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Internal Carbon Pricing as a Purchasing Tool for Emissions Reduction

A case-study of a European OEM

Bachelor's thesis within Technology Management and Economics

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Intern Koldioxidprissättning som ett inköpsverktyg för utsläppsminskning

En fallstudie av en europeisk originaldelstillverkare

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A case-study of Internal Carbon Pricing as a Purchasing Tool for Emissions Reduction in a European Automotive OEM

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Abstract

Problem

The transition toward a low-carbon economy requires firms to internalise the cost of carbon dioxide emissions in their decision-making. This is particularly important within Scope 3, the indirect emissions occurring across the company's value chain, where the largest share of emissions in manufacturing firms typically resides. Internal Carbon Pricing (ICP) has emerged as a management control mechanism designed to bridge corporate sustainability ambitions with operational decision-making. However, although the existing literature describes the conceptual foundations of ICP, empirical evidence on how the mechanism functions in practice within sourcing processes remains limited. Automotive Original Equipment Manufacturers (OEMs) face particular pressure due to emissions-intensive supply chains and approaching regulatory frameworks such as the EU Emissions Trading System (EU ETS) and the Carbon Border Adjustment Mechanism (CBAM). Understanding the conditions under which ICP can produce its intended effects in this context is therefore critical, both for firms preparing for implementation and for policymakers seeking to design supportive regulatory environments.

Aim

The aim of the study is to investigate the organisational, structural, and institutional conditions that determine the effectiveness of ICP as a management control mechanism within the sourcing function of a European automotive OEM. The study seeks to map the practical problems and opportunities that arise when implementing ICP for the management of Scope 3 emissions, and to develop a deeper understanding of what an ICP implementation entails for the organisation. By doing so, the study contributes both theoretical insights into the implementation conditions of ICP and practical guidance for firms and policymakers navigating the green transition.

Theoretical framework

The study's primary research domains are corporate environmental strategy and the organisational implementation of ICP. Within these areas, the previous research draws on peer-reviewed scholarly articles, foundational management literature, and policy reports. Central concepts include institutional pressures on environmental strategy, the structural and pricing dimensions of ICP design, and the behavioural, cultural, and data-related conditions that shape implementation outcomes. The reliability of sources was evaluated against established source-criticism criteria, and the study has prioritised contributions published in peer-reviewed academic journals together with publications from recognised public institutions.

Methodology

The study was conducted as a qualitative exploratory case study using an abductive research approach, examining a single embedded case, a European automotive OEM that had completed a structured ICP pilot study during 2024. Two embedded units of analysis were employed, the sustainability function and the purchasing function, to enable comparison of perspectives across functional boundaries. Primary data were collected through ten semi-structured interviews, complemented by contextual observations of approximately six to seven hours from meetings with key informants at the case company. Secondary data were drawn from internal policy documents, the ICP pilot study material, and publicly available sustainability and annual reports. The empirical material was analysed using thematic analysis, with previous research applied throughout to interpret the findings.

Results and Implications

The study contributes to the literature on corporate environmental strategy and the organisational implementation of ICP by reframing ICP from a technical pricing mechanism to an organisational control system whose effectiveness depends on structural, organisational, and institutional conditions. The empirical findings show that ICP enters the sourcing process too late to influence early supplier qualification, and that its effect on final selection is concentrated on components with high carbon intensity. At the time of this study, purchasing performance was governed entirely by cost-based KPIs reinforced by external market pressure, and no formal implementation of ICP has been made following the pilot study. Three theoretical contributions are made. First, when carbon cost is small relative to total sourcing cost, shadow pricing cannot shift the decision regardless of managerial involvement. Second, an abatement cost framing developed within logistics sourcing is identified, equivalent to shadow pricing but reversed in presentation, which is not captured by existing ICP design typologies. Third, supplier-market competitiveness is established as a crucial factor for ICP effectiveness within sourcing. The practical contribution is that segment selection matters more than price calibration, and that shadow pricing is a viable first step if supported by clear ownership, aligned KPIs, and formal guidelines linking carbon costs to supplier selection. For policymakers, ICP cannot drive decarbonisation in isolation as long as customer markets do not reward sustainability, and firms outside the EU face asymmetric regulation.

The study is written in English.

Keywords: Internal carbon pricing, corporate environmental strategy, Scope 3 emissions, sourcing, automotive OEM, CBAM, shadow price, carbon fee

Sammanfattning

Problem

Övergången mot en koldioxidsnål ekonomi kräver att företag internaliserar kostnaden för koldioxidutsläpp i sitt beslutsfattande. Detta är särskilt viktigt inom Scope 3, de indirekta utsläppen som uppstår längs företagets värdekedja, där den största andelen utsläpp hos tillverkande företag vanligtvis sker. Intern koldioxidprissättning (Internal Carbon Pricing, ICP) har vuxit fram som ett ekonomistyrningsverktyg utformat för att överbrygga företags hållbarhetsambitioner med operativt beslutsfattande. Trots att den befintliga litteraturen beskriver de konceptuella grunderna för ICP, finns dock fortfarande en begränsad mängd empiriska studier kring hur mekanismen fungerar i praktiken inom inköpsprocesser. Tillverkande företag inom fordonsindustrin (Automotive Original Equipment Manufacturers, OEMs) står inför utmaningar till följd av utsläppsintensiva leverantörskedjor och regulatoriska ramverk, som EU:s utsläppshandelssystem (EU ETS) och gränsjusteringsmekanismen för koldioxid (CBAM). Att förstå under vilka förutsättningar ICP kan ge avsedda effekter i detta sammanhang är därför avgörande, både för företag som förbereder implementering och för beslutsfattare som vill utforma stödjande regulatoriska miljöer.

Syfte

Studiens syfte är att undersöka de organisatoriska, strukturella och institutionella förutsättningar som avgör hur effektivt ICP fungerar som ett ekonomiskt styrmedel inom inköpsfunktionen på ett europeiskt fordons-OEM. Studien syftar till att kartlägga de praktiska problem och möjligheter som uppstår vid implementering av ICP för hanteringen av Scope 3-utsläpp, samt att utveckla en djupare förståelse för vad en ICP-implementering innebär för organisationen. Genom detta bidrar studien med såväl teoretiska insikter om implementeringsförutsättningar för ICP som praktisk vägledning för företag och beslutsfattare som navigerar den gröna omställningen.

Teoretiskt ramverk

Studiens primära forskningsområden är företags miljöstrategi och den organisatoriska implementeringen av ICP. Inom dessa områden bygger den tidigare forskningen på vetenskapligt granskade artiklar, grundläggande managementlitteratur och policyrapporter. Centrala begrepp innefattar institutionella påtryckningar på miljöstrategi, de strukturella och prismässiga dimensionerna av ICP-design samt de beteendemässiga, kulturella och datarelaterade förutsättningar som formar implementeringens utfall. Källornas tillförlitlighet har bedömts utifrån etablerade källkritiska kriterier, och studien har prioriterat bidrag publicerade i granskade akademiska tidskrifter tillsammans med publikationer från erkända offentliga institutioner.

Metod

Studien genomfördes som en kvalitativ explorativ fallstudie med en abduktiv forskningsansats, och undersökte ett enskilt inbäddat fall, en europeisk fordonstillverkare som slutförde en strukturerad pilotstudie av ICP under 2024. Två inbäddade analysenheter användes, hållbarhetsfunktionen och inköpsfunktionen, för att möjliggöra jämförelse av perspektiv över funktionella gränser. Primärdata samlades in genom tio semistrukturerade intervjuer, kompletterade med kontextuella observationer om cirka sex till sju timmar från möten med nyckelpersoner vid fallföretaget. Sekundärdata hämtades från interna policydokument, materialet från ICP-pilotstudien, samt offentligt tillgängliga hållbarhets- och årsredovisningar. Det empiriska materialet analyserades med tematisk analys, där tidigare forskning tillämpades genomgående för att tolka resultaten.

Resultat och implikationer

Studien bidrar till litteraturen om företags miljöstrategi och den organisatoriska implementeringen av ICP genom att omformulera ICP från en teknisk prissättningsmekanism till ett organisatoriskt styrningssystem vars effektivitet beror på strukturella, organisatoriska och institutionella förutsättningar. De empiriska resultaten visar att ICP introduceras för sent i inköpsprocessen för att påverka den tidiga kvalificeringen av leverantörer, och att dess effekt på det slutgiltiga leverantörsvalet är begränsad till komponenter med hög koldioxidintensitet. Vid studiens utförande styrs inköpsfunktionen helt av kostnadsbaserade nyckeltal som förstärks av externa marknadstryck, och ingen formell implementering av ICP har genomförts efter pilotstudien. Tre teoretiska bidrag görs. För det första, när koldioxidkostnaden är liten i förhållande till den totala inköpskostnaden kan skuggprissättning inte påverka beslutet, oavsett ledningens involvering. För det andra identifieras en inramning baserad på reduktionskostnad (abatement cost) utvecklad inom logistikfunktionen, vilken är ekvivalent med skuggprissättning men omvänt presenterad, och som inte fångas av befintliga typologier för ICP-design. För det tredje fastställs konkurrensen på leverantörsmarknaden som en avgörande faktor för ICP:s effektivitet inom inköp. Det praktiska bidraget är att segmentval har större betydelse än priskalibrering, och att skuggprissättning kan vara ett bra första steg om det stöds av tydligt ägarskap, samordnade nyckeltal och formella riktlinjer som kopplar koldioxidkostnader till leverantörsval. För beslutsfattare gäller att ICP inte kan driva utsläppsminskning isolerat så länge kundmarknader inte efterfrågar hållbarhet, och företag utanför EU ställs inför asymmetrisk reglering.

Rapporten är skriven på engelska.

Nyckelord: Internal carbon pricing, corporate environmental strategy, Scope 3 emissions, sourcing, automotive OEM, CBAM, shadow price, carbon fee.

Contents

1. Introduction

To address the issue of climate change, economic internalisation of carbon dioxide emissions has been suggested (Helbling, n.d.). Different methods to internalise the effects of CO_2 exist within society. Politicians hold regulatory power whilst companies may use internal pricing. On the first of January 2026 the EU deployed the Carbon Border Adjustment Mechanism (CBAM) for certain materials coming into the union (European Commission, n.d.-b). Preceding CBAM, the EU had already deployed the Emissions Trading System (EU ETS), a trading system for emission rights for actors within the union's borders (European Commission, n.d.-a).

For companies, the issue of climate change has become a strategic concern. Companies position themselves to mitigate the consequences climate change may inflict on their business. Certain companies have chosen a proactive approach to their business' sustainable transformation. For companies that have included environmental impact as a business decision parameter, a conflict of interest between sustainability factors and economic measures often occurs. Internal carbon pricing, henceforth ICP, can be deployed to manage this problem. ICP is defined as a strategic tool that assigns a financial cost per metric tonne of CO_2 equivalents emitted by a specific business unit or activity within a firm (Chen et al., 2025). By attaching a financial cost to emissions, ICP integrates carbon considerations into financial decisions that would otherwise be made on cost grounds alone. The automotive Original Equipment Manufacturer (OEM) in focus for this case study is in the decision phase for introducing ICP.

In preparation for the decision to introduce ICP in the case company, a pilot study was performed in 2024 (Case company, 2024). The pilot study tested two price levels to understand what the implications of implementing ICP in the sourcing process may be for the organisation. Sourcing was selected due to the leverage the case company has on suppliers when negotiating purchasing contracts and the effects ICP may have on Scope 3 emissions. Scope 3 emissions are the indirect emissions occurring across the value chain of the company, both upstream and downstream.

Preceding the pilot study, a series of independent initiatives to try and introduce ICP were made throughout the company. The pilot study marked the first organised effort to investigate what opportunities and challenges ICP may impose. The pilot study's findings suggested that ICP may have a substantial effect on heavier, more complex components. Internal alignment, reliable supplier emissions data and balancing traditional purchasing metrics such as cost and quality, emerged as potential challenges. There is as of this study being performed, no consensus within the case company

on where and how ICP should be implemented, and who should be responsible for controlling the mechanism. The case company has expressed the need for deeper understanding of what current research in terms of its organisational implementation suggests and how ICP can function as a management control mechanism.

Previous research highlights that ICP remains an underexplored area and also explicitly delimit Scope 3 emissions (Klevtun & Nilsson, 2021; Zhu et al., 2022). Research into the scale and depth of ICP implementation and how ICP influences decision-making is partly absent (Chen et al., 2025; Gorbach et al., 2022). This indicates that further research into ICP adoption and implementation is needed, particularly regarding its application to Scope 3 emissions.

