Thesis Paper
on
Green Supply Chain Management Practice in Bangladesh: A Case Study on Anwar Group of Industries

Submitted By
Md. Naeim Uddin
ID: MSCM2401031001
Program: Master of Business Administration
Major: Supply Chain Management
Department of Business Administration
Sonargaon University (SU)

Submitted To
Department of Business Administration
Faculty of Business
Sonargaon University (SU)

Submitted for the partial fulfillment of the degree of
MBA in Supply Chain Management

Sonargaon University (SU)
147/1 GreenRoad, Panthapath, Tejgaon, Dhaka
Date of Submission: January 03, 2026

Thesis Paper
on
Green Supply Chain Management Practice in Bangladesh:
A Case Study on Anwar Group of Industries

Submitted By

Md. Naeim Uddin
ID: MSCM2401031001
Program: Master of Business Administration
Major: Supply Chain Management
Department of Business Administration
Sonargaon University (SU)

Supervised by:

Mst. Marium Akter
Lecturer
Department of Business Administration
Faculty of Business,
Sonargaon University (SU)

Submitted for the partial fulfillment of the degree of
MBA in Supply Chain Management

Sonargaon University (SU)
147/1 GreenRoad, Panthapath, Tejgaon, Dhaka
Date of Submission: January 03, 2026

Letter of Transmittal

January 03, 2025
Mst. Marium Akter
Lecturer
Department of Business Administration
Faculty of Business
Sonargaon University

Subject: Submission of thesis report on **"Green Supply Chain Management practice: A case study on Anwar Group of Industries"**

Dear Madam,
With due respect, I would like to inform you that it is a great pleasure and privilege to present the Dissertation report entitled **"Green Supply Chain Management practice: A case study on Anwar Group of Industries"**, which was assigned to me as a partial requirement for the completion of MBA program. Throughout the study I have tried the best of my capacity to accommodate as much as information and relevant issues as possible and tried followed the instructions that you have suggested. I put my best effort to make this report such as much detailed as possible. I sincerely believe that report would satisfy and meet the requirement and will serve the purpose of my internship program.

I am grateful to you for your kind guidance and cooperation at every step of my endeavor during preparing this report. It would be a great help for me if you kindly take some time to go through the report and evaluate this. It will be a big reward for my effort if it adds value to the research literature.

Sincerely Yours,

…….
Md. Naeim Uddin
ID No. MSCM2401031001
Program: Master of Business Administration
Major: Supply Chain Management
Department of Business Administration
Sonargaon University

Declaration of Student

This is to notify you that, the thesis paper on **"Green Supply Chain Management practice: A case study on Anwar Group of Industries"**, has been prepared as a part of my dissertation formalities. It is an obligatory part of me.
MBA program to submit a thesis paper. Moreover, I was inspired and instructed by **Mst. Marium Akter,** Lecturer, Department of Business Administration, Sonargaon University (SU). I am further declaring that I did not submit this report anywhere for awarding any degree or certificate.

Sincerely Yours,

…….
Md. Naeim Uddin
ID No. MSCM2401031001
Program: Master of Business Administration
Major: Supply Chain Management
Department of Business Administration
Sonargaon University

Letter of Authorization

Certified that this thesis report titled **— "Green Supply chain Management Activity of Anwar Group"** is the bona fide work of **Md. Naeim Uddin**, who carried out the research under my supervision. Certified further that to the best of my knowledge the work reported here in does not form part of any other report or Thesis based on which a degree or award was conferred on an earlier occasion on this or any other candidate.

.....

Mst. Marium Akter
Lecturer
Department of Business Administration
Faculty of Bussiness
Sonargaon University (SU)

Acknowledgement

At the very beginning, I would like to express my sincere gratitude to Almighty Allah for granting me the strength, patience, and wisdom to successfully complete this research work.

I would like to express my deepest appreciation to my honorable academic supervisor, **Mst. Marium Akter** , Lecturer, Department of Business Administration, **Sonargaon University**, for her valuable guidance, continuous encouragement, and constructive supervision throughout the preparation of this thesis. Her insightful suggestions and academic support played a vital role in completing this study successfully.

I am highly grateful to **Anwar Ispat Limited** for providing me with the opportunity to conduct my research in such a reputed organization. I would like to express my sincere thanks to the management and all officials of Anwar Ispat Limited for their cooperation, valuable information, and support during the data collection process. Their professional guidance and willingness to share knowledge greatly enriched this research.

I would also like to extend my heartfelt gratitude to all employees of Anwar Ispat Limited who assisted me by providing necessary information, insights, and practical exposure related to Green Supply Chain Management practices.

Finally, I would like to thank my family, friends, and well-wishers for their continuous encouragement, motivation, and moral support throughout the completion of this study. Their patience and inspiration have been instrumental in achieving this academic milestone.

Abstract

The growing global concern for environmental sustainability has driven organizations to integrate eco-friendly practices into their operations, giving rise to the concept of Green Supply Chain Management (GSCM). This thesis explores the implementation and effectiveness of GSCM practices within Anwar Group of Industries, one of Bangladesh's leading industrial conglomerates. The study examines how the company incorporates environmental considerations into its procurement, production, distribution, and waste management processes. Through a mixed-method approach—combining qualitative interviews with key management personnel and quantitative analysis of operational data—the research identifies the key drivers, challenges, and outcomes of adopting GSCM practices. Findings reveal that Anwar Group's green initiatives have not only reduced carbon emissions and resource consumption but also improved brand image, cost efficiency, and compliance with national and international environmental standards. However, challenges such as limited technological infrastructure, high implementation costs, and lack of supplier cooperation continue to impede broader adoption. The study concludes that a stronger commitment to sustainable innovation, coupled with government incentives and stakeholder engagement, is essential for enhancing the long-term success of green supply chain initiatives in Bangladesh's industrial sector. This case study contributes valuable insights into how traditional manufacturing firms in developing economies can transition toward sustainable and competitive business models.

