Indonesian Journal of Law and Economics Review

Vol. 21 No. 4 (2026): November
DOI: 10.21070/ijler.v21i4.1660



ISSN 2598-9928 (online), https://ijler.umsida.ac.id, published by Universitas Muhammadiyah Sidoarjo
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Indonesian Journal of Law and Economics Review

Vol. 21 No. 4 (2026): November
DOI: 10.21070/ijler.v21i4.1660

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Indonesian Journal of Law and Economics Review

Vol. 21 No. 4 (2026): November
DOI: 10.21070/ijler.v21i4.1660

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Indonesian Journal of Law and Economics Review

Vol. 21 No. 4 (2026): November
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Indonesian Journal of Law and Economics Review

Vol. 21 No. 4 (2026): November
DOI: 10.21070/ijler.v21i4.1660

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Indonesian Journal of Law and Economics Review

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DOI: 10.21070/ijler.v21i4.1660

Reducing the Effect of the Seven Green Wastes Through Green Target Costing for Promoting Sustainability

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Abstract

General Background Proactive environmental cost management during early product design is crucial for curtailing manufacturing waste and ecological degradation. **Specific Background** In Iraq's manufacturing sector, the Seven Green Wastes (SGW) remain significant environmental burdens rarely addressed in pre-production accounting. **Knowledge Gap** Empirical evidence linking Green Target Costing (GTC) to specific waste reduction and quantifiable sustainability performance in Iraqi textile firms remains acutely limited. **Aims** This study investigates GTC's capability to eliminate SGW during the design stage and its subsequent impact on sustainable performance. **Results** Utilizing PLS-SEM on survey data from 46 managers, the analysis confirmed GTC explains 57.4% of the variance in SGW elimination, which in turn drives 40.8% of the variance in achieving sustainable corporate outcomes. **Novelty** This research demonstrates that converting qualitative environmental compliance into design-stagefinancial parameters transforms ecological side-effects into controllable, eliminableoperationallosses.**Implications**Manufacturingmanagersmustembedenvironmentalcost metrics into initial target costing phases to systematically internalize waste reduction, securing both operational cost savings and long-term sustainability.

Highlights:

- Integrating environmental parameters during early product design transforms ecological degradation into controllable, quantifiable production losses.
- Applying proactive financial strategies at the design stage accounts for over half the variance in eliminating operational manufacturing waste.
- Systematically curtailing energy, water, and material losses directly drives robust improvements in overall corporate sustainability performance.

Keywords: Green Target Costing, Seven Green Wastes, Sustainable Performance, Environmental Accounting, PLS-SEM

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Indonesian Journal of Law and Economics Review

Vol. 21 No. 4 (2026): November
DOI: 10.21070/ijler.v21i4.1660

Published date: 2026-11-09

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DOI: 10.21070/ijler.v21i4.1660

I. Introduction

According to the National Strategy for the Protection and Improvement of the Environment in Iraq (2024-2030), it addresses pressing issues such as unsustainable resource use as a factor that contributes to environmental degradation. In today's industrial and development environment in Iraq, there is an urgent need to adopt new accounting techniques to improve sustainability. Based on the argument that demonstrated that most of a product's eventual cost is locked in early, when teams choose materials, architecture, quality targets, and manufacturing assumptions. One influential review puts the share at over 70% of life-cycle cost committed during early design, while another states that 80% of product cost is committed during the design step [1,2]. More recent work reaches the same practical conclusion, showing that decisions made in design significantly shape development, manufacturing, usage, and even after-sales costs [3]. That is why early design is treated as the best moment to influence cost, reduce later changes, and improve production time [1,2].

Hence, avoiding the SGW needs to start in the design stage, because early design decisions shape the product's environmental impact across its whole life cycle [4,5]. The SGW are typically framed as energy, water, materials, garbage, transportation, emissions, and biodiversity, and each one can be identified, measured, and reduced before a product is finalized [6]. In practice, considering these wastes at the design stage means choosing materials carefully, minimizing unnecessary resource use, designing for reuse or disassembly, and checking impacts with life cycle assessment rather than focusing on one issue in isolation [7,8]. Studies on green building design reach the same conclusion: poor choices before design, weak site assessment, design changes, and limited designer experience create waste that harms economic and environmental performance [9].

Green target costing combines cost reduction, environmental dimensions, and quality, and it stands out in the early stages of product design and pricing for environmental improvements. This makes it an important source for creating or enhancing sustainability and competitive advantage by reducing environmental and economic costs. However, Hraiga et al. [10] recognize that the GTC concept in the reality of the Iraqi industry is in its early stages, and address that adopting and integrating the GTC instrument in Iraqi national factories supports environmentally friendly national products and creates sustainability for them, yet its stated aims are to improve resource-use efficiency, reduce waste, and support environmentally friendly product design. The SGW are best operationalized as transportation, inventory, motion, waiting, overproduction, over-processing, and defects, then translated into energy, material, emissions, and disposal burdens through green value-stream logic [11–13].

Green manufacturing is consistently framed as reducing adverse environmental effects through waste reduction, recycling, and better natural-resource use, and several accounting studies argue that conventional costing misses these externalities and therefore understates the real cost of production [14–16]. Iraqi industrial sector includes apparel and textile production manufacturing firms that are highly exposed to material loss, transport, rework, waiting, and inventory waste, and the literature already shows that green production planning and waste conversion can cut both cost and environmental burden in apparel and textile-like settings [17,18]. Across the broader corpus, the central empirical claim is consistent: integrating GTC with environmental accounting improves resource efficiency and supports sustainability-oriented cost reduction in manufacturing, including Iraqi firms [10,19,20]. Within this context, an Iraqi apparel and textile manufacturing firm is likely to experience the SGW in both operational and environmental forms, yet these losses are rarely addressed in an integrated cost system.

This is important for the current model because GTC alone doesn't enhance sustainability in theory; it actually boosts sustainability when it influences design decisions, material selection, emissions, and resource use during production [10,21,22]. The target costing approach promotes sustainability in environmental, social, and human aspects by lowering production costs and minimizing harmful impacts. [19]. This study aims to address the role of GTC in reducing the effect of the SGW and reducing the target-cost gap while promoting sustainability in Iraqi apparel and textile manufacturing firms.

