



Sustainability At the Crossroads: Evaluating Eco-Friendly Traffic Signage Around A University Campus

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STRUCTURED ABSTRACT

Purpose This teaching case examines a sustainability infrastructure decision at Greenfield University, India. It explores whether a university should invest in eco-friendly traffic signages beyond mandatory compliance, raising questions about sustainability leadership, resource allocation, and governance.

Design / Methodology A fictional, decision-focused teaching case. All data and events are illustrative, designed to simulate realistic organisational dilemmas for classroom use.

Findings The case does not prescribe a single outcome. It invites students to analyse trade-offs among environmental benefit, safety, financial responsibility, stakeholder expectations, and institutional jurisdiction.

Practical Implications The case equips future administrators to apply the Triple Bottom Line framework, conduct stakeholder analysis, and design ESG-aligned operational decisions (Elkington, 1997).

Keywords Sustainability leadership; ESG; University management; Green infrastructure; Traffic signages; Triple Bottom Line; Beyond compliance; Stakeholder analysis

Author Note: This case is fictional and has been developed solely for educational purposes. The university, individuals, events, and circumstances described are fictitious. Any resemblance to actual persons, institutions, or events is purely coincidental. The case is intended to stimulate classroom discussion and critical decision-making analysis rather than to illustrate effective or ineffective handling of any administrative situation.



1. THE MORNING WALK

The Monday morning rush had already begun by the time Dr. Selina Mehta stepped out of her car in the faculty parking area of Greenfield University. Students hurried between lecture halls carrying backpacks and coffee cups. Delivery vehicles queued near the service entrance. Faculty members navigated crowded pathways as they made their way to early morning classes.

For most people, the scene represented a normal university morning. For Dr. Mehta, however, it had become a source of growing concern. As Chairperson of the Campus Planning and Sustainability Committee, she had developed a habit of walking through different parts of the campus before starting her day—a practice that often revealed operational issues difficult to identify through reports and committee meetings alone.

That morning, her attention was repeatedly drawn to the same problem. A speed limit sign near the main academic block had become visibly faded. A pedestrian crossing close to the library entrance appeared worn and poorly marked. Several students waited uncertainly before crossing an internal road where motorcycles and delivery vehicles moved continuously throughout the day.

As she approached the university's main gate, a delivery van suddenly braked to avoid a group of students attempting to cross the road. No accident occurred, but the incident highlighted how dependent campus safety was on infrastructure that many people barely noticed. The traffic signages were present. They fulfilled their basic purpose. Yet many showed signs of aging after years of exposure to heat, dust, and monsoon rains.

Dr. Mehta paused and studied one of the weathered signs.

"We invest so much effort in sustainability initiatives. But how often do we examine whether sustainability is reflected in the ordinary infrastructure people interact with every day?"

The question remained with her as she continued toward the administrative building. It would, she realised, soon demand an answer.

2. GREENFIELD UNIVERSITY: CONTEXT AND GROWTH

Located on the outskirts of a rapidly developing Indian city, Greenfield University had transformed significantly over the previous decade. Originally established as a medium-sized private institution, it had expanded into a multidisciplinary university serving thousands of students across business, engineering, design, social sciences, and technology programs.

Growth brought visibility and prestige. New academic buildings, student residences, research centres, and recreational facilities reshaped the campus. The university actively promoted itself as a forward-looking institution committed to innovation, social responsibility, and sustainability. These credentials mattered: increasingly, prospective students cited sustainability commitments as a meaningful factor in institutional choice (Leal Filho et al., 2019).

The university had invested heavily in environmental initiatives. Rooftop solar panels supplied a portion of campus electricity demand. Rainwater harvesting systems were integrated into newer buildings. Waste segregation programs operated campus-wide. Annual sustainability reports served accreditation exercises, institutional communications, and ESG disclosures to stakeholders (Disterheft et al., 2012).

Yet success brought new operational challenges. The expansion generated a substantial increase in daily traffic movement. Students commuting by two-wheelers, ride-sharing services, delivery vehicles, faculty members, service providers, and visitors all relied on the road network surrounding the university.