Table of Contents

List of Acronyms

Acronyms	Full Form
BBS	Bangladesh Bureau of Statistics
BSCI	Business Social Compliance Initiative
CRM	Customer Relationship Management
CSR	Corporate Social Responsibility
ERP	Enterprise Resource Planning
EOQ	Economic Order Quantity
EHS	Environment, Health and Safety
GHG	Greenhouse Gas
GSCM	Green Supply Chain Management
ISO	International Organization for Standardization
IT	Information Technology
JIT	Just-In-Time
KPI	Key Performance Indicator
LCA	Life Cycle Assessment
MRP	Material Requirement Planning
OEM	Original Equipment Manufacturer
R&D	Research and Development
RFID	Radio Frequency Identification
SCM	Supply Chain Management
SOP	Standard Operating Procedure
TCO	Total Cost of Ownership
VMI	Vendor-Managed Inventory
WMS	Warehouse Management System

Chapter-One
Introduction

1.1 Background of the Study

In the 21st century, global supply chains are under growing pressure to become not only efficient and cost-effective but also environmentally responsible. Climate change, resource scarcity, environmental regulations, and increasing awareness among stakeholders have pushed organizations to move beyond traditional Supply Chain Management (SCM) and adopt **Green Supply Chain Management (GSCM)** practices. GSCM integrates environmental thinking into all stages of the supply chain, including product design, raw material sourcing, production, logistics, usage, and end-of-life management such as recycling and disposal.

Bangladesh, as a rapidly developing country, is experiencing fast industrialization, particularly in sectors such as steel, cement, textiles, and construction materials. While this industrial growth contributes significantly to GDP, employment, and infrastructure development, it also generates high levels of **carbon emissions, solid waste, dust, noise, and effluents**, exerting pressure on the environment. As a result, industries in Bangladesh are now increasingly expected to comply with environmental regulations, adopt cleaner technologies, and integrate green practices in their operations to remain sustainable and competitive, both locally and globally.

Anwar Group of Industries (AGI) is one of the oldest and most diversified business conglomerates in Bangladesh, operating in sectors such as steel (Anwar Ispat), cement, textiles, building materials, cables, and consumer products. With a wide range of products and a large distribution and logistics network across the country, Anwar Group handles a high volume of raw materials, finished goods, transport flows, warehousing activities, and energy consumption. As such, its overall supply chain activities have a considerable environmental footprint but also a significant potential for improvement through GSCM initiatives.

In recent years, Anwar Group has started to focus more on sustainability, energy efficiency, waste minimization, and environmental compliance to align with global trends and national regulations. Practices such as **scrap steel recycling, energy-efficient induction furnaces, optimized transportation planning, improved warehouse management, dust and emission control, and better waste handling** indicate a gradual shift towards more environmentally responsible operations. However, the extent to which these practices are integrated under a structured Green Supply Chain Management framework, and their impact on operational, environmental, and economic performance, has not yet been systematically studied.

Therefore, this study focuses on **Green Supply Chain Management practices in Anwar Group of Industries**, with special emphasis on its supply chain activities including procurement, production, warehousing, logistics, and distribution. By exploring the current level of GSCM adoption, challenges, and opportunities within Anwar Group, this research aims to contribute to the broader understanding of how large industrial organizations in Bangladesh can transition towards greener and more sustainable supply chains.

1.2 Scope of the Study

This study primarily focuses on examining **Green Supply Chain Management (GSCM) practices** within **Anwar Group of Industries**, with particular emphasis on its industrial and manufacturing concerns such as **Anwar Ispat** and other related units where supply chain activities are extensive and environmentally significant.

The scope of the study is defined as follows:

- It covers the **key functional areas of the supply chain**, including:
  - Green procurement and sourcing
  - Environmentally conscious production processes
  - Green warehousing and inventory management
  - Green logistics and transportation
  - Waste management and recycling
  - Energy efficiency and resource utilization
  - Compliance with environmental regulations and standards
- The study focuses on **how environmental considerations are integrated** into supply chain decisions such as:
  - Supplier selection and evaluation based on environmental performance
  - Use of eco-friendly or recyclable raw materials where applicable
  - Adoption of cleaner technologies and pollution control measures
  - Route planning and vehicle utilization to reduce fuel consumption and emissions
  - Warehouse layout and 5S implementation to reduce waste and improve space utilization
- The research concentrates mainly on:
  - Selected factories, warehouses, and depots of Anwar Group (e.g., steel and building material units)
  - Distribution and logistics operations that handle **bulk materials and finished products** across different regions of Bangladesh
- The study does **not** attempt to cover all business units of Anwar Group in equal depth, but uses **representative units** to understand GSCM practices at a group level.
- The scope is **organizational and operational**, meaning it focuses on:
  - Internal practices (within factories, warehouses, offices, and transport operations)
  - Relationships with external partners such as suppliers, transporters, and distributors, in the context of green practices

Based on the above, the key aspects covered under the study are:

- **GSCM Practices:**
  An in-depth analysis of existing and emerging green practices in the supply chain of Anwar Group, including green procurement, green logistics, energy and resource efficiency, and waste management.
- **Organizational Performance:**
  The study examines how Green Supply Chain Management (GSCM) practices influence overall organizational performance. It specifically analyzes the impact of these practices on key performance indicators, including cost savings through efficient resource utilization, improved process efficiency across supply chain operations, and enhanced customer satisfaction resulting from reliable and sustainable practices. Additionally, the study evaluates how the adoption of GSCM strengthens brand image and corporate reputation while ensuring compliance with environmental regulations and industry standards.

- **Impact Analysis:**
  The study investigates how specific Green Supply Chain Management (GSCM) initiatives contribute to organizational sustainability and performance. It examines the extent to which these initiatives help reduce environmental impacts through efficient resource utilization and waste minimization. Additionally, the research explores how GSCM practices enhance operational performance by improving process efficiency and coordination. Ultimately, the study highlights the role of these initiatives in supporting the long-term sustainability and competitive stability of the business.

- **Case Study Approach:**
  The study adopts Anwar Group of Industries as a case study to demonstrate the practical implementation of green supply chain practices within the Bangladeshi industrial context. It highlights real-world challenges faced during the adoption of Green Supply Chain Management (GSCM) and draws valuable lessons from the organization's experiences in integrating sustainable practices into its operations.