1.1. Background

The adoption of ICP is shaped by interconnected conditions spanning from global climate policy to the operational realities of individual firms. Manufacturing companies face growing pressure to reduce emissions not only within their own operations but across global supply chains. A tightening regulatory landscape within the EU is transforming CO_2 from an externality into a direct financial cost. The following sections outline the industry and regulatory context that drives ICP adoption, before narrowing the focus to the automotive OEM segment and its sourcing processes.

1.1.1. Context of industry decarbonisation and emissions in the supply chain

The current climate crisis poses great challenges and risks on society as well as firms and manufacturers (Aldy et al., 2023). The Paris Agreement marked a turning point where countries and firms alike started setting goals to lower their CO_2 emissions. Evidence shows that a majority of firms are "behind schedule" with regards to the decarbonisation necessary to meet their internal goals (Aldy et al., 2023). There is also the fact that management teams with goals set too far into the future are less likely to be on track to achieve that goal, motivating the need for more near term incentives and operational tools to control emissions in practice, such as ICP (Aldy et al., 2023).

Manufacturing firms often have large and complex supplier networks. Monitoring and controlling CO_2 emissions becomes difficult with more complex supply chains. Quantifying and locating Scope 3 emissions is a challenge for manufacturing firms, but essential since a substantial amount of total CO_2 emissions come from Scope 3 (Tian et al., 2025). This makes emissions accounting an administrative burden since it requires a large amount of data to be collected from many suppliers, which may have inconsistent data quality and methods of reporting. The further upstream suppliers are located, the more difficult it is to incentivise them to engage in sustainable practices (Tian et al., 2025).

1.1.2. Regulatory landscape as a driver for ICP

The regulatory framework surrounding CO_2 emissions has tightened considerably within the EU over the past decades, not least through the European Climate Law, which commits all member states to climate neutrality by 2050 (European Commission, n.d.-c). Two instruments in particular shape the landscape for large companies managing climate-related risks, namely EU ETS and CBAM.

The EU ETS, in operation since 2005, requires companies within certain European industries to cover their CO_2 emissions with allowances, thereby creating a market-determined price for CO_2 (Gorbach et al., 2022). The system has been progressively tightened, and EU ETS prices have risen during the 2020s (European Commission, n.d.-a). For companies subject to the EU ETS, this means that CO_2 is no longer an externality but a real and growing cost of doing business.

CBAM adds a further layer of regulatory pressure (Nagao et al., 2026). It forces importers of carbon intensive goods into the EU (including steel, aluminium, and cement) to pay a fee based on the CO_2 content of the imported products and the difference in carbon price between the exporting country and the EU. The aim is to prevent carbon leakage, which refers to when companies move production outside of the EU to avoid taxation (Nagao et al., 2026). In practice, CBAM means that carbon costs are spread across the entire supply chain. A manufacturing company using material and components imported from regions that have more liberal CO_2 regulation could cause increased costs. This means supplier selection becomes increasingly shaped by a supplier's carbon footprint (Nagao et al., 2026).

Together, the EU ETS and CBAM mean that carbon costs are no longer abstract but impose concrete financial concerns for manufacturing companies, reinforcing the incentive to proactively integrate these costs into strategic decision-making.

1.1.3. Relevance of automotive OEMs

In a study of the automotive OEM sector, evidence shows that a substantial part of global CO_2 emissions is represented by OEMs with individual actors accounting for more than 1% of annual global emissions (Fugger et al., 2025). The study also concluded that Scope 3 CO_2 emissions from sourced materials make up 33% of automotive OEMs' total CO_2 emissions. The electrification trend within the OEM sector will increase the importance of mitigating upstream emissions as a consequence of more carbon intensive production, and the decrease of CO_2 emissions from the use phase. This could potentially increase the upstream supply chain's share of total CO_2 emissions to between 40% and 83% by 2050.

Automotive OEMs have made ambitious commitments to minimise CO_2 emissions in line with the Paris Agreement (Billedeau & Wilson, 2025). Internal instruments are needed in order to factor sustainability

performance into supplier evaluation and sourcing process in order to translate OEM climate commitments into supplier behaviour.

Previous research shows that the manufacturing industry is not reactive to technological changes but needs price-related incentives in order to have real impact on decision-making. Without a price-related incentive, climate related ambitions stay declarative rather than decision-making factors (Andersson, 2020). In the context of the sourcing process for an automotive OEM, this could translate to the need for ICP integrated into the supplier evaluation criteria, to incentivise suppliers to engage in decarbonisation.

1.2. Problematisation

Scope 3 emissions from purchased materials and components represent the dominant share of an automotive OEMs' carbon footprint. Yet these emissions fall outside the firm's direct operational control by definition, occurring in operations it neither owns nor operates (Ströher et al., 2025). Traditional supplier evaluation weighs price, quality, and delivery reliability, while CO_2 cost remains invisible in the supplier selection process. This systematically favours carbon-intensive suppliers (Schiessl et al., 2021).

ICP is positioned in the literature as a potential response to this discrepancy by internalising a price on CO_2 into the firm's decision-making processes (Chen et al., 2025). However, the potential solution offered by ICP comes with considerable challenges when applied in practice. These challenges are both external market factors and internal organisational challenges (Gorbach et al., 2022).

1.3. Purpose and Research Question

The study will build upon the findings of the previously conducted pilot study at the case company and aims to explore aforementioned research gaps. In particular, ICP as a management tool in a corporate environmental strategy will be analysed. The study aims to understand how ICP can effectively influence sourcing decisions in a heavy automotive OEM. Addressing this requires analysing both the conditions under which ICP can be implemented and the mechanisms through which it operates to shape decisions once in place. Other indirect goals are to better understand how Scope 3 emissions can be managed through ICP and what an ICP implementation may entail for an organisation. A gap-analysis between current research and practical problems will be performed. To investigate these topics, the following research question has been posed:

What factors determine the effectiveness of ICP in the sourcing process of a European automotive OEM, both as a management control mechanism and in terms of its organisational implementation?

1.4. Delimitations

To limit the scope of this study, and make the conclusions meaningful, it is limited to investigating the implementation of ICP in the sourcing function operating within the regulatory scope of the EU. This means that the study will recognise suppliers and actors related to the case company outside of the EU if they are affected by European regulations such as CBAM. This enables generalisability to other regulatory frameworks with similar mechanisms to the ones deployed by the EU.

Since the chosen unit of analysis for this study is the sourcing function of an automotive OEM, the data on the performance of suppliers rather than the company itself is the foundation for the business function's work. Therefore, upstream Scope 3 emissions are a natural boundary for this study. Since Scope 1 and Scope 2 emissions focus on the company itself and its own energy consumption, and only constitute a small part of total emissions, they are less relevant for a given company's sustainable transformation. Fugger et al. (2025) show that Scope 1 and Scope 2 together constitute less than 3% of total CO_2 emissions in a hot-spot analysis of automotive OEMs similar to the case company. Scope 3 downstream emissions are relevant, but remain outside the boundaries of the aforementioned unit of analysis.

The main focus is on two distinct ICP designs, carbon fee and shadow price. This study is also limited to examining CO_2 emissions. Other dimensions of negative externalities from production exist, but CO_2 pricing is currently the most established mechanism in corporate and regulatory practice (Aldy & Gianfrate, 2019). A cradle-to-gate perspective is used throughout the study to achieve a tangible result and facilitate a regulatory comparison since cradle-to-gate is one of the system boundaries of CBAM.

2. Previous research

The main research area of this study is corporate environmental strategy (CES). It involves managing the interface between business operations and the natural environment by integrating ecological considerations into the firm's overarching strategy to maximise competitive advantage (Aragón-Correa & Sharma, 2003; Vadera et al., 2025). As theorised by the Natural Resource-Based View, sustaining such an advantage depends not only on a firm's unique internal capabilities but also on its ability to navigate the limitations and opportunities posed by the natural environment (Hart, 1995). Sharma and Vredenburg (1998) posit that CES exists on a spectrum ranging from reactive compliance to proactive anticipation. Specifically, the adoption of a proactive CES fosters the development of unique organisational capabilities, such as stakeholder integration, higher-order learning, and continuous innovation, thereby strengthening long-term performance and strategic positioning. As external pressures intensify, firms are increasingly required to transform their approach from a passive, compliance-based stance to a proactive environmental strategy (Zhu et al., 2022). The following sections present the theoretical concepts that form the foundation for understanding how the case company translates environmental strategy into practice.

2.1. Corporate Environmental Strategy

This section reviews the theoretical foundations of ICP as a corporate environmental strategy. It begins by examining the strategic drivers and institutional pressures that motivate firms to adopt ICP, then describes the structural design dimensions of an ICP system, and finally discusses the considerations involved in setting appropriate pricing levels.

2.1.1. Strategic drivers and institutional pressure

Gorbach et al. (2022) distinguish between coercive pressure, which arises from laws and regulations, and normative pressure, which reflects the growing societal and stakeholder expectations for companies to mitigate climate change. Historically, carbon disclosure and sustainability initiatives have been largely voluntary. However, recent regulatory shifts, such as the Corporate Sustainability Reporting Directive (CSRD), are transforming these expectations into strict legal requirements, forcing companies to integrate environmental, social and governance (ESG) data into their core operations (Grigorescu et al., 2025). In this context, ICP emerges as a strategic response to external contextual factors, including stakeholder demands, investor expectations, and intensifying climate-related regulations (Elliot et al., 2023). According to Chen et al. (2025), ICP can function as a catalyst for sustainable transition in an organisation. It acts as an institutional tool that internalises societal climate goals into the firm's daily

business operations, thereby potentially altering organisational behaviour and steering investment decisions toward decarbonisation.

A primary motivation for internalising carbon costs is defensive risk management. Firms utilise ICP to anticipate and prepare for future, more stringent carbon constraints and explicit carbon pricing systems, such as the EU ETS (Trinks et al., 2022). By bringing forward investments in low-carbon technologies, companies aim to reduce their sensitivity to volatile and uncertain future carbon costs, thereby avoiding the risk of stranded assets (Trinks et al., 2022). Consequently, ICP serves as a crucial management tool to handle escalating "carbon risks," which encompass both the financial risks of regulatory compliance and the physical climate risks within the supply chain (Yanfei et al., 2023).

Conversely, ICP is not solely a defensive shield against regulatory risks; it can also act as an offensive driver for competitive advantage. Zhu et al. (2022) argue that implementing ICP marks a strategic organisational shift from a passive to a proactive environmental strategy. This shift develops the firm's "dynamic capabilities", which refers to its ability to continuously learn, adapt to external environmental changes, and capture new sustainability opportunities through green innovation (Zhu et al., 2022). Furthermore, this proactive approach aligns with the Porter Hypothesis, which suggests that pollution can be an indication of resource inefficiency (Gorbach et al., 2022). By explicitly attaching a price to CO_2 emissions, ICP incentivises business units to innovate and optimise their products and processes, which can ultimately lead to reduced long-term operating costs (Gorbach et al., 2022).

Even though ICP represents a proactive approach to a sustainable transition, the literature presented that the design and implementation, when and where ICP is used, must consider the company's strategic position. It can be utilised defensively to mitigate future regulatory risks and carbon costs (Trinks et al., 2022; Yanfei et al., 2023), or offensively as a catalyst to build dynamic capabilities and drive green innovation (Chen et al., 2025; Zhu et al., 2022).

2.1.2. Design of the ICP

To operationalise a proactive environmental strategy and translate macro-level pressures into actionable corporate practices, firms increasingly adopt specific management control tools, with ICP emerging as a primary mechanism. By attaching a monetary value to CO_2 emissions, ICP serves to internalise the external societal costs associated with carbon pollution directly into the firm's daily operations and financial decision-making processes (Chen et al., 2025).

The structural design of an ICP system dictates how carbon costs are internalised and how they influence organisational decision-making. According to Elliot et al. (2023), the design of an ICP system

does not occur in isolation but depends heavily on the specific organisational context. The authors establish that a dynamic ICP system is shaped by the interplay of external pressures, internal corporate structures such as business strategy and managerial autonomy, and transfer-specific factors. Consequently, the effectiveness of the ICP design relies on balancing the often-conflicting objectives of regulatory compliance, economic resource allocation, and organisational motivation (Elliot et al., 2023).

To systematically categorise and implement this architecture, organisations must navigate four key dimensions based on the Carbon Disclosure Projekt (CDP) framework. As outlined by Morel et al. (2022), these dimensions include Height, which determines the actual carbon price level reflecting the firm's strategic ambition; Width, which defines the boundaries of the emissions coverage, such as the inclusion of Scope 3 emissions; Depth, which refers to the degree of business influence; and Time, which highlights the dynamic evolution of the pricing strategy.