II. Literature Review and Hypothesis Development

Green target costing is increasingly described as more than a pricing technique; it is a pre-production control system that embeds environmental considerations into cost decisions before waste becomes locked into the process [10,21,22]. In that sense, it fits manufacturing settings where rising energy use, material losses, and environmental burdens are already pressing operational problems, especially in Iraqi industry, where adoption is still early, and field evidence remains limited [10]. Once environmental impacts are translated into cost parameters, firms are better able to treat wasted energy, water, materials, transport, emissions, and disposal not as side effects, but as controllable production losses [10,22]. Where waste reduction is one of the clearest areas where green affects [23]. Green management accounting makes the SGW visible across time, energy, material, and transportation flows, which matters because managers usually improve what they can first identify and quantify [11,13,24]. Case evidence shows that this visibility can translate into real reductions: one study reported energy falling from 1503 to 1089 kWh, water from 3843.5 to 3527.5 liters, material waste from 4571.5 to 3407 kg, transport from 95 to 80 km, and emissions from 21.81 to 12.38 kg after green productivity improvements [11]. The green value stream process provides a practical approach to quickly identify, measure, and minimize the SGW to realize immediate cost savings [12]. Green target costing is designed to push firms toward resource efficiency, waste reduction, and environmentally friendly product design [10,21,25].

The application of GTC in Iraq is in its early stages but shows significant potential. One Iraqi study applied the technique to the General Company for Fertilizer Industry in Basra, finding that it improves the efficiency of resource use, reduces waste, and designs environmentally friendly products, supporting sustainable competitive advantage [10]. Another Iraqi application

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DOI: 10.21070/ijler.v21i4.1660

in the Al-Zawraa State Company for Electrical and Electronic Industries demonstrated the possibility of reducing production costs by applying green target costs to solar panel products to maintain their sustainable competitive advantages [26]. The integration of environmental accounting techniques with sustainability standards provides a robust informational foundation to support the transition toward agile manufacturing, with one Iraqi factory study indicating the possibility of reducing production costs by 22,687 IQD per ton and decreasing emissions by 37.9% [21]. However, local firms in the Kurdistan Region of Iraq face substantial barriers related to weak regulatory enforcement, limited financial capacity, and insufficient technical expertise in green accounting [27].The GTC technique is a useful tool to help determine the allowable cost of the product to be managed because customers are often unwilling to bear additional purchase costs for products [28]. In addition, fully implementing GTC decreases reliance on expensive, environmentally harmful energy sources while maintaining competitive profit margins [10]. Accordingly, this study proposes the following hypothesis.

H1: Green target costing has a significant role in reducing the effect of the seven green wastes in the Iraqi apparel and textile manufacturing firms.

Across manufacturing studies, reducing waste and pollution tends to improve sustainability performance by strengthening environmental, economic, and often social outcomes at the same time [23,29,30]. That pattern appears in several forms: zero-waste management significantly enhances sustainable performance in manufacturing firms [31], green sustainability improves economic, social, and environmental performance [30], and green supply chain practices promote environmental performance partly through waste management and green innovation [32]. Other work reaches the same conclusion from a process perspective: lean energy-saving and emission-reduction strategies improve energy efficiency and reduce waste emissions, thereby promoting manufacturing sustainability [33]. In apparel manufacturing specifically, reducing cutting waste improves cost efficiency and diverts waste from landfill into value-added use, which makes the sustainability pathway especially relevant for an Iraqi apparel and textile manufacturing firm[17].

Several studies show that green practices produce stronger performance outcomes when they operate through intermediate capabilities or operational mechanisms such as zero-waste management, green innovation, ISO 14001, or absorptive capacity [31,34,35]. That matters for the present model because GTC does not improve sustainability by itself in the abstract; it improves sustainability when it changes design choices, material use, emissions, and resource consumption inside production [10,21,22]. The target costing method supports sustainability across environmental, social, and human dimensions by reducing production costs and mitigating harmful side effects [19].

Empirical studies also suggest that integrated green interventions can yield sizable environmental gains, including reductions in carbon footprint, waste, and energy use, which supports the expectation of measurable sustainability improvement once the SGW declines [24,36].

Taken together, the literature justifies proposing that GTC will have a significant role in reducing the SGW in the selected Iraqi apparel and textile manufacturing firm, and that this reduction will improve sustainability performance. Consistent findings show that lower waste, lower emissions, better resource use, and stronger green operational practices are associated with better environmental, economic, and social performance [30,34,37]. Preventing cost disparities through these methods simultaneously reduces expenses and raises earnings, supporting both economic and sustainability development [20].

H2: Reducing the effect of the seven green wastes improves sustainability performance at the Iraqi apparel and textile manufacturing firms.

Reducing the seven green wastes through green target costing (GTC) rests on the integration of environmental concerns into the traditional target costing model, shifting cost management from a reactive accounting exercise to a proactive design-stage environmental strategy [10,22,38]. By translating qualitative environmental compliance metrics into rigorous, quantifiable cost parameters before production begins, GTC forces entities to internalize environmental investments rather than treating them as externalities [22]. This mechanism directly targets the seven green wastes—energy, water, materials, garbage, transportation, emissions, and biodiversity—because environmental design inherently aims to eliminate manufacturing waste, which is the direct source of these ecological losses [38,39]. The theoretical foundation posits that determining the optimal costs for services and products while focusing on environmental dimensions drives the use of sustainable resources, energy-efficient materials, and low-emission processes [10]. Consequently, this strict cost control creates a financial gap between actual and allowable costs that can be reinvested into environmental initiatives, embedding waste reduction into the firm's core financial structure [10,19].

The theoretical linkage between green target costing and the seven green wastes is further underpinned by the convergence of lean and green paradigms, where waste reduction techniques serve as the primary overlap between operational efficiency and environmental management [23,40]. While traditional lean manufacturing focuses on eliminating physical production waste to achieve operational gains, the green approach expands this scope to explicitly identify and measure environmental wastes such as pollution, excessive energy and material utilization, and unnecessary water consumption [39,40]. Green target costing acts as a financial mediator within this lean ecosystem, ensuring that environmental value stream mapping and green Kaizen practices are economically justified [22,38]. By combining green costing mechanisms with target costing steps, organizations develop a comprehensive approach that determines the permissible cost of products while systematically lessening the consumption of chemicals and energy [10]. This integration is theoretically sound because it aligns customer demands for environmentally friendly products with the economic unit's survival, effectively turning environmental compliance into a competitive advantage rather than a financial burden [10,38].

