EXTENDED PRODUCER RESPONSIBILITY (EPR): INTERNATIONAL EXPERIENCE AND POLICY IMPLICATIONS FOR VIETNAM

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Abstract: The significant increase in plastic packaging consumption has created a waste crisis in Vietnam. This study analyzes Extended Producer Responsibility (EPR) implementation for plastic packaging waste in Vietnam using the ROCCIPI framework and comparisons with Germany, Japan, and South Korea. Through document analysis and expert interviews (n=20), we identify substantial gaps between Vietnam and advanced economies in recycling rates (15-20% vs. 70-90%) and implementation capabilities. Major challenges include an incomplete legal framework, limited infrastructure, insufficient capacity, and low public awareness. Vietnam demonstrates strong potential (Opportunity: 9/10) and stakeholder interest (Interest: 7/10), but faces significant weaknesses in regulatory frameworks (Rules: 5/10), information dissemination (Communication: 5/10), and cultural attitudes (Ideology: 5/10). We propose a multifaceted strategy encompassing legal reforms, technological investments, capacity building, and strengthened communication efforts, emphasizing cross-sectoral and international cooperation. This research provides essential foundations for EPR policies to accelerate Vietnam's transition toward a circular economy.

Keywords: Extended Producer Responsibility; plastic packaging waste; circular economy; ROCCIPI framework; waste management policy; Vietnam

1. INTRODUCTION

The global production and consumption of plastic has increased dramatically over the past several decades, creating unprecedented environmental challenges. According to Geyer et al. (2017), from 1950 to 2015, global plastic production reached 8.3 billion tonnes, of which 6.3 billion tonnes became waste. Only 9% of this waste was recycled, 12% incinerated, and the remaining 79% ended up in landfills or was directly discharged into the natural environment. With decomposition periods stretching into hundreds of years, plastic waste accumulation causes severe consequences for marine ecosystems, biodiversity, and human health, necessitating urgent development of sustainable waste management policies.

In Vietnam, the plastic waste problem is particularly acute. Recent research by Nham (2024) indicates that the country now generates approximately 3.27 million tonnes of plastic waste annually—constituting about 8–12% of household solid waste and roughly 5% of medical waste. Alarmingly, up to 90% of this plastic waste is either burned, buried, or discharged into the environment, while only about 10% is recycled. These figures underscore not only the scale of the challenge but also the urgent need for effective intervention to mitigate environmental and public health risks.

Extended Producer Responsibility (EPR) has emerged as a promising policy instrument to address these challenges. EPR is a policy approach that extends a producer's responsibility for a product to the post-consumer stage of its lifecycle (OECD, 2016). This approach shifts waste management responsibility from the public sector to producers, thereby incentivizing businesses to invest in sustainable product design, use environmentally friendly materials, and enhance production processes. By internalizing the environmental externalities associated with products, EPR aims to create closed-loop material cycles that minimize waste and resource depletion. International experiences—such as Germany's "Green Dot" system (Bünemann et al., 2020), Japan's Packaging and Material Recycling Law (JCPRA, 2018), and South Korea's Resource Management and Recycling Act (Heo & Jung, 2014)—demonstrate that well-implemented EPR schemes can significantly improve recycling rates and reduce environmental impacts.

Despite these promising examples, the implementation of EPR in developing countries like Vietnam faces numerous challenges. These include an incomplete legal framework, limited recycling infrastructure, high implementation costs, and insufficient stakeholder engagement (Johannes et al., 2021; Cecchin et al., 2019). Moreover, while previous studies have primarily focused on quantifying plastic waste and highlighting its environmental impacts (e.g., Le, 2022; Nham, 2024), there remains a significant

research gap regarding the economic impacts of EPR on businesses and government, as well as the lack of specific, actionable implementation models tailored to the Vietnamese context. Additionally, most existing research has not adequately addressed the unique socio-economic, cultural, and institutional factors that influence EPR implementation in Vietnam.

To bridge these gaps, this study employs the ROCCIPI analytical framework (Rules, Opportunity, Capacity, Communication, Interest, Process, and Ideology) and draws on in-depth expert interviews to assess the current state of EPR implementation in Vietnam. By systematically analyzing each dimension of the framework and comparing Vietnam's approach with international experiences, this research aims to propose tailored policy solutions that enhance waste management efficiency while fostering a transition towards a circular economy. Our findings contribute to both theoretical understandings of EPR implementation in developing economies and practical policy formulations for Vietnam's environmental governance.

The paper is structured as follows: Section 2 provides a theoretical framework and literature review, examining the conceptual basis of EPR and international experiences. Section 3 outlines our research methodology, including the ROCCIPI framework, document analysis, and expert interview approaches. Section 4 presents the results of our analysis, including expert perceptions, ROCCIPI assessments, and international comparisons. Section 5 discusses the implications of our findings and proposes specific policy recommendations. Finally, Section 6 concludes the paper with a summary of key insights and suggestions for future research.

