

THE EFFECTIVENESS OF IMPLEMENTING SUSTAINABLE DEVELOPMENT EVENTS IN PROMOTING ENVIRONMENTALLY FRIENDLY BEHAVIOR CHANGE: A QUANTITATIVE DESCRIPTIVE SYNTHESIS OF INTERNATIONAL CASE STUDIES

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Abstract

This study examines the effectiveness of Sustainable Development Events (SDEs) in promoting Pro-Environmental Behavior Change (PEBC) through a quantitative descriptive synthesis of several international case studies, including the Toronto International Film Festival (TIFF), Munich Streetlife Festival (SLF), Helsinki World Design Capital (WDC), and the Salt Lake Olympics. Using the Triple Bottom Line (TBL) framework combined with behavioral theories such as the Theory of Planned Behavior (TPB) and the Transtheoretical Model (TTM), the analysis explores how socio-cultural, environmental, and governance dimensions influence behavioral outcomes. The findings reveal that SDEs are particularly effective in reinforcing existing pro-environmental behaviors among motivated individuals, especially those in the Action Stage of behavioral change. Events also contribute to long-term sustainability through soft legacy development, such as institutional policy integration and governance transformation, as demonstrated in the Helsinki WDC case. Moreover, strong socio-cultural capital generated through community pride and social engagement creates a supportive normative environment that facilitates sustainable behavior adoption. However, the study identifies an “efficacy gap,” indicating that while SDEs successfully reinforce behavior among committed participants, they are less effective at initiating behavioral change among less motivated audiences. Overall, SDE effectiveness depends on the integration of socio-cultural engagement, strategic governance legacy, and targeted communication strategies to support long-term behavioral transformation.

Keywords: *Sustainable Development Events, Pro-Environmental Behavior Change, Triple Bottom Line, Behavioral Reinforcement.*

INTRODUCTION

The global mandate for achieving Sustainable Development Goals (SDGs) necessitates a profound and widespread shift in individual consumption patterns and daily routines, collectively termed Pro-Environmental Behavior Change (PEBC) (Eun-Young Lee, n.d.). Sustainable Development Events (SDEs) also interchangeably known as green events or sustainability-focused events have emerged as critical, highly visible mechanisms designed to operationalize this transformation. SDEs are defined by their holistic integration of sustainability guidelines across all phases of planning, organization, and management. Their core purpose transcends minimizing immediate negative environmental impacts; they aim crucially to inform, educate, and motivate attendees toward adopting enduring sustainable lifestyles. The efficacy of SDEs, therefore, hinges directly on their capacity to translate temporary event participation into permanent behavioral shifts and sustained institutional reforms (Yuliani et al., 2025). The evaluation of SDE effectiveness requires a comprehensive assessment utilizing the Triple Bottom Line (TBL) framework, which demands a balanced analysis across economic, socio-cultural, and environmental dimensions. A key understanding within event research is that SDE efficacy is not achieved through “perfect sustainability,” which is acknowledged as an unrealistic goal (Negruşa et al., 2016). Instead, success is defined by demonstrating an ongoing improvement process aimed at reaching an established, desired level of sustainability. The principal challenge for SDE practitioners lies in engineering inherently temporary experiences that reliably yield durable, permanent, and sustainable outcomes. Consequently, strategic legacy planning is

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recognized as indispensable for justifying public expenditure and ensuring sustained effects long after the event concludes (June et al., 2023). Despite the widespread implementation of SDEs by DMOs and local authorities, robust, theory-driven empirical evidence detailing their specific effectiveness in promoting PEBC across diverse audience segments remains fragmented. This report addresses this critical gap by conducting a quantitative descriptive synthesis of correlational data and descriptive statistics derived from four distinct international case studies: a major cultural film festival (Transilvania International Film Festival, TIFF), a specialized green street festival (Munich Streetlife Festival, SLF), a design-focused mega-event (Helsinki World Design Capital, WDC), and a long-term sociological study of a major sports event (Salt Lake Winter Olympics). Research Objectives: 1) To systematically synthesize existing quantitative descriptive evidence concerning the TBL performance and effectiveness profile of diverse SDE typologies. 2) To analyze the psychological mechanisms, using frameworks such as the Transtheoretical Model (TTM) and the Theory of Planned Behavior (TPB), that modulate the effectiveness of SDE sustainability communication in promoting PEBC. 3) To investigate the consequential roles of time, audience heterogeneity, and the strategic deployment of institutional legacy (soft versus hard infrastructure) in guaranteeing the sustained impact and long-term resilience of PEBC frameworks.

