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Green Islands as Living Labs: Tracking Awareness-to-Action Pathways in a School-Based Green Infrastructure Programme

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Abstract: This study evaluates the twelve-month "Green Islands for Sustainable Communities" sustainability education programme implemented in Covasna, Harghita, and Mureş counties, Romania. Six composting-linked planting units were installed at five educational institutions, complemented by workshops addressing SDG 12, composting, and urban gardening. Two independent anonymous surveys conducted in late 2025 (n = 129) and May 2026 (n = 133) assessed awareness and self-reported learning outcomes. Findings indicate increased reported understanding of SDG 12, composting knowledge (M = 4.09/5), and positive behavioural intentions. However, the absence of a comparison group, individual-level matching, and validated instruments limits causal and longitudinal conclusions.

Keywords: SDG12, school composting, experiential learning, programme evaluation, urban gardening

1. Introduction

Global education and development frameworks increasingly position schools as sites for translating the abstract targets of the Sustainable Development Goals (SDGs) into concrete, experiential learning [1], [2]. "Responsible Consumption and

Production" is a frequent anchor for such interventions because its themes – waste reduction, resource circularity, and sustainable production – map naturally onto everyday, observable practices such as food-waste sorting, composting, and small-scale urban agriculture (United Nations Statistics Division, n. d.). School-based composting and gardening programmes are commonly justified on the premise that direct, hands-on engagement with material and biological cycles produces cognitive, attitudinal, and behavioural change more effectively than classroom instruction alone [3], [4]; [5], [6], [7], and [8] examined 83 empirical studies on the relationship between experiential learning and sustainability education. They found that experiential learning connects education with real-world practice, promotes collaboration, and can support a range of learning outcomes.

The present paper evaluates one such intervention, "Green Islands for Sustainable Communities", implemented between July 2025 and June 2026 by the Association for Ecosystem Management (AME) in Sfântu Gheorghe, Romania, with partner institutions in Covasna, Harghita, and Mureş counties (Sfântu Gheorghe, Târgu Secuiesc, Miercurea Ciuc, Ditrău, Sânmartin, and Târgu-Mureş). The intervention combined physical infrastructure – six "green island" planting units (five raised outdoor beds and one indoor green-wall unit) and six composting units installed at five partner institutions (four vocational high schools and two faculties of Sapientia Hungarian University of Transylvania) – with an educational programme of workshops, school visits ("Green Week"), and dissemination events targeting primary school pupils, secondary school (grades 9–12) students, university students, and teachers.

The project's own theory of change, articulated in its narrative report to the funder, distinguishes three cumulative levels of beneficiary change: (i) "connection" – exposure to project activities without necessarily any change in knowledge, attitude, or behaviour; (ii) "improvement" – a measurable gain in knowledge, attitude, or behaviour; and (iii) "transformation" – internalization of the target practices to the point of self-directed action and peer dissemination [9], [10], [11]. This framework, common in donor-funded social-impact reporting, motivates the evaluation questions addressed here. However, published evidence on small, locally implemented school programmes of this kind is scarce, and such programmes are often reported only in project documents. This paper addresses that gap by documenting a real-world programme transparently, including the limits of its data. We ask two questions:

RQ1. How did self-reported awareness of SDG12 and composting-related knowledge, attitudes, and practices differ between a pre-spring workshop survey (March 2026) and an endline survey (May 2026) among the target population?

RQ2. What do these patterns suggest about progress along the connection–improvement–transformation continuum, and how far can the available evidence support the programme's own claims?

This paper is, deliberately, a programme evaluation rather than a controlled study [12]. It draws on data that the implementing organization collected for accountability and learning purposes – not for research purposes – and it treats the resulting evidence with the corresponding epistemic caution. Its purpose is to summarize, as rigorously as the available data permit, what the two questionnaires and the narrative report show, and to be explicit about what they do not show.