1.3 Objectives of the Study

Broad Objective

The broad objective of this study is:

To assess the Green Supply Chain Management (GSCM) practices and their impact on the organizational performance of Anwar Group of Industries.

Specific Objectives

The specific objectives of the study are:

- To identify the key **Green Supply Chain Management practices** implemented by Anwar Group of Industries in areas such as procurement, production, warehousing, logistics, and distribution.
- To examine the extent to which **environmental considerations** (e.g., pollution control, waste reduction, energy efficiency) are integrated into the supply chain decisions of Anwar Group.
- To evaluate the **relationship between GSCM practices and organizational performance**, with respect to:
  - Cost efficiency
  - Operational effectiveness
  - Environmental performance
  - Customer satisfaction
  - Corporate image
- To analyze the **challenges and barriers** faced by Anwar Group in adopting and implementing Green Supply Chain Management practices in the context of Bangladesh.
- To provide **practical recommendations** for strengthening GSCM practices in Anwar Group of Industries to ensure sustainable growth, regulatory compliance, and competitive advantage.

1.4 Research Methodology

To achieve the stated objectives, this study follows a **comprehensive research methodology** combining both **qualitative and quantitative approaches**, inspired by the structure used in similar SCM studies.

Primary Sources of Data

Primary data will be collected directly from various stakeholders associated with the supply chain, such as:

- Supply chain, distribution, and logistics personnel
- Warehouse and factory managers
- Procurement and commercial department staff
- Quality, compliance, and EHS (Environment, Health & Safety) officials

The primary data collection methods include:

- **Surveys / Questionnaires**
- **Personal Interviews**
- **Direct Observations**
- **Internal Documents and Records**

Secondary Sources of Data

Secondary data will be collected from various published and credible sources to provide a broader understanding of GSCM and its application in industrial settings:

- Books and Manuals
- Journals and Research Articles
- Official Publications
- Websites and Online Resources
- Industry and Consultancy Reports

1.5 Significance of the Study

This study holds significant importance at **multiple levels**—organizational, sectorial, and national.

- **For Anwar Group of Industries:**
    - It will help the company **identify the current status** of its GSCM practices in different parts of the supply chain.
    - It will highlight **strengths, weaknesses, and gaps** in existing systems related to green procurement, warehousing, logistics, and waste management.
    - The findings can support **strategic decision-making** for future investments in sustainable technologies, process improvements, and environmental initiatives.
- **For the Industrial Sector in Bangladesh:**
    - The research provides a **practical example** of how a large local conglomerate is adopting Green Supply Chain Management.
    - It may serve as a **reference model** for other industrial organizations wishing to integrate environmental sustainability into their supply chains.

    - The study contributes to ongoing discussions about **balancing growth and environmental responsibility** in heavy industries such as steel and building materials.
- **For Policymakers and Regulators:**
    - Insights from the study can support government agencies in **designing policies and incentives** that encourage industries to adopt GSCM.
    - It will highlight the practical challenges industries face in complying with environmental regulations and implementing green initiatives.
- **For Academicians and Researchers:**
    - The study adds to the **limited body of research** on Green Supply Chain Management practices in Bangladeshi industrial conglomerates.
    - It offers a **case-based understanding** of how GSCM affects operational and environmental performance in a real-world context.
- **For the Environment and Society:**
    - Green supply chain practices contribute to **reduced pollution, lower emissions, efficient resource usage, and better waste management**.
    - As a result, the study indirectly supports wider goals such as **sustainable development, public health, and environmental protection**.

1.6 Limitations of the Study

Despite sincere efforts to design and conduct a comprehensive study, several limitations must be acknowledged:

- **Limited Organizational Scope:**
  The study is focused primarily on selected units and supply chain functions within **Anwar Group of Industries**. It does not cover all business units or sister concerns in equal detail. Therefore, the findings may not fully represent the practices of every unit under the group.
- **Generalizability:**
  Since this is a **single-company case study**, the results and conclusions may not be directly generalizable to all industrial organizations in Bangladesh or other countries. Different industries and companies may have different levels of awareness, resources, and regulatory pressures related to GSCM.
- **Data Availability and Confidentiality:**
  Some internal organizational data—particularly those related to cost structures, emission levels, energy consumption, and internal environmental audit findings—are confidential in nature. As a result, access to such sensitive information may be restricted, which can limit the depth and scope of quantitative analysis in the study.
- **Time Constraints:**
  The study was conducted within a limited time frame, which imposed certain constraints on the research process. Due to this limitation, the number of factory and warehouse visits was restricted, as well as the number of employees and managers who could be interviewed. Additionally, the short duration of the study limited the ability to observe seasonal variations or long-term changes in Green Supply Chain Management practices.

- **Respondent Bias:**
  The primary data collected through questionnaires and interviews may be influenced by certain limitations. These include personal bias of respondents, social desirability bias where participants may attempt to portray the organization more positively, and the possibility of incomplete or less accurate responses due to workload pressures or time constraints.
- **Dynamic Business Environment:**
  Supply chain practices, environmental policies, and organizational strategies are dynamic in nature. Any major external change—such as new government regulations, fuel price changes, or market disruptions—can influence GSCM practices. However, this study captures the situation only within a specific period.
- **Limited Quantitative Environmental Data:**
  Due to the nature of industrial data collection in Bangladesh, detailed and standardized environmental performance data (e.g., exact carbon footprint, precise emission statistics) may not always be available or fully measured. Hence, the study relies partly on **perceptual measures and qualitative assessments** of environmental performance.
- Acknowledging these limitations provides context for interpreting the results and highlights opportunities for future, more extensive research on Green Supply Chain Management in Anwar Group and other industrial organizations.

1.7 Structure of the Thesis

This thesis is organized into several chapters to present the research in a systematic and logical manner. The structure is as follows:

This thesis is organized into **seven chapters**.

Chapter One: Introduction presents the background of the study, outlining the research problem, objectives, scope, significance, and limitations. It establishes the foundation of the study and clarifies the purpose and direction of the research.

Chapter Two: Literature Review reviews existing theoretical and empirical literature related to Green Supply Chain Management. It discusses the evolution of GSCM, its key components, theoretical foundations, and relevant studies conducted in manufacturing and industrial sectors, with particular emphasis on sustainability and environmental management.

