Assessing the implementation level of the circular economy model in industrial parks of Vietnam

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Abstract

In the context of Vietnam's rapid industrial growth and mounting environmental challenges, the circular economy (CE) has become an essential approach to balance economic development with sustainability. Industrial parks (IPs), as the backbone of industrial production, offer a critical entry point for CE practices that can improve resource efficiency, reduce costs, and enhance competitiveness. This study evaluates the extent of CE adoption in 30 Vietnamese IPs through the ReSOLVE framework (Regenerate, Share, Optimize, Loop, Virtualize, Exchange), combining survey data with qualitative insights. The findings highlight stronger progress in Regenerate and Share, identify gaps in the remaining areas, and propose policy measures to accelerate the transition toward circular industrial development.

Keywords: *circular economy, industrial parks, ReSOLVE, Vietnam*

1. Introduction

Over the past few decades, the circular economy has moved from an abstract idea into a mainstream development lens for re-designing how we produce and consume. Early work highlighted the need to close material loops and to view waste as a resource rather than an inevitable by-product of growth (Pearce and Turner, 1990). Later, influential institutions reframed CE as a regenerative industrial system: one that deliberately designs out waste and pollution, extends product lifecycles, and substitutes finite inputs with renewable ones. This shift is not simply about end-of-pipe treatment; it asks us to build business models and infrastructures that mimic nature's cycles, channeling materials back into productive use (Ellen MacArthur Foundation, 2013).

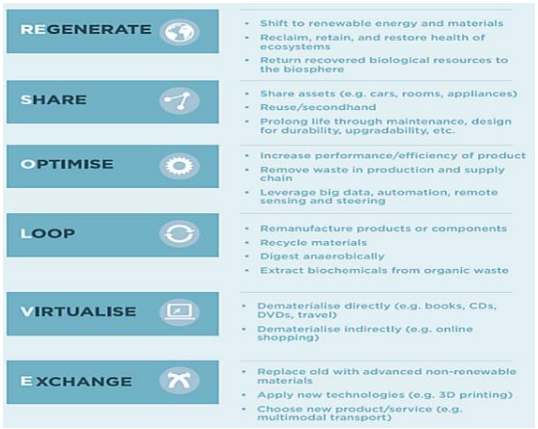
Vietnam has embedded this thinking into law and strategy. The 2020 Law on Environmental Protection formally defines CE and encourages its integration across design, production, consumption, and services. Subsequent decisions on green growth, a national CE scheme, and a national action plan through 2035, signal a progressively clearer policy pathway. The direction of travel is evident: move beyond pilot projects and begin measuring, incentivizing, and mainstreaming circular practices, particularly where they can change outcomes at scale.

Industrial parks offer a promising setting for this transition. They combine concentrated demand for utilities with centralized management, shared infrastructure, and proximity among tenants – conditions that make resource

sharing, by-product exchanges, wastewater reuse, and joint energy solutions feasible. Among the different zone typologies, eco-industrial parks (EIPs) are the most natural hosts for circular strategies. Other park models can also move toward circularity, yet those focused primarily on logistics or export processing often lack the monitoring, shared infrastructure, and environmental oversight needed to implement CE in a meaningful way.

To systematize what "circular" looks like in practice, we draw on the **ReSOLVE framework (Figure 1.1).** Developed by the McKinsey Center for Business and Environment in collaboration with the Ellen MacArthur Foundation, ReSOLVE groups CE strategies into six action areas. In brief, Regenerate centers on renewable energy and restored natural systems; Share focuses on shared assets and extended product life; Optimize improves system performance through efficiency and process innovations; Loop closes material cycles via remanufacturing and recycling; Virtualize shifts activities into digital channels; and Exchange promotes new materials and technologies that displace resource-intensive options. Using ReSOLVE as an evaluation lens makes it easier to compare parks, track progress, and identify gaps that policy and investment can address.