Within these dimensions, the most fundamental structural choice in ICP design is the selection of the pricing mechanism, with the two approaches being the shadow price (sometimes referred to as proxy price) and the internal carbon fee (Gorbach et al., 2022). A shadow price is a hypothetical, predetermined cost attached to CO_2 emissions that is integrated into business planning and investment evaluations to assess sensitivities to future regulatory carbon prices (Gorbach et al., 2022; Vadera et al., 2025). Because it is a non-monetary transfer, meaning no actual capital changes hands between business units, it requires less administration to implement and can be used as a risk-management tool (Elliot et al., 2023; Gorbach et al., 2022). However, from an accounting perspective, shadow pricing lacks a direct financial impact on operational budgets. Consequently, it may fail to effectively promote short-term emission reductions if the rationale for the hypothetical price is not clearly communicated (Gorbach et al., 2022; Vadera et al., 2025).

In contrast, an internal carbon fee involves a practical exchange of money, where a central department charges business units a fee based on their carbon footprint (Gorbach et al., 2022; Vadera et al., 2025). This mechanism creates a direct and tangible financial incentive for division managers to voluntarily reduce their carbon footprint to protect their unit's profitability (Vadera et al., 2025). Despite its effectiveness in fostering behavioural change, implementing actual monetary transfers requires substantial structural and administrative modifications, and frequently encounters organisational resistance from emission-intensive business units (Elliot et al., 2023; Gorbach et al., 2022).

2.1.3. Pricing levels of ICP

Vadera et al. (2025) discuss the different roles that ICP can have and consequently its effectiveness for the company's transition. Different calculation methods will better reflect different departments' specific conditions. They suggest there is a trend towards a unified price across the organisation. However, they also explain that multiple calculation methods will likely be used to determine said price. The authors underline the importance of ensuring that the entire organisation accepts the price level for ICP to sustainably drive transition. The effectiveness of ICP comes not from the price level being technically precise, but rather from its ability to drive change. Hence the price level should reflect the strategic ambition of the company.

In contrast, Gorbach et al. (2022) suggest that different prices across the organisation might be suitable to reflect different departments' possibilities to transition towards more sustainable business practice. The authors hypothesise that the different price levels might lead to greater acceptance within the organisation. However, using different price levels can complicate communication and politics.

When taking both Gorbach et al. (2022) and Vadera et al. (2025) into consideration, it appears that operational acceptance seems to be an important factor when considering which pricing method to use. Each department's possibilities must be taken into consideration whilst at the same time considering cross-departmental communication. The risks of conflicts arising from not being able to effectively implement the mechanism must be balanced with the risk of conflicts arising from cross-departmental interaction.

2.2. Organisational implementations of ICP

To effectively discuss how corporate environmental strategy can be implemented within an organisation, it is important that we also delve into literature concerning organisational implementation of ICP.

2.2.1. Structural and technical integration

A fundamental challenge in implementing a new management control tool is that it risks conflicting with already existing goals and measurement systems. If managers or other business units are still measured and rewarded solely on the basis of traditional financial returns, a goal conflict is created that actively impedes implementation. For ICP to have real impact, it must therefore be integrated into the organisation's existing budgeting systems and not treated as a separate initiative (Vadera et al., 2025). Grigorescu et al. (2025) argue that a shift, such as the accounting department moving from being a

technical profession to taking a greater role in decision-making, is as much a cultural and organisational transformation as it is a technical one.

Another challenge firms often struggle with is fragmented data systems, inconsistent ESG data, and limited expertise among accounting professionals, all of which can hinder effective ICP implementation (Grigorescu et al., 2025). Without deep integration into existing management systems and budget processes, ICP risks being treated as a separate initiative rather than a core management tool (Vadera et al., 2025).

2.2.2. Cultural and organisational transformation

Beyond technical system integration, effective ICP implementation requires new organisational capabilities and professional competencies. The transition toward sustainable accounting, particularly under regulatory frameworks such as CSRD, presupposes digital maturity and skilled accounting professionals who can move beyond traditional financial reporting and convert environmental data into decision-relevant indicators (Grigorescu et al., 2025). This demands cross-functional collaboration with operations, sustainability, and strategy departments, ensuring that CO_2 emissions indicators are embedded into core business processes rather than treated as a compliance exercise (Grigorescu et al., 2025).

However, even the most technically sophisticated system will fall short if the people within the organisation do not understand or accept it. Yanfei et al. (2023) emphasise that organisations need to actively build internal engagement around their goals, and that employees need to understand not only what the system entails but also why it exists and how the collected funds are used. If internal units perceive the system as arbitrary, or perhaps disproportionately penalising, it risks creating resistance that ultimately undermines the entire control effect (Vadera et al., 2025; Yanfei et al., 2023).

Furthermore, Chen et al. (2025), drawing on transition management theory, argue that the shift toward a low-carbon economy extends well beyond technological change. Rather, it constitutes a fundamental reorganisation of socio-technical systems, requiring simultaneous adaptation across organisational structures, social practices, and cultural values. Within this perspective, tools such as ICP function as institutional mechanisms that catalyse and steer the transition. By attaching a monetary value to carbon emissions, an internal carbon price shapes corporate strategy, redirects investment priorities, and drives behavioural change throughout the organisation. Crucially, however, such far-reaching systemic change does not occur automatically. It requires deliberate governance characterised by strategic direction, collaboration across stakeholder groups, and ongoing evaluation of progress (Chen et al., 2025). Importantly, the successful implementation of an internal tool like ICP is often contingent on the wider

institutional environment, meaning that favourable regulatory frameworks can accelerate and reinforce the internal transformation (Bento et al., 2021).

2.2.3. Incentives for environmental transformation

A well-designed ICP architecture is only effective if it aligns with the behavioural incentives of the individuals operating within the management control system. Implementing ICP introduces inherent friction within an organisation primarily because it disrupts traditional performance metrics. According to Elliot et al. (2023), a fundamental challenge in management control is balancing the independent financial performance targets of business units with the corporation's overarching need to integrate climate considerations. If strategic goals for carbon neutrality are not linked to actual managerial incentives, the desired emission-reducing actions will not be stimulated (Vadera et al., 2025). The literature identifies distinct behavioural challenges depending on the chosen ICP mechanism. While shadow prices are administratively simple, they are often ignored by decision-makers because they do not impact actual operational budgets or personal evaluations (Elliot et al., 2023; Gorbach et al., 2022; Vadera et al., 2025). Conversely, implementing an actual internal carbon fee creates a tangible financial responsibility, but it frequently encounters strong organisational resistance and frustration because business units perceive it as a tax-like burden (Gorbach et al., 2022; Vadera et al., 2025).

To overcome this resistance and mitigate conflicts of goals, the design of the incentive and revenue structure is critical. Yanfei et al. (2023) demonstrate with game-theoretic modelling that if a firm solely imposes a carbon cost on its internal organisations without sufficient incentives, internal trust and willingness to cooperate are eroded, which undermines long-term cooperation on emission reductions. However, if the firm instead applies secondary investments or allocates cost-sharing subsidies directly into the business units' own green initiatives, emission levels are reduced due to increased motivation (Yanfei et al., 2023). This approach transforms the carbon price from a mere penalty into an enabler for departmental improvement.

Finally, bridging this behavioural and cultural gap requires new organisational competencies and cross-functional collaboration. The broader transition toward sustainable accounting, which encompasses the operationalisation of analytical tools like ICP, is often hindered by a lack of ESG competence and specialised knowledge among traditional financial departments (Grigorescu et al., 2025). Furthermore, this competence and cultural gap extends specifically to the purchasing function. Morel et al. (2022) note that materials buyers often struggle to equate a hypothetical environmental shadow cost with a tangible financial cost, highlighting the critical need for new learning and closer integration between material buyers and environmental experts. Moreover, this cross-functional collaboration is not solely a matter of ESG competence, but a structural necessity. Desjardins and Sinclair-Desgagné (2025)

demonstrate that when business units actively engage in pollution abatement, traditional financial departments and environmental strategists can no longer operate in silos. In order to establish an effective internal carbon price that drives actual behaviour, there must be direct and continuous coordination to balance financial optimisation with environmental strategy (Desjardins & Sinclair-Desgagné, 2025). Ultimately, organisational willingness is a necessary but insufficient condition. Real emission reductions ultimately depend on the analytical tools and practical constraints that exist at the organisational level.

2.2.4. Data availability and emissions allocation in the supply chain

While the sections above have addressed ICP design and the cultural conditions for its implementation, a separate set of challenges emerges when ICP is extended beyond the firm's own operations to encompass the supply chain. Gorbach et al. (2022) identify the allocation of emissions to responsible cost centres as one of the two main barriers to ICP implementation. When the allocation logic is extended to the supply chain, the challenge intensifies considerably, as companies often lack primary emissions data from their suppliers and instead rely on industry averages or spend-based estimates (Essouid et al., 2026).

This reliance on aggregated data creates a dilemma for supplier engagement. As Schiessl et al. (2021) demonstrate, using regional industry averages assigns identical environmental performance scores to all suppliers regardless of their actual emissions, effectively neutralising the ability of ICP to differentiate between carbon-efficient and carbon-intensive suppliers. This implies that a supplier who has invested in cleaner production thus receives no competitive advantage in the selection process, reducing the incentive to improve environmental performance or to share more granular data. Essouid et al. (2026) confirm this pattern, identifying supplier data quality, transparency, and willingness to share information as challenges in Scope 3 purchasing emissions accounting. Some suppliers are reluctant to share information due to concerns over business-related consequences (Essouid et al., 2026).

2.2.5. Practical implementation and effects on decisions of ICP

Integrating financial carbon costs into core decision-making processes is a prerequisite for ICP to drive meaningful change. Vadera et al. (2025) argue that investment decisions represent the stage at which ICP contributions can be expected to be most significant, as embedding carbon costs into NPV calculations enables firms to systematically favour lower-emission investment alternatives. This is corroborated by Trinks et al. (2022), who find that firms use ICP with the aim of bringing forward low-carbon investments in anticipation of future carbon cost scenarios. Yanfei et al. (2023), taking a long-term dynamic perspective, further demonstrate that carbon emission reductions accumulate and

strengthen over time across all modelled strategies, and that coupling the carbon fee with incentives for internal organisations yields greater sustained reductions than merely imposing a cost without them.

Short-sighted managerial behaviour can significantly weaken the effectiveness of ICP mechanisms by shifting focus toward short-term financial returns rather than long-term emission reduction outcomes (Yanfei et al., 2023). The discount rate plays a central role in shaping a firm's strategic decisions over time. With increasing discount rates, both total profits and carbon emission reductions gradually decline, as firms exhibit short-sighted behaviour by prioritising short-term financial returns. Furthermore, under conditions of short-sighted managerial behaviour, ICP can converge toward a stable value over time, while higher discount rates simultaneously reduce carbon emission outcomes (Yanfei et al., 2023). The effectiveness of ICP ultimately depends on managerial time horizons and short-term orientation can systematically undermine its emission reduction potential.

3. Methodology

This study employs a qualitative research design in which data were collected primarily through semi-structured interviews and subsequently analysed thematically, with the aim of understanding the factors that determine the effectiveness of ICP, both as a management control mechanism and in terms of its organisational implementation. This chapter describes and justifies the methodological choices made in conducting this study, proceeding from the overarching research design, through case selection, data collection, and analysis, to an assessment of research quality and a discussion of methodological limitations.

3.1. Research design and strategy

ICP implementation involves processes of organisational interpretation, incentive alignment, and institutional negotiation that cannot be adequately captured through numerical measurement alone. Exploratory research is particularly valuable for generating new insights where prior empirical evidence is limited (Robson, 2002), and given that ICP in Scope 3 purchasing contexts remains largely unexamined empirically (Chen et al., 2025; Gorbach et al., 2022), the existing literature does not provide a sufficient basis for fixed propositions or a confirmatory design. A qualitative and exploratory design was therefore the most appropriate choice for examining how and why particular outcomes occur within their organisational context (Saunders et al., 2009). A single embedded case study strategy was employed, which is appropriate when the research seeks rich understanding of context and process rather than statistical regularity, and when the boundaries between the phenomenon and its context are not clearly evident (Yin, 2003). The rationale for case selection is elaborated in section 3.2.