Chapter Three: Theoretical Framework and Hypothesis focuses on the conceptual foundations of GSCM. It explains various dimensions such as green procurement, green logistics, supplier relationship management, technology integration, sustainability initiatives, and quality management. This chapter also develops the Hypothesis and theoretical framework guiding the study.

Chapter Four: Research Methodology outlines the research design and methodological approach adopted in the study. It includes details on data collection methods, research instruments, sampling techniques, and data analysis procedures used to achieve the research objectives.

Chapter Five: Data Analysis and Results presents the analysis and interpretation of collected data. This chapter examines respondents' demographic profiles and analyzes various aspects of green supply chain practices, including procurement, logistics, supplier management,

information sharing, sustainability, quality management, and customer relationship management.

Chapter Six: Discussion interprets the findings in relation to existing literature and theoretical frameworks. It discusses the implications of the results, highlights key insights on GSCM practices, and evaluates their impact on organizational performance.

Chapter Seven: Recommendations and Conclusion provides practical recommendations based on the study findings, offers concluding remarks, and highlights the overall contributions of the research. It also suggests directions for future research in the field of Green Supply Chain Management.

Chapter-Two
Literature Review

2.1 Concept of Green Supply Chain Management (GSCM)

Green Supply Chain Management (GSCM) refers to the integration of environmental considerations into traditional supply chain management practices, including procurement, production, warehousing, logistics, and distribution. It aims to minimize the negative environmental impact of supply chain activities while maintaining efficiency, cost-effectiveness, and customer satisfaction.

In the context of Anwar Group of Industries, GSCM involves the adoption of eco-friendly raw material sourcing, energy-efficient manufacturing processes, waste recycling, green warehousing practices, and environmentally responsible transportation. The concept emphasizes coordination and collaboration among suppliers, manufacturers, distributors, and customers to ensure sustainable flow of materials, information, and finances throughout the supply chain.

GSCM goes beyond compliance with environmental regulations by embedding sustainability into strategic decision-making, thereby enhancing long-term organizational performance and corporate responsibility.

2.2 Evolution from SCM to Green Supply Chain Management

Supply Chain Management initially focused on logistics and physical distribution, emphasizing cost reduction and operational efficiency. Over time, globalization, technological advancement, and increasing environmental concerns expanded SCM into a strategic function involving supplier collaboration, information sharing, and risk management.

The evolution toward Green Supply Chain Management emerged due to stricter environmental regulations, rising stakeholder awareness, and pressure for sustainable industrial practices. Modern GSCM integrates environmental objectives with economic goals by utilizing cleaner technologies, renewable energy, waste minimization, and emission reduction strategies.

For industrial organizations like Anwar Group, this evolution reflects a shift from traditional operational efficiency to sustainable competitiveness, where environmental performance is considered a key success factor.

2.3 Theoretical Frameworks Supporting GSCM

Several theoretical frameworks underpin Green Supply Chain Management practices and explain their strategic importance:

Resource-Based View (RBV)

RBV suggests that organizations gain competitive advantage through valuable, rare, and inimitable resources. Green capabilities such as energy efficiency, recycling systems, and environmental expertise can serve as strategic resources for Anwar Group.

Transaction Cost Economics (TCE)

This theory emphasizes cost minimization through efficient supplier relationships. GSCM reduces transaction costs by improving supplier reliability, regulatory compliance, and risk mitigation.

Systems Theory

Systems theory views the supply chain as an interconnected system where environmental improvements in one area positively influence overall performance.

SCOR Model

The Supply Chain Operations Reference (SCOR) model provides a standardized framework to evaluate supply chain performance across planning, sourcing, manufacturing, delivery, and returns, incorporating environmental performance metrics.

Agile and Sustainable Supply Chain Models

These models emphasize flexibility, responsiveness, and sustainability through collaboration and information sharing—critical for industrial supply chains such as steel and construction materials.

2.4 Key Components of Green Supply Chain Management

Green Supply Chain Management consists of several interconnected components:

Green Sourcing and Procurement

Selection of suppliers based on environmental compliance, use of recyclable materials, and sustainable sourcing practices.

Green Manufacturing

Adoption of energy-efficient machinery, emission control systems, scrap recycling, and cleaner production technologies.

Green Warehousing

Implementation of 5S, efficient space utilization, waste reduction, safe material handling, and energy-efficient lighting systems.

Green Logistics and Distribution

Route optimization, vehicle maintenance, load optimization, and gradual adoption of eco-friendly transportation methods.

Waste Management and Reverse Logistics

Recycling of scrap materials, safe disposal of hazardous waste, and reuse of packaging materials.

Information Technology

Use of digital systems for monitoring energy consumption, inventory optimization, and performance measurement.

2.5 Importance of GSCM in Modern Industrial Business

Green Supply Chain Management has become a critical determinant of competitiveness in modern industrial organizations. Effective GSCM provides multiple benefits, including:

- **Cost Reduction:** Reduced energy consumption, fuel savings, and waste minimization.
- **Environmental Compliance:** Adherence to government regulations and international standards (e.g., ISO 14001).
- **Operational Efficiency:** Improved production planning, logistics optimization, and inventory control.
- **Corporate Reputation:** Enhanced brand image and stakeholder trust.

- **Sustainable Growth:** Long-term resilience and responsible industrial development.

For Anwar Group of Industries, GSCM supports both environmental responsibility and strategic business performance.

2.6 Review of Literature on GSCM in Heavy and Manufacturing Industries

Existing literature highlights the importance of GSCM in heavy industries such as steel, cement, and construction materials, where environmental impact is significant.

Green Manufacturing and Emission Control

Studies emphasize the role of cleaner technologies, emission reduction systems, and energy efficiency in improving environmental and operational performance.

Green Logistics and Transportation

Research indicates that route optimization, fuel-efficient vehicles, and logistics planning significantly reduce carbon emissions and costs.

Supplier Collaboration and Green Procurement

Literature shows that close collaboration with environmentally compliant suppliers improves sustainability performance across the supply chain.

Waste Recycling and Resource Efficiency

Industrial waste recycling, especially scrap reuse, contributes to cost savings and environmental protection.