Figure 1.1. The ReSOLVE framework



Source: Towards a circular economy: Business rationale for an accelerated transition

2. Methods

Our study focuses on the entities that plan and operate parks: the industrial park management companies. Compared with individual tenant firms, these organizations oversee the broader industrial ecosystem – zoning, utilities, environmental services, and the rules that enable or discourage resource sharing. They therefore have an outsized influence on whether circular practices can take root at scale.

We adopt a mixed-methods approach. A structured survey, administered in Vietnamese and English via Google Forms during February–May 2025, captures

quantitative signals of CE adoption across **24 practices** aligned to ReSOLVE. Respondents represent 30 parks that either declared an intention to transition, are already undertaking that transition, or were recently established as EIPs. To supplement the numbers, we invite open comments and brief elaborations about barriers, enablers, and examples. These qualitative inputs help explain why scores look the way they do.

Each of the 24 practices is scored on a four-point implementation scale, mapped numerically for analysis: ***0 for non-existent, 3 for under implementation, 6 for established, and 10 for fully established and optimized.*** We then compute three indicators. **The Implementation Rate** captures the share of parks that have adopted a practice to any degree. **The Practice Score** is the average numerical score for that practice, reflecting depth. **The Action Score** averages practice scores within each ReSOLVE group, offering a concise view of relative progress across the six action areas.

3. Findings and Discussion

3.1. Overall progress

Across the parks we surveyed, most practices are underway but not yet mature. Scores cluster in the lower-middle range, with many activities sitting at the "under implementation" stage and fewer reaching "established and optimized." When we aggregate by action groups, Regenerate performs best, followed by Share. The remaining four – Optimize, Loop, Virtualize, and Exchange, tend to lag, and their scores are relatively close to one another. This pattern points to a transition that has begun in visible, infrastructure-centric areas such as energy, water, and shared services, but that remains uneven where deeper process change or new market arrangements are required.

3.2. Regenerate: leading but uneven

Among the six ReSOLVE groups, Regenerate stands out with the highest Action Score of 4.3. This reflects a visible emphasis on renewable energy adoption, green infrastructure, water conservation, waste management, and cleaner production. Within this group, the best-performing practice is green infrastructure development (No.2), which achieved a Practice Score of 4.6. Nearly half of the surveyed parks (46.7%) reported having these measures at the "established" or "fully optimized" levels, and two parks in Ho Chi Minh City and Tay Ninh, scored a perfect 10. Similarly, renewable energy and energy efficiency (No.1) recorded a Practice Score of 4.4, with 43.3% of parks reporting established or optimized adoption. Yet here the distribution was polarized: while two parks have reached full optimization, others had not introduced any renewable energy projects at all.

Water conservation measures (No.3) showed encouraging uptake, with 60% of parks at the "under implementation" stage and a mean score of 4.2. This suggests broad recognition but limited depth, as most parks have only started introducing basic

technologies rather than comprehensive reuse systems. Notably, the two aforementioned IPs also achieved the maximum score, showing that higher standards are possible when managers explicitly integrate water reuse into their infrastructure planning. Waste management and recycling (No.4) also scored 4.2, with 53.3% of parks reporting established practices. However, none reported optimized implementation, pointing to a ceiling effect: collection and sorting are in place, but higher-value recycling and closed-loop initiatives remain rare. The weakest practice in this group is cleaner production (No.5), averaging just 3.9. Around 16.7% of parks had not adopted any measures at all, and only 3.3% reached the optimized stage. The IP in Tay Ninh once again stood out as a positive case, being the only park to report full optimization.