2. Methods and data

Three primary sources were used. First, the project's narrative reports, with retrospective information on activities from the start of the project in July 2025 up to June 2026, implementation milestones, activity dates and locations, and the organization's own qualitative assessment of outcomes (Association for Ecosystem Management, 2026). Second, a first-wave questionnaire ("Preliminary assessment of sustainability knowledge") was administered online (Google Forms) between 19 and 31 March 2026, yielding 129 responses. Because the project started in July 2025 and the infrastructure had already been established and the autumn 2025 activities completed (see Section 2.1), this survey is not a true pre-intervention baseline. It captures knowledge and attitudes before the spring 2026 workshop series and before planting, and it is referred to below as the "baseline" for brevity. Third, an endline questionnaire ("Closing questionnaire on the effects of the 'Green Island' project") was administered between 7 and 28 May 2026, yielding 133 responses.

Both instruments were anonymous, self-administered, single-time-point online surveys aimed at secondary school students (grades 9–12) in partner institutions. No respondent identifier links the two questionnaires, and the item content slightly differs between them. Consequently, the design is not a matched pre–post (within-subject) design but a repeated cross-sectional design comparing two independent samples of the same general target population at two points in the implementation timeline (baseline: early stage of the project, prior to most workshops; endline: after the spring 2026 workshop series and after physical planting had taken place). This distinction is analytically important and is revisited in the *Discussion* and *Limitations* subsections below.

Quantitative items using ordinal 1–5 Likert-type response scales were summarized using means and standard deviations; categorical items were summarized as frequencies and percentages. Because the two samples are independent and non-overlapping in item content, no inferential test of statistical significance for "change" was computed; where a pre-survey item and a post-survey item address conceptually related but not identical constructs, this is noted explicitly and no formal comparison of means is presented as evidence of programme effect. Open-text responses (on the endline questionnaire's "most valuable part of the project" and "what could be improved" items) were summarized thematically. Analyses were performed in

Python (pandas) from the raw exported spreadsheets; timestamps were retained to establish the fielding window of each instrument.

2.1. Project description

The project pursued three stated objectives: (1) raising SDG12-related awareness among an estimated 1,858 pupils and students (1,544 primary/secondary school pupils and 314 university students) through six workshops involving cca 80 teachers and experts; (2) reducing organic waste through composting at five partner institutions using six composting units, with a target of valorizing at least one ton of organic waste over twelve months; and (3) installing six "green islands" (five raised planting beds and one indoor green-wall unit) at five partner institutions. Physical infrastructure was installed between 25 August and 18 September 2025. Educational activities included a "Green Week" in Covasna County (20–24 October 2025, reportedly reaching over 600 primary school pupils throughout the project's duration), a composting workshop for university students (30 October 2025), and a series of high school workshops between March and May 2026 in Ditrău, Sânmartin, Miercurea Ciuc, Târgu Secuiesc, and Târgu Mureş, each reportedly attended by 20–70 students. Because of the region's growing season, actual planting of the green islands was delayed to April–May 2026, after the baseline questionnaire had already been fielded; this timing is relevant to interpreting the baseline as capturing knowledge and attitudes prior to hands-on planting activity, while the endline captures self-reported outcomes after planting and after the main block of spring workshops (*Table 1*).

Table 1. List of workshops within the framework of the implemented project

Institution	Town (county)	Type	Composting unit	Green island	Workshop date	Participants
Faculty of Life Sciences and Sports, Sapientia Hungarian University of Transylvania	Sfântu Gheorghe (Covasna)	University	300 kg	1 unit	30 Oct. 2025 Composting Workshop, 22 Apr. 2026, Green Island workshop 28 May 2026, Green Island workshop	107 students

Institution	Town (county)	Type	Compost-ing unit	Green island	Workshop date	Participants
Faculty of Technical and Human Sciences, Sapientia Hungarian University of Transylvania	Târgu-Mureş (Mureş)	University	300 kg	1 unit	26 May 2026 Green Island workshop	92 students
Gábor Áron Technological High School	Târgu Secuiesc (Covasna)	Vocational high school	300 kg	1 unit	19 May 2026 Green Island workshop	92 students
Venczel József Technological High School	Miercurea Ciuc (Harghita)	Vocational high school	300 kg	1 unit	29 Apr 2026 Green Island workshop	20 students
Puskás Tivadar Technological High School	Ditrău (Harghita)	Vocational high school	300 kg	1 unit	23 Apr 2026 Green Island workshop	75 students
Tivai Nagy Imre Technological High School	Sânmartin (Harghita)	Vocational high school	300 kg	1 unit	7 May 2026 Green Island workshop	38 students