These insights are directly applicable to Anwar Group of Industries due to its large-scale industrial operations and logistics-intensive activities.

2.7 Research Gaps in GSCM Literature Related to Anwar Group of Industries

Despite growing research on GSCM, several gaps remain, particularly in the context of Bangladeshi industrial groups:

Limited Case Studies on Heavy Industries in Bangladesh

There is a lack of organization-specific empirical studies on GSCM implementation in steel and construction material industries.

Digital Technologies in GSCM

- How technologies such as IoT, ERP, and data analytics influence green logistics, energy monitoring, and waste management.
- Challenges of implementing digital GSCM tools in large industrial organizations.

Energy Efficiency and Emission Reduction

- Assessment of renewable energy adoption and energy-saving technologies.
- Measurement of carbon footprint reduction in industrial supply chains.

Risk Management and Supply Chain Resilience

- Strategies for managing environmental, operational, and regulatory risks.
- Role of GSCM in ensuring business continuity during disruptions.

Integration of GSCM with Organizational Performance

- Relationship between green practices and financial, operational, and customer performance.
- Integration of GSCM with production, marketing, and logistics functions.

Chapter-Three
Conceptual Framework and Hypothesis

3.1 Green Procurement Practices at Anwar Group of Industries

Procurement plays a vital role in the implementation of Green Supply Chain Management (GSCM) at Anwar Group of Industries. The organization's procurement practices focus on acquiring raw materials, spare parts, packaging materials, and services in a manner that ensures cost efficiency, quality compliance, and environmental sustainability. Through structured supplier selection, evaluation, and strategic sourcing, Anwar Group aims to reduce environmental impact while maintaining uninterrupted industrial operations.

3.1.1 Supplier Selection and Evaluation

Supplier selection at Anwar Group is conducted through a systematic process that emphasizes both operational and environmental criteria.

Key Steps in Supplier Selection:

- Identification of material and service requirements, including quality standards, quantity, delivery timelines, and environmental compliance
- Identification of potential suppliers through market research, tendering, and request for proposal (RFP) processes
- Evaluation of suppliers based on cost competitiveness, quality assurance systems, delivery performance, production capacity, and financial stability
- Shortlisting of qualified suppliers followed by contract negotiation
- Trial procurement to assess supplier performance before long-term engagement

Common Selection Criteria:

- Competitive pricing and cost structure
- Product quality and consistency
- Delivery reliability and lead time
- Capacity and scalability
- Environmental compliance and sustainability practices
- Ethical business conduct and reputation

Supplier Evaluation Methods:

- Performance scorecards using key performance indicators (KPIs) such as on-time delivery, defect rate, and responsiveness
- Periodic supplier audits to ensure quality and environmental compliance
- Performance review meetings to identify improvement opportunities

3.1.2 Strategic Sourcing and Risk Management

Anwar Group adopts strategic sourcing practices to ensure supply continuity and environmental responsibility. Long-term contracts are established with reliable suppliers to secure stable supply and favorable pricing. Supplier diversification and contingency planning are implemented to mitigate supply risks related to market volatility, logistics disruption, or regulatory changes.

3.1.3 Quality Assurance and Cost Management

Strict quality standards are enforced for all procured materials to ensure compliance with industrial and safety requirements. Quality control inspections and supplier audits are conducted regularly.

Cost management focuses on total cost of ownership (TCO) rather than purchase price alone. Cost reduction initiatives include:

- Negotiation and consolidation of procurement volumes
- Value engineering and alternative material sourcing
- Continuous monitoring of procurement costs and supplier performance

3.1.4 Sustainability and Ethical Sourcing

Sustainability and ethical sourcing are integral to Anwar Group's green procurement strategy. Suppliers are required to comply with environmental regulations, labor laws, and ethical standards.

Key initiatives include:

- Preference for environmentally responsible suppliers
- Reduction of hazardous and non-recyclable materials
- Enforcement of a supplier code of conduct covering environmental, social, and ethical issues

3.2 Green Inventory and Warehouse Management Practices

Effective inventory and warehouse management support Anwar Group's GSCM objectives by reducing waste, energy consumption, and operational inefficiencies.

3.2.1 Demand Forecasting and Inventory Planning

The organization applies structured demand forecasting techniques by analyzing historical sales data, production plans, and market demand trends. Coordination between production, sales, and logistics departments ensures accurate inventory planning and reduces excess stock.

3.2.2 Inventory Optimization

Anwar Group maintains optimal inventory levels to balance customer demand and operational efficiency.

Key practices include:

- Application of Economic Order Quantity (EOQ) principles
- Safety stock calculation to prevent production disruptions
- Monitoring inventory turnover ratios to improve material utilization

3.2.3 Inventory Control Systems

Modern inventory control systems are used to enhance accuracy and visibility across warehouses.

- Real-time inventory tracking systems
- Barcoding and ERP-based material movement records
- Warehouse Management Systems (WMS) for efficient storage, picking, and dispatch

3.2.4 Lean and Just-in-Time (JIT) Practices

Lean inventory principles are adopted to minimize waste and carrying costs. Close coordination with suppliers allows timely delivery of raw materials, reducing the need for excessive stock. Flexible production scheduling further supports Just-in-Time inventory practices.

3.3 Green Distribution and Logistics Practices

Distribution and logistics activities at Anwar Group are designed to ensure timely delivery while minimizing environmental impact.

3.3.1 Green Warehousing and Storage

Warehousing operations emphasize:

- 5S implementation for efficient space utilization
- Energy-efficient lighting and equipment
- Safe storage of raw materials, finished goods, and scrap
- Waste segregation and recycling within warehouse premises

3.3.2 Green Transportation and Distribution

Transportation practices focus on reducing fuel consumption and emissions.
Key initiatives include:

- Route planning and load optimization
- Regular vehicle maintenance to reduce emissions
- Monitoring fuel consumption and trip efficiency
- Use of third-party logistics (3PL) providers where appropriate to improve efficiency

3.3.3 Supply Chain Visibility and Technology Integration

Anwar Group utilizes information systems to enhance supply chain visibility.