Table 3.1. The implementation level of the circular economy model in industrial parks of Vietnam

ReSOLVE	Description of CE Practice	Degree of Implementation (%)				Score {μ (σ)}	
		NE	UI	ES	EO	Practice Score	Action Score
A. REGENERATE	1. Have mechanisms encouraging enterprises to adopt renewable energy sources (e.g., solar, wind, biomass) and implement energy-efficient technologies.	6.7	50	36.6	6.7	4.4 (2.3)	4.3 (0.2)
	2. Implement guidelines and initiatives promoting the development of green infrastructure, including afforestation, biodiversity conservation, and ecosystem restoration.	3.3	50	40	6.7	4.6 (2.2)	
	3. Introduce programs supporting enterprises implement rainwater harvesting systems and adopt water-saving measures in production and operations to enhance water efficiency within the industrial park.	6.7	60	23.3	10	4.2 (2.5)	
	4. Facilitate waste management solutions that support businesses in reusing, recycling, or converting waste into raw materials or energy instead of conventional disposal.	13.3	33.3	53.3	0	4.2 (2.1)	
	5. Provide guidance helping enterprises adopt cleaner production practices, reducing the consumption of raw materials, fuel, and energy while minimizing waste generation.	16.7	40	40	3.3	3.9 (2.4)	
B. SHARE.	6. Develop or upgrade shared infrastructure services to help enterprises optimize resource use and meet environmental requirements.	13.3	26.7	53.3	6.7	4.7 (2.6)	3.5 (0.8)
	7. Have programs promoting industrial symbiosis and resource-sharing, where waste or by-products from one enterprise can serve as raw materials for another.	23.3	40	30	6.7	3.7 (2.8)	
	8. Offer guidance and technical support to enterprises in conducting Life Cycle Assessment (LCA) and applying eco-design principles	30	46.7	20	3.3	2.9 (2.5)	
	9. Provide solutions to help enterprises monitor energy and resource consumption, track environmental performance, and control emissions using smart monitoring systems (IoT, AI)	26.7	60	10	3.3	2.7 (2.2)	
C. OPTIMIZE	10. Have guidelines encouraging enterprises to adopt energy-saving technologies, such as LED lighting, thermal insulation, and smart heating systems in industrial production.	3.3	56.7	33.3	6.7	4.4 (2.2)	3.1 (0.7)
	11. Have incentives or penalties to motivate enterprises to achieve environmental performance targets, including green building certifications and emission reduction goals.	26.7	53.3	16.7	3.3	2.9 (2.4)	
	12. Invest in research and development (R&D) related to circular economy practices and provide businesses with guidance on transitioning to more sustainable production models.	33.3	50	13.3	3.3	2.6 (2.4)	
	13. Have green logistics solutions supporting or requiring enterprises to reduce emissions by adopting low-emission transport, shared warehousing, or optimizing delivery routes.	33.3	36.7	26.7	3.3	3.0 (2.7)	
	14. Provide programs to support enterprises improve resource efficiency in production and operations, reducing material waste.	36.7	46.7	13.3	3.3	2.5 (2.4)	
D. LOOP	15. Implement solutions to assist enterprises in collecting, transporting, and handling used materials, packaging, hazardous waste, and expired products	23.3	50	23.3	3.3	3.2 (2.4)	3.2 (0.1)
	16. Enforce regulations requiring enterprises to segregate and recycle industrial waste, accompanied by inspection, monitoring, and penalties for non-compliance.	16.7	60	20	3.3	3.3 (2.2)	
	17. Provide guidelines or incentive programs encouraging the use of recycled construction materials and promote the recovery of industrial by-products for reuse in manufacturing.	26.7	50	20	3.3	3.0 (2.4)	
E. VIRTUALIZATION	18. Require enterprises to utilize digital platforms for sustainability reporting, regulatory compliance monitoring, and environmental impact assessments.	33.3	40	23.3	3.3	2.9 (2.6)	3.0 (0.3)
	19. Implement measures to assist businesses in optimizing transportation and reducing logistics-related emissions.	26.7	60	10	3.3	2.7 (2.2)	
	20. Implement regulations requiring enterprises to adopt digital documentation systems for environmental compliance, minimizing paper consumption and improving transparency in environmental management.	26.7	40	30	3.3	3.3 (2.6)	
F. EXCHANGE	21. Implement initiatives encouraging enterprises to use renewable or recoverable materials while limiting hazardous materials to reduce environmental impact.	26.7	40	30	3.3	3.3 (2.6)	3.3 (0.2)
	22. Provide guidance and incentives to encourage enterprises to use sustainable construction materials in infrastructure and production.	23.3	46.7	23.3	6.7	3.5 (2.7)	
	23. Requires businesses to gradually transition from conventional energy sources to cleaner and more efficient alternatives	26.7	40	26.7	6.7	3.4 (2.8)	
	24. Enforces sustainability standards guiding enterprises in upgrading infrastructure and modernizing technology in line with circular economy principles under a phased implementation approach.	30	46.7	20	3.3	2.9 (2.5)	