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DOI: 10.21070/ijler.v21i4.1660

Promoting sustainability through this waste-reduction framework relies on the theory that eliminating the seven green wastes simultaneously enhances the economic, environmental, and social pillars of the triple bottom line [23,40]. The application of target costing supports sustainability across multiple dimensions by reducing production costs and optimizing resource use, which directly mitigates the harmful side effects and environmental damage caused by industrial releases [19,21]. Theoretical models suggest that when lean and green tools are combined, they consistently increase the performance of waste minimization plans, ultimately leading to balanced performance improvements across environmental, social, and economic dimensions [23,41]. Furthermore, the integration of environmental management accounting tools like GTC enables firms to transform environmental costs from a financial burden into a strategic investment, balancing profitability with long-term ecological goals [21]. This synergy definitively challenges the prevailing myth that sustainability initiatives inherently stifle economic efficiency, asserting instead that integrating environmental cost structures is a strategic imperative for long-term competitive resilience [22].

III. Methodology

Iraqi apparel and textile manufacturing firms continuously innovate and reinvent modern production models throughout the year to meet their targets. When proposing a new model or improving an existing one, it must redesign and reevaluate target costing to achieve competitive pricing or identify cross-margin opportunities, which in turn requires considering environmental issues by reducing SGW and enhancing financial and environmental advantages. However, real production-cost data is confidential and hard to access. So, the study explores the role of GTC in reducing the SGW to enhance sustainability and support decision-making to achieve companies' targets. The descriptive analytical method was used; a quantitative, cross-sectional questionnaire survey fits this study because recent manufacturing sustainability research commonly uses structured surveys to test latent constructs such as green practices, waste reduction, and sustainable performance [42–44]. Respondents are drawn across departments to improve coverage of different production settings and sustainability practices [45–47]. The target respondents are managers who are directly involved in innovation, design, production, cost, quality, logistics, and environmental activities, since studies repeatedly select knowledgeable manufacturing personnel rather than general employees [45,48,49]. The instrument is organized into construct blocks covering GTC, the SGW, and sustainability performance, with responses captured on a five-point Likert scale, which is the most common format across these manufacturing survey studies [44–46]. A pilot test is important before the full survey because green and sustainability measurement studies emphasize the need for validated indicators and context-appropriate constructs rather than narrow, unweighted measures [47,50,51]. So, the questionnaire was distributed for the first time to run the pilot test. We received and analyzed 22 responses to assess the reliability of the measures. The scale items were sensibly investigated. The results showed satisfactory reliability for the full instrument, with Cronbach's alpha above 0.7, as shown in Table 1 below.

Table 1 Reliability analysis results (Pilot test result n = 22)

Construct	Coding	Number of Items	Cronbach's alpha
Green Target Costing	GTC	10	0.898
Seven Green Wastes	SGW	21	0.963
Sustainability Promoting	SP	12	0.943

The final survey was administered through self-completed paper forms, with follow-up contact to improve the response rate, as both contact-based and distributed questionnaire strategies are common in PLS-SEM sustainability research [47,52,53]. For analysis, PLS-SEM is appropriate because the study examines multiple latent variables and directional paths simultaneously, including possible mediation between GTC, SGW reduction, and sustainability promotion [42,53,54]. The analysis began with data screening for missing values and outliers, then assessed the measurement model through item reliability, Cronbach's alpha, convergent validity, and discriminant validity before testing path coefficients, R^2, effect sizes, and predictive relevance in the structural model [44,48,55]. This approach is well established in manufacturing sustainability studies, including work using SmartPLS to test direct, indirect, and higher-order relationships among green, circular, and sustainability constructs [43,46,56].

IV. Results

Researchers received 49 responses and deleted three due to high missing values, leaving 46 clear responses with no missing values or outliers.

A. Measurement model assessment:

To evaluate the empirical viability of the conceptual framework, the measurement model was assessed using Partial Least Squares Structural Equation Modeling (PLS-SEM). This assessment involved evaluating internal consistency reliability, indicator reliability, convergent validity, and discriminant validity across the three latent variables: GTC, SGW, and Sustainable Performance (SP).

Internal Consistency Reliability and Convergent Validity

Internal consistency reliability was evaluated using Composite Reliability (CR) and Cronbach's Alpha (CA). Concurrently, indicator reliability and convergent validity were determined via item factor loadings and the Average Variance Extracted (AVE). The complete statistical parameters for these metrics are detailed in Table 2. Both (CR) and (CA) should be greater than 0.6 and 0.7, respectively Hair et al., 2017. However, Sekaran and Bougie (2016) state that 0.6 is the minimum acceptable threshold for Cronbach's alpha.

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DOI: 10.21070/ijler.v21i4.1660