- Real-time tracking of deliveries and material movement
- Use of ERP and data analytics for performance monitoring
- Identification of bottlenecks and optimization of logistics routes

3.3.4 Regulatory Compliance and Safety

The organization complies with national environmental regulations, occupational safety standards, and ISO requirements. Security and safety measures are implemented to prevent material loss, accidents, and environmental hazards.

3.4 Green Supplier Relationship Management at Anwar Group of Industries

Supplier relationships are a critical component of Green Supply Chain Management (GSCM) at Anwar Group of Industries. The organization recognizes that suppliers play a pivotal role in ensuring uninterrupted supply of raw materials, cost efficiency, quality compliance, and environmental sustainability. Strong and collaborative supplier relationships support long-term operational stability and green performance.

3.4.1 Long-Term Supplier Partnerships

Anwar Group prioritizes long-term partnerships with key suppliers based on trust, transparency, and mutual benefit. Long-term commitments enable collaborative initiatives such as joint process improvement, cost optimization, and environmental compliance. These partnerships also allow suppliers to invest in sustainable production methods aligned with Anwar Group's green objectives.

3.4.2 Supplier Development Programs

The organization actively supports supplier development initiatives to improve suppliers' operational efficiency, quality standards, and environmental practices. Supplier development may include:

- Technical guidance on quality and compliance
- Training on environmental and safety standards
- Capacity-building initiatives to enhance reliability and sustainability

Such initiatives contribute to improving overall supply chain performance and environmental responsibility.

3.4.3 Supplier Performance Management

Anwar Group implements structured performance management systems to monitor and evaluate supplier performance regularly.

Key Performance Indicators (KPIs) include:

- On-time delivery performance
- Product quality and defect rates
- Cost competitiveness
- Responsiveness and communication
- Compliance with environmental and ethical standards

Performance reviews and corrective action plans are used to ensure continuous improvement.

3.4.4 Risk Management and Collaboration

Supplier collaboration plays a key role in managing supply chain risks. Anwar Group works closely with suppliers to identify potential risks such as supply disruptions, quality issues, or regulatory non-compliance. Joint contingency planning and supplier diversification strategies help mitigate these risks and enhance supply chain resilience.

3.4.5 Sustainability and Ethical Sourcing

Sustainability and ethical sourcing are integral to supplier relationship management at Anwar Group. Suppliers are required to comply with environmental regulations, labor laws, and ethical business practices. A supplier code of conduct ensures responsible resource usage, pollution control, and social compliance throughout the supply chain.

3.5 Technology Integration in Green Supply Chain Management

Technology integration plays a vital role in enhancing the effectiveness of GSCM practices at Anwar Group of Industries. Digital systems improve operational efficiency, reduce waste, enhance transparency, and support environmentally responsible decision-making.

3.5.1 Enterprise Resource Planning (ERP) Systems

ERP systems provide centralized control over procurement, inventory, production, logistics, and finance functions.

Key functions include:

- Material requirement planning (MRP)
- Inventory and warehouse tracking
- Production scheduling and monitoring
- Financial and cost control

Real-time data visibility enables proactive decision-making, reduces manual errors, and supports green inventory and logistics planning.

3.5.2 Supply Chain Management (SCM) Software

SCM software supports demand forecasting, inventory optimization, and logistics planning.
Key benefits include:

- Accurate demand prediction to reduce overproduction
- Optimization of inventory levels to minimize waste
- Transportation planning to reduce fuel consumption and emissions

3.5.3 Internet of Things (IoT) Applications

IoT technologies support real-time monitoring and operational efficiency.
Applications include:

- Monitoring of equipment performance and energy consumption
- Tracking material movement and shipment conditions
- Predictive maintenance to reduce breakdowns and energy loss

3.5.4 Advanced Analytics and Artificial Intelligence

Data analytics and AI tools enable Anwar Group to analyze operational data for improved decision-making.

- Predictive modeling for demand forecasting and inventory planning
- Identification of inefficiencies and potential disruptions
- Optimization of logistics routes and warehouse operations

3.5.5 Blockchain for Traceability and Transparency

Blockchain technology enhances traceability of materials from sourcing to delivery. It improves supply chain transparency, supports ethical sourcing verification, and strengthens data security across supply chain transactions.

3.6 Sustainability Initiatives in GSCM at Anwar Group of Industries

Anwar Group integrates sustainability principles into its supply chain management practices, focusing on environmental protection, social responsibility, and ethical governance.

3.6.1 Environmental Sustainability

Environmental sustainability initiatives focus on reducing resource consumption and environmental impact.

- **Energy Efficiency:** Adoption of energy-efficient machinery, lighting systems, and optimized equipment usage
- **Waste Management:** Segregation, recycling of scrap materials, and safe disposal of hazardous waste
- **Water Conservation:** Efficient water usage in industrial processes and reuse where feasible

3.6.2 Social Responsibility

Social responsibility initiatives ensure employee welfare and community development.

- Compliance with labor laws and safety regulations
- Provision of safe working conditions and employee training
- Community engagement through employment generation and social programs

3.6.3 Ethical Sourcing and Governance

Ethical sourcing ensures responsible procurement practices.

- Supplier code of conduct covering labor rights and environmental compliance
- Regular supplier audits and assessments
- Enhanced traceability and transparency in sourcing decisions

3.7 Quality Management in Green Supply Chain Operations

Quality management supports GSCM by ensuring consistency, safety, and compliance across supply chain activities.

Key quality management practices include:

- Supplier approval and quality audits
- Inspection and testing of raw materials and finished goods

- Documentation control and standard operating procedures (SOPs)
- Continuous improvement through corrective and preventive actions

Quality assurance ensures reduced waste, rework, and environmental impact.

3.8 Background of Hypothesis Development for GSCM

The development of Hypothesis in this study is grounded in established supply chain and sustainability theories. Prior research suggests that green procurement, supplier collaboration, technology integration, and logistics efficiency significantly influence organizational performance.

Theoretical foundations such as the Resource-Based View (RBV), Transaction Cost Theory (TCT), and Supply Chain Integration Theory provide a logical basis for examining the relationships between GSCM practices and organizational performance at Anwar Group of Industries.

3.9 Importance of Hypothesis Development in GSCM Research

Hypothesis development provides research direction and ensures scientific rigor. It helps identify cause-and-effect relationships between green supply chain practices and performance outcomes such as cost efficiency, environmental performance, and customer satisfaction.