The study applies an abductive approach through systematic combining (Dubois & Gadde, 2002), in which the previous research, empirical data collection, and case analysis evolve simultaneously through continuous movement between theory and empirical observation. The study entered the empirical context with an established body of previous research grounded in corporate environmental strategy and the organisational implementation of ICP, which was successively refined as the data collection generated insights it could not fully address. The objective was not to generate new theory from scratch, but to develop and refine existing theoretical concepts through confrontation with organisational reality. Consistent with this approach, the study targets analytical rather than statistical generalisation (Yin, 2003). The findings are abstracted to a theoretical level, with the aim of generating insights about the conditions under which ICP can be implemented as an effective management control mechanism. The transferability of these insights is expected to vary across findings depending on whether they reflect industry-specific operational characteristics, broader organisational dynamics, or the regulatory environment, a distinction returned to in the discussion.

3.2. Case selection and sampling strategy

The object of study is a global automotive OEM headquartered in Europe. To preserve confidentiality in accordance with established ethical guidelines (Saunders et al., 2009), the organisation is anonymised and referred to throughout this study as the "case company". The case company operates through a globally dispersed and emissions-intensive supply chain, and the company has made formal commitments to reduce greenhouse gas emissions in line with the Paris Agreement, both of which are clearly stated in internal sustainability reporting and public disclosures reviewed as secondary data for this study. In preparation for a potential implementation decision of ICP, the company conducted a structured pilot study in 2024, testing two shadow price levels within its purchasing function to assess the practical implications for supplier selection and cost evaluation. The pilot study surfaced challenges related to supplier data reliability, incentive alignment, and functional ownership. At the time of this study, no formal implementation decision had been made, and the questions of price level, process integration, and organisational responsibility remained unresolved.

The case company was selected on the basis of critical case sampling (Patton, 2002), which selects cases of particular analytical importance to enable logical generalisations to be drawn (Saunders et al., 2009). Three criteria justified this selection. First, as a European automotive OEM, the case company is directly exposed to the regulatory frameworks most relevant to ICP adoption, including the EU ETS and CBAM, making it an appropriate context for studying how external carbon pricing pressure shapes internal governance responses. Second, the 2024 pilot study provided a level of organisational engagement with ICP that is rare in practice, allowing the study to examine enacted processes rather than hypothetical ones. While this organisational maturity strengthens the analytical value of the case, it also positions the case company further along the implementation trajectory than most peers. Third, the company was at an active decision point at the time of the study, meaning that the tensions, ownership disputes, and data challenges central to the research question were live and observable. Together, these criteria make the case analytically significant beyond its own boundaries and instructive for other automotive OEMs facing comparable decarbonisation pressures.

Given the cross-functional nature of the research question, the study treated the case company as a single case with two embedded units of analysis (Yin, 2003), the purchasing function and the sustainability function. This embedded design was appropriate because the research question concerns not only how ICP is designed, but how its design interacts with the operational realities of purchasing. Examining both functions separately, while situating them within the same organisational case, enabled a comparison of perspectives across functional boundaries and a more complete account of the organisational mechanisms through which ICP operates. Access to both embedded units was secured through two designated organisational gatekeepers, one affiliated with each function. Within each

function, interview participants were selected through purposive sampling, which enables the researcher to select participants best positioned to answer the research question rather than aiming for statistical representativeness (Saunders et al., 2009).

Selection criteria were defined in terms of direct experience with sustainability strategy or their application within purchasing decisions, with each gatekeeper drawing on their internal knowledge to identify individuals meeting these criteria. The final sample comprised ten respondents, six from the sustainability function and four from the purchasing function. Sample size was determined by thematic saturation, with later interviews predominantly reinforcing rather than introducing new patterns relative to those already identified. The somewhat higher representation from the sustainability function reflects the broader range of strategic and analytical roles engaged with ICP within that unit, rather than a deliberate weighting in the research design.

3.3. Data collection

The empirical foundation of this study rests on two primary sources of data, semi-structured interviews and secondary documentary material, complemented by contextual meetings with key informants at the case company. This multi-source approach was adopted to strengthen the credibility of the findings by allowing interview accounts to be compared against both directly observed organisational reasoning and formal documentation.

3.3.1. Primary data collection

Semi-structured interviews were chosen as the primary method of data collection. Given that the study seeks to understand how and why ICP influences supplier selection, it was necessary to allow respondents to elaborate on context, reasoning, and organisational dynamics in their own terms. A fully structured interview would have constrained this, while an entirely unstructured approach would have made cross-respondent comparison difficult. Semi-structured interviews provided the necessary balance, maintaining a consistent thematic focus while allowing the conversation to follow lines of inquiry that emerged during each session (Saunders et al., 2009).

Two interview guides were developed, one for each embedded unit, reflecting the different relationships the two functions have with ICP. The sustainability guide addressed the strategic design of the ICP mechanism, carbon accounting logic, and organisational governance. The guide for the purchasing group addressed the operational application of ICP within supplier selection and the practical tensions that arise when carbon costs are introduced alongside established purchasing criteria. Both guides consist of open-ended questions and are provided in Appendix A. Interviews lasted approximately 40 to 65 minutes and were conducted primarily via video conference, with in-person sessions used upon

request. Respondents were offered the choice of their native language or English, and where interviews were conducted in their language, quotes were translated with a focus on conceptual equivalence rather than literal accuracy, maintaining technical terms in their original form to ensure precision. All interviews were audio-recorded and transcribed verbatim with the explicit prior consent of each participant. Anonymity was assured, the right to withdraw was clearly communicated, and personal identifiers were removed during transcription. Data management practices were aligned with GDPR regulations throughout. A summary of all interview respondents, including functional roles, business area, and interview durations, is provided in Table 1.

Table 1. Overview of interview respondents.

Respondent	Functional role	Business Area	Experience	Duration	Date
Purchasing respondent 1	Segment Leader	Purchasing	5+ years	~40 min	March 13, 2026
Purchasing respondent 2	Segment Leader	Purchasing	4+ years	~60 min	March 23, 2026
Purchasing respondent 3	Segment Leader	Purchasing	9+ years	~60 min	March 31, 2026
Purchasing respondent 4	Segment Leader and Buyer	Purchasing	5+ years	~65 min	March 25, 2026
Sustainability respondent 1	Sustainability Manager, Responsible Purchasing	Sustainability	6+ years	~60 min	March 13, 2026
Sustainability respondent 2	Business Intelligence Manager	Sustainability	8+ years	~65 min	March 26, 2026
Sustainability respondent 3	Process Owner, Sourcing Strategy	Sustainability	2+ years	~45 min	April 9, 2026
Sustainability respondent 4	Carbon and Energy Advisor	Sustainability	10+ years	~55 min	March 24, 2026
Sustainability respondent 5	Logistics Sustainability Manager	Sustainability	20+ years	~60 min	March 23, 2026
Sustainability respondent 6	Sustainability Leader	Sustainability	6+ years	~60 min	March 23, 2026

Beyond the interviews, the researchers participated in a series of meetings with key informants at the case company, totalling approximately six to seven hours across sessions between January 22 and April 17, 2026. These meetings served a contextual rather than evidentiary function, providing background information on the organisational structure, the design and execution of the 2024 pilot study, and the operational environment surrounding ICP. The meetings informed the interpretation of the interview data and the broader understanding of the case context.

3.3.2. Secondary data collection

Secondary documentary data was collected to complement the primary data and enable understanding and conceptualisation by comparing respondents' accounts against formal organisational structures and definitions. Three categories of documents were reviewed. Internal policy and steering documents were examined, including materials related to the 2024 ICP pilot study, which established the technical definitions of instruments such as shadow prices and carbon fees as formally defined within the case

company. Purchasing and strategy documents outlining supplier selection criteria and sourcing procedures were reviewed to assess how sustainability considerations are formally embedded in existing processes. Publicly available sustainability and annual reports were consulted to contextualise the company's stated decarbonisation commitments and external reporting obligations. Documents were shared by respondents during or following the interviews, as well as by key informants in connection with meetings. All non-public material was treated confidentially and used strictly for contextual and analytical purposes.

3.4. Literature search and source selection

The literature served to establish the theoretical foundation from which the empirical material was interpreted. Scopus was used as the primary search database given its strong coverage of management, sustainability, and engineering journals in which ICP research is predominantly published (Falagas et al., 2008), supplemented by Google Scholar to capture highly cited contributions and policy reports not indexed in Scopus. Searches were conducted using keyword combinations related to carbon pricing, regulatory frameworks, supply chain management, and decarbonisation, including terms such as "internal carbon pricing", "CBAM", "EU ETS", and "Scope 3".

Given the recent emergence of ICP as a research topic, the search was primarily restricted to publications from 2020 onwards, with foundational contributions included regardless of publication date where they provided theoretical grounding not available in more recent work. Selection was guided by relevance to the research question and the academic standing of the publishing journal. The keyword approach may not have captured all relevant work published under different terminology, and non-academic sources such as industry reports were not systematically included, which represents a limitation of the search process.

3.5. Data analysis

A qualitative thematic analysis was applied to the empirical material, drawing on the principles described by Braun and Clarke (2006). The process began with repeated reading of all interview transcripts before any coding was applied, allowing the researchers to understand how respondents framed and reasoned about ICP in their own terms before imposing any categorical structure on the material. Following familiarisation, the transcript material was coded and organised into a structured data display. Interview responses were mapped against the questions in the interview guide, which had been developed from the previous research on corporate environmental strategy and organisational implementation of ICP. This generated two types of codes: a priori codes derived from the previous

research of the study, and empirically derived codes based on the respondents' reasoning about ICP in their organisational context.

The structured data display allowed patterns and recurring themes to be identified systematically across respondents. Responses from the sustainability and purchasing functions were analysed both within and across groups, enabling the study to identify where accounts converged and where they diverged. Divergences between the two groups were treated as analytically significant, as they revealed tensions between the strategic intent behind ICP and its operational application in purchasing. Secondary documentary data was incorporated at this stage to assess whether organisational intent was formally recorded in internal documents aligned with what respondents described in interviews. Data analysis was conducted in parallel with data collection rather than as a separate subsequent phase. As themes and patterns emerged from early interviews, these informed the focus of subsequent sessions, allowing the thematic framework to develop iteratively alongside the empirical material.

3.6. Research quality

The quality of this qualitative study was assessed against the criteria of trustworthiness established by Lincoln and Guba (1985), comprising credibility, transferability, dependability, and confirmability. Credibility concerns whether the findings accurately represent the reality of the participants and the organisational context studied (Lincoln & Guba, 1985). Credibility was strengthened through combining interview accounts with secondary documentary data to assess whether respondents' descriptions of ICP were consistent with formally recorded organisational structures and intentions. Cross-functional perspectives further enhanced credibility, as the sustainability and purchasing respondents were systematically compared, reducing the risk that the findings reflected a single functional viewpoint rather than a broader organisational reality.

Transferability does not rest on representativeness but on the depth and transparency of contextual description (Lincoln & Guba, 1985). The case company is described in detail throughout the introduction and methodology chapters, covering its regulatory exposure, organisational structure, supply chain characteristics, and the conditions surrounding the ICP pilot study. This allows readers in comparable contexts to assess whether the findings are relevant to their own situation.

Dependability relates to the consistency and transparency of the research process, such that it could be followed and evaluated by an external assessor (Lincoln & Guba, 1985). An audit trail was established through the documentation of methodological decisions across this chapter, including the rationale for case selection, the design of interview guides, the coding approach, and the iterative development from

the previous research. This procedural transparency enables external assessment of the logic and execution of the study.

Confirmability pertains to whether the findings are grounded in the data rather than shaped by researcher bias (Lincoln & Guba, 1985). Open-ended interview questions ensured that analytical categories were not imposed on respondents in advance, allowing them to elaborate on their experiences and reasoning in their own terms. The structured data display used during analysis made the link between raw interview data and emerging themes explicit and traceable. Together, these procedural choices ensured that the analytical conclusions were anchored in the empirical material rather than in researcher preconceptions.

3.7. Methodological limitations

While the above criteria attest to the overall trustworthiness of the study, several methodological limitations warrant acknowledgement. As with most qualitative interview studies, the data is subject to social desirability bias, where respondents may subconsciously align their answers with perceived corporate ideals or ambitious sustainability targets. While anonymity was guaranteed to encourage open responses, the risk remains that accounts reflect the intended design of ICP rather than its actual operational friction. This limitation was partially mitigated by cross-functional perspectives, comparing the strategic accounts of sustainability respondents with the operational experiences of purchasing respondents to identify discrepancies between stated intent and experienced reality. Access to respondents was facilitated by two organisational gatekeepers, which introduces the possibility of selection bias. Gatekeepers may, intentionally or not, have directed the researchers toward respondents who were more informed about or favourable toward ICP, potentially underrepresenting more sceptical or disengaged perspectives within the organisation. The cross-functional design partially mitigated this risk by ensuring that neither gatekeeper controlled access to both embedded units.