The sequence of events is therefore as follows: infrastructure installation (August–September 2025); Green Week and university composting workshop (October 2025); first-wave survey (19–31 March 2026); high school workshop series (March–May 2026); planting (April–May 2026); endline survey (7–28 May 2026). Respondents to the first-wave survey may therefore already have been exposed to the infrastructure and autumn activities, and the comparison between the two waves should be read accordingly. For the main proportions, 95% Wilson confidence intervals are reported. Means and standard deviations are reported for Likert-type items. No tests of change between the two surveys were conducted, since the samples are independent and the items differ.

3. Results

3.1. Baseline

At baseline, three-quarters of respondents (76.0%) reported never having heard of SDG12, and only 6.2% reported knowing it well (*Table 2*). At baseline, 76.0% (95% CI 67.9–82.5%) reported never having heard of SDG12, and 34.9% (95% CI 27.2–43.5%) reported that their household composts. This low familiarity with the formal SDG12 label coexisted with generally favourable, already high self-reported attitudes: mean agreement that an environmentally conscious lifestyle is important was 4.14 out of 5 (SD = 0.85), and mean agreement that young people

have an important role in environmental protection was 4.12 out of 5 (SD = 0.85). This pattern – low familiarity with formal sustainability terminology alongside high pre-existing pro-environmental attitude – is consistent with a population that holds generic environmental values but has had limited prior exposure to the specific SDG framework or to composting practice.

Table 2. Baseline questionnaire, 19–31 March 2026 (n = 129)

Item	Response categories / statistic	n	%
Prior awareness of SDG12	Not heard of it	98	76.0%
	Heard of it	23	17.8%
	Know it well	8	6.2%
Importance of an environmentally conscious lifestyle (1–5 scale)	M = 4.14, SD = 0.85, n = 129	—	—
Knows what composting means	Yes, precisely	73	56.6%
	Roughly	54	41.9%
	No	2	1.6%
Composts at home	No	74	57.4%
	Yes	45	34.9%
	Don't know	10	7.8%
Perceived fate of school green waste	Landfill (treated as ordinary waste)	48	37.2%
	Municipal collection	36	27.9%
	Composting	35	27.1%
	Other/incineration	10	7.8%
Prior participation in school gardening/growing	No	68	52.7%
	Yes	61	47.3%
Agreement: "Young people have an important role in environmental protection" (1–5 scale)	M = 4.12, SD = 0.85, n = 129	—	—
Has used "smart" growing technology (e.g. sensors, automatic irrigation)	No	88	68.2%
	Yes	41	31.8%

Composting-specific knowledge was moderate: 56.6% reported knowing precisely what composting means, and a further 41.9% reported knowing "roughly", leaving only 1.6% reporting no knowledge at all. However, only around a third of respondents (34.9%) reported that their household actually composts, and over half (57.4%) said

their household does not. Respondents' beliefs about what happens to their own school's green waste were split roughly into thirds among "landfill/ordinary waste" (37.2%), "municipal collection" (27.9%), and "composting" (27.1%), suggesting that, prior to the project's composting-unit installation and associated instruction, a majority of students either believed or assumed that school green waste was not composted. Close to half of the respondents (47.3%) reported some prior experience of school gardening or plant growing, while less than a third (31.8%) had prior exposure to "smart" growing technologies such as sensors or automated irrigation (*Table 2*, *Figure 1*).

3.2. Endline

At endline, self-reported understanding of the SDG12 objectives after the workshop series averaged 3.67 out of 5 (SD = 1.30) – a moderately high mean but with the largest dispersion of any item in either survey, indicating substantial heterogeneity in how much respondents felt they understood the framework even after direct instruction. Self-reported growth in composting knowledge was higher and more consistent (M = 4.09, SD = 0.98), and perceived usefulness of the practical (hands-on) activities was likewise high (M = 3.97, SD = 1.05).