Several roads immediately outside the campus boundary remained under municipal jurisdiction. However, the majority of their users were affiliated with the university. This created an unusual situation: while Greenfield influenced traffic patterns significantly, it did not fully control the infrastructure supporting them.

Although no major traffic accidents had occurred, near-misses and informal safety complaints were becoming increasingly common. Faculty members reported situations in which vehicles ignored speed restrictions. Security personnel raised concerns about sign visibility during adverse weather. None of these issues individually demanded urgent intervention. Collectively, however, they suggested a broader question.

Was Greenfield University's commitment to sustainability limited to visible environmental projects, or should it extend to everyday operational decisions affecting safety, mobility, and campus infrastructure?

3. GREENFIELD'S SUSTAINABILITY JOURNEY

For more than a decade, sustainability had been an integral component of Greenfield University's strategic vision. The governing board frequently emphasised the institution's responsibility to contribute to environmental stewardship while preparing students to become responsible global citizens—a commitment aligned with the United Nations Sustainable Development Goals, particularly SDG 4 (Quality Education) and SDG 11 (Sustainable Cities and Communities) (United Nations, 2015).

Several initiatives reflected this commitment. The university's sustainability achievements were highlighted during accreditation reviews, admissions campaigns, and stakeholder communications. Industry partners and government agencies showed growing interest in environmental, social, and governance (ESG) practices, and Greenfield's proactive stance reinforced relationships with these constituencies (KPMG, 2022).

For Dr. Selina Mehta, however, these developments revealed a recurring pattern. Sustainability discussions frequently focused on large, visible projects—solar energy systems, green building certifications, or zero-waste initiatives. Smaller operational decisions rarely received the same level of attention. Questions relating to transportation, pedestrian mobility, traffic safety, and campus infrastructure were often categorised as facilities management issues rather than sustainability concerns.

Yet the academic literature on sustainable campus management increasingly challenged this separation. Leal Filho et al. (2019) argued that genuine sustainability requires embedding environmental considerations into every layer of institutional operations, not merely flagship programs. The credibility of a university's sustainability commitment depended on consistency—on demonstrating that sustainability principles influenced routine decisions as much as major investments.

This perspective would soon influence how Dr. Mehta viewed the university's traffic infrastructure challenge.

4. THE TRAFFIC INFRASTRUCTURE CHALLENGE

The road network surrounding Greenfield University had evolved gradually over many years. What had once been a relatively quiet educational zone had become a busy mixed-use area characterised by student residences, retail outlets, cafés, hostels, coaching centres, and commercial establishments.

Traffic volumes increased significantly during peak hours. Between 8:00 and 10:00 a.m., and again during the late afternoon, roads near the university gates experienced congestion created by student arrivals, ride-sharing services, delivery vehicles, public transportation, and private automobiles.

The university's security department routinely monitored traffic conditions. Records indicated a growing number of minor incidents and near-misses. Informal complaints from students frequently referenced



difficulties in crossing roads safely near campus entrances. Faculty members raised similar concerns during committee meetings. Several noted that faded traffic signages and poorly maintained road markings reduced the visibility of safety instructions, particularly during adverse weather.

Future development plans projected additional enrollment, expanded hostel facilities, and new academic buildings over the next five years. Consequently, traffic demand was expected to increase substantially. While no immediate crisis existed, Dr. Mehta believed that waiting for a major incident before acting would be inconsistent with responsible campus planning—a view supported by the literature on proactive sustainability governance (Baumgartner & Rauter, 2016).

The challenge was determining what type of intervention would be both practical and consistent with the university's sustainability goals.

5. EXISTING TRAFFIC SIGNAGE PRACTICES

Greenfield University's traffic signage system reflected a conventional approach adopted by many educational institutions across India. Signages were primarily constructed from metal sheets coated with standard reflective paints, compliant with applicable traffic and safety requirements under the Motor Vehicles Act, 1988, and relevant Bureau of Indian Standards (BIS) guidelines.