LITERATURE REVIEW

1. Defining Event Sustainability and the Triple Bottom Line (TBL) Framework

The TBL framework serves as the theoretical and practical foundation for sustainability measurement in the event sector. It requires a balanced evaluation of economic, socio-cultural, and environmental impacts. Economic impacts typically involve assessing the capacity to attract investments, generate additional revenues for local government, and create employment opportunities (Purnama, 2024). Socio-cultural impacts often focus on the building of social capital, fostering community development, enhancing residents' quality of life, and cultivating community pride. Environmental impacts are measured via methods such as ecological footprint analysis, carbon calculations, and assessing the efficiency of litter reduction and waste management measures (Ismail et al., 2025).

1.1. Measuring Economic, Socio-Cultural, and Environmental Impact Perceptions: The TIFF Case

Resident perceptions are fundamental to the social pillar of event sustainability, as local support and positive attitudes are prerequisites for long-term development.² The Transilvania International Film Festival (TIFF) case provides quantitative baseline data on how a cultural SDE is judged by its local resident participants (Grad-Rusu, 2019). When comparing the synthetic mean scores for each TBL dimension, the analysis revealed that Socio-Cultural Sustainability achieved the highest score (Mean 4.39 on a 5-point Likert scale). This quantified preference highlights the event's strength in developing cultural life, facilitating educational and cultural enrichment, and providing opportunities for free time and social interaction. The other dimensions followed, with Environmental at a mean of 3.83 and Economic at a mean of 3.68. The empirical dominance of the socio-cultural pillar carries significant implications for PEBC promotion. This high positive valuation of social outcomes suggests that cultural SDEs are inherently effective at generating social capital and collective solidarity. This creates a receptive normative environment, a powerful subjective norm in psychological models through which subsequent environmental messages can be effectively diffused (Dewi et al., 2025). By first building strong community ties, the event establishes a platform that leverages social cohesion to encourage participation in collective PEBC efforts, such as supporting public green initiatives.

2. Models of Pro-Environmental Behavior (PEB) and Sustainable Consumption

The critical transition from SDE exposure to measurable PEBC is best understood through psychological models that explain behavioral intention and action. PEB, or ecological behavior, is defined as any action that contributes positively to protecting or preserving the natural environment, contributing directly to broader sustainability goals (Jan, 2025).

2.1. The Transtheoretical Model (TTM): Audience Segmentation and Stage-Matched Interventions

The TTM describes behavioral change as a sequential and dynamic process involving five core stages: Pre-Contemplation, Contemplation, Preparation, Action, and Maintenance. This model posits that the efficacy of persuasive interventions relies critically on tailoring messages to the individual's specific stage of readiness for change, facilitating their movement toward the next stage (Hashemzadeh et al., 2019).

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The study of the Munich Streetlife Festival (SLF) provided explicit quantitative audience segmentation data based on TTM stages. The analysis determined that 38.80% of attendees were already situated in the Action Stage, indicating a high baseline of environmental commitment. Other segments included Contemplation/Preparation (15.90%) and Pre-Contemplation (12.50%). The TTM analysis confirmed that the event's communication primarily appealed to sustainability-minded visitors in the Action Stage, who subsequently reported higher learning effects (Prochaska & Prochaska, 2019). This pattern confirms the "preaching to the converted" scenario: SDE communication is highly effective at reinforcing and stabilizing existing pro-environmental behaviors, providing crucial positive social affirmation required for progressing toward the Maintenance stage. However, this success comes at the cost of largely failing at the difficult task of initiation and penetration into the indifferent or apathetic segments (Pre-Contemplation) (Bauernschmidt et al., 2023).