On more behaviourally specific items, 60.9% of respondents reported having learned how to reduce the volume of organic waste, and a further 35.3% reported having learned this "partially"; only 3.8% reported no such learning. Regarding behavioural intention or change, the largest single response category (34.6%) reported changing habits "to a small extent", closely followed by 31.6%, who reported already composting or paying attention to waste at home as a direct result of the project, and 27.1%, who reported having "thought about it" without yet acting; only 6.8% reported no change. When asked which practical activity they would actively engage in going forward, responses were evenly spread across composting (24.8%), planting (23.3%), plant care (22.6%), smart-technology use (16.5%), and green-island maintenance (12.8%), suggesting no single activity dominated stated future engagement (*Figure 1*).

Overall programme evaluation was positive: 86.5% of respondents felt the project contributed "to a great extent" to their school's environmental awareness, while 13.5% selected "not at all". Only these two categories appear in the exported data, although the item was probably designed with intermediate options. This pattern is difficult to reconcile with the other items (for example, only 4.5% would not recommend the programme, and 6.8% reported no change in habits), and the item is therefore treated as unreliable and not interpreted further. According to the survey, 75.2% said they would recommend the programme to other students or schools, with a further 20.3% responding "maybe" and only 4.5% responding

"no". Open-text responses on "the most valuable part of the project" were dominated by references to composting, planting demonstrations, biodiversity content, and the enthusiasm of the facilitators, with many respondents answering simply "everything"; open-text responses on "what could be improved" were overwhelmingly of the form "nothing" / "it's fine as it is", with a small number of substantive suggestions (e.g. more interactive activities; extending the programme to more schools) (*Table 3*, *Figure 1*).

Table 3. Endline questionnaire, 19–31 March 2026 (n = 133)

Item	Response categories / statistic	n	%*
Understanding of SDG12 objectives after the workshop (1–5 scale)	M = 3.67, SD = 1.30, n = 133	—	—
Self-rated growth in composting knowledge (1–5 scale)	M = 4.09, SD = 0.98, n = 133	—	—
Activity respondent would actively engage in (single choice)	Composting	33	24.8%
	Planting	31	23.3%
	Plant care	30	22.6%
	Use of smart technology	22	16.5%
	Green-island maintenance	17	12.8%
Learned how to reduce the volume of organic waste	Yes	81	60.9%
	Partially	47	35.3%
	No	5	3.8%
Would change own habits as a result of the project	Yes, to a small extent	46	34.6%
	Yes, now composts / attentive to waste at home	42	31.6%
	Thought about it	36	27.1%
	No	9	6.8%
Perceived usefulness of the practical activities (1–5 scale)	M = 3.97, SD = 1.05, n = 133	—	—
Project's perceived contribution to the school's environmental awareness	To a great extent	115	86.5%
	Not at all	18	13.5%
Would recommend the programme to other students/schools	Yes	100	75.2%
	Maybe	27	20.3%
	No	6	4.5%

Note: * Percentages may not sum to 100 because of rounding.