From a regulatory perspective, the system performed adequately. Periodic inspections ensured that damaged signs were replaced when necessary. However, several operational limitations were becoming apparent. Exposure to heat, dust, ultraviolet radiation, and seasonal monsoon rainfall accelerated wear and tear. Some signages required repainting or replacement within three to five years of installation.

Moreover, conventional signages generated environmental concerns that had rarely been examined. Manufacturing processes typically involved energy-intensive production methods, chemical-based coatings, and materials that were difficult to recycle at the end of their useful life (McDonough & Braungart, 2002). Research on lifecycle assessment of road infrastructure materials consistently highlighted the embedded carbon costs of conventional signage production (Sandru et al., 2019).

Although the environmental impact of individual signages appeared small in isolation, Dr. Mehta began to question whether infrastructure decisions should be evaluated solely on immediate functionality and cost, or whether lifecycle sustainability considerations should also be weighted—a question at the centre of contemporary sustainable procurement debates (United Nations Environment Programme, 2017).

6. AN UNEXPECTED PROPOSAL

The issue moved from observation to formal consideration during a scheduled meeting of the Campus Planning and Sustainability Committee. As members discussed upcoming infrastructure priorities, a junior faculty member introduced a proposal that had recently emerged during a professional conference on sustainable campus development.

The proposal involved the adoption of eco-friendly traffic signages. According to the vendor presentation provided, these signages incorporated recycled materials, low-VOC (volatile organic compound) coatings, enhanced retroreflective technologies, and in some cases solar-powered illumination systems. Vendors claimed that eco-friendly alternatives offered lower lifecycle environmental impacts while maintaining full compliance with applicable safety standards (Zito & Salvo, 2011).



The proposal immediately attracted interest. Several committee members argued that traffic signages represented a uniquely visible component of campus infrastructure. Unlike many sustainability investments that remained invisible once installed—such as underground water systems or building insulation—traffic signages were encountered by students, staff, visitors, and community members every day.

Replacing conventional signages with environmentally responsible alternatives could therefore generate both environmental and symbolic benefits. Bansal (2002) argued that sustainability initiatives with high stakeholder visibility can generate positive institutional legitimacy, reinforcing the perceived alignment between stated values and organisational action.

"Students see these signs every day. They communicate what kind of institution we are."

Another committee member suggested that such an initiative could complement the university's broader sustainability strategy by demonstrating that environmental responsibility extended beyond major projects into routine operational decisions—what Shamir (2008) described as the shift from extraordinary sustainability gestures toward normalised sustainability governance.

At first glance, the proposal appeared to align perfectly with Greenfield University's sustainability aspirations. However, the discussion soon revealed that the decision was considerably more complicated than it initially appeared.

7. EARLY CONCERNS: SAFETY, COST, AND OPERATIONAL RISK

The Facilities Manager was among the first to express reservations. While acknowledging the environmental benefits, he emphasised that traffic signages served a critical safety function. Their primary purpose was not environmental performance but the communication of information necessary to protect road users. He questioned whether eco-friendly materials would withstand local environmental conditions—summers exceeding 40°C and monsoon seasons bringing prolonged exposure to moisture and humidity.

The university's Safety Officer shared similar concerns. Research on the performance of road signage materials consistently showed that retroreflectivity—the optical property that makes signs visible at night and in rain—degrades at different rates depending on material composition, climate, and maintenance protocols (Hossain et al., 2022). Any reduction in visibility or reliability, regardless of environmental benefit, could compromise the safety of students and road users.

Financial considerations also emerged. Preliminary estimates suggested that eco-friendly alternatives would require a capital outlay approximately 30–45 per cent higher than conventional signages, with maintenance protocols that remained less established and less predictable. Given competing sustainability priorities, committee members questioned whether the same resources could generate greater environmental returns elsewhere.

The discussion increasingly reflected a fundamental tension in sustainability decision-making: the challenge of balancing symbolic leadership with measurable impact, a tension widely documented in the ESG literature (Porter & Kramer, 2011; Hahn et al., 2015).