2. THEORETICAL FRAMEWORK AND LITERATURE REVIEW

2.1. Theoretical Foundation of EPR

EPR emerged in the early 1990s, defined by Thomas Lindhqvist as "an environmental protection strategy to reach an environmental objective of a decreased total environmental impact from a product, by making the manufacturer of the product responsible for the entire life-cycle of the product" (Hickle, 2017). The concept shifted from traditional command-and-control regulation toward market-based instruments that internalize environmental externalities (Cai & Choi, 2021).

Core principles include: (1) the polluter pays principle, extending producer responsibility for environmental impacts throughout product lifecycles; (2) lifecycle thinking, considering impacts across all product stages; (3) design for environment, encouraging environmentally conscious product design; and (4) resource efficiency, maximizing utility while minimizing waste.

Implementation mechanisms include product take-back systems (individual or collective), advance disposal fees, deposit-refund systems, product standards, and Producer Responsibility Organizations (PROs) that manage collection and recycling processes on behalf of member producers.

2.2. International EPR Experiences

Germany pioneered EPR through the "Green Dot" system in 1991, requiring producers to pay fees for packaging collection and recycling based on material type and recyclability. These fees fund the Duales System Deutschland, which coordinates separate collection parallel to municipal waste management. By 2022, Germany achieved a 70-90% plastic packaging recycling rate through clear legal requirements, transparent fee structures, and robust monitoring.

Japan implemented EPR through the Containers and Packaging Recycling Law (1995), employing a shared-responsibility model where municipalities handle collection while producers finance recycling. Japan emphasizes technological innovation and stakeholder engagement, achieving an 86% recycling rate by 2022 through advanced recycling technologies and comprehensive public education.

South Korea established the Resource Circulation Act in 2003, featuring mandatory recycling targets integrated with broader resource circulation policies. The system includes an electronic monitoring system (EPRIS) and volume-based waste fees, achieving 70-86% recycling rates by 2020. The Korea Environment Corporation facilitates knowledge exchange with other countries, including Vietnam.

Despite different approaches, all three systems share clear legal frameworks, specific recycling targets, transparent cost allocation mechanisms, and strong stakeholder engagement that have developed incrementally over decades.

2.3. EPR Development in Vietnam

Vietnam's EPR journey began with the 2005 Environmental Protection Law (Article 67), which introduced producer responsibility concepts as voluntary guidelines. The Development Stage (2013-2020) brought more detailed specifications through Decision 50/2013/QD-TTg and Decision 16/2015/QD-TTg, establishing registration requirements and reporting obligations, though implementation remained limited.

Figure 1 illustrates the evolutionary trajectory of Vietnam's EPR policy, highlighting the transition from voluntary guidelines to mandatory requirements and showing key milestones in the regulatory framework development alongside implementation progress.

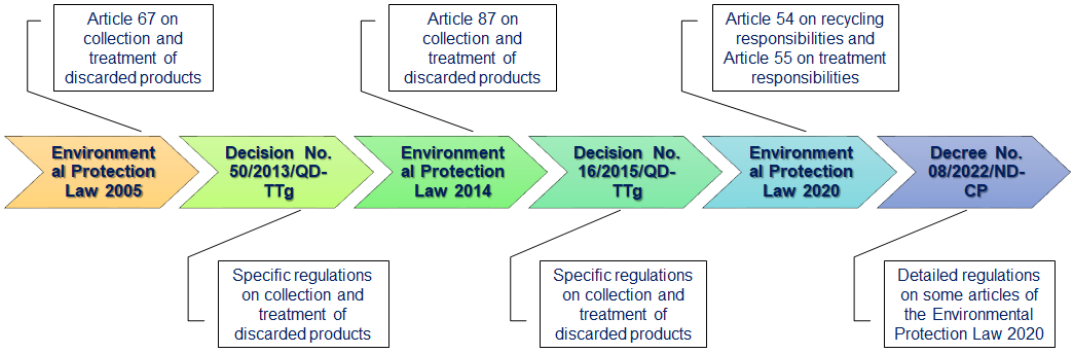

Figure 1. 15-year history of EPR development in Vietnam

The 2020 Environmental Protection Law marked a crucial transition to mandatory EPR, with Articles 54 and 55 establishing clear legal obligations for producers. Decree 08/2022/ND-CP created a comprehensive implementation framework with flexibility in compliance approaches: self-managed recycling, PRO membership, or financial contributions to the Environmental Protection Fund.

Vietnam has established a phased implementation roadmap covering packaging (2024), electronics (2025), and vehicles (2027). Supporting mechanisms include preferential loans (2.6% interest rate) and tax incentives (up to 10%) through the Vietnam Environmental Protection Fund. International partnerships with organizations like KECO and KORA provide technical assistance and knowledge sharing.

Despite this progress, significant challenges remain in recycling infrastructure development, stakeholder coordination, technical guidance, and public awareness—reflecting Vietnam's early implementation stage compared to reference countries with decades of experience.

3. RESEARCH METHODOLOGY

3.1. Research Design

This study employed a sequential exploratory mixed-methods approach combining document analysis, expert interviews, and quantitative evaluation using the ROCCIPI framework. Research was conducted from January to December 2023, guided by three questions: (1) What are the current status, challenges, and opportunities for EPR implementation in Vietnam? (2) How does Vietnam's implementation compare with established systems? (3) What improvements would be most effective based on international experiences and local context?