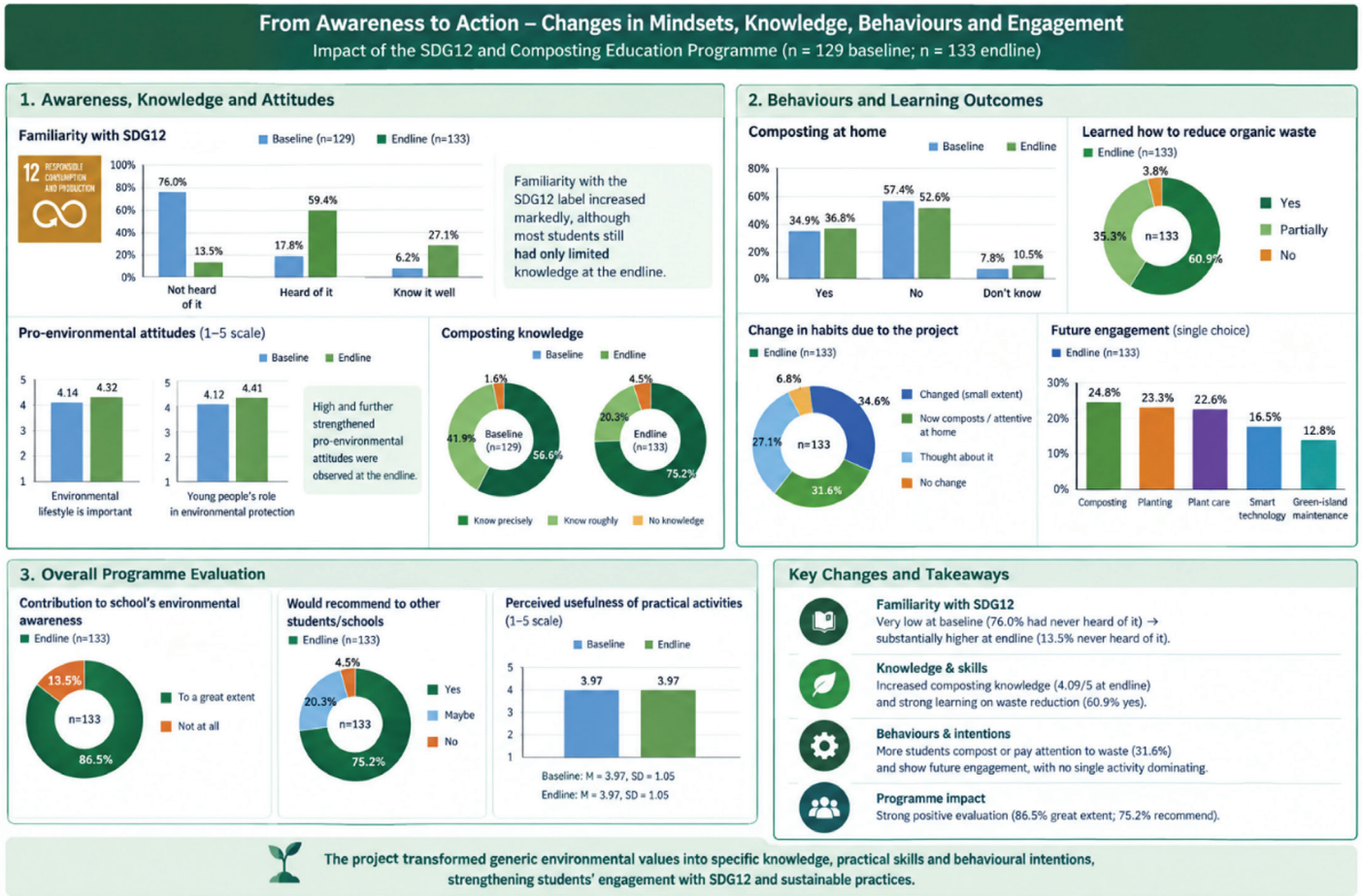

Figure 1. Infographic about "From Awareness to Action: Changes in Mindsets, Knowledge, Behaviours, and Engagement"

3.3. Cross-referencing with the narrative report

The narrative report classifies all 133 endline respondents at the highest tier ("transformation") because they took part in practical composting, planting, and green-island activities. Participation is not, however, evidence of internalized, self-directed action, and since the endline survey is anonymous, it is not clear how the report can link the survey sample to individual participation records. The endline habit item allows a more cautious, self-reported mapping onto the three tiers (*Figure 2*).