Source: Author's calculation

Taken together, these results show that regeneration practices are reasonably well integrated into Vietnam's industrial parks, but most are plateauing at mid-level implementation. The gap between *"established"* and *"optimized"* stages remains large, suggesting that while technologies and infrastructure are available, parks need clearer standards, more robust enforcement, and stronger financial incentives to move from pilot projects to systemic adoption.

3.3. Share: strong in infrastructure, weak in knowledge and monitoring

The Share group ***ranks second, with an Action Score of 3.5.*** The clearest success here lies in shared infrastructure services (No.6), which scored 4.7 and had the highest degree of uptake across all actions. About 60% of the parks reported being at the established or optimized levels. Two parks, one in Tay Ninh and one in Hai Phong, scored a full 10, demonstrating how collective facilities can lower costs for tenants while improving environmental performance.

By contrast, industrial symbiosis and resource-sharing programs (No.7) scored 3.7. While several parks have started trial exchanges, many others, including some IPs in Hanoi, Bac Ninh, Dong Nai... reported no formal schemes. Technical support for life-cycle assessment and eco-design (No.8) and monitoring energy and resource consumption (No.9) fared even worse, with Practice Scores of just 2.9 and 2.7. In both cases, around 60% of parks said they were only at the "under implementation" stage, and some had not started at all. Only the IP in Tay Ninh reported having fully optimized these practices.

The qualitative feedback reinforces this uneven picture. Some managers described regulatory barriers that slow down industrial symbiosis, such as the lack of standardized contracts and liability provisions. Others highlighted low tenant participation, with firms focusing narrowly on compliance rather than joining collective resource-sharing schemes. Yet there are promising examples: one IP in Ninh Binh has operated a by-product exchange where fertilizer waste is reused in cement production, and one IP in Bac Ninh has installed metering systems to track water and energy consumption at tenant level. These cases show that when management companies take an active role, sharing systems can function effectively, but scaling up requires stronger regulatory and financial backing.

3.4. Exchange: interest in new materials, but implementation remains patchy

The Exchange group achieved an ***Action Score of 3.3,*** ranking just below Share. The leading practice here is guidance and incentives for sustainable construction materials (No.22), which scored 3.5. Nearly half of the parks (46.7%) reported being at the *"under implementation"* stage, suggesting that progress is underway but far from optimized. Adoption of renewable or recoverable materials (3.3) (No.21) and energy transition initiatives (3.4) (No.23) was broadly similar, with both practices showing only moderate progress across the surveyed parks. The weakest area was infrastructure upgrade standards (No.24), which averaged only 2.9, reflecting the fact that most parks lack binding green standards for buildings, roads, or utilities.

Qualitative insights confirm that the main bottlenecks are unclear criteria and weak enforcement. Even parks that are committed to sustainable construction say they lack national benchmarks or certification systems for "green" materials. Without standardized requirements, many projects remain voluntary and fragmented. Nevertheless, leading parks such as IPs in Tay Ninh, Ninh Binh and Hai Phong are experimenting with alternative fuels, recycled aggregates, and rooftop solar. These

examples show that, with the right policy and financial support, Exchange actions could quickly accelerate.

3.5. Loop: regulatory foundation but limited private sector uptake

Loop practices scored ***an average of 3.2***, slightly below Exchange. Regulatory frameworks for hazardous waste classification, segregation, and recycling are in place, but implementation at park level remains shallow. Waste segregation and recycling regulations (No.16) emerged as the strongest within this group, with 60% of parks at the "under implementation" stage and a Practice Score of 3.3. Two other practices, assisting enterprises with handling used materials (No.15) and encouraging recycled construction materials (No.17), scored 3.2 and 3.0, respectively. However, very few parks reached full optimization, and non-adoption rates were still notable.