2.2. The Theory of Planned Behavior (TPB): Attitude, Norms, and Control as Predictors

The TPB predicts behavioral intention based on behavioral beliefs (attitude towards the action), subjective norms (perceived social pressure), and perceived behavioral control (awareness of resources and barriers) (Baker et al., 2017). Structural Equation Modelling of the Munich SLF data quantified these relationships. Internalized moral obligation (an extended TPB construct) was confirmed as a strong positive predictor of Environmental Behavior ($\beta=0.377, p<0.05$). Similarly, the motive "environmental protection/charity projects" correlated positively with learning outcomes ($\beta=0.255, p<0.05$). A contrasting finding revealed that the purely hedonic motive for attendance ("to have fun/stroll/enjoy the food") exhibited a statistically significant negative correlation with learning effects ($\beta=-0.412, p<0.1$). This indicates that seeking entertainment actively competes with and undermines the cognitive processing of sustainability messages (Simanihuruk et al., 2025).

The SLF data also revealed a crucial functional relationship regarding perceived behavioral control. While constraints (such as cost or limited knowledge) did not significantly prevent committed individuals from performing existing PEB ($\beta=-0.071, p>0.10$), the awareness of these constraints significantly increased learning effects ($\beta=0.287, p<0.01$).² This outcome demonstrates that SDEs effectively function as a solution-finding mechanism, providing motivated consumers with the practical knowledge needed to overcome known barriers, thereby increasing their perceived behavioral control.

3. Event Legacy: Transitioning Ephemeral Impact into Long-Term Sustainability

Legacy planning is universally recognized as critical for guaranteeing the long-term sustainability of SDEs, validating public investment and ensuring durable effects. Legacy is typically categorized into tangible hard legacy (e.g., permanent infrastructure) and intangible soft legacy (e.g., policy, institutional capacity, and knowledge networks).

3.1. Helsinki WDC Model: Soft Legacy Efficacy and Institutional PEBC

The Helsinki 2012 World Design Capital (WDC) adopted a strategy explicitly prioritizing *soft legacy* through its Design Driven City (DDC) initiative, aiming for profound institutionalization. The core goal was to embed "design thinking" user-centricity and co-design principles into routine municipal operations, which successfully led to the creation of the permanent Chief Design Officer (CDO) role (Dagois et al., 2017). This soft legacy approach represents the most potent mechanism for sustained PEBC promotion. By fundamentally altering the city's operational structure integrating design thinking into all public service development the event ensures that environmentally conscious and efficient policies are systematically applied long after the temporary event structure has dissolved. In this model, the SDE functions predominantly as a political lever for permanent administrative reform (Liu, 2018).

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METHOD

1. Justification of Quantitative Descriptive Approach

The methodology employed in this expert report is a Quantitative Descriptive Synthesis. This approach is necessitated by the objective to systematically aggregate, compare, and interpret the diverse quantitative outputs including descriptive statistics, correlation data, and standardized regression coefficients derived from multiple distinct primary research studies. By focusing strictly on empirically measured outcomes and relationships, this methodology provides a robust, generalizable perspective on SDE impacts on PEBC, transcending the limitations of individual case studies.

2. Data Aggregation and Case Selection: Towards a Cross-Sectional and Longitudinal View

Four SDE cases were selected to ensure diversity in event type, geographic setting, and available quantitative data richness related to sustainability metrics and behavioral outcomes:

- TIFF (Cultural Event): Used for baseline TBL perception scores and measures of community support.
- Munich SLF (Green Street Festival): Provides crucial quantitative evidence on psychological mechanisms (TTM/TPB) and communicative efficacy for PEBC.
- Helsinki WDC (Mega-Event, Design Focus): Offers descriptive data on soft legacy outcomes and the institutionalization of sustainable principles.
- Salt Lake Olympics (Mega-Event, Longitudinal Focus): Supplies long-term quantitative sociological data (OLS regression coefficients) necessary to test the temporal resilience of social perceptions.