3.2. Document Analysis

We analyzed four categories of documents: (1) legal and policy documents including primary legislation and implementing regulations; (2) government and international organization reports from MONRE, VEPF, OECD, and WWF; (3) academic literature on EPR in developing countries; and (4) industry and NGO publications. Documents were analyzed using structured content analysis with the ROCCIPI framework as a coding scheme, complemented by inductive analysis to identify emerging themes.

3.3. Expert Interviews

We conducted in-depth interviews with 20 experts representing diverse stakeholder groups: government agencies (n=5), producers and manufacturers (n=5), waste management businesses (n=3), industry associations (n=4), and NGOs/academia (n=3). Selection criteria included minimum five years of relevant experience, sectoral representation, geographic coverage, and decision-making position. Interviews followed a semi-structured format covering EPR implementation status, challenges, opportunities, ROCCIPI dimension assessments (1-10 scale), international comparisons, and recommendations. Data were analyzed through thematic analysis with a hybrid deductive-inductive approach using R software. Reliability was enhanced through independent coding by two researchers and member checking with selected participants.

3.4. ROCCIPI Analytical Framework

The ROCCIPI framework (Figure 2), originally developed for regulatory reform analysis, was adapted for this study to evaluate EPR policy implementation. ROCCIPI is an acronym representing seven dimensions that influence policy compliance and effectiveness:

- Rules: Legal and regulatory provisions establishing EPR
- Opportunity: Infrastructural and systemic conditions enabling implementation
- Capacity: Financial, technical, and human resources available to stakeholders
- Communication: Information dissemination about EPR obligations and processes
- Interest: Stakeholder motivations and incentives for participation
- Process: Practical procedures for implementing EPR
- Ideology: Cultural values and attitudes toward environmental responsibility

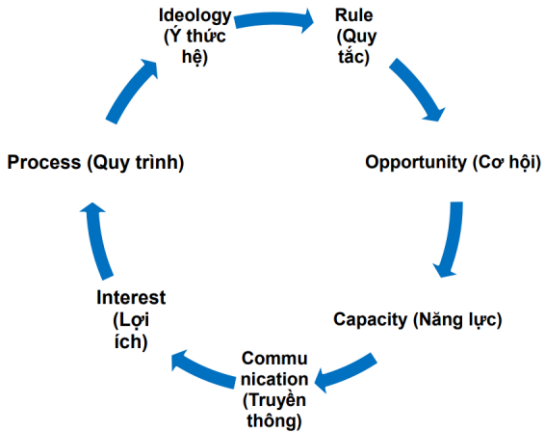

Figure 2. ROCCIPI Analysis Framework

We selected the ROCCIPI framework after considering several alternative analytical approaches commonly used in environmental policy analysis:

- Policy cycle analysis focuses on stages of policymaking (agenda setting, formulation, implementation, evaluation) but provides limited insight into factors affecting implementation effectiveness at each stage.
- Institutional analysis and development (IAD) framework emphasizes institutional arrangements and collective action but lacks specific focus on regulatory compliance factors central to EPR implementation.
- Life-cycle assessment (LCA) evaluates environmental impacts across product lifecycles but focuses primarily on environmental outcomes rather than policy implementation processes.
- Circular economy indicators measure resource flows and efficiency outcomes but offer limited insights into policy implementation mechanisms and barriers.

The ROCCIPI framework's comprehensive nature makes it particularly suitable for analyzing complex policy implementations like EPR that require coordination across multiple stakeholders, sectors, and governance levels. Its multidimensional perspective allows for identification of both technical policy issues and underlying social, economic, and cultural factors affecting implementation.

We evaluated each ROCCIPI dimension using both qualitative and quantitative methods. Document analysis provided baseline information, while expert interviews offered implementation insights. All 20 experts rated dimensions on a 1-10 scale, with results aggregated into arithmetic means and rounded to whole numbers for comparison purposes. For example, the Rules dimension received an average score of 5.26 (rounded to 5). Qualitative data contextualized these ratings by identifying specific strengths, weaknesses, and improvement opportunities. The final assessment was visualized through a radar chart illustrating Vietnam's performance across all dimensions, highlighting asymmetrical development patterns and priority areas for improvement.

3.5. International Comparative Analysis

We compared Vietnam's EPR implementation with Germany, Japan, and South Korea using the ROCCIPI framework. The analysis identified structural similarities and differences, success factors contributing to high recycling rates, and potential adaptations suitable for Vietnam. Particular attention was paid to how reference countries addressed implementation challenges similar to those facing Vietnam.

4. RESEARCH RESULTS

4.1. Expert Interview Findings

In-depth interviews with 20 experts across the EPR ecosystem revealed nuanced perspectives on Vietnam's implementation progress and challenges. Experts consistently acknowledged the significant advancement in Vietnam's legal framework, particularly through the 2020 Environmental Protection Law and Decree 08/2022/ND-CP, which established a mandatory EPR system with specific producer obligations. Government representatives emphasized the strategic significance of these developments within Vietnam's broader environmental governance strategy, framing EPR as a fundamental policy shift that aligns national practices with international standards while addressing Vietnam's specific waste management challenges.