Table 2 Internal consistency and convergent validity

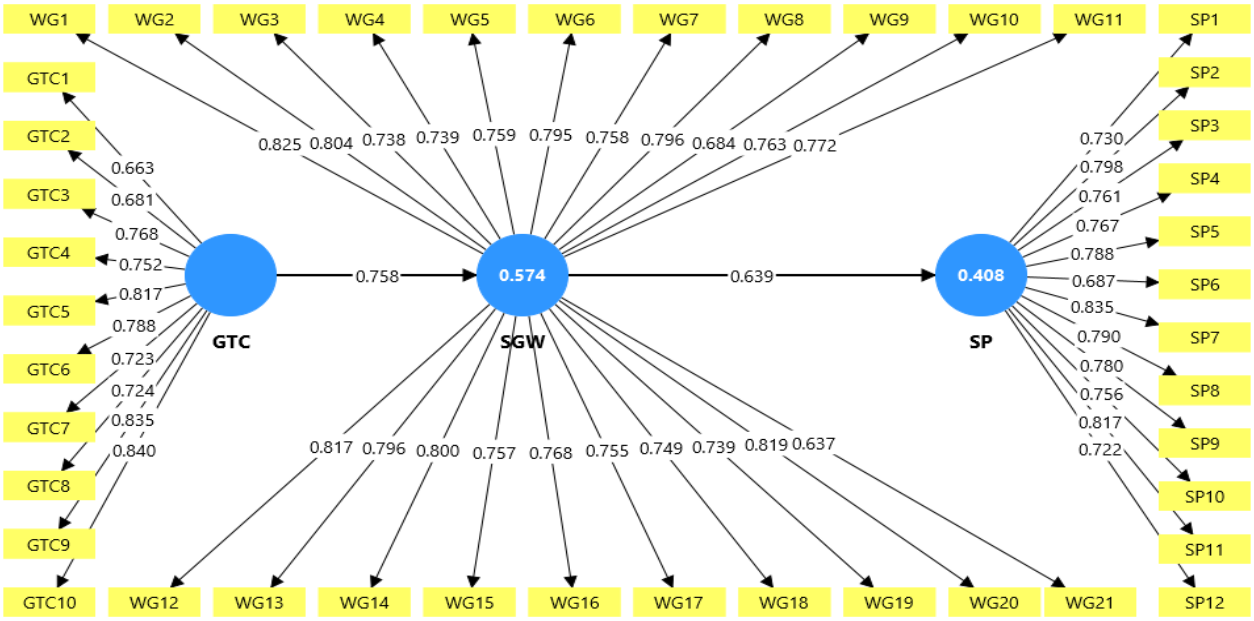
Variables	Items	Loading	CR	CA	AVE
GTC	GTC1	0.663	0.923	0.918	0.580
	GTC2	0.681			
	GTC3	0.768			
	GTC4	0.752			
	GTC5	0.817			
	GTC6	0.788			
	GTC7	0.723			
	GTC8	0.724			
	GTC9	0.835			
	GTC10	0.840			
SGW	SGW1	0.825	0.967	0.965	0.588
	SGW2	0.804			
	SGW3	0.738			
	SGW4	0.739			
	SGW5	0.759			
	SGW6	0.795			
	SGW7	0.758			
	SGW8	0.796			
	SGW9	0.684			
	SGW10	0.763			
	SGW11	0.772			
	SGW12	0.817			
	SGW13	0.796			
	SGW14	0.800			
	SGW15	0.757			
	SGW16	0.768			
	SGW17	0.755			
	SGW18	0.749			
	SGW19	0.739			
	SGW20	0.819			
	SGW21	0.637			
SP	SP1	0.730	0.940	0.937	0.593
	SP2	0.798			
	SP3	0.761			
	SP4	0.767			
	SP5	0.788			
	SP6	0.687			
	SP7	0.835			
	SP8	0.790			
	SP9	0.780			
	SP10	0.756			
	SP11	0.817			
	SP12	0.722			

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Indonesian Journal of Law and Economics Review
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DOI: 10.21070/ijler.v21i4.1660

As shown in Table 2, the measurement model demonstrates strong internal consistency. The Composite Reliability values range from 0.923 to 0.967. Similarly, Cronbach's Alpha values range from 0.918 to 0.965, exceeding the standard threshold of 0.70. Taken together, these results indicate good internal consistency across all measurement scales.

Figure 1 Outer Model



Convergent validity was successfully established based on two complementary criteria. First, standardized factor loadings for almost all reflective items exceeded the ideal threshold of 0.70 as shown in Figure 1 and Table 2. A small subset of items (GTC1, GTC2, SGW9, SGW21, and SP6) exhibited loadings between 0.637 and 0.687. These items were retained because their removal was not empirically necessary to improve construct reliability, and their values remained well above the absolute minimum loading parameter of 0.50. Second, the AVE values for all three latent constructs GTC (0.580), SGW (0.588), and SP (0.593) exceeded the mandatory threshold of 0.50. This confirms that each construct captures more than half of the variance of its underlying indicators on average.

Discriminant Validity

Discriminant validity ensures that each latent construct is empirically unique and distinct from the other variables in the structural model. To provide a rigorous assessment, discriminant validity was evaluated using two separate approaches: the traditional Fornell-Larcker criterion and the modern Heterotrait-Monotrait ratio of correlations (HTMT).

Fornell-Larcker Criterion

According to the Fornell-Larcker approach, discriminant validity is established when the square root of the Average Variance Extracted (AVE) for each respective construct exceeds its correlation coefficients with all other constructs in the model. Table 3 presents these comparative matrix elements.

Table 3 Discriminant validity (Fornell-Larcker Criteria)

Construct	GTC	SGW	SP
GTC	**0.761**		
SGW	0.758	**0.767**	
SP	0.488	0.639	**0.770**

Note: Diagonal bold values represent the square root of the Average Variance Extracted (AVE). Off-diagonal elements represent inter-construct correlations.

Heterotrait-Monotrait Ratio of Correlations (HTMT)

To supplement the Fornell-Larcker criterion, discriminant validity was further cross-examined using the more stringent HTMT approach. Methodologists suggest a conservative threshold of 0.85 or a liberal threshold of 0.90, below which discriminant validity is considered fully established between any two latent constructs. The generated HTMT correlation ratios are listed in Table 4.

Table 4 Discriminant validity (HTMT Criteria)

Construct	GTC	SGW	SP

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Vol. 21 No. 4 (2026): November
DOI: 10.21070/ijler.v21i4.1660

GTC	---	---	----
SGW	0.789	---	---
SP	0.517	0.655	---

Note: Values represent the Heterotrait-Monotrait Ratio of correlations (HTMT).

The values displayed in Table 4 reveal that all calculated HTMT ratios fall well below the conservative strict benchmark of 0.85. The maximum correlation ratio observed is between SGW and GTC (0.789), followed by SP and SGW (0.655), and SP and GTC (0.517). Because none of these ratios approach or cross the 0.85 limit, the findings in Table 4 provide robust evidence that each construct represents a completely distinct latent phenomenon.

In summary, the combined results from the indicator loadings, CA, CR, AVE, Fornell-Larcker matrix, and HTMT values show that the measurement model has high reliability and valid measurement properties, making it eligible for structural model path analysis.

