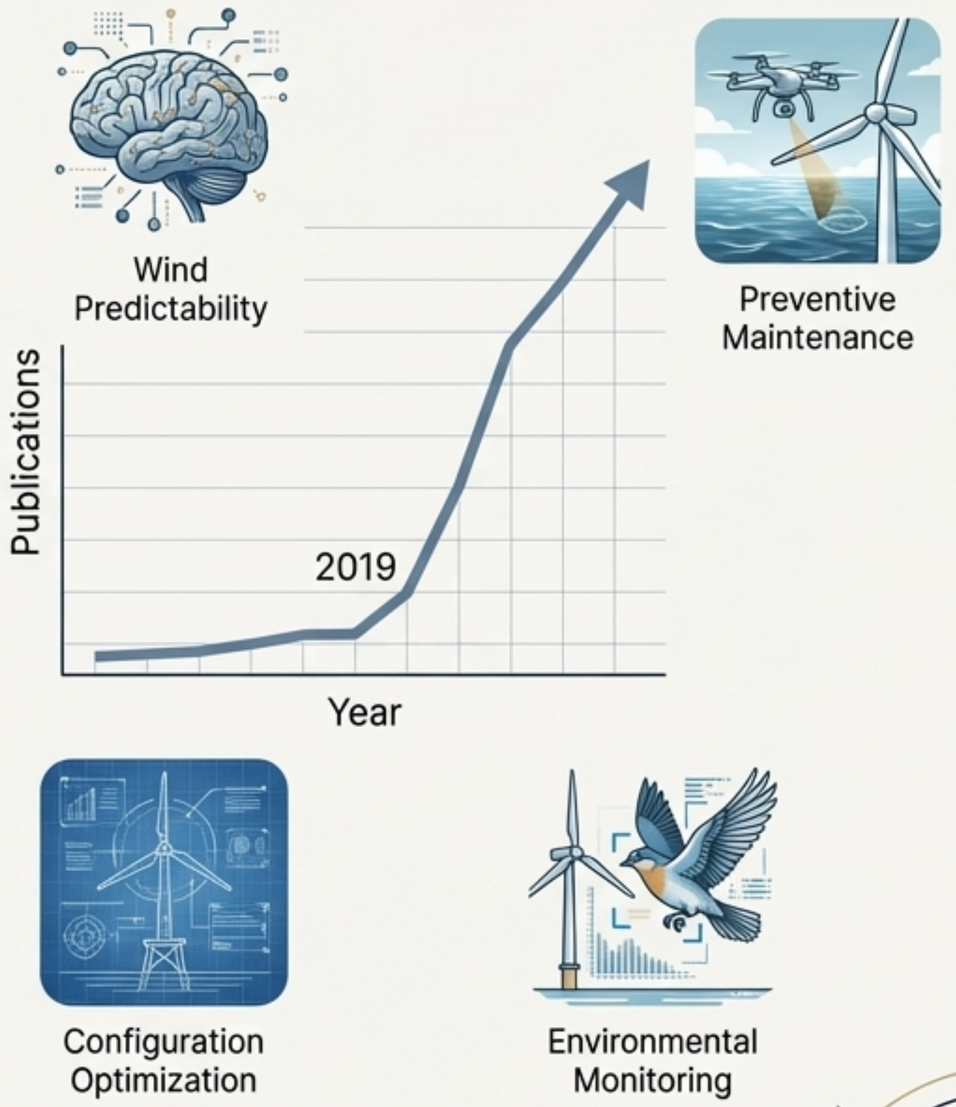
AI (Machine Learning, Deep Learning) and Robotics (UAVs, AUVs, Crawlers) serve as tools to reduce costs, optimize processes, and increase the competitiveness of renewable energy.

Methodology

A bibliometric study mapping 161 papers from the Scopus database, identifying eight central research clusters.

Key Trends/Findings

Research in this area has sharply increased since 2019. Key application clusters include Wind Predictability (Neural Networks), Preventive Maintenance (autonomous drones), Turbine Configuration Optimization, and Environmental Monitoring (bird detection via Deep Learning).