Industry stakeholders recognized EPR's necessity but expressed practical concerns regarding implementation feasibility. Representatives from manufacturing and consumer goods sectors highlighted the gap between regulatory requirements and implementation capacity, noting that while their organizations support EPR conceptually and have experience with similar systems in other markets, Vietnam presents unique infrastructural and market constraints that complicate compliance efforts. Meanwhile, civil society organizations and academic experts viewed EPR positively as a mechanism for advancing circular economy principles, emphasizing its potential to simultaneously reduce waste and drive innovation in product design and business models.

Despite these varied perspectives, a strong consensus emerged (78% of experts) that EPR implementation in Vietnam remains in nascent stages, characterized as a transition period where the regulatory foundation has been established but practical implementation mechanisms remain underdeveloped. Experts identified five interconnected implementation challenges with notable consistency across stakeholder groups. Infrastructure limitations represented the most significant barrier, cited by 91% of respondents, who highlighted the underdeveloped collection and sorting systems, particularly in rural and mountainous regions where formal waste management infrastructure is minimal. This infrastructural gap creates compliance difficulties even for well-resourced companies committed to meeting their EPR obligations.

Technical capacity constraints constituted the second major challenge (identified by 83% of experts), with particular impact on small and medium enterprises that comprise approximately 70% of Vietnam's plastic packaging sector. These businesses often lack the technical knowledge, personnel, and resources to understand and implement complex EPR requirements. Experts also noted similar capacity limitations within regulatory agencies responsible for monitoring and enforcement activities. Financial considerations formed the third significant barrier (mentioned by 74% of respondents), with stakeholders expressing concerns about substantial implementation costs without clear economic returns, particularly given the underdeveloped market for recycled materials in Vietnam. Without established value chains and pricing mechanisms for recovered materials, the business case for investment remains challenging.

Coordination challenges between multiple stakeholders represented the fourth key issue (highlighted by 65% of experts), with specific reference to ineffective linkages between the Vietnam Environmental Protection Fund, Producer Responsibility Organizations, collection systems, and recycling facilities. The fifth significant barrier involved public awareness and participation limitations (cited by 61% of respondents), with experts noting that low consumer understanding of waste separation practices undermines the effectiveness of collection systems that support EPR implementation, particularly in regions outside major urban centers.

To address these challenges, experts proposed a comprehensive strategy comprising five interconnected solutions. Financial support mechanisms received the strongest endorsement (87% of experts), with specific recommendations to maintain the current 2.6% interest rate while extending grace periods for infrastructure investments and enhancing corporate tax incentives from 10% to 15-20% for businesses exceeding recycling targets. Technical capacity building initiatives (recommended by 83% of experts) centered on establishing a national EPR technical assistance center to provide standardized guidance, training programs, and implementation support tailored to different business sectors and sizes, complemented by parallel capacity building for regulatory personnel.

International cooperation emerged as the third critical pathway (supported by 78% of respondents), focusing on leveraging partnerships with organizations like KECO and KORA to access technical expertise, implementation models, and funding support that could accelerate Vietnam's EPR development. Communication and awareness campaigns represented the fourth key recommendation (endorsed by 70% of experts), encompassing coordinated multi-stakeholder efforts to increase understanding among both businesses and consumers. The fifth strategy involved phased implementation with clear milestones (suggested by 65% of respondents), maintaining the existing product category rollout schedule while establishing intermediate performance targets with appropriate compliance flexibility during initial phases.

Despite acknowledging these substantial challenges, experts expressed cautious optimism about Vietnam's EPR trajectory. Most (83%) believed that with appropriate support mechanisms and stakeholder coordination, Vietnam could achieve significant improvements in packaging recycling rates within five years, potentially reaching 40-50% compared to the current 15-20%. This positive outlook was grounded in several encouraging developments, including emerging private sector initiatives, increasing consumer awareness of plastic pollution issues, and demonstrable government commitment to environmental sustainability through policy prioritization and international engagement.

4.2. ROCCIPI Analysis

Based on expert ratings and qualitative assessments, each ROCCIPI dimension was evaluated to provide a comprehensive understanding of Vietnam's current EPR implementation status for packaging waste.

- Rules (5/10): Vietnam has established foundational regulatory frameworks but lacks detailed technical guidelines, verification protocols, and enforcement mechanisms.
- Opportunity (9/10): Vietnam demonstrates substantial potential through international cooperation, investment interest, and opportunities to learn from established systems without repeating early implementation mistakes.
- Capacity (6/10): Moderate implementation capacity exists, with multinational corporations possessing experience while SMEs and government agencies face resource constraints.
- Communication (5/10): Information dissemination remains limited, with significant gaps in technical guidance and public awareness campaigns, particularly in rural areas.
- Interest (7/10): Stakeholder motivation has increased, driven by regulatory requirements, environmental awareness, and potential business opportunities.
- Process (6/10): Basic administrative mechanisms exist, but significant gaps remain in monitoring systems, verification protocols, and coordination processes.
- Ideology (5/10): Cultural attitudes supporting EPR are underdeveloped, with inconsistent waste separation practices and limited public understanding of producer responsibility concepts.