B. Structural Model Assessment

Following the verification of a reliable and valid measurement model, the structural model was evaluated. The structural model analysis involves examining the predictive capabilities of the model and testing the significance of the hypothesized direct relationships using path coefficients, effect sizes (f2), and bootstrapping with 5,000 resamples.

Explanatory Power (R2)

The coefficient of determination (R2) values measure the internal model's predictive capability by indicating the proportion of variance in the endogenous constructs explained by their predictor variables. Hair et al. guide that (R2) values around 0.25, 0.50, and 0.75 can be considered weak, moderate, and substantial, respectively.

Table 5 Coefficient of Determination (R2) of Endogenous Construct

Endogenous Construct	(R^2) Value	(R^2) Adjusted	Explanatory Power
SGW	0.574	0.565	Moderate
SP	0.408	0.394	Moderate

As illustrated in Table 5, SGW (SGW) exhibits an R2 value of 0.574 (R2 adjusted = 0.565), which indicates that 57.4% of the variance in SGW elimination is explained by GTC. For Sustainable Performance (SP), the model yields an R2 value of 0.408 (R2 adjusted = 0.394), showing that 40.8% of the total variance in sustainable outcomes is driven by the structural path configuration. Both values demonstrate robust and meaningful explanatory power in a corporate sustainability context.

Assessment of Effect Size (f2)

Before examining path significance, the effect size (f2) was evaluated to determine the substantive impact of each exogenous construct on its corresponding endogenous target variable. Following Cohen's (1988) operational guidelines, f2 values of 0.02, 0.15, and 0.35 are classified as small, medium, and large effects, respectively.

Table 6 Effect size on the exogenous variable

Exogenous construct	f^2	Effect size
GTC	1.349	large
SGW	0.689	large

As reported in Table 6, both exogenous variables demonstrate exceptionally robust statistical contributions. Specifically, GTC yields an f2 value of 1.349, indicating a large effect size on SGW (SGW). Similarly, SGW (SGW) produces an f2 value of 0.689, representing a large effect size on Sustainable Performance (SP). These findings reveal that beyond being statistically significant, both GTC and SGW carry substantial practical relevance in explaining variance within the structural model.

Structural Hypothesis Testing

To test the statistical significance of the hypothesized direct paths, a PLS bootstrapping procedure with 5,000 resamples was performed. The path coefficients, t-statistics, p-values, and 95% bias-corrected confidence intervals are structured in Table 7.

Table 7 Structural Model Bootstrapping Results (Hypothesis Testing)

Hyp	Rel	Path coefficients	T statistics	P values	Confidence Interval		Results
					2.5%	97.5%	
H1	GTC -> SGW	0.758	16.284	0.000	0.676	0.858	Supported
H2	SGW -> SP	0.639	8.433	0.000	0.501	0.796	Supported

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Vol. 21 No. 4 (2026): November
DOI: 10.21070/ijler.v21i4.1660

Note: Critical t-values are > 1.96 for a two-tailed test at the 5% significance level.

The empirical results indicate that hypothesis H1, which posits that GTC positively impacts SGW (SGW), is strongly supported (beta = 0.758, t = 16.284, p < 0.001). The 95% confidence interval [0.676, 0.858] does not include zero, confirming the high stability and significance of the relationship. This highlights GTC as a powerful driver for eliminating SGW.

Similarly, hypothesis H2, which suggests that SGW directly influences Sustainable Performance (SP), is highly significant and supported (beta = 0.639, t = 8.433, p < 0.001). The 95% confidence interval [0.501, 0.796] excludes zero, showing that eliminating SGW using GTC successfully translates into real sustainability Performance.

V. Discussion and Conclusion

These results align with the broader literature because GTC is designed to move environmental concerns into the product design and cost-planning stage, where waste can be prevented before it becomes embedded in production. This logic helps explain the strong H1 coefficient: when firms use GTC, they do not merely record environmental losses after they occur, but actively reshape materials, energy use, process choices, and product specifications to reduce them at source [22,38,57]. The general lean-green literature points in the same direction, showing that waste-reduction techniques sit at the center of the overlap between lean and green systems, and that integrated monitoring tools can even double waste-reduction impact in manufacturing settings [23,58].

The size and stability of H1 also make sense when read against studies showing that modern green cost systems expose hidden non-green costs that traditional accounting usually leaves buried inside overheads [20,57]. Iraqi evidence is especially consistent here: one refinery-based study found that non-green costs reached 12.49% of total indirect costs, which means waste is not a marginal issue but a financially meaningful one once measured correctly [20]. Other Iraqi work similarly argues that GTC helps rationalize energy use, recover wasted energy, reduce harmful emissions, and create an investable gap between actual and allowable cost that can be redirected toward environmental initiatives [10]. In practical terms, your H1 result suggests that Iraqi apparel and textile manufacturing firms' managers are seeing the same thing reported elsewhere: once environmental costs are translated into operational targets, the SGW becomes more eliminable, more controllable, and harder to ignore [12,59].

H2 is also well grounded in the literature because the elimination of the SGW is not only an environmental outcome; it is a pathway to broader sustainability performance. Across manufacturing research, reducing waste, emissions, energy intensity, toxic outputs, and unnecessary transport tends to improve environmental, economic, and social performance together rather than separately [15,60]. Studies on green manufacturing describe this as a win-win pattern, where resource efficiency lowers cost while also improving reputation, compliance, and long-run competitiveness [22,60,61]. This is why the positive SGW→SP path in your model is theoretically convincing: cutting energy waste, material loss, pollution, and non-value-adding activity strengthens sustainability Performance because sustainability in factories is built through day-to-day operational discipline, not through slogans alone [15,23,62].

The Iraqi literature supports this second link quite clearly, even if it often uses different labels such as sustainable development, sustainability support, or sustainable competitive advantage. Field and applied studies in Iraq report that green manufacturing reduces costs and supports sustainable development, while target costing improves sustainability through better resource use, lower damage from harmful releases, and stronger protection of workers and external stakeholders [19,61]. Iraqi company-level evidence also shows that GTC can be applied to sustain competitive products, especially when supported by value engineering and design-stage cost reduction [63]. Related Iraqi and regional studies further show that eliminating waste, reusing products, and linking price to environmental cost all have significant positive relationships with sustainable development dimensions, which reinforces the meaning of your H2 finding [64].