Well-developed Hypothesis bridge the gap between theory and industrial practice, offering actionable insights for managerial decision-making.

3.10 GSCM Literacy and Practical Behavior: A Theoretical Perspective

GSCM literacy refers to the knowledge and awareness of green supply chain principles among employees and managers. Practical behavior represents the actual implementation of this knowledge in operational activities.

The Knowledge-Based View (KBV) and Resource-Based View (RBV) suggest that organizations with higher GSCM literacy and effective practical behavior gain competitive advantage through improved coordination, reduced waste, and enhanced sustainability performance.

At Anwar Group of Industries, aligning GSCM knowledge with operational practice strengthens environmental performance, operational efficiency, and long-term sustainability.

Chapter-Four
Research Methodology

4.1 Research Design

This study adopts a **descriptive and analytical research design** to examine Green Supply Chain Management (GSCM) practices at **Anwar Group of Industries**. The descriptive component focuses on identifying existing green supply chain practices in procurement, production, warehousing, logistics, and supplier management. The analytical component evaluates the impact of these practices on organizational performance, including cost efficiency, environmental performance, and operational effectiveness.

Both **qualitative and quantitative research approaches** are applied to ensure a comprehensive understanding of GSCM implementation across relevant departments such as Procurement, Production, Warehouse, Logistics, and Administration.

4.2 Data Collection Methods

Both **primary and secondary data collection methods** are used in this study.

- **Primary Data Collection:**
  Data are collected through structured questionnaires and interviews with employees and managers directly involved in supply chain activities.
- **Secondary Data Collection:**
  Data are collected from company records, academic journals, official reports, and previous studies related to GSCM and industrial supply chains in Bangladesh.

4.3 Data Analysis Techniques

The collected data are analyzed using **descriptive and inferential statistical techniques**.

- Descriptive statistics such as **frequency distribution, percentage, mean, and standard deviation** are used to summarize survey responses.
- **Correlation analysis** is applied to examine relationships between GSCM practices and organizational performance.
- **Regression analysis** is used to assess the impact of green procurement, green logistics, supplier collaboration, and waste management on performance outcomes.

Data analysis is conducted using **Microsoft Excel and statistical software** to ensure accuracy and reliability.

4.4 Research Instruments

The primary research instrument is a **structured questionnaire** consisting of multiple-choice and Likert-scale questions designed to measure employee perceptions of GSCM practices and their impact on organizational performance.

In addition, **semi-structured interview guides** are used to collect qualitative insights from managerial personnel.

4.5 Sampling Design and Sample Size

The sampling design of this study was developed to ensure the collection of relevant, reliable, and representative data related to Green Supply Chain Management practices at Anwar Group of Industries. A purposive sampling technique was adopted, as the research required

insights from individuals who are directly involved in supply chain, procurement, logistics, production, and environmental management activities. Respondents were selected based on their job responsibilities, experience, and involvement in decision-making processes. The sample size included employees from different functional departments to ensure a balanced understanding of organizational practices. This approach enhanced the reliability of the findings by capturing diverse perspectives across operational and managerial levels.

4.6 Research Variables and Measurement

The study considered several key variables related to Green Supply Chain Management. The independent variables included green procurement, green logistics, green inventory management, supplier collaboration, and environmental compliance. The dependent variables focused on organizational performance indicators such as cost efficiency, operational effectiveness, environmental performance, and corporate reputation. These variables were measured using structured questionnaire items designed on a Likert scale, allowing respondents to express the extent of their agreement or perception. The measurement approach ensured consistency and enabled meaningful quantitative analysis of relationships between variables.

4.7 Reliability and Validity of the Study

Ensuring the reliability and validity of research findings was a major concern in this study. Reliability was maintained by using standardized and previously validated measurement scales wherever possible. A pilot test was conducted to identify ambiguities and improve questionnaire clarity. Internal consistency of the responses was assessed using reliability testing techniques such as Cronbach's Alpha. Validity was ensured by aligning the questionnaire items with the study objectives and relevant literature, thereby confirming content and construct validity. Expert opinions were also sought to enhance the credibility of the research instrument.

4.8 Ethical Considerations

Ethical considerations were strictly followed throughout the research process. Participation in the study was entirely voluntary, and respondents were informed about the purpose of the research prior to data collection. Confidentiality of personal and organizational information was strictly maintained, and responses were used solely for academic purposes. No personal identifiers were disclosed in the final report. The study complied with ethical standards of academic research and respected the privacy and professional integrity of all participants.

4.9 Data Processing and Techniques

After data collection, responses were carefully reviewed, edited, and coded for analysis. Quantitative data obtained from questionnaires were entered into statistical software for processing. Coding schemes were developed to categorize responses systematically, enabling efficient analysis and interpretation. Descriptive statistics such as percentages, mean values, and frequency distributions were used to summarize data, while graphical representations were applied to enhance clarity and understanding of the findings.

4.10 Analytical Framework of the Study

The analytical framework of this study was developed to illustrate the relationship between Green Supply Chain Management practices and organizational performance. It demonstrates how various GSCM dimensions—such as green procurement, eco-friendly logistics, supplier collaboration, and environmental management—collectively influence operational efficiency, sustainability performance, and competitive advantage. This framework served as a guide for data analysis and helped in testing the proposed relationships within the research model.

4.11 Limitations of the Research Methodology

Despite careful planning, the study faced several methodological limitations. Time constraints restricted the depth of data collection and the number of respondents. Access to certain confidential organizational data was limited due to corporate policies. Additionally, reliance on self-reported data may introduce respondent bias. These limitations were acknowledged and considered while interpreting the research findings.

4.12 Reliability Testing Tools

To assess the internal consistency of the research instrument, reliability testing tools such as Cronbach's Alpha were applied. A satisfactory alpha value indicated that the questionnaire items were consistent and reliable for measuring the intended constructs. This ensured that the data collected were dependable and suitable for further statistical analysis.