The radar chart visualization (Figure 3) reveals a distinctive pattern in Vietnam's EPR implementation profile. The notable asymmetry between dimensions indicates uneven development across the ROCCIPI factors, with significant strengths in certain areas counterbalanced by substantial weaknesses in others.

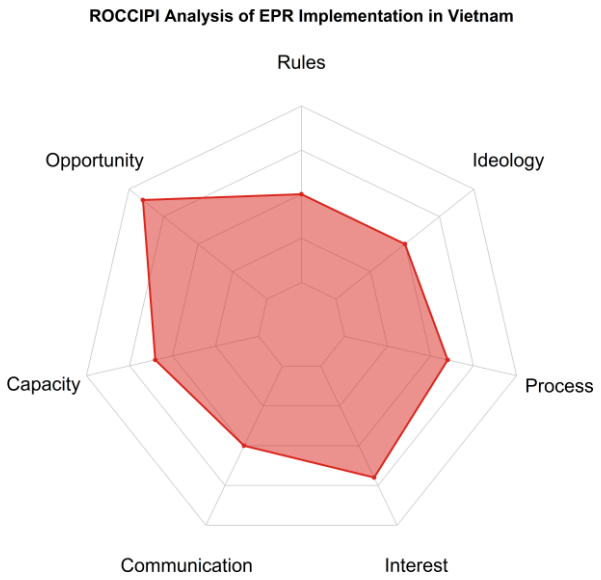

Figure 3. ROCCIPI Radar Chart for EPR Implementation

The "Opportunity" dimension stands as the clear strength (9/10), creating a pronounced extension in the radar chart. This reflects Vietnam's significant potential for EPR development based on international partnership opportunities, growing investor interest, and the ability to learn from established systems in other countries. This dimension represents a foundation upon which Vietnam can build more robust implementation capabilities.

The "Interest" dimension also demonstrates relative strength (7/10), indicating positive stakeholder engagement and growing recognition of EPR benefits among government agencies, businesses, and civil society organizations. This suggests a favorable environment for advancing EPR implementation through collaborative approaches that leverage stakeholder motivations.

The "Capacity" and "Process" dimensions show moderate development (6/10 each), indicating partial progress in building implementation capabilities and operational mechanisms. These mid-range ratings suggest that while basic systems are in place, significant enhancement is needed to achieve effective implementation.

The "Rules," "Communication," and "Ideology" dimensions received the lowest ratings (5/10 each), creating notable indentations in the radar chart. These dimensions represent critical barriers to effective EPR implementation that require targeted interventions. The triangulation of these three weaknesses is particularly significant, as it indicates interconnected challenges in the regulatory framework, information dissemination, and cultural attitudes that mutually reinforce implementation barriers.

The overall pattern suggests that Vietnam has established a foundation for EPR implementation with promising opportunities and stakeholder interest, but faces significant challenges in developing comprehensive regulations, effective communication systems, and supportive cultural values to enable successful implementation.

4.3. Comparative Analysis

The comparative analysis reveals significant performance gaps between Vietnam's emerging EPR system and established frameworks in Germany, Japan, and South Korea. Figure 4 visually illustrates these disparities. While Vietnam demonstrates strong potential (Opportunity: 9/10) and stakeholder interest (Interest: 7/10), it lags considerably in five critical dimensions.

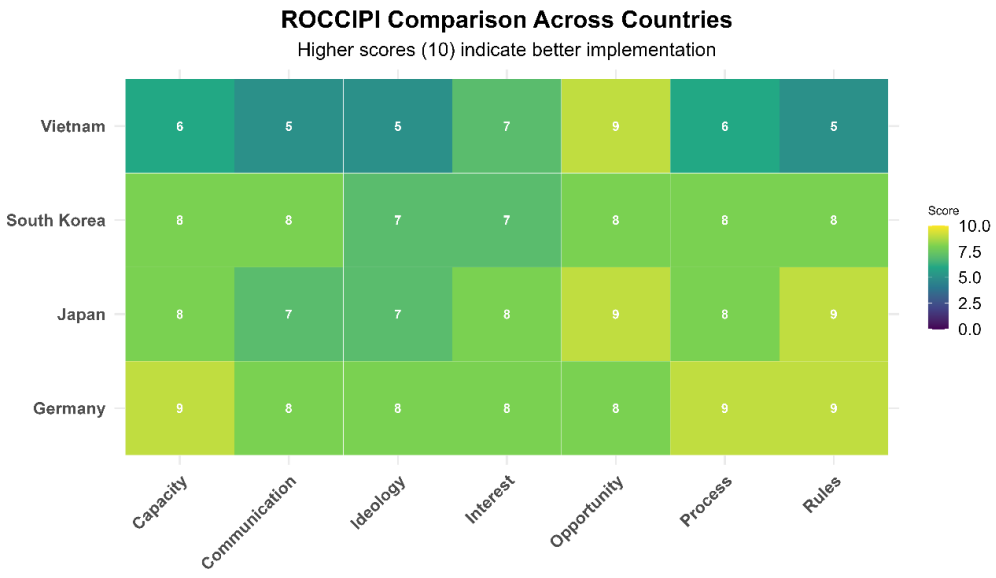

Figure 4. Comparison of EPR Policies Across Countries Using the ROCCIPI Framework

The Rules dimension presents the most pronounced disparity, with Vietnam scoring 5 compared to Germany (9), Japan (8), and South Korea (8). This reflects Vietnam's recent EPR transition (2020) versus decades of regulatory refinement in reference countries (Germany: 1991, Japan: 1995, South Korea: 2003). This thirty-year implementation gap has allowed advanced economies to develop comprehensive technical standards, verification protocols, and enforcement mechanisms that Vietnam is still establishing.