As the meeting concluded, Dr. Mehta realised that the proposal had evolved into something much larger than a routine infrastructure decision. The debate was no longer only about traffic signages. It was becoming a discussion about how Greenfield University defined sustainability leadership—and whether that leadership required going beyond established compliance standards.



8. SUSTAINABILITY LEADERSHIP OR REGULATORY COMPLIANCE?

In the weeks following the committee meeting, Dr. Mehta found herself revisiting the proposal repeatedly. Greenfield University already complied with all applicable traffic signage regulations. There was no legal requirement to replace existing signages, nor had any regulatory authority recommended changes. From a compliance perspective, the university had fulfilled its obligations.

Yet sustainability leadership often involved moving beyond minimum requirements. This distinction became the central focus of Dr. Mehta's thinking. Dyllick and Hockerts (2002) drew a clear conceptual distinction between eco-efficiency—doing more with less within existing compliance frameworks—and ecological sustainability, which required reorienting decisions around longer-term environmental and social goals even in the absence of external mandates.

Historically, many of Greenfield's sustainability initiatives had emerged because leadership chose to act proactively rather than reactively. Solar panels were installed before rising energy costs made them financially attractive. Waste segregation programs were implemented before they became common practice among peer institutions. Water conservation measures were introduced long before local regulations encouraged such investments. In each instance, Greenfield had positioned itself as a leader rather than a follower.

Some committee members strongly supported this leadership philosophy. They argued that universities occupy a unique normative position within society. Beyond providing education, universities influence social norms, community expectations, and future leadership practices (Wright, 2010). Visible sustainability initiatives—even relatively modest ones—could signal the institution's commitment to environmental responsibility and inspire behavioural change among students and staff.

"Students learn not only from what we teach but also from what we choose to do."

Others remained sceptical. Several administrators questioned whether replacing already functional signages represented the most effective use of limited sustainability resources. Environmental benefits would likely be incremental rather than transformative. Alternative investments—additional solar capacity, energy-efficient lighting, or composting infrastructure—might generate more measurable environmental returns per rupee invested. This perspective aligned with the materiality principle in ESG reporting frameworks, which encourages organisations to prioritise investments with significant, measurable environmental impact (GRI, 2021; SASB, 2018).

9. THE GOVERNANCE CHALLENGE

A second layer of complexity emerged as the committee examined the spatial scope of the proposed initiative. Most members agreed that Greenfield University could reasonably make decisions regarding infrastructure located within campus boundaries. Internal roads, pedestrian pathways, parking areas, and academic zones clearly fell under university authority.

The situation became considerably less clear outside the campus gates. Many of the traffic safety concerns that had initially attracted Dr. Mehta's attention occurred on roads immediately adjoining the university. These roads experienced heavy use by students, faculty, and service providers every day. However, they remained under municipal jurisdiction.

Concerned about this ambiguity, Dr. Mehta arranged an informal discussion with a senior municipal planning officer. The conversation was inconclusive. The officer acknowledged that the university's growth had significantly altered traffic patterns on adjacent roads, but indicated that the municipality had no immediate plans for signage upgrades in the area. He was neither supportive nor dismissive of the idea of the university



contributing to infrastructure on public roads—but he was clear that any university-funded installation on municipal roads would require formal permissions and ongoing coordination. No commitment was made.

This exchange reinforced the governance complexity. Should the university invest resources in infrastructure beyond its formal area of control? If eco-friendly signages were installed on public roads, who would bear responsibility for ongoing maintenance? What would happen if municipal authorities adopted different standards or removed the signages in the future? These questions remained unanswered.

Some committee members believed that Greenfield had a moral responsibility to contribute to the safety and sustainability of areas heavily used by its community, irrespective of formal ownership. This view resonated with stakeholder theory, which argues that organisations are responsible to all parties materially affected by their operations—not merely those within formal contractual boundaries (Freeman, 1984; Mitchell et al., 1997).