Feedback from managers highlights the lack of a functioning market for secondary materials, unclear cost-sharing rules between parks and tenants, and weak enforcement of existing recycling obligations. Some parks reported that while they guide tenants on waste classification, actual compliance varies, and there are limited downstream facilities willing to absorb large volumes of recycled by-products. Without stronger demand signals and investment in supporting infrastructure, Loop practices are likely to remain stuck at the halfway stage.

3.6. Optimize: energy-saving measures advance, but others lag

The Optimize group ***averaged 3.1***, but this masks wide disparities. Adoption of energy-saving technologies (No.10) is relatively advanced, scoring 4.4. More than half of the parks (56.7%) reported being at least under implementation, and only one park said it had not started. In contrast, other practices performed poorly. Incentives for environmental performance (No.11) scored 2.9, while investment in clean R&D (No.12) and green logistics solutions (No.13) scored 2.6 and 3.0. The lowest result was for resource efficiency improvements (No.14), which averaged just 2.5, with over one-third of parks reporting no action at all.

These findings suggest that energy efficiency has benefited from existing regulations and audits, but other optimization strategies lack a strong policy or financial push. Managers also pointed to a shortage of technical expertise to help tenants redesign processes or logistics in greener ways. Some parks have organized knowledge-sharing workshops, but SMEs in particular see limited value without concrete incentives or subsidies to offset high upfront costs.

3.7. Virtualize: digital transformation remains the weakest link

The lowest Action Score came from Virtualize, ***at just 3.0.*** Among its three practices, digital documentation systems (No.20) led with a score of 3.3, showing that some parks have begun adopting electronic reporting. Transport optimization (No.19) followed closely at 2.9, while digital platforms for sustainability (No.18)

reporting lagged behind at 2.7, with only a handful of parks reaching the established or optimized stages.

The qualitative feedback explains this weakness. Many firms remain reluctant to share environmental performance data due to concerns about confidentiality and data security. Managers also noted the absence of any mandatory requirements for digital reporting or monitoring, meaning adoption depends on voluntary initiatives. As a result, nearly 70% of parks have yet to integrate digital solutions in a systematic way. Those that have, report faster compliance checks and clearer benchmarking, but the wider diffusion of digital tools is still far from reality.

3.8. Variability and emerging leaders

The results also show significant variation across parks. Standard deviations for practice scores ranged from 2.1 to 2.8, underscoring the unevenness of implementation. Optimize, Loop, Virtualize, and Exchange showed relatively consistent adoption patterns, while Share and Regenerate displayed the widest disparities. Several parks stand out as emerging leaders. The IP in Tay Ninh achieved the maximum score in multiple categories, reflecting comprehensive sustainability guidelines, renewable energy systems, and strong support for industrial symbiosis. The IP in Ninh Binh also adopted nearly all CE practices, missing only one. By contrast, some others IPs in Bac Ninh, Dong Nai... scored lowest, with several practices still at zero. These parks, however, are included in the 2025–2029 phase of Vietnam's Global Eco-Industrial Parks Programme (GEIPP) and are expected to progress.

In short, while progress is real and visible in certain areas, Vietnam's industrial parks remain at an early to mid-stage of the circular transition. The strongest advances are in areas where centralized infrastructure and clear regulations make adoption easier. In other areas, weak incentives, vague criteria, and coordination challenges keep practices from moving beyond trial stages.

3.9. Perceived benefits and barriers

Park managers consistently point to ***reduced operating and maintenance costs*** as the most immediate benefit of CE adoption. A close second is ***reputational***: parks that can prove their environmental credentials and circular performance attract investors with stringent ESG requirements, often multinationals looking for reliable, low-risk locations (Figure 3.9.1). On the other hand, the most frequently cited barrier is ***the lack of clear, detailed regulations and incentives. High upfront costs for infrastructure upgrades and limited willingness or capacity among some tenants,*** especially SMEs, to invest in new equipment or to share data compound the challenge. These constraints reinforce one another: absent strong rules and financial signals, investment slows and collaboration thins, which in turn keeps the supplier ecosystem underdeveloped (Figure 3.9.2).