Vietnam's Capacity score (6) reflects significant resource constraints compared to reference countries (8-9), stemming from economic development differences, historical underinvestment in environmental infrastructure, limited technical expertise, and less developed institutional frameworks. Similarly, Vietnam scores lower in Communication (5 vs. 8) due to fragmented information systems, resource limitations, and insufficient public education programs.

The Ideology dimension shows substantial disparity (5 vs. 7-8) resulting from different historical trajectories in environmental consciousness development, with reference countries benefiting from environmental movements dating to the 1970s and longer histories of waste separation practices. Process implementation also lags (6 vs. 8-9) due to less sophisticated tracking systems, procedural frameworks, digital infrastructure, and stakeholder coordination mechanisms.

These dimensional gaps translate directly to performance outcomes, with Vietnam's 15-20% plastic packaging recycling rate dramatically lower than the 70-90% achieved in reference countries – reflecting the cumulative impact of infrastructure limitations, capacity constraints, and lower public participation.

5. DISCUSSION AND POLICY RECOMMENDATIONS

5.1. Policy Framework Enhancement

Our ROCCIPI analysis identified significant gaps in Vietnam's regulatory framework (Rules: 5/10) compared to reference countries (8-9/10). This reflects Vietnam's recent transition to mandatory EPR (2020) versus decades of regulatory refinement in Germany (1991), Japan (1995), and South Korea (2003). To address this gap, Vietnam should develop detailed technical guidelines for each packaging type, focusing initially on high-potential materials as identified through the comparative analysis. Following South Korea's successful phased approach, regulations should establish a progressive improvement pathway with predetermined milestones, allowing stakeholders to adapt while maintaining clear direction.

Expert interviews (87% of respondents) highlighted the need for standardized calculation methodologies for recycling targets and verification protocols. These improvements would address the "incomplete technical regulations" weakness identified in the ROCCIPI analysis, providing greater clarity for stakeholders while enhancing compliance monitoring. Additionally, procedures should clarify roles,

reporting requirements, and compliance mechanisms, addressing the "insufficient stakeholder coordination" challenge cited by 65% of experts.

5.2. Infrastructure Development Strategy

The "infrastructural limitations" challenge, mentioned by 91% of experts, represents the most significant barrier to effective EPR implementation in Vietnam. Drawing from reference countries' experiences, recycling infrastructure development should focus initially on high-population urban areas where waste volumes and economic viability are greatest, before gradually expanding to rural regions. This approach mirrors successful trajectories in all three reference countries, particularly Japan's strategic infrastructure development.

To address the identified financial barriers (cited by 74% of experts), the Vietnam Environmental Protection Fund's loan program should be expanded with extended grace periods for infrastructure investments. As suggested by industry stakeholders during interviews, public-private partnerships should be encouraged through land access, permitting assistance, and operational support to accelerate infrastructure development, particularly for material recovery facilities and sorting centers that support the formal integration of informal waste collectors.

5.3. Capacity Building Initiatives

Expert interviews identified "technical capacity constraints" as the second most significant challenge (83% of respondents), particularly among SMEs comprising approximately 70% of Vietnam's plastic packaging sector. To address this gap (Capacity: 6/10 vs. reference countries: 8-9/10), Vietnam should establish a National EPR Technical Assistance Center providing standardized guidance, training programs, and implementation support. This recommendation addresses experts' observation that "many businesses, especially SMEs, remain unaware of their specific EPR obligations or how to fulfill them cost-effectively" (Respondent A3, 2023).

Following South Korea's institutional development model, capacity building should extend to regulatory agencies through specialized training for monitoring and enforcement personnel. As highlighted by 78% of experts, international partnerships with organizations like KECO should be leveraged for technology transfer programs focusing on appropriate technologies for Vietnam's context, addressing the identified gaps in technical expertise while avoiding solutions that exceed local implementation capacity.

5.4. Communication and Awareness Strategy

The ROCCIPI analysis revealed significant weaknesses in Vietnam's communication systems (Communication: 5/10 vs. reference countries: 8/10) and ideological support (Ideology: 5/10 vs. 7-8/10). Expert interviews (61% of respondents) confirmed that "public understanding of recycling practices and the importance of separating packaging waste remains limited" (Respondent C3, 2023), undermining collection system effectiveness.