Taken together, the two hypotheses tell a coherent story: GTC works first through waste elimination, and that waste elimination then carries the effect forward into sustainability Performance. This sequence matches the wider literature on green operations, green value chains, and green Kaizen, which treats cost as a driver of environmental change and continuous improvement as the mechanism that turns savings into durable sustainability gains [22,59,65]. It also fits the Iraqi context, where adoption is still described as early and uneven, but the available evidence consistently shows that when firms move beyond traditional accounting and use modern green cost techniques, they become better able to reduce waste, lower costs, and support sustainability in a measurable way [10,20,65]. In that sense, your H1 and H2 results are not isolated statistical outcomes; they are a credible empirical confirmation of what both the international and Iraqi literature have been steadily pointing toward.

VI. Limitations and Future Research Directions

Despite its robust empirical contributions, several limitations in this study provide fertile ground for future academic investigation:

- Cross-Sectional Data Constraints: This study utilized a cross-sectional research design, capturing data at a single point in time. Because technological deployments and leadership styles evolve over multi-year horizons, future studies should employ a longitudinal research approach to observe the long-term patterns and sustainable Performance outcomes of SGW.
- Geographic and Industry Specificity: The data were collected from a targeted sample of logistics and supply chain

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DOI: 10.21070/ijler.v21i4.1660

professionals within a specific geographic/market context. The generalizability of these findings across highly diverse economic regions or completely distinct asset-light service industries remains unverified. Future comparative research across developing vs. developed markets would enrich the external validity of the model.

- Unexplored Confounding Variables: The structural model successfully explained a substantial portion of the variance in sustainable performance (R2 = 0.408), yet 59.2% of the variance remains unexplained. Future research could expand the framework by incorporating potential boundary conditions, such as government regulatory pressures or green supply chain integration, as moderating or mediating variables.

References

1. Asiedu Y, Gu P. Product life cycle cost analysis: State of the art review. Int J Prod Res 1998;36:883–908. https://doi.org/http://dx.doi.org/10.1080/002075498193444.
2. Duverlie P, Castelain JM. Cost Estimation During Design Step: Parametric Method versus Case Based Reasoning Method. Int J Adv Manuf Technol 1999;15:895–906. https://doi.org/10.1007/s001700050147.
3. Relich M, Nielsen I, Gola A. Reducing the Total Product Cost at the Product Design Stage. Appl Sci 2022;12:1921. https://doi.org/10.3390/app12041921.
4. Dahmani N, Benhida K, Belhadi A, et al. Smart circular product design strategies towards eco-effective production systems: A lean eco-design industry 4.0 framework. J Clean Prod 2021;320:128847. https://doi.org/10.1016/j.jclepro.2021.128847.
5. Delaney E, Liu W, Zhu Z, et al. The investigation of environmental sustainability within product design: a critical review. Des Sci 2022;8:e15. https://doi.org/10.1017/dsj.2022.11.
6. Wills B. Green Intentions: Creating a Green Value Stream to Compete and Win. 1st Edition. 2009.
7. Chen L, Huang L, Hua J, et al. Green construction for low-carbon cities: a review. Environ Chem Lett 2023;21:1627–57. https://doi.org/10.1007/s10311-022-01544-4.
8. Pratap B, Tiwari H. The Imperative and Implementation of Eco Friendly Product Design. Int J Adv Res Sci Commun Technol 2025;5:244–52. https://doi.org/https://doi.org/10.48175/ijarsct-30528.
9. Issa UH, AbdelHaffez AG, Abdel-Hafez AA, et al. Identifying and evaluating causes of waste effect in green building projects. J Eng Appl Sci 2025;72:9. https://doi.org/10.1186/s44147-025-00580-5.
10. Hraiga RA, Hadi AN, Abbas AA. The Role of Green Target Costing in Achieving Sustainable Competitive Advantage in Economic Units. J Econ Adm Sci 2025;31. https://doi.org/https://doi.org/10.33095/a42m8y73.
11. Prayugo J, Zhong LX. Green productivity: waste reduction with green value stream mapping. A case study of leather production. Int J Prod Manag Eng 2021;9:47. https://doi.org/10.4995/ijpme.2021.12254.
12. Wills B. Green Intentions: Creating a Green Value Stream to Compete and Win. New York: Productivity Press; 2020. https://doi.org/10.4324/9780367806682.
13. Zhu X-Y, Zhang H, Jiang Z-G. Application of green-modified value stream mapping to integrate and implement lean and green practices: A case study. Int J Comput Integr Manuf 2020;33:716–31. https://doi.org/10.1080/0951192X.2019.1667028.
14. Bedekar DJS. Costing for Sustainability: Integrating Environmental Costs into Accounting. Int J Innov Res Creat Technol 2026;12:1–10. https://doi.org/https://doi.org/10.62970/IJIRCT.v12.i2.2604024.
15. Haleem A, Javaid M, Singh RP, et al. A pervasive study on Green Manufacturing towards attaining sustainability. Green Technol Sustain 2023;1:100018. https://doi.org/10.1016/j.grets.2023.100018.
16. Jones MJ. Accounting for the environment: Towards a theoretical perspective for environmental accounting and reporting. Account Forum 2010;34:123–38. https://doi.org/10.1016/j.accfor.2010.03.001.
17. Mostak S, Tanjim T, Akther M, et al. Green waste management and cost reduction strategies for cutting room waste in apparel industries. Tekst Ind 2025;73:40–9. https://doi.org/10.5937/tekstind2503040M.
18. Tsai W-H. Green Production Planning and Control for the Textile Industry by Using Mathematical Programming and Industry 4.0 Techniques. Energies 2018;11:2072. https://doi.org/10.3390/en11082072.
19. AL-Mashkoor I, AL-Maliki H. The effect of target cost in sustainability support. Edelweiss Appl Sci Technol 2024;8:7550–8. https://doi.org/10.55214/25768484.v8i6.3637.
20. Mashkoor IASA, H. Ali J, Al-Kanani MM. The Role of Green Activity-Based Costing in Achieving Sustainability Development: Evidence From Iraq. Int J Prof Bus Rev 2023;8:e01276. https://doi.org/10.26668/businessreview/2023.v8i4.1276.
21. Al-Mansouri SHMH, Al-Kawaz SMJ, Al-Mamouri JAB. The Role of An Agile Manufacturing Strategy in Managing Environmental Costs According to Sustainability Accounting Standards. Iraqi J Adm Sci 2026;22:572–90. https://doi.org/10.71207/ijas.v22i87.5840.
22. Ralfsamy A, Ruwary C, Alfarizi I, et al. Integration of Environmental, Social, and Governance (ESG) Factors into Target Costing in Lean Production Systems: A Systematic Literature Review. RIGGS J Artif Intell Digit Bus 2026;5:13690–7. https://doi.org/10.31004/riggs.v5i1.7946.
23. Fercoq A, Lamouri S, Carbone V. Lean/Green integration focused on waste reduction techniques. J Clean Prod 2016;137:567–78. https://doi.org/10.1016/j.jclepro.2016.07.107.
24. Hasibuan S, Kandasamy J, Purba HH, et al. Green Manufacturing Practices for Improving Sustainability Performance in Packaging Manufacturing MSMEs. AJARCDE Asian J Appl Res Community Dev Empower 2025;9:75–80. https://doi.org/10.29165/ajarcde.v9i2.657.
25. Idoko FA, Ezeamii GC, Ojochogwu OJ. Green chemistry in manufacturing: Innovations in reducing environmental impact. World J Adv Res Rev 2024;23:2826–41. https://doi.org/10.30574/wjarr.2024.23.3.2938.
26. Roy M, Sen P, Pal P. An integrated green management model to improve environmental performance of textile industry towards sustainability. J Clean Prod 2020;271:122656. https://doi.org/10.1016/j.jclepro.2020.122656.
27. Das AK, Hossain MdF, Khan BU, et al. Circular economy: A sustainable model for waste reduction and wealth creation in the textile supply chain. SPE Polym 2025;6:e10171. https://doi.org/10.1002/pls2.10171.
28. Chlaihawi DrMOA. Using Green Target Costing and Reverse Engineering Techniques to Reduce Costs. Int Acad J Soc