Beyond respondent-level limitations, the single case study design represents an inherent limitation in terms of generalisability. The depth of understanding gained within one organisational setting comes at the cost of breadth across multiple cases. A further consideration is that the case company is positioned at an unusually advanced stage of ICP development, having completed a structured pilot study at a time when most peers have not yet engaged with the instrument in any operational form. While this maturity is precisely what made the case analytically valuable, it also means that the findings primarily illuminate the conditions facing organisations approaching ICP implementation, and may have more limited transferability to firms situated earlier in the decarbonisation trajectory. This is further compounded by the cross-sectional nature of the study, as CBAM had only recently entered into full effect at the time

of the study, exposing the case company to a regulatory pressure that did not exist in comparable form even a few years earlier and that will continue to evolve as the regulations reshape the industry.

A related limitation is the national and cultural context of the case company. European automotive OEMs tend to operate within an organisational culture characterised by relatively high baseline sustainability maturity, and strong internal engagement with environmental issues, all of which shape how ICP is interpreted, negotiated, and operationalised. The mechanisms identified in this study are therefore likely to be most directly applicable in settings that share these cultural and institutional features, and may manifest differently in organisations operating within national contexts characterised by a lower baseline engagement with sustainability strategy.

4. Empirical findings

This chapter presents the empirical findings from the interviews, structured around key themes identified through the abductive approach. The results describe how ICP is understood and applied within the sourcing process, as well as the organisational factors affecting its implementation.

4.1. Unstructured sustainability integration

The sourcing process at the case company is characterised by a structured framework that typically spans a duration of approximately 20 weeks. During this period, the purchasing department acts as a central coordinator between multiple cross-functional stakeholders, including quality, logistics, finance, and design engineering, to facilitate supplier selection. Initial requests for quotations are managed through centralised enterprise resource planning systems, while subsequent evaluations rely heavily on spreadsheet-based tools. In the current process suppliers are evaluated based on CO_2 in the late stages of the supplier selection process. Multiple respondents described a similar sequential structure: the process is initiated through a kickoff meeting involving cross-functional representatives, followed by the distribution of a request for proposal or request for quotation to an initial pool of typically three to eight candidate suppliers. Suppliers are then progressively narrowed down through iterative rounds of technical clarification, cost breakdown analysis, and negotiations, before a final recommendation is presented to the sourcing board. Throughout this process, suppliers are assessed according to the QDCF framework (Quality, Delivery, Cost, and Features) which has been expanded to include TSR criteria: Technology, Sustainability, and Risk. While it is observed that sustainability is formally included as an evaluation dimension, it does not yet carry a monetised weight in the final comparison.

Despite the existence of structured processes, the comparison of environmental and financial data remains technically fragmented. Currently, carbon footprints are mapped using spreadsheet-based decision support tools that track supply chain emissions, while financial evaluations are maintained in separate files dedicated to cost breakdowns and NPV calculations. In other words, environmental and financial dimensions are presented separately in the final sourcing decision material.

Integrating ICP in the sourcing process requires determining the optimal point of integration. In this context, both sustainability and purchasing respondents point out that sustainability measures often come in late in the process when the supplier pool already has been narrowed down. As Sustainability respondent 2 explains: "Emissions data is requested from the supplier either with the quotation or even later in the process". One purchasing respondent specifically states how sustainability data comes in too late in the process and mentions the utility of a tool that enables a broader comparison early in the supplier selection process. Overall, the respondents indicate that ICP would have the most significant

impact early in the sourcing process, facilitating both internal comparisons and supplier negotiations. By integrating ICP early in the sourcing process it can be used as leverage to persuade suppliers into selecting lower impact solutions.

Although environmental aspects are taken into account in the existing process it is given less attention and is not a deciding factor when selecting a supplier. One purchasing respondent notes that, in the final selection discussion, financial aspects are discussed about five times longer than environmental aspects. Moreover, Purchasing respondent 3 states: "I have not seen a single case where we chose a supplier solely because it was more environmentally friendly". Another purchasing respondent added that a supplier must be competitive in all other aspects first and then in the sustainability aspect to be considered for a contract.

Within the ICP pilot study, sustainability respondents adapted existing spreadsheet-based tools by introducing additional parameters, enabling automatic calculation of carbon cost impacts based on product carbon footprint and spend data. One sustainability respondent noted that in the pilot study, the ICP-adjusted comparison was ultimately presented at the sourcing committee as part of the total cost of ownership (TCO) assessment, that is, at the very last stage of the decision process. However, both sustainability and purchasing respondents emphasised, in retrospect, that for such a mechanism to meaningfully influence decision-making, it must be introduced throughout the sourcing process. In particular, findings showed that applying ICP already at the request for quotation stage would enable earlier comparison across a broader set of suppliers and support discussions related to supply chain configuration, such as production location or supplier structure, before the candidate pool is narrowed down.

4.2. Applicability and data

The findings cluster around two interacting conditions: whether the sourced component has characteristics that make ICP meaningful as a decision criterion, and whether supplier emissions data is reliable enough to act on. Where either condition is not met, the mechanism loses practical effect.

The sustainability respondents, drawing on the findings of their pilot study, emphasised that ICP's usefulness depends on how carbon cost compares to material cost for a given component. Heavy and complex components, particularly those sourced from outside the EU, carried higher emissions and a larger carbon cost as ICP was included, while simple and light-weight parts did not. Purchasing volume amplified the effect, with ICP having its greatest impact where both emissions intensity and purchasing volumes were high. The purchasing function confirmed the patterns described by the sustainability group.

The purchasing respondents added the aspect of supplier-market competitiveness. In segments with many comparable suppliers, the case company can place greater demands on suppliers to engage in sustainable practices. In segments with fewer alternatives, supply-security considerations outweigh carbon-related demands. A further condition was raised by Sustainability respondent 2, an expert on CBAM, who explained that product segments exposed to CBAM acquire a carbon cost as they are imported into the EU, making those segments especially important for ICP implementation as a hedge against future regulatory exposure.

A second theme raised by sustainability respondents in logistics sourcing was that the weight of the carbon cost generally remained small relative to total cost. One sustainability respondent estimated carbon cost at roughly two percent of sourcing value, and doubling the price level in the pilot study did not drastically change outcomes. Another respondent pointed out that what determines whether ICP changes a decision is not the price level itself but whether the component is carbon-intensive enough for the carbon cost to flip the ranking on total cost. The mechanism still served an informational purpose by making the magnitude of emissions visible and translating them into a common cost language, but that at this low ratio it did not function as a binding decision criterion.

In response to the limited observed impact of ICP, two sustainability respondents had developed an alternative framing in logistics sourcing based on abatement cost. Rather than attaching a hypothetical carbon cost to each sourcing decision, the abatement-cost approach isolated the additional cost per tonne of CO_2 needed to pick a more sustainable choice. One ICP level was used as a decision threshold. Decisions with an abatement cost below it can be approved without the need for escalation to higher management. While the abatement cost method gives identical decisions to shadow pricing, the respondents found it more practical because it translates decarbonisation criteria into a directly comparable metric across different segments. Due to this comparability the logistics sourcing function had built a database of abatement costs for different types of freight and shipping alternatives. The respondents argued that this approach enables organisation-wide decarbonisation at the lowest additional cost, which was one of the stated purposes of the ICP pilot study.

Beyond component characteristics, both respondent groups identified variation in emissions data as an important constraint on ICP. Some suppliers report detailed data across multiple tiers of the supply chain, while others rely on approximations, industry averages, or default values, which undermines comparability. One sustainability respondent described a paradox this produces in practice: a supplier with high data maturity who reports its own emissions across the full upstream supply chain can appear more carbon-intensive than a supplier with less complete reporting, so the mechanism can end up penalising the most transparent supplier. The purchasing respondents shared this concern.

At the case company, suppliers provide information on sub-tier suppliers and logistics distances through spreadsheet-based tools, which are then used to estimate emissions across the supply chain. One sustainability respondent described how reported data is validated against multiple reference points, including data from existing suppliers, estimates from an external database, and internal targets, in the same way price data is benchmarked. Deviations from these benchmarks serve as warning signals that trigger further negotiation. The respondent acknowledged that the rigour of this approach depends on having enough reliable reference points. Carbon footprint breakdowns have been integrated directly into the cost breakdown file that all suppliers complete during sourcing evaluation, so that every supplier reports against a common methodology regardless of their individual data maturity, a noted improvement in both respondent groups. The company also uses a centralised carbon accounting platform that produces standardised estimates. A sustainability respondent acknowledged that these estimates tend to underestimate emissions but argued that consistency in data quality across suppliers is more important than complete accuracy when the objective is comparison, a view shared by the purchasing respondents.

The investment required to reach this point is illustrated by the parallel trajectory in the logistics function. When carrier evaluation on emissions began in 2018, reported figures were inconsistent, calculated differently by different carriers, and had no shared method. The function responded by developing its own baseline and dashboard, collecting granular information on emission standards, vehicle type, fuel type, fuel consumption, loading factors, and fleet ownership, and mandating this data in all logistics sourcing since 2020. The longer-term ambition is third-party verification through telematics and auditing, already implemented for sea freight and under development for road transport.

Building usable supplier-level data coverage is a slow process, and respondents pointed to it from three different angles. At the industry level, one sustainability respondent argued that a fundamental obstacle is the absence of a global framework for carbon data. There is no standardised method for collecting and reporting emissions across companies, countries, and industries, and different standards can produce contradicting results, particularly across a geographical and cultural divide. The respondent argued that the case company should prioritise its largest emission sources first and build a methodology outward from there. Internally, a purchasing respondent pointed to an AI-based tool that provides emissions information for buyers at the component level as one route toward better coverage. Externally, a sustainability respondent specialising in regulation noted that CBAM's default values, set at the highest emissions levels per country and sector and scheduled to rise annually, create an incentive for suppliers to produce verified data rather than accept unfavourable regulatory defaults.

4.3. Lack of incentive structure and the external market conflict

The empirical findings indicate a structural discrepancy between the case company's environmental ambitions and the incentive structures that govern purchasing performance. A misalignment regarding which ICP design is perceived as most relevant in daily operations is also present.

Respondents from the purchasing function state that no sustainability KPIs or CO_2 performance measurements are in place and that the KPI:s are designed with respect to the cost-sensitive customers. Purchasing respondent 1 said: "Today's KPIs are entirely cost-driven, they measure price reductions and savings on existing items, but there are no climate-related KPIs". Sustainability respondents specify that the cost of the component, more specifically the Material Cost Level (MCL), is the primary metric used to evaluate buyer performance and that buyers are expected to achieve productivity improvements every year by negotiating cost reductions with suppliers. The common finding is that current performance measurement systems do not incentivise more sustainable supplier selection when these decisions conflict with cost performance.

Although the KPI conflict may appear to be an internal issue concerning organisational alignment, multiple respondents argue that external market pressure reinforces cost-driven KPIs. Purchasing respondents describe how the market has shifted since 2022. During this time the case company faced less competition, operated at full production capacity and could prioritise sustainability initiatives. However, increasing competition has intensified price pressure. Purchasing respondent 3 captured the development directly: "A few years ago there was more sustainability focus, but today the market has changed. Today it is speed and cost that come before sustainability." This indicates that the market for more sustainable products that the case company anticipated when the pilot study was conducted in 2024 has not materialised in the way the organisation had assumed. The respondents argue that since customers are mainly cost-driven, the case company must further prioritise cost efficiency to maintain market shares, and that business choices ultimately depend on whether customers are willing to pay a premium for more sustainable products. One sustainability respondent stated that the internal focus on sustainability has decreased in practice, even though the formal environmental strategy remains unchanged. The KPI conflict cannot be resolved through internal alignment alone, as long as customers are unwilling to pay a premium for sustainability, the commercial incentive to prioritise cost over environmental performance will persist.

Despite the discrepancy between internal organisational values and external market drivers, multiple respondents express the need for complementary sustainable KPIs in order for ICP to function as intended. Respondents argue that if reduction in CO_2 would be presented in the same way as cost-savings, it would increase the effectiveness of ICP as a decision-making tool. Furthermore, in order to

achieve organisational change, you need to track decisions and data. One respondent proposes introducing sustainability tags in the cost tracking system, so that a buyer who selects a more expensive but lower-emission supplier is given visibility for that choice rather than simply appearing to underperform on MCL.