To address these gaps, Vietnam should develop a comprehensive communication strategy addressing different stakeholder needs: technical guidance for businesses, procedural information for regulatory agencies, and awareness campaigns for consumers. Drawing from Japan's successful community education approach that contributed to its 86% recycling rate, public awareness campaigns should focus on waste separation behavior and EPR's environmental role, integrated with school curricula and community programs. This approach directly addresses the "consumption culture not yet focused on sustainability" weakness identified in the ROCCIPI analysis.

5.5. Economic Incentive Alignment

Expert interviews highlighted financial considerations as a significant challenge (74% of respondents), with stakeholders expressing concerns about implementation costs and uncertain returns. To address this challenge while leveraging Vietnam's relatively strong stakeholder interest (Interest: 7/10), economic incentives should be refined through a fee structure that reflects actual recycling costs and material-specific challenges, similar to Germany's approach that links producer fees to packaging weight and recyclability.

As recommended by 74% of experts, corporate tax reductions should be enhanced (15-20%) for exceeding recycling targets or investing in infrastructure, providing meaningful economic motivation for businesses. Market development for recycled materials should be supported through preferential

procurement policies and content requirements, addressing the "underdeveloped markets for recycled materials" weakness identified in the ROCCIPI analysis. These measures directly respond to expert observations that "without clear economic incentives or established markets for recycled materials, the financial equation remains challenging for many businesses" (Respondent I5, 2023).

Each of these recommendations draws directly from identified implementation gaps and expert solutions while incorporating relevant lessons from reference countries' experiences. Together, they constitute a comprehensive strategy to address Vietnam's most significant EPR implementation challenges while leveraging its existing strengths in opportunity and stakeholder interest.

6. CONCLUSION

Vietnam has made significant progress in establishing legal foundations for EPR through the 2020 Environmental Protection Law, transitioning from voluntary to mandatory requirements. However, substantial gaps remain between regulatory ambition and implementation reality, with current plastic packaging recycling rates (15-20%) significantly lower than reference countries (70-90%).

Our ROCCIPI analysis revealed a nuanced implementation profile characterized by strong potential (Opportunity: 9/10) and stakeholder interest (Interest: 7/10) alongside critical weaknesses in regulatory frameworks (Rules: 5/10), information dissemination (Communication: 5/10), and cultural attitudes (Ideology: 5/10). Expert interviews identified five key challenges: infrastructural limitations (91% of respondents), technical capacity constraints (83%), financial considerations (74%), coordination difficulties (65%), and limited public awareness (61%). These challenges reflect Vietnam's early implementation stage compared to reference countries with decades of experience.

The comparative analysis with Germany, Japan, and South Korea yielded transferable lessons for accelerated development, including phased implementation with clear progression pathways, flexible PRO models, material-specific approaches, informal sector integration, economic incentive alignment, targeted communication strategies, appropriate technology transfer, and complementary policy integration. These lessons underscore that effective implementation requires adaptation to local conditions rather than direct replication of foreign models.

This study contributes the first comprehensive application of the ROCCIPI framework to EPR in Vietnam, generating actionable guidance for policymakers, businesses, and civil society organizations. Despite limitations in sample representation and methodological constraints, the findings provide a scientific foundation for policy development tailored to Vietnam's unique context.

Future research should focus on longitudinal implementation tracking, product-specific analyses beyond packaging, economic impact assessments, regional comparative studies, and behavioral research on public participation. These research directions would further enhance understanding of EPR implementation dynamics in developing economies.

While Vietnam faces significant implementation challenges, the foundations for success have been established. The experience of reference countries demonstrates that building effective EPR systems requires sustained commitment and incremental improvement, but also offers encouraging evidence that significant advances in recycling performance are achievable through comprehensive policy implementation.

APPENDICES

Appendix A: Expert Interview Protocol

The semi-structured interview protocol consisted of six sections designed to systematically gather expert insights on EPR implementation in Vietnam. Each interview began with an introduction of the research purpose, confidentiality assurances, and obtaining informed consent, including permission for audio recording.

In the background section, experts described their professional roles, experience with waste management or environmental policy, and their organization's involvement with EPR implementation. This established their expertise and contextual perspective.

The perception assessment section explored experts' views on Vietnam's current EPR implementation status, significant achievements to date, and stakeholder awareness levels. This provided baseline understanding of implementation progress and knowledge gaps.

The challenges and opportunities section identified primary implementation barriers, specific obstacles for businesses, potential enhancement opportunities, and infrastructure adequacy. This revealed practical implementation constraints and potential solution pathways.

The ROCCIPI framework assessment used a standardized 1-10 rating scale for each dimension: regulatory framework clarity and enforceability; infrastructure and systemic conditions; stakeholder capacity; information dissemination effectiveness; stakeholder motivation; procedural effectiveness; and cultural values supporting environmental responsibility. This enabled quantitative comparison across dimensions and with reference countries.

The international comparison section explored relevant models from other countries, potentially adaptable elements, and aspects requiring Vietnam-specific approaches. This facilitated identification of transferable practices while acknowledging contextual differences.

The recommendations section solicited experts' views on policy improvements, support mechanisms, future evolution of EPR in Vietnam, and stakeholder roles. This generated actionable insights for policy enhancement.