Others cautioned that extending investments beyond university boundaries could create unrealistic expectations and expose the institution to future financial and legal liabilities. The governance debate reinforced the realisation that the decision sat at the intersection of sustainability, operations, safety, finance, and institutional responsibility.

10. ALTERNATIVE COURSES OF ACTION

As discussions progressed, the committee identified three realistic strategic alternatives. Dr. Mehta was aware that the choice would likely set a precedent for how sustainability considerations were integrated into future infrastructure decisions across the university.

Alternative A: Maintain Existing Signages (Status Quo)

The first option involved continuing with the existing signage system and replacing signages only when necessary to maintain compliance and safety standards. Supporters argued that this approach represented prudent resource management. Existing signages remained functional, regulatory requirements were being met, and funds could be directed toward sustainability projects with more measurable environmental benefits.

Advantages: Lowest financial commitment; proven operational reliability; minimal implementation risk; continued regulatory compliance.

Limitations: Potential signal of institutional conservatism; missed opportunity for sustainability leadership; no reduction in infrastructure lifecycle environmental impact.

Alternative B: Campus-Wide Eco-Friendly Upgrade

The second option involved replacing conventional signages with eco-friendly alternatives throughout the campus and, where feasible, along selected adjoining roads. Supporters viewed this as a visible demonstration of sustainability leadership aligned with institutional values and ESG commitments.

Advantages: Reduced environmental footprint; strong sustainability branding; enhanced institutional reputation; alignment with ESG principles.

Limitations: Higher capital expenditure; unproven durability under local conditions; uncertain long-term maintenance costs; governance complexity for off-campus locations.



Alternative C: Pilot Study and Phased Evaluation

The third option proposed implementing eco-friendly signages in selected high-traffic locations—main campus entrances, key pedestrian crossings, library access roads, and student activity zones—while monitoring performance before committing to broader adoption.

This approach reflected the evidence-based decision-making philosophy advocated by Lozano et al. (2015) in the context of campus sustainability transformations, whereby institutions gather performance data before committing to systemic change.

Advantages: Balances innovation with caution; generates local performance evidence; limits financial risk; maintains sustainability leadership narrative.

Limitations: Slower pace of change; pilot projects may lack the institutional visibility associated with system-wide initiatives.

11. PREPARING THE RECOMMENDATION

As the date of the strategic planning meeting approached, Dr. Mehta understood that senior leadership expected a clear recommendation. The Vice Chancellor had specifically requested guidance on how sustainability considerations should be integrated into future infrastructure investments, and the committee's recommendation was expected to serve as a policy precedent.

Dr. Mehta reviewed committee reports, maintenance records, sustainability documents, budget estimates, and relevant academic literature. She examined lifecycle cost models for eco-friendly versus conventional signage materials. She consulted the university's legal advisors regarding governance responsibilities for adjoining roads. She discussed durability concerns with the Facilities Manager and reviewed vendor technical specifications.

Each alternative appeared reasonable. Maintaining existing signages represented a financially conservative choice. A campus-wide upgrade demonstrated leadership and alignment with institutional values. A phased pilot balanced innovation with evidence-based decision-making. The difficulty was that no alternative offered a perfect solution. Every option required trade-offs across environmental, financial, safety, and governance dimensions.

Dr. Mehta returned, once again, to the question that had occupied her since that morning walk.

12. DR. SELINA MEHTA'S DILEMMA

The evening before the strategic planning meeting, Dr. Mehta sat in her office reviewing the final presentation. Outside her window, students crossed campus pathways. Vehicles moved steadily through the university gates. Traffic signages—ordinary, familiar, and often overlooked—continued performing their intended function.

Yet the decision before her was not really about signages.

It was about the meaning of sustainability leadership.

Greenfield University complied with all existing requirements. No regulation demanded additional investment. No immediate safety crisis required urgent action. At the same time, universities increasingly faced expectations to demonstrate environmental responsibility through both symbolic and practical actions—an imperative reinforced by global sustainability frameworks, accreditation bodies, and student communities (Leal Filho et al., 2019; GRI, 2021).