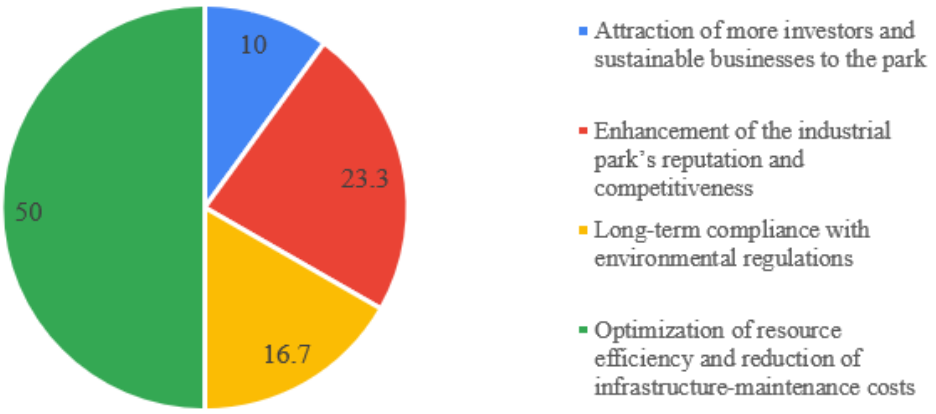


Figure 3.9.1. Benefits of implementing CE in IPs in Vietnam (Unit: %)

Source: Survey's results

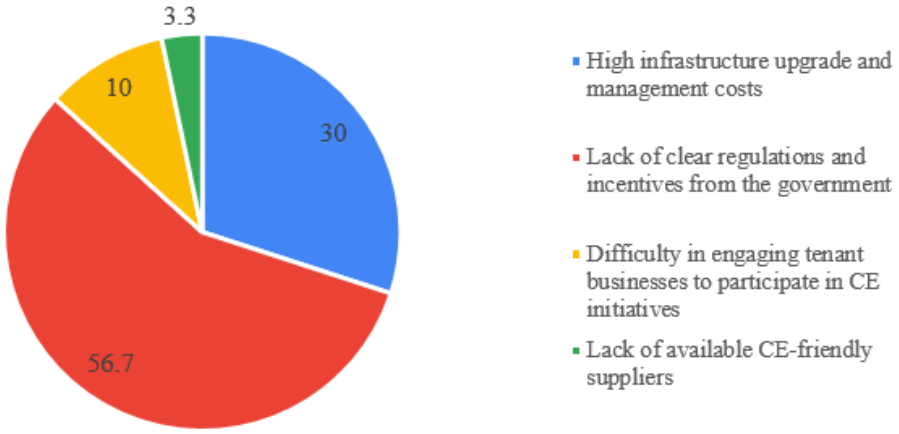


Figure 3.9.2. Challenges of implementing CE in IPs in Vietnam (Unit: %)

Source: Survey's results

4. Policy Landscape and Gaps

Vietnam's CE policy architecture has deepened in both scope and specificity (Table 4.1.). It began with definitions and strategic direction, moved through institutionalization with decrees that set criteria and introduced the concept of EIPs, and is now entering an "action and measurement" phase with a national plan to 2035 and technical criteria for EIP certification. Three features stand out: coverage across legal tiers and sectors; an increasing degree of obligation as instruments mature; and a growing blend of incentives with accountability.