Paper title

Artificial Intelligence (AI) in Competitive Intelligence (CI) Research

Generative AI models like ChatGPT-4, Scholar GPT, and Consensus GPT are fundamentally restructuring the academic research process, offering powerful assistance from literature review to data analysis.

Authors & Institutions
Hair, J. F. & Sabol, M. (University of South Alabama)

Perspective/Theory

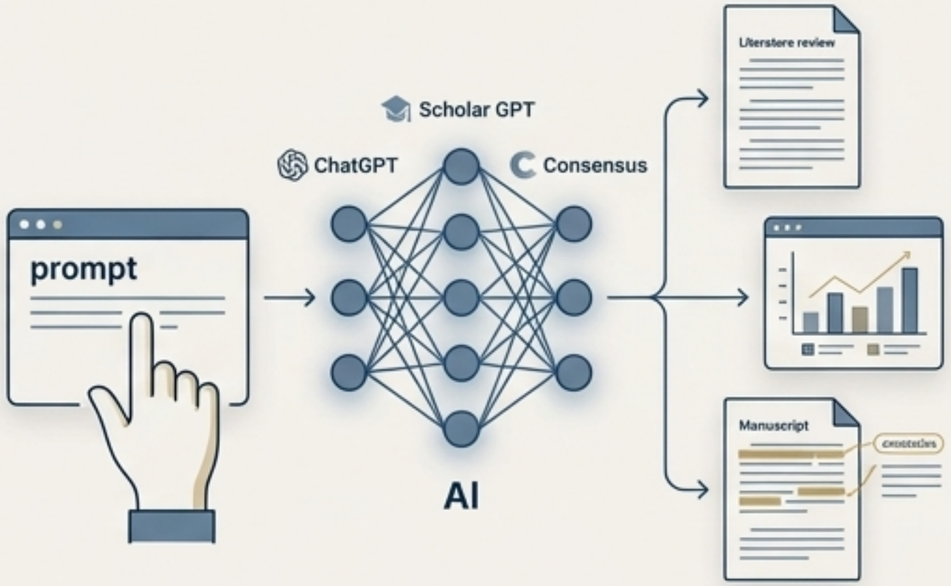
GPT models (Generative Pre-Trained Transformers) function as research collaborators, but their output quality is critically dependent on the quality of the input (prompt engineering).

Methodology

A comprehensive review of literature on AI's integration into academic research, evaluating specific GPT models for different research tasks.

Key Trends/Findings

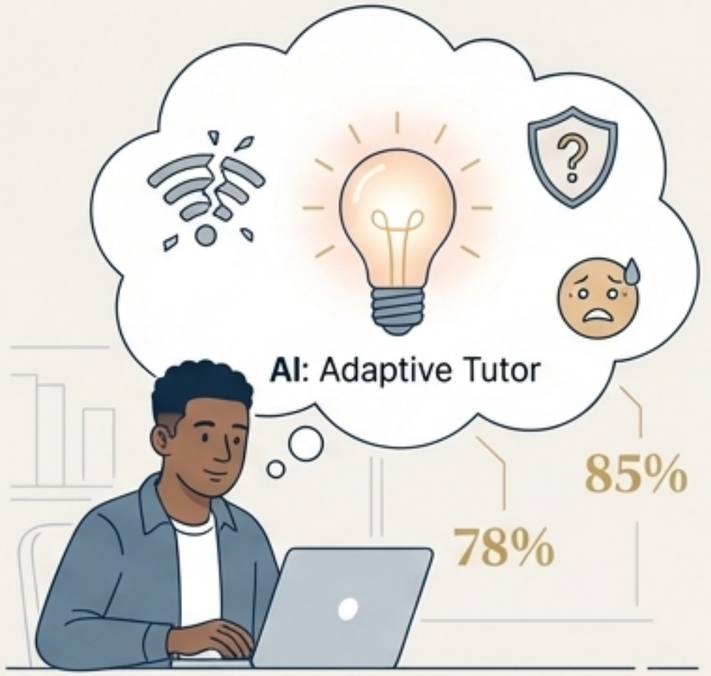
AI excels at generating search strings, summarizing articles, and identifying literature gaps. Consensus GPT is less likely to generate "made-up" references due to its real-time database access. AI can assist in both qualitative (textual analysis) and quantitative (interpreting regression tables, generating charts) data analysis.