The interview concluded by providing experts an opportunity to address additional aspects, gauging their willingness to review preliminary findings, and soliciting recommendations for additional expert contacts through snowball sampling.

Appendix B: ROCCIPI Rating Methodology

The ROCCIPI analytical framework employed a standardized rating system to evaluate EPR implementation across seven dimensions. Each dimension was assessed on a 10-point scale with clearly defined performance levels: scores of 1-2 indicated very poor/non-compliant systems with significant deficiencies; 3-4 reflected poor performance with major gaps outweighing strengths; 5-6 represented moderate development with basic elements present but requiring substantial improvement; 7-8 signified good performance with minor weaknesses; and 9-10 denoted excellent/fully compliant systems aligned with international best practices.

For each dimension, five specific criteria guided the assessment. The Rules dimension evaluated legal framework clarity, technical guideline specificity, requirement enforceability, alignment with broader policies, and contextual appropriateness. Opportunity assessed infrastructure availability, recycled materials market development, investment potential, international cooperation opportunities, and political-economic enabling factors. Capacity measured financial resources, technical expertise, human resources, organizational structures, and technology access.

Communication evaluation focused on stakeholder awareness, implementation guidance availability, information dissemination effectiveness, two-way communication mechanisms, and information transparency. Interest examined stakeholder motivation, business interest alignment, consumer engagement, cost-benefit perceptions, and competitive advantages. Process assessed administrative efficiency, monitoring mechanisms, reporting systems, stakeholder coordination, and operational feasibility. Ideology evaluated cultural attitudes toward environmental responsibility, consumer behaviors, corporate sustainability values, public awareness, and social norms.

The quantitative assessment process followed a systematic four-step methodology: expert ratings collection, arithmetic mean calculation for each dimension, rounding to the nearest whole number, and collection of qualitative explanations to contextualize the ratings. This approach enabled both quantitative comparison across dimensions and qualitative understanding of performance drivers, creating a comprehensive evaluation framework that balanced measurement precision with contextual insight.

Appendix C: Expert Interview Citations

Throughout this paper, interview data is cited using an alphanumeric coding system to maintain respondent confidentiality while preserving traceability. Citations follow the format "Respondent [Code], 2023" where:

- The first letter indicates respondent category:

A: Government agencies (n=5)
B: Producers and manufacturers (n=5)
C: Waste management businesses (n=3)
I: Industry associations (n=4)
N: NGOs/academia (n=3)
- The number indicates the specific respondent within each category

All interviews were conducted between January and December 2023. Complete interview transcripts and respondent profiles are maintained in a secure database by the researchers in accordance with research ethics protocols.

Examples of respondents cited in this paper include:

- Respondent A3: Senior environmental policy official with 8 years of experience in waste management regulation
- Respondent C3: Operations manager at a recycling facility with 12 years of experience in plastic waste processing
- Respondent I5: Director of sustainability at an industry association representing consumer goods manufacturers

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TRÁCH NHIỆM MỞ RỘNG CỦA NHÀ SẢN XUẤT (EPR): KINH NGHIỆM QUỐC TẾ VÀ HÀM Ý CHÍNH SÁCH CHO VIỆT NAM

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Tóm tắt. Sự gia tăng đáng kể trong tiêu thụ bao bì nhựa đã tạo ra khủng hoảng rác thải tại Việt Nam. Nghiên cứu này phân tích việc thực hiện Trách nhiệm Mở rộng của Nhà sản xuất (EPR) đối với rác thải bao bì nhựa tại Việt Nam thông qua khung phân tích ROCCIPI và so sánh với Đức, Nhật Bản và Hàn Quốc. Thông qua phân tích tài liệu và phỏng vấn chuyên gia (n=20), chúng tôi xác định khoảng cách đáng kể giữa Việt Nam và các nền kinh tế phát triển về tỷ lệ tái chế (15-20% so với 70-90%) và năng lực thực hiện. Những thách thức chính bao gồm khung pháp lý chưa hoàn thiện, cơ sở hạ tầng hạn chế, năng lực không đủ và nhận thức công chúng thấp. Việt Nam thể hiện tiềm năng mạnh mẽ (Cơ hội: 9/10) và sự quan tâm của các bên liên quan (Lợi ích: 7/10), nhưng đối mặt với những điểm yếu đáng kể trong khung quy định (Quy tắc: 5/10), phổ biến thông tin (Truyền thông: 5/10) và thái độ văn hóa (Ý thức hệ: 5/10). Chúng tôi đề xuất chiến lược đa chiều bao gồm cải cách pháp lý, đầu tư công nghệ, nâng cao năng lực và tăng cường nỗ lực truyền thông, nhấn mạnh hợp tác đa ngành và quốc tế. Nghiên cứu này cung cấp nền tảng thiết yếu cho các chính sách EPR nhằm đẩy nhanh quá trình chuyển đổi của Việt Nam hướng tới nền kinh tế tuần hoàn.
Từ khóa: Trách nhiệm Mở rộng của Nhà sản xuất; rác thải bao bì nhựa; kinh tế tuần hoàn; khung phân tích ROCCIPI; chính sách quản lý chất thải; Việt Nam

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