3. Metrics and Operationalization of Effectiveness Variables

Effectiveness variables for this synthesis were operationalized by abstracting summary indices and model coefficients from the original research. PEBC promotion is primarily measured by: (a) self-reported learning effects, (b) self-reported environmental behaviors, and (c) the quantified influence of TTM stage membership on these outcomes.² Table 1 details the core quantitative metrics utilized.

Table 1: Operationalization of Key Effectiveness Variables (Metrics for Synthesis)

Effectiveness Dimension	Operational Variable	Measurement Scale/Type	Source/Case Study	Significance/Rationale
Socio-Cultural Impact	Resident Perceptions Mean Score	5-point Likert Scale (Synthetic Variable Median)	TIFF ²	Baseline measure of community support and social capital generation.
Behavioral Learning	Learning Effects (Eco)	Latent Variable (SEM, β coefficient)	Munich SLF ²	Direct measure of communicative efficacy of the SDE program.
Behavioral Predictors	Moral Obligation, Constraints, Motives	Latent Variable (SEM, β coefficient)	Munich SLF ²	Determines psychological drivers and barriers to PEBC.
Institutional Legacy	Policy/Governance Implementation	Qualitative (Soft Legacy Outcomes)	Helsinki WDC ²	Measures long-term structural changes supporting PEBC

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				durability.
Social Resilience (Longitudinal)	Scandal Recovery Perception	OLS Regression (Time Factor β coefficient)	Salt Lake Olympics	Assesses the long-term emotional sustainability of the event.

4. Analytical Strategy: Synthesis of Descriptive Statistics and Segmentation Analysis

The analytical strategy centers on synthesizing the quantitative output: Descriptive Performance Metrics (Table 2) are utilized to compare TBL outcomes across the event types, while Behavioral Predictive Models (Table 3) generalize the TTM and TPB mechanisms for promoting PEBC. This comparative framework facilitates a critical examination of how different SDE typologies prioritize and succeed in achieving diverse components of sustainable effectiveness.

RESULTS AND DISCUSSION

1. Effectiveness through Socio-Cultural Uplift and Community Pride (TIFF and Helsinki WDC Case Insights)

SDE effectiveness is established fundamentally by maximizing socio-cultural benefits, thereby creating a robust foundation of communal goodwill that underpins sustainability efforts (Van der Waltd, 2024). The TIFF case provided strong empirical evidence for the dominance of the socio-cultural pillar (Mean 4.39).² This outcome highlights the intrinsic capacity of cultural SDEs to foster strong social ties, develop cultural life, and increase residents' educational and cultural levels.² This quantifiable social capital dividend is instrumental for PEBC because it establishes a supportive normative environment, which is a key psychological predictor of behavioral adoption under the TPB framework. The Helsinki WDC case study illustrates how this social effectiveness can be strategically converted into permanent, systemic institutional capacity. The city deliberately prioritized the creation of *soft legacy* through the DDC initiative, focusing intensely on institutionalization of design thinking (user-centricity and co-design) (Liu, 2018). This strategic focus on process and governance culminated in the establishment of the permanent Chief Design Officer (CDO) role, a mechanism designed to integrate environmentally and socially conscious principles into public service development indefinitely. This soft legacy approach represents the most enduring tier of SDE effectiveness in promoting PEBC, as the event successfully transitions its function to a political catalyst for permanent administrative change.