Investigating Students' AI Usage Through the Community of Inquiry (CoI) Framework: A Mixed-Method Study in the Caribbean Region

For Caribbean students, AI is a 'cognitive amplifier,' but its benefits are mediated by infrastructure gaps, access inequities, and academic anxiety.

Baksh, S. (The University of the West Indies)



Perspective/Theory

Integrates the Community of Inquiry (CoI) framework (focusing on learning quality) with the Unified Theory of Acceptance and Use of Technology (UTAUT) (focusing on adoption behavior).

Methodology

A convergent mixed-methods design, combining survey data from 114 tertiary-level students with qualitative narratives.

85%

Key Trends/Findings

Top Uses: Clarifying complex content (85%) and generating ideas (78%).

78%

Key Predictor: Teaching presence significantly predicts AI's perceived usefulness (β = 0.437).

β = 0.437

Qualitative Themes: Students view AI as an "adaptive tutor" but face challenges with internet access, ethical concerns, and fear of being penalized.

Artificial Intelligence Assimilation and University Service Quality: The Mediating Role of Student Satisfaction

Successful AI integration in universities isn't just about technology; student satisfaction is a critical mediating factor that determines whether AI assimilation actually improves perceived service quality.

Sebopelo, P. (Botswana Open University), Baloyi, O. (Walter Sisulu University), Chukwuma, N. N. (National Open University of Nigeria)

Perspective/Theory

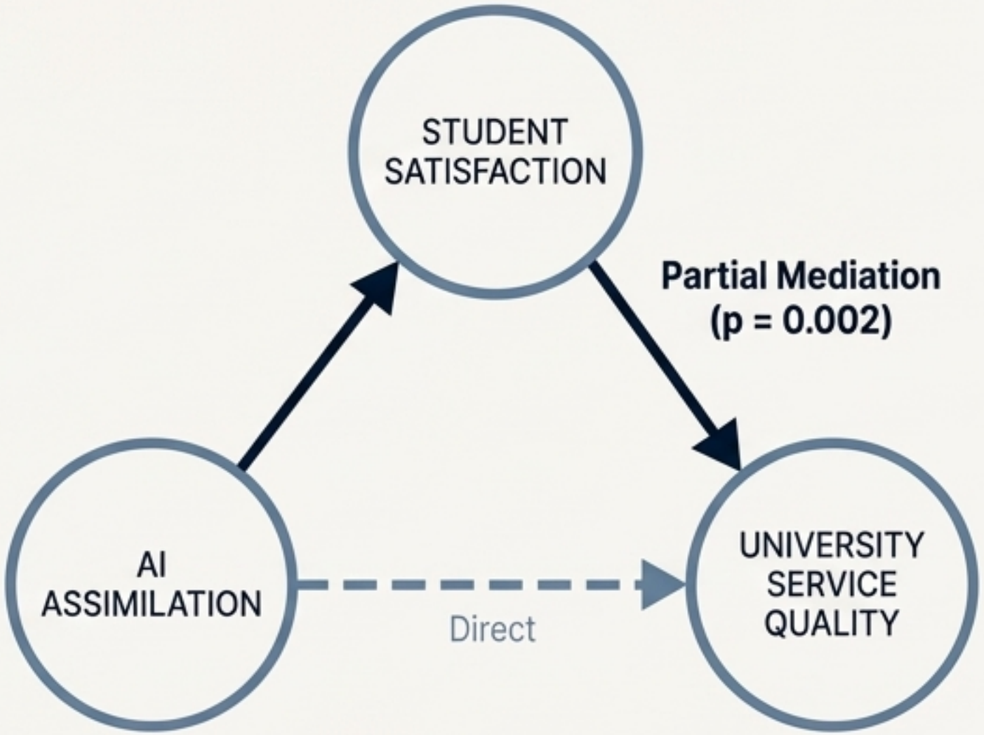
Grounded in Constructivist Learning Theory, which posits that learners actively construct knowledge, a process that can be supported by AI tools.