The proposed eco-friendly signages represented an opportunity to translate sustainability commitments into visible operational practice. Doing so would require additional expenditure, acceptance of uncertainty, and willingness to operate beyond established standards. It would also require clarity on governance boundaries—a question that the inconclusive municipal meeting had left unresolved.

As she finalised her recommendation, Dr. Mehta reflected on the question that had accompanied her since that morning walk several weeks earlier.

"Should Greenfield University limit itself to regulatory compliance and direct sustainability resources toward other initiatives with more measurable returns—or should it embrace eco-friendly traffic signages as a visible expression of sustainability leadership, accepting the financial, operational, and governance uncertainties that this entailed?"

The answer would shape not only the future of traffic infrastructure at Greenfield University, but also the institution's broader approach to sustainability decision-making for years to come.



EXHIBITS

Exhibit 1: Greenfield University — Sustainability Initiatives (As of Case Date)

Initiative	Status	Year Implemented	Estimated Impact
Rooftop Solar Energy	Implemented	2017	~30% electricity offset
Rainwater Harvesting	Implemented	2018	Reduced municipal consumption
Waste Segregation Program	Implemented	2019	Diversion of organic waste
Green Landscaping	Implemented	2020	Urban heat island reduction
Eco-Friendly Traffic Signages	Under Consideration	—	Pending evaluation

Exhibit 2: Conventional vs. Eco-Friendly Signage — Comparative Analysis

Evaluation Criteria	Conventional Signage	Eco-Friendly Signage
Initial Capital Cost	Lower (baseline)	30–45% higher than conventional
Materials	Metal sheets, chemical-based coatings	Recycled substrates, low-VOC coatings
Environmental Footprint	Higher lifecycle impact	Lower lifecycle impact
Durability (Indian Climate)	3–5 years; well-documented	Unverified locally; vendor claims positive
Regulatory Compliance	Yes (Motor Vehicles Act / BIS)	Yes (if properly specified)
Visibility / Safety	Proven retroreflectivity	Enhanced tech; requires field validation
ESG / Brand Alignment	Moderate	High
Maintenance Predictability	High — established protocols	Moderate — limited local experience



Exhibit 3: Strategic Alternatives Assessment Matrix

Alternative	Financial Risk	Environmental Benefit	Safety Risk	Sustainability Leadership
A: Maintain Existing Signages	Low	Low	Minimal	Low
B: Campus-Wide Eco-Friendly Upgrade	High	High	Moderate	High
C: Pilot and Phased Evaluation	Moderate	Moderate	Low	Moderate-High

Exhibit 4: Triple Bottom Line (TBL) Decision Framework Applied

TBL Dimension	Alt A: Status Quo	Alt B: Full Upgrade	Alt C: Pilot
Planet	No change to environmental footprint	Significant reduction in lifecycle impact	Partial reduction; scalable if successful
People	Safety maintained; no signage improvement	Enhanced visibility; community benefit	Improved safety in priority zones
Profit	Lowest cost; lowest sustainability branding value	Highest cost; strongest branding and accreditation value	Moderate cost; generates data for future ROI decisions

Source: Adapted from Elkington (1997). *Cannibals with Forks: The Triple Bottom Line of 21st Century Business*.



REFERENCES

All references follow APA 7th edition format, consistent with Emerald Publishing guidelines.