Table 2: Comparative Descriptive Metrics of Event Effectiveness by TBL Pillar

Event Case Study	Primary Focus/Type	Socio-Cultural Mean Score (1-5)	Environmental Impact Score (1-5)	Key PEBC Mechanism	Legacy Prioritized Type
TIFF ²	Cultural Event	High (4.39 - Community Pride)	Positive (3.83, perceived built environment improvement)	Attitude reinforcement via content specificity.	Soft (Cultural infrastructure, social ties)
Munich SLF ²	Green/Street Festival	N/A	Variable (Learning Effects Measured)	Targeted reinforcement of Action-Stage visitors (39%).	Communication/Educational
Helsinki	Design	High	Indirect	Institutionalizati	Soft

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WDC ²	Capital/Mega-Event	(Policy/Governance Change)	(Embedding Design Thinking)	on of user-centric city policies (CDO).	(Governance/Policy)
Salt Lake Olympics	Mega-Event (Social Legacy)	Mixed (Initially Negative, Recovered by 2007)	Positive (Green Games commitment, environmental offsets)	Time-driven healing and economic/hard legacy persistence.	Hard & Environmental

2. Direct Behavioral Influence: Learning Effects and Motivational Differentiation (Munich Streetlife Festival Analysis)

The Munich SLF case provides the foundational quantitative evidence on the SDE's efficacy in driving individual learning and behavior through its educational program.

2.1. Analyzing the Correlational Landscape: Motivation, Constraints, and Learning Outcomes

Analysis of the SLF data confirms that the cognitive processing of sustainability information during SDEs is strongly mediated by the participant's initial motivational state (Arsyianti et al., 2019). The statistically significant negative correlation observed between the purely hedonic motive ("fun/stroll/enjoy food" at $\beta=-0.412$) and learning effectiveness ($\beta=-0.412, p<0.1$) demonstrates that broad-appeal SDEs must recognize that the pursuit of entertainment actively interferes with the retention of environmental messages. Furthermore, the simultaneous existence of a negative, non-significant correlation between constraints and overt PEB ($\beta=-0.071$) alongside a positive, significant correlation between awareness of constraints and learning effects ($\beta=0.287, p<0.01$) highlights a crucial functional success. This demonstrates that SDEs are highly effective as solution exposure platforms for motivated consumers. By providing knowledge, the event reduces perceived behavioral control barriers (e.g., lack of information), thereby enabling committed individuals to transition into action, rather than serving merely as a tool for initial awareness.

2.2. The "Preaching to the Converted" Scenario: Targeting and Reinforcing Action-Stage Behavior

The dominant clustering of SLF attendees in the TTM Action Stage (39%) determines that the primary and most effective function of the event is behavioral reinforcement.² While SDEs struggle to initiate change in Pre-Contemplators, they excel at stabilizing behavior in the Action Stage. Transitioning from Action to Maintenance requires consistent social support and positive validation, which SDEs effectively provide, validating existing PEB choices and promoting long-term persistence.² To overcome the observed Efficacy Gap for Pre-Contemplators, communication strategies must shift toward integrated, emotional, and hedonic programming that embeds sustainable choices within the entertainment experience, aligning with TTM intervention theory (Mare, 2025).

Table 3: Summary of Predictive Relationships in Behavior Change Models (Munich SLF Synthesis)

Predictor Variable (TTM/TPB/Motivation)	Dependent Variable (PEB/Learning Effect)	Observed Correlation (Direction/Significance)	Theoretical Implication
Motive: Environmental Protection	Learning Effects (Eco)	Positive, Significant ($\beta=0.255, p<0.05$)	Rational motivation aligns with communicative effectiveness (H1 supported).
Motive: Fun/Stroll/Enjoy Food	Learning Effects (Eco)	Negative, Significant ($\beta=-0.412, p<0.1$)	Hedonic motives actively distract from sustainability messages

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			(H2 supported).
Moral Obligation (TPB Norm)	Environmental Behavior (PEB)	Positive, Significant ($\beta=0.377, p<0.05$)	Internalized values are the strongest direct driver of expressed PEB (H6 supported).
Constraints (Price/Knowledge)	Environmental Behavior (PEB)	Negative, Non-Significant ($\beta=-0.071, p>0.10$)	Constraints do not prevent current PEB in highly motivated segments (H4 rejected).
Constraints (Price/Knowledge)	Learning Effects (Eco)	Positive, Significant ($\beta=0.287, p<0.01$)	Information seeking is maximized by awareness of barriers (H3 supported).
Belonging to TTM Action Stage	Learning Effects (Eco)	High Positive Correlation ($\beta=0.352$)	Confirms the "Preaching to the Converted" reinforcement effect (H9 supported).