The design choice of ICP affects implementation aspects and also the perceived relevance in daily operations. Two main options were discussed by the respondents, a shadow price and a carbon fee. Purchasing and sustainability respondents highlight that a shadow price risks being disregarded in business decisions since it carries no actual monetary value. Furthermore, the respondents emphasise that the purpose of a shadow price is to visualise the long term financial risk of less sustainable decisions. Purchasing respondents stated that one consequence of a shadow price was that buyers did not receive organisational support when presenting management with more sustainable supplier selections. However, sustainability respondents describe that a shadow price is easier to implement and better suited to the supplier data reliability issue. A purchasing respondent believed that a carbon fee could cause friction between departments since emission density varies across components and would therefore have different effects on different product segments. No consensus emerged among the respondents regarding the optimal design choice of ICP. The discrepancy was between implementation possibility, where shadow price is favoured, and relevance to the decision-making, where a carbon fee is considered more effective.

A related design question concerns whether a single ICP level should apply across the entire organisation or whether levels should be differentiated between segments or business units. The majority of respondents, across both groups, favoured a uniform price. They argued that differentiated levels would undermine internal consistency, complicate cross-segment comparisons, and damage the credibility of the instrument, while a single price is easier to administer and align around. One respondent raised the alternative view that segment-specific levels could better reflect varying decarbonisation conditions, but this remained a minority position.

The respondents identify a clear gap between the organisation’s sustainability ambitions and the measurement systems and structures that govern daily purchasing operations. The choice of ICP design affects to what degree ICP is perceived as relevant for business decisions. Lastly, without formal sustainability KPIs the organisation lacks the incentive structure necessary for ICP to influence buyer and management behaviour.

4.4. Unresolved ownership and CBAM as implementation catalyst

The ICP pilot study was concluded approximately two years prior to this study, yet no formal implementation decision was made. The findings reveal how fragmented initiative origins, an unresolved ownership structure, and the absence of a company-wide mandate have collectively prevented the pilot study from translating into practice. Understanding this condition requires examining how the initiative was formed, how knowledge of it was distributed across the organisation, and what external forces are now beginning to pressure the status quo.

The initiative to explore ICP within the case company did not emerge from a single coordinated mandate. Several sustainability respondents describe that multiple teams explored ICP in parallel, without shared direction, with efforts eventually consolidated at the company level without a formal decision of implementation. Some respondents point to operational observations and leadership ambition as the initial drivers, while others highlight that purchasing was selected as the pilot study platform partly because of a particularly engaged purchasing manager whose involvement created the conditions for the pilot study to proceed.

The majority of sustainability respondents confirm that top management involvement was a decisive factor, noting that such initiatives are considerably easier to sustain when senior leadership is actively engaged. Following a change in purchasing management, the pressure on the ICP agenda decreased markedly, with organisational ambition shifting from genuine commitment to an attitude characterised as desirable but non-binding. Several sustainability respondents also identify the failure to agree on a common price level as a primary reason for why implementation has not materialised, with diverging prices seen as undermining the instrument's credibility.

This unstructured implementation approach is most visible at the operational level. Several purchasing respondents had no awareness of the ICP pilot study prior to being contacted for this study, and among those who were aware, the governance structure around sustainability was described as unclear. This lack of clarity is captured by Purchasing respondent 3: "It feels like we have a CO_2 net-zero goal but quite few who own the question. From management it isn't clear who does what and when, who follows up." Some purchasing respondents also describe receiving near-identical sustainability questionnaires from multiple internal functions simultaneously, pointing to a broader fragmentation in sustainability governance that extends beyond ICP specifically.

When asked to rank the drivers behind ICP adoption, the majority of sustainability respondents placed regulatory risk first, followed by internal strategic ambition, with investor pressure ranked third. Among purchasing respondents, orientations varied more widely, with some ranking genuine climate

commitment above regulatory compliance and framing ICP as a means of offering greener outcomes to end customers, while others described regulatory pressure and an intrinsic desire to be sustainable as equally driving forces.

Where internal alignment has proved elusive, CBAM is beginning to impose a common frame of reference. Several sustainability respondents note that CBAM covers a smaller range of supplier emissions than the organisation's own ICP methodology intends to address, creating a tension between regulatory compliance and the broader environmental ambition the pilot study was designed to serve. Nevertheless, some sustainability respondents frame ICP as a tool for managing this regulatory exposure, describing CBAM's entry into force as a significant enabler of a future implementation decision.

The pilot study generated knowledge of what ICP can do, but the organisation has not established the conditions needed to act on it. Knowledge remained predominantly among sustainability respondents and did not reach the purchasing respondents responsible for applying the instrument. Sustainability and purchasing respondents hold different views on why ICP matters, with regulatory risk management on one side and climate values and customer outcomes on the other, and no common framework has been established to align them. This dynamic is captured by sustainability respondent 1: "It's this hot potato effect where no one really wants to take the ownership and take the decision [...] it becomes a very almost political topic." Several sustainability respondents describe the entry into force of CBAM as the development most likely to bring the question of implementation back onto the organisational agenda.

5. Analysis

This chapter discusses the empirical findings in relation to the previous research, with the aim of interpreting how ICP should be designed in order to work effectively as a management control mechanism within the organisation. The analysis focuses on explaining the identified challenges through concepts from corporate environmental strategy and theories concerning organisational implementations of ICP, and examines how organisational conditions influence the effectiveness of ICP.

5.1. Aligning ICP with existing decision-making structures

From the empirical findings it is evident that the sourcing process at the case company is a complex process containing numerous steps and involves a series of different stakeholders. As the sourcing process is a multifaceted area incorporating many different stakeholders and evaluation criteria it requires careful consideration of how to structurally integrate a new tool such as ICP.

Effective implementation of ICP depends on the organisation's ability to integrate it into existing processes and financial systems, as opposed to having them separated. By integrating ICP fully into existing processes it can drive sustainability work forward (Grigorescu et al., 2025). This view is further supported by the argument that ICP must be fully embedded into decision-making structures to create transformation (Morel et al., 2022). This theoretical standpoint contradicts the current situation at the case company, where sustainability metrics remain separated from financial metrics. While sustainability is included in the decision-making process, it is reported and presented separately from financial metrics. Facilitating an implementation of ICP therefore requires integration into existing structures such as evaluation sheets or NPV calculations (Morel et al., 2022).

An important action to facilitate a structural integration of ICP is identifying the optimal point of integration in the sourcing process structure. Empirical findings show that ICP would be most effective if integrated early or continuously through the supplier selection process. A particular reason for integrating ICP early in the process was to affect a broader range of suppliers and establish CO_2 emissions as a competitive benchmark. This increases the negotiation leverage over suppliers and can influence suppliers into becoming less carbon intensive according to the empirical findings. This reasoning connects with what prior research suggests on how ICP can be used as a proactive environmental strategy to reduce carbon intensity (Zhu. et al., 2022).

5.2. Selective materiality and supplier data reliability

The empirical findings indicate that the effectiveness of ICP at the case company mainly depends on three central factors: the carbon intensity of the sourced component, the price range between different supplier offerings in a given segment, and the reliability of supplier emissions data. The CO_2 intensity of components and the price difference between different suppliers together determine whether the difference in CO_2 cost between two suppliers outweighs the difference in material cost, enough to influence a sourcing decision to the more sustainable choice. The reliability of supplier emissions data determines whether any comparison between suppliers is meaningful in the first place.

The analysis below broadly aligns with the previous research presented in this study, but extends it in three aspects. First, a structural threshold on ICP influence that operates independently of the behavioural barriers emphasised in prior research. Second, an abatement cost variant not captured in the standard ICP design framework. Third, a data quality paradox in which the most transparent suppliers can appear the most carbon intensive.

The empirical observation that ICP produces meaningful effects only for components that are complex, heavy, carbon intensive, and regulation-exposed is consistent with prior research emphasising that ICP effectiveness depends on external, internal, and transfer-related contextual factors rather than operating uniformly across decision contexts (Elliot et al., 2023). The CDP framework used by Morel et al. (2022) formalises the scope of emissions coverage through its Width dimension. The pattern observed by the respondents, that ICP becomes relevant only for certain types of components, nuances this dimension by showing that formal coverage does not necessarily translate into equal decision relevance across all sourced components. The interviews with the sustainability respondent group reinforce this view. They state that the influence of ICP decreases the lower the carbon intensity is, and that higher purchasing volumes raise the share of carbon cost relative to total cost. The purchasing respondents added a further condition that has not been directly addressed in the literature, namely supplier-market competitiveness. Where competition between suppliers is high, the buyer can demand emissions reductions and improved supplier data quality. Where alternatives are few, this leverage diminishes regardless of carbon price level, being overridden by supply-security. ICP influence is therefore bounded not only by carbon cost ratio but also by the competitive structure in the supplier market.

A second pattern in the empirical results extends the existing literature on shadow pricing. Gorbach et al. (2022) argue that shadow pricing is administratively simple but often ignored because it does not affect operational budgets or personal evaluations. The pilot study displayed that NPV calculations were the primary evaluation method for shadow price. High discount rates can disregard the long-term financial effects of CO_2 reduction and prove ICP ineffective on a strategic level. This is aligned with

previous research, Yanfei et al. (2023) establish that short-sighted managerial behaviour risks decreasing emissions reduction.

The abatement cost mechanism developed in the logistics sourcing function is a finding that diverges from prior research, which describes three principal ICP designs: shadow price, internal carbon fee, and internal emissions trading (Morel et al., 2022; Gorbach et al., 2022). Rather than adding a hypothetical CO_2 cost to a total cost comparison, the abatement cost view asks how much the emissions reduction costs, per tonne of CO_2, and compares that to the ICP level as a threshold. What makes this framing organisationally useful is that it produces a single, portable metric that can be compared across unrelated decisions. This is what enabled the logistics sourcing function to build a cross-segment database of abatement costs, supporting decarbonisation prioritisation at an organisational level rather than on a decision-by-decision basis. While the concept of abatement cost is well established, its use as a structured ICP threshold mechanism for sourcing decisions is not captured in the existing ICP design framework.

The findings on supplier data reliability align with prior research on the structural limits that supply-chain emissions data place on ICP. Schiessl et al. (2021) demonstrate that regional industry averages assign identical performance scores to all suppliers in a given category, removing the ability of ICP to differentiate between carbon-efficient and carbon-intensive suppliers, and supplier data quality, transparency, and willingness to share are widely identified as persistent obstacles in Scope 3 accounting (Essouid et al., 2026).

The organisational responses observed at the case company illustrate the type of internal investment described as necessary in this literature (Grigorescu et al., 2025): a centralised cradle-to-gate accounting platform, the integration of carbon footprint breakdowns into the cost breakdown file, the validation of supplier-reported data against multiple reference points, and the granular data collection mandated in logistics since 2020.

The findings extend this literature in one further direction. Where prior work emphasises that averages prevent differentiation, the empirical pattern shows that incomplete or inconsistent reporting can harm the comparison even further and penalise those suppliers who are most transparent. A supplier disclosing comprehensive product carbon footprints across multiple tiers in the supply chain can appear more carbon-intensive than a less transparent competitor, producing the opposite of the intended effect. When default values or industry averages dominate, two suppliers delivering identical components become indistinguishable in the emissions comparison, and no amount of tool design can change that without a shared framework for emissions reporting. Reliable supplier data is therefore a necessary condition for ICP to function at all as a mechanism that differentiates between suppliers.

Taken together, the analysis indicates that ICP effectiveness at the case company is bounded by structural conditions that ICP implementation design cannot resolve on its own. First, the carbon cost must be large enough relative to the difference in price between suppliers to influence decision-making, which limits the segments where ICP can shift outcomes. Second, the emissions data underpinning any comparison must be reliable and comparable, which depends on progress that is partly external to the firm. The abatement cost variant of shadow price observed in logistics sourcing produces identical choice impact as shadow price but suggests that the framing and communication of a decision parameter could be equally important as its technical specification. Neither the proportionality problem nor the absence of a global data framework can be resolved by instrument design alone, and both therefore constitute boundary conditions for any ICP implementation in a sourcing context.