Table 4.1. Vietnam's policy framework for the specific CE components in IPs

Action (ReSOLVE)	Practice	Current central-level policy
R (Regenerate)	Green infrastructure development	Decree 82/2018/ND-CP (Art. 42) mandates that at least 25% of industrial-park land be allocated to green spaces, transport corridors, common-use service infrastructure; further elaborated by Decree 35/2022/ND-CP.
	Renewable energy & energy efficiency	Law No. 50/2010/QH12 on Economical and Efficient Use of Energy: a sector-wide framework for planning, audits and renewable promotion; Circular No. 02/2014/TT-BCT, later replaced by Circular 28/2021/TT-BCT: detailed energy-saving measures for industrial facilities.
	Water-conservation measures	Law on Water Resources 2023, which mandates protection and efficient use of water; accompanied by implementing decrees...
	Waste management & recycling	Decree 08/2022/ND-CP on management of wastes and scrap; Circular 02/2022/TT-BTNMT requiring segregation of common and hazardous solid waste...
	Cleaner production	Decision 889/QD-TTg (2020) approving National action plan for sustainable production and consumption for 2021–2030; Circular 02/2022/TT-BTNMT encouraging environmentally friendly technology and energy saving...
S (Share)	Shared infrastructure services	Decree 82/2018/ND-CP (Art. 3(3)) requires master-plans for IPs to include the development, investment, operation and maintenance of common-use technical and social infrastructure; Decree 35/2022/ND-CP further simplifies administrative procedures while preserving these obligations...
	Industrial symbiosis & resource sharing	No specific policy for IPs. Decree 35/2022/ND-CP (Art. 37) requires provincial People's Committees to support on- and off-park infrastructure investment so enterprises within EIPs can exchange byproducts, energy, water, and other resources as part of a symbiotic network...
	LCA and eco-design guidance	No specific policy mandating LCA or eco-design for industrial zones.
	Monitoring energy & resource use	No park-level policy. Circular 28/2021/TT-BCT requires enterprises (not parks) to conduct energy audits and reporting...
O (Optimize)	Energy-saving technologies	No park-level policy; enterprises must adopt energy-saving technologies per Law 50/2010/QH12 and Decision 280/QD-TTg (National Energy Efficiency Programme 2019–2030).
	Incentives for environmental performance	Law on Environmental Protection (2020) and Law on Investment (2020) provide incentives for environmentally friendly projects...
	R&D investment	Law on Science and Technology (2013) encourages R&D in green technology and cleaner production; supported by national-level science and technology programmes...
	Green-logistics solutions	No specific policy dedicated to "green logistics"; Vietnam's logistics strategies (Decision 200/QD-TTg, Resolution 163/NQ-CP) set broad sector targets but include no mandatory green-transport or eco-logistics measures for IPs.
	Improving resource efficiency	Law on Energy Efficiency (2010), Circular 28/2021/TT-BCT, and Law on Environmental Protection (2020) all promote resource-efficiency measures...
L (Loop)	Handling used materials & hazardous waste	No specific policy on IPs; general provisions under Law on Environmental Protection (2020) and Decree 08/2022/ND-CP apply.
	Recycled construction materials &	Joint circulars from the Ministry of Construction and MONRE on the use of fly ash, slag, etc.; related national technical regulations such as QCVN 16:2019/BXD...

	industrial by-products	
	Waste segregation & recycling	Circular 02/2022/TT-BTNMT mandates waste segregation at source; Decree 08/2022/ND-CP promotes reuse and recycling of industrial waste...
V (Virtualize)	Digital documentation systems	No specific policy. Decision 749/QD-TTg on National Digital Transformation sets broad goals but does not mandate digital systems at the park level.
	Transport optimisation	No specific policy for green transport within zones; road-traffic law and transport master plans contain no dedicated "green" provisions for IZs.
	Digital platforms for sustainability reporting	No specific policy; the Law on Environmental Protection (2020) only requires general environmental reports.
E (Exchange)	Sustainable construction materials	The Construction Law (2020) and National Technical Regulations QCVN 09:2017/BXD on energy-efficient buildings sets mandatory technical requirements for the design, construction or retrofit of civil works.
	Energy-transition initiatives	Law on Amending and supplementing a number of articles of the Electricity (2012) strengthens support for renewable energy by requiring electricity development plans to include new and renewable sources and by adopting preferential policies for investment in renewable energy power plants; Decision No. 11/2017/QD-TTg provides a 20-year feed-in tariff of 9.35 US¢/kWh for grid-connected solar projects and grants import-duty exemptions, land-use incentives, and tax holidays for solar power developments.
	Renewable or recoverable materials	Law on Environmental Protection 2020 (Art. 73) promotes recycled and reusable materials; Decree 08/2022/ND-CP governs management of industrial scrap.
	Infrastructure-upgrade standards	No mandatory green standards yet; only general technical regulations exist for transport, water, and energy systems.