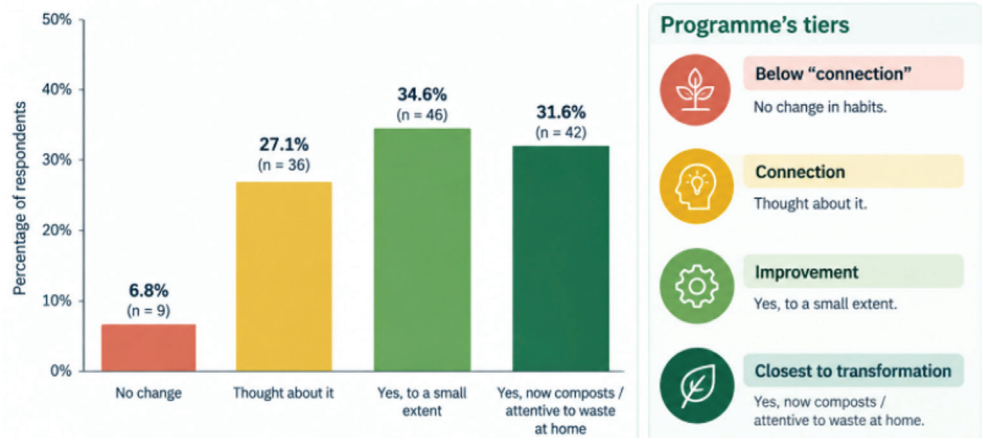

Figure 2. Self-reported change in habits mapped onto the programme's tiers

The project narrative reports also state that infrastructural targets were met on schedule (six composting units and six green islands installed at five institutions by September 2025), while the organic-waste valorization target (≥ 1 tonne composted, over a 12–36-month composting cycle) and the smart-technology/self-sustainability training component remained in progress at the time of reporting, with completion contingent on the spring 2026 planting season.

Logged organic waste quantities for the period of July 2025 – June 2026 amounted to 1.5 kg across 6 sites, 150% of the one-tonne target. Plant survival in the green islands at 30.07.2026 was 100% in all 6 sites. These figures come from the implementing organization's own records.

3.4. Communication, video marketing, and social media dissemination

To maximize the social impact of the "Green Islands" project, a strategic digital communication campaign was executed. The primary objective of the campaign

was to bridge the gap between environmental intervention and community engagement, transforming physical spaces into educational milestones through digital storytelling.

For public engagement and dissemination of the "Green Islands" project outcome, a series of ten concise, engaging Q&A, cause-and-effect short reel videos were distributed via social media platforms to highlight the purposes of green islands in two languages: Hungarian and Romanian – in accordance with the region's ethnic specificities.

The central question formulated was: "Why Green Islands?". Each of the ten videos was then dedicated – in a form of video series – to expanding upon this question, addressing socio-ecological benefits of urban agriculture and micro-ecosystems (*Table 4*).

Table 4. Messages of the "Why Green Islands?" video series

Message ("Green islands to…")	**Underlying rationale**
Bring nature closer to people	Bridging the urban–nature divide
Transform urban spaces into vibrant, welcoming places	Urban revitalization
Create areas for relaxation and inspiration	Student well-being
Encourage environmental stewardship through small yet consistent actions	Building small daily habits
Grow vegetables and herbs in schools and campuses	Hyper-local agriculture
Educate the community about urban agriculture and sustainability	Open-air classrooms
Use smart technologies for responsible water consumption	Smart resource management
Foster collaboration among students and the local community	Community collaboration
Turn unused spaces into productive micro-ecosystems	Micro-ecosystem innovation
Demonstrate that sustainability can be beautiful, practical, and accessible	Accessible sustainability

Digital communication relied heavily on visual storytelling, recognizing that the use of visuals is more effective at driving engagement among high school and university students than traditional only text-based posts. Several videos were captured directly at the installation sites, documenting the establishment, growth, and ecological features of the green islands. This raw video material was then edited into a series of 10 short-form videos optimized for social media platforms. Short-form video content was strategically selected to align with contemporary media consumption, ensuring visibility, shareability, and information retention.

Romanian-language reels have a total view of 860, while Hungarian-language content has a total view of 875 (as of 05.10.2026).

By designing message-driven video content, the campaign achieved two critical functions. First, it provides visibility to corporate social responsibility (CSR) initiatives, validating Raiffeisen Bank's investment in green infrastructure in collaboration with Sapientia Hungarian University of Transylvania. Second, it fostered a sense of psychological ownership among the students and faculty. The digital campaign did not merely report on the project; it intends to actively promote behavioural changes, turning passive observers into active caretakers of their local green environments.

4. Discussion

Taken together, the two cross-sectional surveys and the narrative report describe a coherent and plausible, if not rigorously demonstrated, story of programme engagement: a target population that, before the spring 2026 workshops, had limited familiarity with formal SDG12 terminology but favourable generic environmental attitudes; an implementation phase combining infrastructure with educational activities (workshops, the Green Week, and dissemination events) across six locations; and an endline population reporting high perceived learning gains, positive attitudes towards the practical activities, and largely positive behavioural intentions. Similar findings have been reported in numerous surveys conducted at primary, secondary, and university levels, particularly regarding the relationship between favourable environmental attitudes and specific knowledge of sustainability [3], [13], [14], [15], [16], [17]. This pattern is broadly consistent with programme theory expectations for hands-on environmental education and with the implementing organization's own "connection → improvement → transformation" framework, in the sense that the proportions reporting concrete behaviour change (e.g. composting at home, reducing organic waste) are smaller than the proportions reporting mere awareness or interest, as the framework would predict.