5.3. Incentive structures, design choices, and external pressures

Without incentive structures that measure key sustainability metrics related to supplier selection, ICP will fail to influence business decisions. The empirical findings indicate that purchasing functions are primarily evaluated based on cost-related metrics and no formal performance indicators are in place to measure or reward CO_2 reductions. Prior research emphasises that the effectiveness of management control tools depends on their alignment with organisational incentive structures. If sustainability-related metrics are not integrated into performance measurement systems, they are unlikely to influence managerial behaviour (Vadera et al., 2025). When financial targets conflict with environmental objectives, decision-makers tend to prioritise established evaluation criteria, which undermines the implementation of control mechanisms such as ICP (Elliot et al., 2023). Empirical findings show that shadow price is used to visualise the cost of CO_2 in order for buyers to be aware of the CO_2 emissions related to the sourced parts. Previous research shows that buyers can struggle to equate hypothetical environmental shadow costs with tangible financial costs (Morel et al., 2022). Previous research and our empirical findings show that ICP risks becoming ineffective as a decision-making tool if KPIs are not integrated into performance measurements of buyers and managers.

The findings further demonstrate that the two ICP designs carbon fee and shadow price pose different challenges and advantages related to organisational implementation and effectiveness as a decision-making tool. The empirical findings indicate that a shadow price may risk having limited impact on decision-making, reflecting the challenge identified in the literature that non-transactional mechanisms may be disregarded in operational decision-making (Gorbach et al., 2022; Vadera et al., 2025). Control tools risk being disregarded if the people within the organisation don't understand the purpose of the tool (Yanfei et al., 2023). Our empirical findings show that there was a lack of understanding and knowledge about the purpose and design of ICP. In order for a shadow price to impact the supplier

selection and decision-making process, buyers and key-decision-makers in the sourcing board need to be incentivised and measured with KPIs reflecting the purpose of shadow price as well as understanding its purpose.

The empirical findings indicate openness toward a carbon fee mechanism, particularly when associated with a redistribution of funds to support sustainability initiatives. This aligns with prior research suggesting that the design of ICP systems, including how revenues are allocated, plays a critical role in shaping organisational acceptance. The willingness of business units to engage in emission reduction activities increases when carbon-related costs are complemented by reinvestment mechanisms or incentives (Yanfei et al., 2023). The empirical findings also reflect a broader behavioural challenge identified in the literature, where control mechanisms that impose costs without corresponding incentives risk generating resistance. Internal carbon fees may be perceived as punitive if they are not accompanied by clear benefits or support mechanisms for affected units (Gorbach et al., 2022; Vadera et al., 2025). A carbon fee therefore requires greater organisational effort to implement than a shadow price, but can result in larger CO_2 reductions when the conditions for acceptance are met.

Empirical evidence shows that organisational friction may also arise when consistent price levels are not applied throughout the organisation, which highlights the importance of aligning economic control tools with organisational motivation and perceived fairness (Gorbach et al., 2022). The majority of respondents favoured a uniform ICP level across the organisation, arguing that differentiated prices would undermine internal consistency, complicate cross-segment comparisons, and damage the credibility of the instrument. A minority view raised by some respondents, that segment-specific levels could better reflect varying decarbonisation conditions, mirrors an alternative position in the literature (Gorbach et al., 2022; Vadera et al., 2025).

A trade-off emerges when external market dynamics and the internal environmental strategy are misaligned, where long-term environmental commitments come at the cost of short-term financial wins. The empirical findings indicate that normative pressure from customers still has a greater impact on decision-making than the coercive pressure imposed by regulations such as CBAM and EU ETS, despite the latter representing a more direct financial exposure (Gorbach et al., 2022). The empirical findings further show that customer preferences shaped by short-term cost considerations create a misalignment between the company's sustainability ambitions and its financial targets. This forces back the proactive and long-term logic that ICP, as a tool for anticipating future costs linked to CO2 emissions, is designed to embody (Trinks et al., 2022). The implementation of ICP represents a shift from a passive to a proactive environmental strategy, but commercial reality may prevent the company from adopting ICP as a proactive tool in practice (Zhu et al., 2022). ICP's effectiveness as a proactive tool is therefore conditional on the external market, not only on internal organisational design.

Overall, the analysis indicates that the effectiveness of ICP in sourcing depends on conditions that extend beyond its technical design. Performance measurement systems must integrate sustainability metrics for the instrument to influence behaviour. While a carbon fee may have greater potential to shift decisions, respondents leaned towards shadow price as the more practical first step given the implementation barriers a carbon fee would face. A uniform price level appears to be a precondition for organisational acceptance, but even when these internal conditions are met, the proactive logic of ICP can be forced back by short-term commercial pressures from customers.

5.4. Institutional barriers to functional ownership

Beyond structural and incentive-related barriers, ICP adoption is contingent on institutional conditions that must be established prior to any technical implementation. A consolidated mandate is a precondition for any function to claim legitimate ownership of the implementation decision. Where neither coercive nor normative pressure has been consolidated into a shared organisational rationale, no single function holds the legitimacy to impose the costs that formalisation entails (Gorbach et al., 2022). Sustainability respondents ground the case for ICP in regulatory risk exposure while purchasing respondents frame it in terms of climate values and customer outcomes, and no common rationale has been established across functions. An effective low-carbon transition requires concurrent alignment of organisational structures and cultural values under active cross-stakeholder governance (Chen et al., 2025), and the absence of such alignment means that ownership of the ICP decision remains institutionally unresolved.

Of these prerequisites, the absence of a formalised governance structure represents the most fundamental barrier. Effective ICP implementation requires a governance structure anchored in the specific organisational context and independent of individual managerial engagement (Gorbach et al., 2022; Elliot et al., 2023). The finding that momentum was lost following a change in purchasing management illustrates that such a structure has not been established, leaving the initiative contingent on individual engagement rather than institutional commitment. Without this foundation, decisions on price level, functional ownership, and system integration cannot be made with organisational authority. ICP must also be integrated into existing management control systems to function as an operational mechanism rather than an isolated initiative (Grigorescu et al., 2025), and the limited awareness of the pilot study among purchasing respondents responsible for its application indicates that this level of integration has not yet been achieved.

The governance gap is further compounded by the absence of organisation-wide consensus on a common price level. ICP effectiveness depends not on technical precision in price-setting but on broad

organisational acceptance of a unified level and its rationale (Vadera et al., 2025), and employees and business units must understand what the instrument entails and why it exists before any pricing decision can carry organisational legitimacy (Yanfei et al., 2023). Sustainability respondents identify the absence of price consensus as a primary implementation barrier, consistent with a broader pattern in which carbon considerations remain peripheral to core business processes rather than embedded within them. Achieving such consensus depends on direct coordination across sustainability, financial, and operational functions (Desjardins & Sinclair-Desgagné, 2025; Grigorescu et al., 2025), and the absence of any entity assuming responsibility for a binding decision on price level and implementation structure indicates that this coordination remains insufficient.

Where internal conditions have proved insufficient to produce a binding decision, external regulatory pressure may assume a compensatory role. Companies exposed to tightening regulatory frameworks adopt ICP as a mechanism for internalising external carbon costs, with price levels tending to reflect expectations of more stringent future regulation rather than current prices (Trinks et al., 2022), and such regulatory tightening has been shown to accelerate internal transformation and increase the likelihood of sustained ICP adoption (Bento et al., 2021). Sustainability respondents identify the entry into force of CBAM as the development most likely to bring formal implementation onto the organisational agenda. Another limitation reflected in the findings is how CBAM would cover a narrower range of supplier emissions than the organisation's own ICP methodology, highlighting how regulatory pressure alone does not substitute the required internal governance structures (Gorbach et al., 2022).

6. Discussion

The case company's pilot study demonstrated that ICP has the potential to make carbon costs visible in the supplier selection process, but that the mechanism as it was designed and used in the pilot did not impact the final supplier selection in the majority of the examined product segments. The interviews pointed to several barriers, including insufficient emissions data, a lack of organisational ownership, and a KPI structure that does not support more sustainable buyer behaviour. The previous section has examined these barriers in relation to the previous research. This discussion takes a step back to consider what the implications of these findings are regarding how ICP should be understood as a management control mechanism, what structural conditions shape its effectiveness, and what its implementation reveals about the organisation itself.

6.1. ICP under regulatory convergence, from voluntary tool to hedging mechanism

The interviews shed light onto the effects CBAM and EU ETS will have on the underlying logic of ICP. If these regulatory frameworks are implemented across all supply chains of goods entering the EU, involving CO_2 emissions into business decisions will not be an option made by companies that have established a proactive sustainability strategy, but rather a reality for all actors within the EU. This fundamentally changes what an internal carbon price means for any given company. Since the actual emissions of any given product will already be included in the price through the regulatory system, ICP will not be necessary for the sole purpose of displaying hidden carbon costs.

However, the interviews showed that contracts with suppliers are made on a basis of at least a couple of years. As one purchasing respondent mentioned, the company's ICP-level at any given time might instead need to factor in the forecasted development of the EU ETS price-level to account for its potential increase during the contract period. A dynamic pricing method, showing projections for the EU ETS levels for the next couple of years and applied by comparing the duration of any given contract with this price development, will be essential in order to not put pressure on financial margins. This would mean that different sourcing decisions made at the same time might use varying ICP levels for the supplier screening depending on the contract period.

The findings extend the prior literature by reframing ICP from an internalisation tool to a financial risk mechanism. The previously established logic, captured by Helbling (n.d.) and operationalised in much of the ICP literature, is that ICP corrects a market failure by attaching a cost to an externality. Once that externality is internalised externally through CBAM and EU ETS, the logic shifts. The relevant risk is no longer that emissions are uncosted, but that the cost of emissions cannot be predicted with sufficient

accuracy. The implication is that ICP under regulatory development could function more as a financial risk management tool. However, a firm might still want to use a higher ICP level if the forecasted regulated level does not align with their own ambition for their environmental transition.

CBAM also reshapes the data problem identified throughout the empirical findings. As CBAM applies default values based on worst-case scenarios where data quality is insufficient, suppliers can no longer benefit from withholding emissions data. Every actor shipping goods into the EU affected by CBAM will face higher costs if their CO_2 emissions are not on a similar level to their competitors. For the case company, this means that the issue of insufficient supplier data will increasingly be addressed by the regulatory system itself rather than through internal effort. The data-quality investments described by the sustainability respondents thus serve a dual purpose: they support internal ICP design today, and they prepare the supplier base for a regulatory environment in which transparent reporting becomes a necessity.

6.2. Market asymmetry as a structural limit on ICP

The findings also extend the existing literature by surfacing the role of market conditions in shaping ICP's effectiveness. The interviews point to a more fundamental issue, namely that the market for more sustainable products within the case company's current product portfolio has not proven as strong as the company assumed when the pilot study was conducted. If there is only a small market for sustainable technology relative to the total market, the shift from the current way of doing business as ICP will require, will cause higher prices for customers and likely lead to a decrease in demand. As the interviews showed, a sustainability premium is not a reality for the case company. The effectiveness of ICP will be limited if the organisational changes it requires and consequences for end customers are not aligned with market dynamics.

This points to a structural limit on ICP that the existing literature treats only implicitly. ICP is positioned as a mechanism that internalises carbon costs into the firm's decisions, but its effectiveness ultimately depends on if those costs can be passed through to customers. In markets where customers prioritise cost over sustainability and competitors are not considering carbon costs, the firm that adopts ICP risks losing market shares to competitors. The empirical findings indicate that since 2022, this dynamic has intensified at the case company, with increased competition pushing the sustainability agenda back even though the formal environmental strategy at the case company has remained unchanged.

This asymmetry is reinforced by the geographical scope of emissions regulation. CBAM and EU ETS apply carbon costs for goods crossing into the EU, but firms operating outside the EU and selling to non-EU markets face no equivalent cost. The case company's commitments therefore translate into competitive disadvantages in markets where regulatory pressure is weaker, regardless of how well ICP

is designed internally. The implication is that ICP cannot resolve a problem that is fundamentally located in the demand side of the market and in the asymmetry of regulatory pressure across regions. Policies that shape customer willingness to pay for sustainability, and that ensure all actors within a market commit to a transition, are necessary for any firm-level mechanism such as ICP to be effective.

6.3. Strategic clarity as a precondition for ICP

A third reading of the findings is that the difficulties the case company encountered with ICP reveal more about the organisation than about the mechanism itself. The pilot study was concluded approximately two years prior to this study, yet no formal implementation decision has been made. The reasons identified in the empirical findings are not technical. The pilot study generated a working method, two tested price levels, and concrete observations of where ICP would and would not shift decisions. What was missing was not knowledge of the mechanism itself but the organisational conditions.