Methodology

A quantitative study using a Likert-scale questionnaire with students from two open universities. Data was analyzed using Structural Equation Modelling (SEM) in Smart PLS.

Key Trends/Findings

AI assimilation significantly influences students' perception of university service quality. Student satisfaction *partially mediates* this relationship (indirect effect p-value = 0.002). While students accept AI, they express concern that over-reliance might hinder critical thinking.



The Human Frontier: Bridging the Gap Between Values and Action

Consumer Behavior and Sustainability: What We Know Still Need to Know

*While consumers express positive attitudes towards sustainability, a persistent **'attitude-behavior gap'** remains the central challenge, with most research focused on explaining behavior rather than changing it.*

Fernandes, A. (Universidade Nove de Julho), Gabriel, M. L. D. S. (ESPM)

Perspective/Theory

Reviews dominant theories like the Theory of Planned Behavior (TPB), Behavioral Reasoning Theory (BRT), and Social Identity Theory (SIT). Highlights that TPB is the most-cited framework (Ajzen, 1991 cited 48 times).

Methodology

A systematic literature review combined with a bibliometric analysis of 240 articles from Scopus and Web of Science.

Key Trends/Findings

The 'motor theme' of research is 'attitudes, intention, and products.' Sustainable consumption is a three-stage process: responsible purchasing, usage, and disposal. Key research gaps include the need for studies on *how to change* behavior, not just explain it.

The Eco-Engaged Runner's Edge: How Green Consumer Values Drive Opportunity Spotting and Effortless Product Disposal

Key Insight: *For amateur runners, strong green values directly increase the recognition of sustainable purchasing opportunities and, surprisingly, make product disposal feel less difficult.*

Ribeiro, J. & Gabriel, M. L. D. da S. (ESPM)

Perspective/Theory

Green consumer values (the tendency to express environmental protection through consumption) and ecologically conscious consumption influence the purchasing decision process.

Methodology

A quantitative survey of 208 amateur runners, analyzed with Partial Least Squares Structural Equation Modelling (PLS-SEM).

Key Trends/Findings

Green consumer values have a strong positive effect on recognizing needs/opportunities (Path coeff. = 0.783). Ecologically conscious consumption has a negative effect, suggesting more cautious decision-making (Path coeff. = -0.276).

The 'runner's profile' moderates the relationship between decision-making and final product disposal.

Corporate Governance and Sustainable Development: A Bibliometric Analysis

The conversation on corporate governance has evolved from early themes of 'business ethics' to a modern focus on board responsibility, sustainability reporting, and ESG.

Cristina da Silva, C. (University of Sao Paulo)

Perspective/Theory

Corporate governance is the system for directing and monitoring companies (Cadbury Code), with the board of directors as the key instrument. It provides the incentives and accountability for sustainable growth.

Methodology

A bibliometric analysis of 686 articles from Web of Science and Scopus using Bibliometrix software.

Key Trends/Findings

Early Focus: Business ethics and social responsibility.
Modern Focus: Board of directors, corporate social responsibility (CSR), and sustainability.
Emerging Themes:
Sustainable finance, board size, ESG, and green innovation.

This indicates a move towards quantifiable and structural governance mechanisms.

Geographical Indications and Their Impacts on Sustainable Development: Literature Review

Geographical Indications (GIs) are widely seen as a tool for sustainable development, but their real-world impacts are mixed, with literature showing both significantly positive and negative effects on the SDGs.

Malaguti, J. M. A. & Avrichir, I. (ESPM)

Perspective/Theory

GIs are an industrial property instrument that links a product's quality to its geographic origin, intended to add value and protect producing regions, thereby fostering sustainable development.

