

Waste management education in coastal communities: evaluating the impact of visual campaigns and local engagement

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Article Info

Article history:

or short-term awareness workshops [1], [2], [3]. Studies have shown that participatory approaches and environmental education can improve short-term knowledge and attitudes toward waste management [4], [5], [6]. However, many programs remain limited by their reliance on verbal communication and one-off interventions, which often fail to translate awareness into sustained behavioral change. Visual-based environmental campaigns—such as posters, murals, and contextual signage—have been widely applied in urban settings [2], [7] but remain underexplored in rural coastal contexts, particularly when integrated with local social structures. Furthermore, existing studies rarely combine visual communication strategies with systematic community engagement and post-intervention monitoring [8], [9], [10]. This gap highlights the need for an integrated model that evaluates how visual campaigns, when embedded within local participation mechanisms, can influence everyday waste management

intentionally designed to be context-specific, using local language and imagery relevant to fisheries activities. Strategic planning also emphasized the integration of local actors—particularly youth groups and environmental cadres—as campaign agents. The implementation timeline, division of roles, and monitoring indicators were jointly formulated to ensure community ownership and contextual adaptability of the program [11], [12], [13].

As shown in Table 2, baseline environmental awareness regarding plastic waste impacts was limited to approximately 20–30% of surveyed households. Observation data indicate that only 35–45% of households practiced any form of waste separation, while 55–65% disposed of waste directly into coastal or riverine areas. Waste composition audits revealed that plastic materials constituted at least 60% of total household and market-generated waste. Infrastructure mapping identified

The implementation results affirm the effectiveness of combining visual communication with participatory engagement in fostering early behavioral change [3], [7], [14]. From a behavioral change theory perspective, high visual exposure acted as a continuous environmental cue that disrupted habitual disposal practices, while socialization sessions facilitated reflective learning. The involvement of youth as campaign agents functioned as a social reinforcement mechanism, supporting norm diffusion within the community. The observed reduction in waste accumulation at hotspots suggests that visual interventions can generate immediate

decline observed by week six. Institutional support from village authorities remained informal throughout the evaluation period. Participatory assessments indicated a moderate to moderately high outlook for program sustainability.

The monitoring and evaluation results reveal that behavioral change induced through visual and participatory interventions follows a gradual consolidation pattern rather than linear acceleration

dynamics reveal that engagement mechanisms are shaped by both social relationships and material conditions [5], [16]. Effective community programs therefore require not only participatory structures but also adaptive strategies that accommodate economic rhythms and provide institutional acknowledgment to sustain local actors' involvement.

The third set of implications relates to the monitoring phase, which highlights

INFORMED CONSENT

We have obtained informed consent from all individuals included in this study.

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