At the same time, several features of the endline data warrant caution before this pattern is read as strong evidence of programme impact. First, self-reported understanding of SDG12 objectives after the workshop (M = 3.67) is numerically lower, not higher, than baseline agreement that an environmentally conscious lifestyle is important (M = 4.14) or that young people have an environmental role (M = 4.12); because these are different constructs measured on different (non-identical) samples, this is not evidence that the programme reduced understanding, but it does indicate that the endline SDG12-specific comprehension item was the most modestly and most variably rated item in either survey, and it should temper any inference of uniformly strong knowledge gains specifically for the SDG12 framework, as distinct from composting-specific knowledge (M = 4.09, SD = 0.98).

Second, the item on the project's contribution to the school's environmental awareness recorded only two response categories ("to a great extent" and "not at all"). This is difficult to reconcile with the other endline items, and the cause could not be established from the exported data. The item is therefore not interpreted, and its 86.5% "great extent" figure should not be taken as evidence of impact.

Third, and most fundamentally, the repeated cross-sectional design cannot separate programme effects from alternative explanations such as general maturation, concurrent curricular content, media coverage of environmental topics, seasonal exposure to gardening, or differences in who responded at each wave.

A further point concerns home composting. At baseline, 34.9% (95% CI 27.2–43.5%) of respondents reported that their household composts, while at endline 31.6% (95% CI 24.3–39.9%) reported composting or managing waste at home as a result of the project. The questions differ in wording and focus (household practice versus project-attributed change), so the figures are not directly comparable, but the shares are not higher at endline and the confidence intervals overlap. The data therefore do not show an increase in home composting.

4.1. Limitations

Design. The two surveys are independent, anonymous, and non-identical in content. No within-subject change can be computed, and no comparison group exists.

Timing. The first survey was fielded after the project had started, so it is not a pre-intervention baseline.

Self-report. All outcomes are self-reported perceptions or intentions, which are open to social-desirability bias, particularly when surveys are administered in a school context.

Ceiling effects. Baseline attitudes were already high (around 4.1/5), leaving little room to show improvement.

Selection. Participation was voluntary, and respondents may differ from non-respondents.

Language and wording. The instruments were administered in Hungarian, and the wording of items differed between waves.

Data quality. One endline item had only two response categories in the exported data. Verification. No independent data on composted volumes, plant survival, or resource use were available.

5. Conclusions

This evaluation of the "Green Islands for Sustainable Communities" programme finds a consistent, even if methodologically modest, body of evidence that the

programme was partially implemented as planned. According to the narrative report, the infrastructure was installed on schedule at the partner institutions and a substantial series of workshops and events was carried out, while the organic-waste target and the smart-technology training were still in progress at the time of reporting. Participants in the later stages reported favourable learning experiences, moderate-to-high self-rated gains in composting knowledge, and mostly positive behavioural intentions. About a third of endline respondents (31.6%) report already composting or managing waste at home as a result of the project, and a further 27.1% report having thought about it. These are self-reported figures, and the data do not show that behaviour changed between the two surveys.

For future rounds of this or similar programmes, three design changes would materially strengthen the evidence base at a comparatively low cost: (i) assigning each respondent a consistent, anonymous identifier (e.g. a self-generated code) so that the same individuals can be tracked from baseline to endline, enabling genuine within-subject comparison; (ii) including at least a subset of identical items on both instruments, ideally drawn from previously validated environmental-attitude or -knowledge scales so that pre–post change can be computed directly and compared against established benchmarks; and (iii), where feasible, incorporating an untreated or later-treated comparison school and objective outcome indicators (e.g. logged quantities of composted material, follow-up observation of green-island maintenance) to help separate programme effects from concurrent seasonal or maturational change. Implementing these changes would allow the organization's own connection–improvement–transformation framework to be evaluated with the rigour its final, highest tier implicitly claims.

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