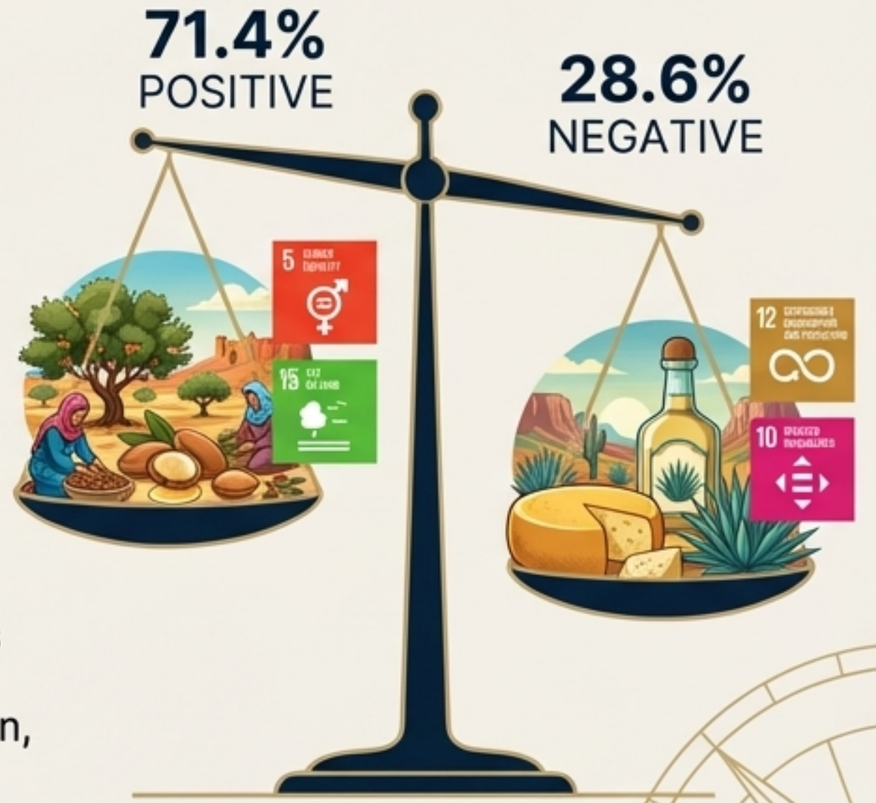
Methodology

A qualitative content analysis of 29 articles from the Scopus database, coding the impacts of GIs against the 17 SDGs.

Key Trends/Findings

Of 49 impacts identified, 71.4% were positive or positive with reservations. 28.6% were negative or negative with reservations.
Positive Example: Moroccan Argan Oil GI empowered women (SDG 5) and protected forests (SDG 15).

Negative Examples: European cheese GIs have negative environmental impacts (SDG 12), and tequila GI in Mexico failed to prevent production concentration, harming small farmers (SDG 10).



The SDGs journey: from learning to knowing to disseminating to mentoring

Integrating SDG-focused thinking bridges the gap between research and teaching, empowering students to move beyond disciplinary silos and see the interconnected, global nature of sustainability challenges.

Govindarajan, V. (The Energy Research Institute's School of Advanced Studies)

Perspective/Theory

A reflective account of operationalizing SDG 4 (Quality Education) by using personal research outputs to mentor students, encouraging holistic, "out-of-the-silos" thinking.

Methodology

A reflective, semi-formal approach drawing on personal publications, classroom interactions, and direct student feedback.

Key Trends/Findings

Students successfully embedded SDGs into their own research reports after being mentored. The author also extended this approach by writing a novella, "Tribute to the Green Brigade," to educate the public.

"Every intervention or change that is brought about has ripple effects elsewhere in the world, for someone else, in some other respect."

- Erik Timmermann, Student

The Path Forward is Integrated

Technology provides the tools, but is only effective assimilated thoughtfully fully and ethically.

Behavior is the engine of change, but bridging the value-action gap requires more than just awareness.

Strategy sets the direction, but must be informed by ground-level realities and translate knowledge into mentorship and action.

Achieving the SDGs requires a holistic approach—one that seamlessly integrates our most advanced tools, our deepest human values, and our most thoughtful strategies.