3. The Durability of Effectiveness: Longitudinal Perceptions and Resilience

The Salt Lake Olympics case provides a critical longitudinal study of event sustainability, testing the resilience of social legacy against a catastrophic ethical failure (the bid scandal).

3.1. Fading Effects of Negative Externalities (Salt Lake Olympics Scandal)

The bid scandal represented a severe failure of social sustainability, profoundly impacting governance ethics. Longitudinal tracking of resident perceptions of the state's recovery demonstrated that time is a significant predictor of perceived social resilience. Residents generally felt the state had not recovered in the immediate years following the scandal (up until 2003); however, this perception shifted significantly positive by the 2007 survey wave (all $p<0.001$). This outcome illustrates that a successful, sustained legacy in the economic and environmental pillars (e.g., enduring infrastructure, tourism growth, documented environmental offsets) can effectively mitigate and overwrite a catastrophic initial failure in the social/ethical pillar over time. Consequently, the event's overall sustainable legacy is defined by the long-term persistence of its benefits rather than the ethics of its foundation (Tölkes & Butzmann, 2018).

3.2. The Interplay of Event Legacy Perception and Community Desirability

The Salt Lake study revealed a complex sociological dynamic: a stronger, more positive perception of the overall Olympic Legacy (i.e., improved economic and recreational outcomes) correlated negatively with the belief that the state had recovered from the scandal. This statistical contradiction suggests that the most ardent supporters and direct beneficiaries of the event maintain the longest-term, critical awareness of the ethical costs involved. They recognize that the event's success occurred *despite* the moral failure, implying that the ethical shadow persists longest among the segment most invested in the event's realized benefits.

CONCLUSION

1. Synthesis of Findings and Theoretical Contribution to SDE Effectiveness

The quantitative descriptive synthesis demonstrates that SDE effectiveness in promoting PEBC is achieved through a multi-faceted and often indirect process. SDEs primarily succeed by: (1) Reinforcing existing PEB in motivated audiences (TTM Action Stage efficacy); (2) Institutionalizing sustainable governance through strategic soft legacy development (Helsinki WDC model); and (3) Leveraging a high baseline of socio-cultural capital (TIFF model) to create a receptive normative environment. Time is confirmed as a potent non-psychological factor that protects the sustainable legacy, permitting long-term benefits to mitigate the damage caused by initial

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social/ethical failures. The core finding is the quantitative identification of the Efficacy Gap: SDEs demonstrate exceptional proficiency at reinforcing behavior but struggle demonstrably to initiate change, necessitating a re-evaluation of communication strategies tailored for heterogeneous audiences.

2. Recommendations for Policy and Practice

Based on the quantitative findings, the following recommendations are critical for maximizing SDE effectiveness in promoting PEBC:

- a. **Mandate Stage-Matched Communication:** Event organizers must adopt stage-matched interventions. This involves utilizing integrated, emotional, and hedonic appeals to engage TTM Pre-Contemplators (whose motive is "fun/stroll") and employing highly rational, solution-oriented messaging to reinforce Action-Stage participants by reducing perceived constraint barriers.
- b. **Prioritize Institutional Soft Legacy:** Public funding for major SDEs should be contingent upon the establishment of permanent post-event governance structures dedicated to sustainability and design. This ensures that the event acts as a temporary catalyst for permanent systemic change in urban policy, guaranteeing sustained PEBC frameworks beyond the event's temporal limit.
- c. **Implement Longitudinal Tracking and Resilience Measurement:** Policy evaluation frameworks must incorporate long-term resident perception tracking (over 5–10 years). This is essential for accurately measuring the social resilience and durability of the sustainable legacy, acknowledging that the full value of an SDE is realized only when enduring economic and environmental benefits are quantified against and demonstrate mitigation of initial social or ethical costs.

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