- Bansal, P. (2002). The corporate challenges of sustainable development. *Academy of Management Perspectives*, 16(2), 122–131. <https://doi.org/10.5465/ame.2002.7173572>
- Baumgartner, R. J., & Rauter, R. (2016). Strategic perspectives of corporate sustainability management to develop a sustainable organization. *Journal of Cleaner Production*, 140, 81–92. <https://doi.org/10.1016/j.jclepro.2016.04.146>
- Disterheft, A., Ferreira da Silva Caeiro, S. S., Ramos, M. R., & de Miranda Azeiteiro, U. M. (2012). Environmental Management Systems (EMS) implementation processes and practices in European higher education institutions. *Journal of Cleaner Production*, 31, 80–90. <https://doi.org/10.1016/j.jclepro.2012.02.034>
- Dyllick, T., & Hockerts, K. (2002). Beyond the business case for corporate sustainability. *Business Strategy and the Environment*, 11(2), 130–141. <https://doi.org/10.1002/bse.323>
- Elkington, J. (1997). *Cannibals with forks: The triple bottom line of 21st century business*. Capstone Publishing.
- Freeman, R. E. (1984). *Strategic management: A stakeholder approach*. Pitman.
- Global Reporting Initiative. (2021). *GRI Universal Standards*. GRI. <https://www.globalreporting.org/standards/>
- Government of India. (1988). *The Motor Vehicles Act, 1988 (No. 59 of 1988)*. Ministry of Law and Justice. <https://legislative.dept.gov.in/sites/default/files/A1988-59.pdf>
- Hahn, T., Pinkse, J., Preuss, L., & Figge, F. (2015). Tensions in corporate sustainability: Towards an integrative framework. *Journal of Business Ethics*, 127(2), 297–316. <https://doi.org/10.1007/s10551-014-2047-5>
- Hossain, M., Tasnim, M., & Ahmed, K. (2022). An analysis of the factors influencing the retroreflectivity performance of in-service road traffic signs. *Applied Sciences*, 12(5), 2413. <https://doi.org/10.3390/app12052413>
- KPMG. (2022). *KPMG survey of sustainability reporting 2022*. KPMG International. <https://kpmg.com/xx/en/home/insights/2022/09/survey-of-sustainability-reporting.html>
- Leal Filho, W., Azeiteiro, U. M., Alves, F., & Caeiro, S. (Eds.). (2019). *Universities and sustainability: Global sustainability*. Springer. <https://doi.org/10.1007/978-3-030-11352-0>
- Lozano, R., Ceulemans, K., Alonso-Almeida, M., Huisingh, D., Lozano, F. J., Waas, T., Lambrechts, W., Lukman, R., & Hugé, J. (2015). A review of commitment and implementation of sustainable development in higher education. *Journal of Cleaner Production*, 108, 1–18. <https://doi.org/10.1016/j.jclepro.2014.09.048>
- McDonough, W., & Braungart, M. (2002). *Cradle to cradle: Remaking the way we make things*. North Point Press.
- Mitchell, R. K., Agle, B. R., & Wood, D. J. (1997). Toward a theory of stakeholder identification and salience. *Academy of Management Review*, 22(4), 853–886. <https://doi.org/10.5465/amr.1997.9711022105>
- Porter, M. E., & Kramer, M. R. (2011). Creating shared value. *Harvard Business Review*, 89(1–2), 62–77. <https://hbr.org/2011/01/the-big-idea-creating-shared-value>
- Sandru, C., Voiculescu, C., & Baicusi, R. (2019). Sustainable road design: Promoting recycling and non-conventional materials. *Sustainability*, 11(21), 6106. <https://doi.org/10.3390/su11216106>



- Sustainability Accounting Standards Board. (2018). SASB standards overview. SASB.
<https://www.sasb.org/standards/>
- Shamir, R. (2008). The age of responsabilization: On market-embedded morality. *Economy and Society*, 37(1), 1–19. <https://doi.org/10.1080/03085140701760833>
- United Nations. (2015). Transforming our world: The 2030 Agenda for Sustainable Development (A/RES/70/1). United Nations. <https://sdgs.un.org/2030agenda>
- United Nations Environment Programme. (2017). Global review of sustainable public procurement 2017. UNEP. <https://www.oneplanetnetwork.org/resource/global-review-sustainable-public-procurement-2017>
- Wright, T. (2010). University presidents' conceptualizations of sustainability in higher education. *International Journal of Sustainability in Higher Education*, 11(1), 61–73.
<https://doi.org/10.1108/14676371011010057>
- Zito, P., & Salvo, G. (2011). Toward an urban transport sustainability index: An European comparison. *European Transport Research Review*, 3(4), 179–195. <https://doi.org/10.1007/s12544-011-0059-0>