Copyright © Author(s). This is an open-access article distributed under the terms of the Creative Commons Attribution License (CC BY).

Vol. 21 No. 4 (2026): November
DOI: 10.21070/ijler.v21i4.1660
Sci 2023;10:15–24. https://doi.org/10.9756/IAJSS/V10I2/IAJSS1009.
29. Omar A, Shari A, Shah SH, et al. Green manufacturing practices and SMEs' sustainable performance: a moderated mediation mechanisms of green innovation and managerial discretion. Eur Bus Rev 2023;36:588–609. https://doi.org/10.1108/ebr-06-2023-0186.
30. Opoku RK. Championing green sustainability in manufacturing of a developing economy: implications for sustainable performance through eco-regulatory compliance. Int J Product Perform Manag 2025;74:2442–70. https://doi.org/10.1108/IJPPM-06-2024-0408.
31. AlSheyadi A, Abbas H, Baawain A, et al. Linking Zero-Waste Management and Green Innovative Supply Chains to Sustainable Performance: The Mediating Role of Green Dynamic Capabilities in Manufacturing Firms. Sustainability 2025;17:10348. https://doi.org/10.3390/su172210348.
32. Liu D, Yousaf Z, Rosak-Szyrocka J. Environmental Performance Through Green Supply Chain Management Practices, Green Innovation, and Zero Waste Management. Sustainability 2024;16. https://doi.org/10.3390/su162411173.
33. Cai W, Lai K, Liu C, et al. Promoting sustainability of manufacturing industry through the lean energy-saving and emission-reduction strategy. Sci Total Environ 2019;665:23–32. https://doi.org/10.1016/j.scitotenv.2019.02.069.
34. Javed A, Li Q, Basit A, et al. A holistic approach to greening manufacturing supply chains: integrating innovation, absorptive capacity and big data for sustainable performance. J Manuf Technol Manag 2025;36:1026–48. https://doi.org/10.1108/JMTM-10-2024-0582.
35. Oyelakin IO, Yusuf AH, Arbak S, et al. Building Resource Capabilities Through Green Servitization and ISO 14001 for Sustainable Performance: Perspectives From Manufacturing Firms. Corp Soc Responsib Environ Manag 2025;32:3770–84. https://doi.org/10.1002/csr.3150.
36. Maware C, Muvunzi R, Machingura T, et al. Examining the Progress in Additive Manufacturing in Supporting Lean, Green and Sustainable Manufacturing: A Systematic Review. Appl Sci 2024;14:6041. https://doi.org/10.3390/app14146041.
37. Niu B, Wang L. How does green manufacturing promote the recycling of renewable solid waste and carbon reduction? Resour Conserv Recycl 2024;203:107410. https://doi.org/10.1016/j.resconrec.2024.107410.
38. Abdul Ridha DA, Abdul Ridha IA, Abdul Ridha DA. Green Quality Management and Green Target Costing and Their Role in Achieving Competitive Advantage. Eximia 2024;13:799–814. https://doi.org/10.47577/eximia.v13i1.503.
39. Farrukh A, Mathrani S, Taskin N. Investigating the Theoretical Constructs of a Green Lean Six Sigma Approach towards Environmental Sustainability: A Systematic Literature Review and Future Directions. Sustainability 2020;12:8247. https://doi.org/10.3390/su12198247.
40. Teixeira P, Sá JC, Silva FJG, et al. Connecting lean and green with sustainability towards a conceptual model. J Clean Prod 2021;322:129047. https://doi.org/10.1016/j.jclepro.2021.129047.
41. Cherrafi A, Elfezazi S, Govindan K, et al. A framework for the integration of Green and Lean Six Sigma for superior sustainability performance. Int J Prod Res 2017;55:4481–515. https://doi.org/10.1080/00207543.2016.1266406.
42. Dao D, Nguyen C. Application of the PLS-SEM Model in Assessing the Sustainable Performance of Manufacturing Enterprises. Sage Open 2025;15. https://doi.org/10.1177/21582440251411598.
43. Hossain MI, Jamadar Y, Islam MF, et al. Environmental sustainability practices in SMEs: Insights from integrated PLS-SEM and fsQCA approaches. J Clean Prod 2025;503:145185. https://doi.org/10.1016/j.jclepro.2025.145185.
44. Prasad S, Khanduja D, Sharma SK. An empirical study on applicability of lean and green practices in the foundry industry. J Manuf Technol Manag 2016;27:408–26. https://doi.org/10.1108/JMTM-08-2015-0058.
45. Awan FH, Dunnan L, Jamil K, et al. Mediating Role of Green Supply Chain Management Between Lean Manufacturing Practices and Sustainable Performance. Front Psychol 2022;12:810504. https://doi.org/10.3389/fpsyg.2021.810504.
46. Saddewisasi W, Ibrahim MM, Kristiadi AlA, et al. Business sustainability of manufacturing companies: The role of eco supply chain management (ESCM) and total quality management (TQM). Uncertain Supply Chain Manag 2025;13:309–18. https://doi.org/10.5267/j.uscm.2024.8.001.
47. Yusuf MF, Mohamad Nasarudin NAI, Sorooshian S, et al. Exploring the Impact of Contingency Theory on Sustainable Innovation in Malaysian Manufacturing Firms. Sustainability 2023;15:7151. https://doi.org/10.3390/su15097151.
48. Mohammed M, Shafiq N, Elmansoury A, et al. Modeling of 3R (Reduce, Reuse and Recycle) for Sustainable Construction Waste Reduction: A Partial Least Squares Structural Equation Modeling (PLS-SEM). Sustainability 2021;13:10660. https://doi.org/10.3390/su131910660.
49. Trianni A, Cagno E, Neri A, et al. Measuring industrial sustainability performance: Empirical evidence from Italian and German manufacturing small and medium enterprises 2019.
50. Ahmad S, Wong KY, Butt S. Status of sustainable manufacturing practices: literature review and trends of triple bottom-line-based sustainability assessment methodologies. Environ Sci Pollut Res 2022;30. https://doi.org/10.1007/s11356-022-22172-z.
51. Digalwar A, Tagalpallewar A, Sunnapwar V. Green manufacturing performance measures: an empirical investigation from Indian manufacturing industries. Meas Bus Excell 2013;17:59–75. https://doi.org/10.1108/MBE-09-2012-0046.
52. Islam Q, Ali Khan SMF. Assessing Consumer Behavior in Sustainable Product Markets: A Structural Equation Modeling Approach with Partial Least Squares Analysis. Sustainability 2024;16:3400. https://doi.org/10.3390/su16083400.
53. Mia MdM. Waste management techniques to promote sustainability and green practices. Manag Environ Qual Int J 2024;36:183–207. https://doi.org/10.1108/MEQ-08-2023-0292.
54. Fayyaz A, Liu C, Xu Y, et al. Linkages between lean six sigma, green manufacturing, circular economy and operational performance in manufacturing organizations of a developing country. Int J Lean Six Sigma 2025;16:1549–86. https://doi.org/10.1108/IJLSS-12-2023-0229.
55. Pires PB, Morais C, Delgado CJM, et al. Sustainable Fashion: Conceptualization, Purchase Determinants, and Willingness to Pay More. Adm Sci 2024;14:143. https://doi.org/10.3390/admsci14070143.
56. Hassan M, Shaukat S. Achieving sustainable business outcomes through eco-innovation adoption in manufacturing firms of Pakistan: a higher-order PLS-SEM approach. Int J Innov Sci 2026:1–26. https://doi.org/10.1108/IJIS-10-2024-0283.