Several explanations surface from the interviews. A common observation is that the introduction of ICP is perceived as an expansion of existing work rather than a natural part of existing roles. Respondents from both the purchasing and sustainability functions describe ownership as falling between the cracks. The result is that neither function assumes the full mandate to drive the integration between the two perspectives. Desjardins and Sinclair-Desgagné (2025) argue that when business units actively engage in emissions reduction, traditional financial departments and environmental strategists can no longer operate in silos, and that direct and continuous coordination is required to balance financial optimisation with environmental strategy. The finding that different sustainability groups within the organisation send out separate forms with similar questions to suppliers reinforces the picture of inadequate coordination, and suggests that this is not only a lack of ownership for the ICP implementation specifically, but a broader organisational fragmentation in how sustainability issues are managed.

This problem is amplified by the case company's environmental strategy in practice appearing to be driven more as a grassroots strategy than as a clearly formulated strategic direction from top management. Interview respondents describe the sustainability work as neither distinctly proactive nor reactive, but as a combination of both. Implementing ICP is described in the literature as marking a strategic shift from a passive to a proactive environmental strategy (Zhu et al., 2022), yet the uncertainty observed at the case company suggests that this shift has not been fully realised. The organisation appears to be caught between two strategic orientations, which makes it difficult to establish the long-term leadership required to carry out an implementation of a new control mechanism such as ICP. The findings extend the existing literature by challenging an assumption embedded in much of the ICP scholarship, namely that the introduction of ICP itself constitutes evidence of a proactive environmental strategy. The case company's experience suggests the opposite causal direction: a proactive strategy is

a precondition for implementing ICP successfully, not a consequence of it. Where the strategic posture is uncertain, the introduction of ICP can reinforce fragmentation rather than resolve it, by adding another initiative to a portfolio of disconnected sustainability efforts without consolidating them under a shared mandate.

The findings further extend the literature by nuancing how resistance to carbon fee mechanisms is characterised. Gorbach et al. (2022) and Vadera et al. (2025) warn that internal carbon fees are frequently perceived as a punitive internal tax, generating strong organisational resistance from emission-intensive business units. However, the empirical findings of this study suggest a more nuanced picture. Several respondents expressed a willingness to accept a carbon fee, provided that the revenues are redistributed to support sustainability initiatives within the organisation rather than simply absorbed as a cost. This suggests that the perceived punitiveness of a carbon fee is not inherent to the mechanism itself, but depends on how its revenue structure is designed and communicated. When respondents could see a clear link between the fee they would pay and the green investments it would enable, the resistance predicted by the literature did not materialise to the same extent. This finding aligns more closely with Yanfei et al. (2023), who argue that reinvestment mechanisms are the critical factor in determining whether a carbon cost is met with cooperation or resistance. The implication is that organisational acceptance is shaped less by the choice between shadow pricing and carbon fee, and more by whether the firm has the strategic clarity and ownership structures to communicate why the mechanism exists and how its proceeds will be used.

6.4. Implications beyond the case company

Three implications follow from the discussion above. First, for automotive OEMs and other manufacturers facing Scope 3 exposure, the findings suggest that the timing of ICP adoption matters. Firms considering ICP in the period leading up to full CBAM implementation face a different design problem than firms that will adopt it once CBAM is fully in force. The first group needs a mechanism that internalises an externality not yet included in the price by regulation; the second group needs a mechanism that hedges against the forecast of an externally set price. The literature does not yet distinguish between these two design problems, and treating them as identical may lead firms toward ICP designs that are theoretically coherent but practically misaligned with their regulatory environment.

Second, for policymakers, the findings indicate that ICP cannot be expected to drive decarbonisation in isolation. Two market conditions undermine its effectiveness: customer markets that do not reward a sustainability premium, and regulatory asymmetry between regions that exposes EU-based firms to competitive disadvantages. CBAM addresses the second condition partially, but its narrower scope of emissions coverage compared to firms' own ICP methodologies means that significant gaps remain. Policy support that strengthens demand-side incentives for more sustainable products, and that

progressively widens CBAM's scope to align with the emissions categories firms are already managing internally, would make ICP both easier to implement and more effective once established.

Third, for the literature on corporate environmental strategy, the findings suggest that ICP should be treated as a diagnostic instrument as much as a prescriptive one. A firm's experience implementing ICP reveals where its decision-making structures, incentive systems, and strategic ownership stand. Where these are aligned, ICP can be embedded as a control mechanism. Where they are not, the difficulties of implementing ICP make those gaps visible. This reframes ICP from a tool whose value lies in its emissions-reducing impact to one whose value also lies in what it forces the organisation to confront about its own strategic posture.

Taken together, these implications differ in their scope of generalisation. The findings about which components ICP can meaningfully influence, those characterised by high carbon intensity, high price spread, and reliable data, are most directly tied to the automotive OEM context, where supply chains are long, components are physically complex, and contract durations span several years. The organisational findings, including the role of ownership fragmentation, the strategic posture as a precondition for ICP, and the dependence of carbon fee acceptance on revenue redistribution, are likely to extend to other large manufacturers with significant Scope 3 exposure and similar functional separations between sustainability and purchasing. The reframing of ICP as a hedging mechanism rather than an internalisation tool, in contrast, is contingent on the continued development of CBAM and the EU ETS as binding regulatory instruments. If these frameworks were to weaken or stall, the logic shift identified in this study would not materialise, and ICP would retain its original role as a voluntary internalisation mechanism.

7. Conclusion

The aim of the study was to investigate what factors determine the effectiveness of ICP in the sourcing process of a European automotive OEM, based on interviews with sustainability and purchasing respondents and analysis of the 2024 ICP pilot conducted at the case company.

This study suggests that ICP can impact sourcing decisions when four conditions hold: carbon cost is significant relative to component cost, supplier emissions data is reliable enough to differentiate alternatives, the supplier market is competitive enough to allow buyer leverage, and organisational ownership and aligned KPIs support the mechanism. Where these conditions are met, ICP can influence supplier selection. Where they are not, ICP remains informational but its ability to significantly impact a decision is impeded.

The study makes three contributions to the literature on ICP and corporate environmental strategy. First, while prior research frames ICP's limitations as behavioural, the findings show that a structural threshold precedes these barriers: when carbon cost is small relative to total purchasing cost, shadow pricing cannot shift the decision even with full managerial attention. Second, the abatement-cost framing developed in logistics, mathematically equivalent to shadow pricing but reversed in presentation, is not captured by the design typology of Morel et al. (2022) and Gorbach et al. (2022). Third, supplier-market competitiveness is identified as a necessary condition for ICP effectiveness, extending the CDP Width dimension beyond emissions scope. Taken together, these findings reframe ICP as an organisational control system rather than a technical pricing mechanism, where the strategic shift from passive to proactive environmental strategy that ICP is theorised to mark (Zhu et al., 2022) does not follow automatically from introducing the tool.

For practitioners, segment selection matters more than price calibration. Segments that should be targeted are those where carbon cost is significant, supplier competition allows leverage, and CBAM exposure is rising. Shadow pricing is a viable first step given its lower organisational threshold, but only if complemented by clear ownership, aligned KPIs, and formal guidelines linking carbon costs to supplier selection. For policymakers, ICP cannot carry the decarbonisation transition alone as long as customer markets do not reward sustainability and firms outside the EU face asymmetric regulation. CBAM is identified by respondents as the development most likely to force formal implementation, but its narrower emissions scope means it cannot substitute for internal governance. Policy support that strengthens demand-side incentives and harmonises regulatory pressure across markets would make ICP easier to implement and more effectively reduce carbon emissions once established.

Future research could examine whether the structural threshold, the abatement-cost framing, and the market-competitiveness condition hold in other industries and regulatory contexts, and how ICP designs

evolve once CBAM and EU ETS prices are fully integrated into supplier contracts. Another relevant area of future investigation is how to incorporate other environmental externalities into management control systems.

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Appendix A

A.1. Sustainability function interview guide

1. Before the interview

1.1 Is it okay if we record and transcribe the interview?

1.2 Nothing reproduced in the study will be done so by name or traceable to either the company or you as an individual. You have the right to withdraw at any time if you wish.

1.3 We may sound a bit robotic when asking our questions, but we have to stay consistent for the sake of our study.

2. Background information

2.1 Can you tell us a little about your previous experience on the path to your current position?

2.2 Could you briefly describe your educational background?

2.3 Describe your current position and how long you have been in that position?

2.4 Can you describe what the current process looks like when you select your suppliers?

2.5 Do you work with sustainability in this already, and if so, how?

3. ICP Design:

Purpose: What does the design of the ICP tool look like?

- A pilot project for ICP has previously been carried out in which a hypothetical price per tonne of CO_2 was set in the investment calculations used in supplier selection. In that pilot, the shadow price (i.e., an ICP design in which no internal transaction takes place) was identified as the option the case company wishes to continue with. How do you reason about the advantages and disadvantages of a shadow price compared to a carbon fee, where money is actually redistributed internally?

Height

- How did the initiative to want to introduce ICP come about? From what level in the organisation did this come from?
- What factors have been driving forces behind the initiative (to introduce ICP)?
- In the pilot, the case company used two price levels, how did you arrive at these prices?
- Which factors carry the most weight when you determine the price level for the internal CO_2 price?
- If you were to rank which factors most influence the internal price level, based on market price (EU ETS), future regulations, internal ambitions, or competitive benchmarking, what would that look like?

- What is your primary objective in implementing ICP?
- Should all purchasing segments have the same price levels, or can these vary between product groups?

Time

- Is the price level static, or are you working with a price trajectory that changes over time?
- How do you account for the discount rate in relation to the CO_2 price in long-term investments?

Width

- What is the reason that purchasing specifically became the platform for the pilot project?
- Which product groups have you planned for ICP to apply to?
- Which Scopes does your ICP implementation cover?

Depth

- What do you think would be the best way to negotiate the fact that different suppliers might have varying quality of emissions data that they provide to you?
- If a supplier negotiation is under clear budget constraints and ICP makes the purchase too costly, is it mandatory for purchasers to take ICP into account (i.e. that the project cannot proceed), or does the purchaser have the mandate to disregard the ICP cost if there may be other stronger incentives to carry out the project?
- At what point in the decision-making process ahead of supplier selection do you consider ICP should be implemented?

4. Organisational implementation

Purpose: Investigate whether the organisation is reactive or proactive

- How would you rank regulatory risk, market/investor pressure, and internal strategic ambition, based on what's more important to your sustainability strategy?
- What does ICP contribute to your sustainability strategy?

Purpose: Examine whether the cultural prerequisites for effective implementation are in place

- How do you work with different stakeholders in the introduction of sustainability initiatives (such as ICP)?
- Purchasing is measured on cost minimisation. ICP may risk making it harder for purchasing to keep costs down. How do you reason about counteracting goal conflicts between incentive structures and operational reality?

A.2. Purchasing function interview guide

1. Before the interview

1.1 Is it okay if we record and transcribe the interview?

1.2 Nothing reproduced in the study will be done so by name or traceable to either the company or you as an individual. You have the right to withdraw at any time if you wish.

1.3 We may sound a bit robotic when asking our questions, but we have to stay consistent for the sake of our study.

2. Background information

2.1. Can you tell us a little about your previous experience on the path to the role you hold today?

2.2 Briefly describe your educational background?

2.3 Describe your current position and how long you have held it?

2.4 Can you describe what the current process looks like when you select your suppliers?

2.5 Do you work with sustainability in this, and if so, how?

3. ICP Design:

Purpose: What does the design of the ICP tool look like?

- A pilot project for ICP has previously been carried out in which a hypothetical price per tonne of CO_2 was set in the investment calculations used in supplier selection. In that pilot, the shadow price (i.e., an ICP design in which no internal transaction takes place) was identified as the option the case company wishes to continue with. How do you reason about the advantages and disadvantages of a shadow price compared to a carbon fee, where money is actually redistributed internally?
- How does ICP differ from the existing climate requirements you place on suppliers today?
- What steps are included in your supplier selection process today?
- At which stage of the supplier selection process would a CO_2 price have had the greatest impact on the final decision?

Depth

- If purchasing negotiates with a supplier that has a higher purchase price for a particular component than another supplier delivering an identical component, how does that affect other functions' budgets, such as R&D or product development?

4. Organisational implementation

Purpose: Investigate whether the organisation is reactive or proactive

- If a purchasing decision entails lower cost but higher CO_2 emissions, how would that affect your performance measurement based on existing KPIs and bonus systems?
- Do climate-related KPIs carry the same weight as cost-based KPIs at present?

Purpose: Examine whether the cultural prerequisites for effective implementation are in place

- Do you feel that within purchasing you have the training and support you need to fully understand and use the carbon data that ICP requires?
- Purchasing is measured on cost minimisation. ICP may risk making it harder for purchasing to keep costs down. Emissions for certain goods are higher than for others. How do you reason about the potential problems this entails?

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