Source: Author's compilation based on Vietnamese policy documents

Yet gaps remain when viewed through the ReSOLVE lens. Digitalization and material/technology substitution are not backed by sufficiently clear or mandatory requirements at the park level. Shared infrastructure is encouraged, but practical frameworks for industrial symbiosism, contracts, liability, metering and settlement, and licensing, are still evolving. Optimization lacks robust incentive schemes tied to verifiable targets, while closed-loop material markets need standardized specifications and reliable demand signals to scale. In short, the "why" of CE is largely in place; the "how," especially the codified mechanics that help parks and firms collaborate at low transaction cost, is still catching up.

5. Recommendations

The evidence suggests that progress accelerates when expectations are specific, measurement is standardized, and incentives reward results rather than intentions. For policymakers, one priority is to translate the ReSOLVE structure into a practical set of core indicators for parks, with a phased timeline and periodic disclosure. Linking preferential access to credit, tax benefits, and pilot funds to verified performance, such as increases in water reuse, reductions in energy intensity, or a rising share of secondary materials in projects, would encourage investments that deliver measurable outcomes. Establishing clear templates for industrial symbiosis

agreements, including provisions for metering, quality assurance, and risk sharing, would lower the legal and administrative hurdles that currently slow exchanges.

Digitalization deserves a dedicated push. A simple, standardized protocol for environmental and resource data, implemented through provincial or regional platforms, would make it easier for parks to report consistently and for authorities to target support where it matters. Over time, a transition to digital MRV can underpin results-based incentives and create a level playing field for parks competing to attract high-quality tenants.

Management companies can act now by setting park-level circular roadmaps over a three- to five-year horizon, incorporating ReSOLVE elements into lease agreements, and offering an onboarding package that introduces tenants to metering, reporting, and symbiosis opportunities. Building shared assets, such as wastewater reuse, rooftop solar, and consolidated sorting and staging for secondary materials, sends a strong signal and often reduces unit costs for tenants. For firms themselves, structured plans to cut emissions and resource intensity, combined with participation in material and energy exchanges, raise competitiveness and resilience, especially as supply chains tighten sustainability requirements.

Finally, the transition will be faster and fairer if smaller firms are not left behind. Targeted technical assistance, streamlined access to green credit, and standardized toolkits for life-cycle assessment and eco-design can help SMEs move from awareness to implementation. Collaboration with international partners and domestic research institutes can fill capability gaps and reduce risk in early projects. When a handful of exemplar parks demonstrate that circular practices are both feasible and commercially sensible, diffusion tends to follow.

6. Conclusion

Vietnamese industrial parks are moving toward circularity, with the most visible progress in areas where centralized management and shared infrastructure create natural advantages. Regenerate and Share are out in front; the others are underway but require sharper rules, better incentives, reliable markets for secondary materials, and stronger digital foundations. The survey of 30 parks confirms what many practitioners already suspect: the enabling environment is improving, but the mechanics of implementation still determine outcomes on the ground.

If policy continues to evolve from broad commitments to concrete, measurable requirements, and if incentives are tied to verified performance, parks will find it easier to invest, tenants will be more willing to collaborate, and the supplier ecosystem will grow in response. In this setting, the ReSOLVE framework is not just an assessment tool; it can be a shared roadmap for aligning infrastructure, finance, technology, and management practices. With steady, coordinated effort, Vietnam’s industrial parks can translate circular economy principles into everyday

operations, yielding economic gains and environmental benefits that reinforce one another over time.

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