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Vol. 21 No. 4 (2026): November
DOI: 10.21070/ijler.v21i4.1660

57. Abbas RM. Integration of Green Target Costing and Activity-Based Budgeting. J Manag Econ 2025;5:10–24. https://doi.org/10.55640/jme-05-04-03.
58. Verrier B, Rose B, Caillaud E. Lean and Green strategy: the Lean and Green House and maturity deployment model. J Clean Prod 2016;116:150–6. https://doi.org/10.1016/j.jclepro.2015.12.022.
59. Ghali ZH. Reducing Costs Thru The Implementation Of The Green Value Chain and Green Kaizen. J Ekon Manaj Akunt Dan Keuang 2026;7:1–15. https://doi.org/10.53697/emak.v7i4.4144.
60. Anass C, Garza-Reyes JA, Kumar V, et al. Lean, Green Practices and Process Innovation: A Model for Green Supply Chain Performance. Int J Prod Econ 2018;206:79–92. https://doi.org/10.1016/j.ijpe.2018.09.031.
61. Hassan D. The Role of using Green Manufacturing as One of the Requirements for Sustainable Development in Reducing Costs. Int Acad J Account Financ Manag 2023;10:64–71. https://doi.org/10.9756/IAJAFM/V10I1/IAJAFM1008.
62. Logesh B, Balaji M. Experimental Investigations to Deploy Green Manufacturing through Reduction of Waste Using Lean Tools in Electrical Components Manufacturing Company. Int J Precis Eng Manuf-Green Technol 2021;8:365–74. https://doi.org/10.1007/s40684-020-00216-4.
63. Almusawi ProfDrANK, Mahmood Alani SS. USING THE GREEN TARGET COST TO BUILD A SUSTAINABLE COMPETITIVE ADVANTAGE IN ALZAWRAA STATE COMPANY FOR ELECTRICAL AND ELECTRONIC INDUSTRIES PRODUCTION AND ASSEMBLY OF SOLAR PANELS. Int J Res Soc Sci Humanit 2022;12:183–209. https://doi.org/10.37648/ijrssh.v12i04.012.
64. Maaroof A, Murat D. The Impact of Green Marketing on Sustainable Development: Opportunities and Issues. J Econ Adm Sci 2025;31:50–67. https://doi.org/10.33095/rp0r4f88.
65. AL-Shafeay K. Green Value Engineering and Green Kaizen Technologies and Their Role in Reducing Costs: A Theoretical Study. Int J Transform Bus Manag 2024;14:1–13. https://doi.org/10.37648/ijtbm.v14i01.001.

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