4.13 Ethical Approval and Confidentiality Assurance

Prior to data collection, necessary permission was obtained from relevant authorities within Anwar Group of Industries. Participants were informed about the purpose of the study, and their consent was obtained. All data were handled with strict confidentiality, and no individual or departmental information was disclosed in the research findings. This ethical approach strengthened the credibility and integrity of the study.

Chapter-Five
Data Analysis & Results

5.1 Introduction

This chapter presents a detailed analysis and interpretation of the data collected from different functional departments of **Anwar Group of Industries** to evaluate the practices of **Green Supply Chain Management (GSCM)**. The primary objective of this analysis is to assess how GSCM initiatives influence operational efficiency, environmental sustainability, and overall supply chain performance within the organization.

The study emphasizes key GSCM dimensions such as **green procurement, inventory optimization, eco-friendly logistics and transportation, information sharing, and sustainable operational practices**. Both qualitative and quantitative data have been utilized to examine how environmentally responsible supply chain practices contribute to cost reduction, waste minimization, energy efficiency, and improved organizational performance at Anwar Group.

5.2 Data Analysis Perspective on Respondents' Departmental Distribution

The departmental distribution of respondents indicates that the majority of participants belong to the **Store & Inventory Department**, accounting for **75%** of the total sample. This strong representation reflects the crucial role of inventory management in implementing GSCM practices, such as reducing material waste, optimizing stock levels, and ensuring efficient resource utilization.

Employees from the Store & Inventory department are directly involved in day-to-day material handling, storage, and distribution activities, which are key operational areas for green supply chain implementation. Therefore, their responses provide valuable insights into the practical aspects of sustainable inventory and logistics management.

Other respondents were drawn from **Procurement (8.33%)**, **Logistics and Transport (8.33%)**, **Merchandising (2.78%)**, **Commercial (2.78%)**, and **Quality Assurance (2.78%)** departments. Although these departments represent smaller proportions, their inclusion enriches the dataset by offering diverse perspectives on green procurement, supplier compliance, sustainable transportation, and quality assurance.

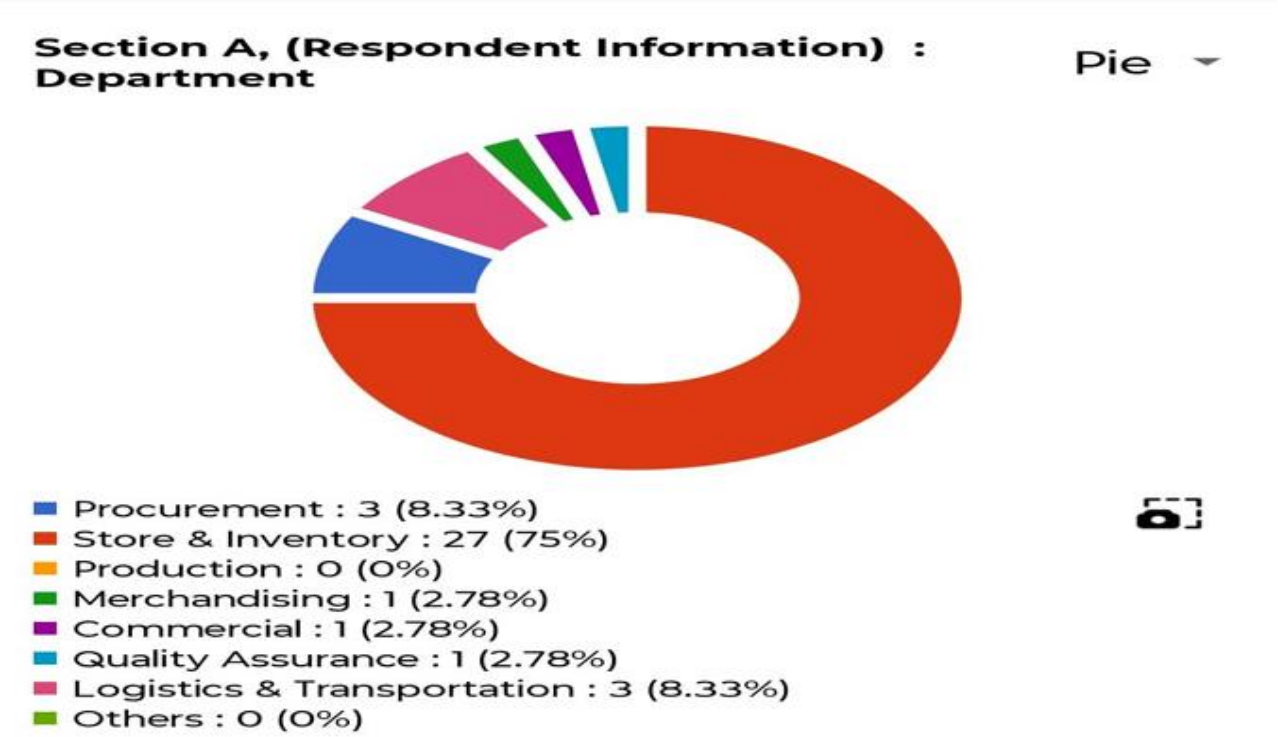
However, the absence of respondents from the Production department may limit direct insights related to green manufacturing processes and eco-efficient production planning.

Data Analysis & Result (Department-wise)

Department	Frequency	Percentage
Procurement	3	8.33%
Store & Inventory	27	75%
Production	0	0%
Merchandiser	1	2.78%
Commercial	1	2.78%
Quality Assurance	1	2.78%
Logistics & Transport	3	8.33%
Total	**35**	**100%**

Graph Presentation

A **pie chart** has been used to visually represent the departmental distribution of respondents, clearly illustrating the dominance of the Store & Inventory department and highlighting the contributions of other functional areas within Anwar Group's green supply chain.



5.3 Data Analysis Perspective on Respondents' Position Levels

The analysis of respondents' position levels provides insight into the diversity of organizational perspectives included in the study. The largest group of respondents falls under the **"Others" category (34.29%)**, which primarily includes operational and support staff directly involved in routine supply chain activities. Their participation ensures that practical, ground-level experiences related to green logistics, inventory handling, and operational sustainability are well represented.

Managers and Senior Managers account for **25.71%** of respondents, offering strategic insights into policy formulation, green decision-making, and sustainability initiatives at the organizational level. **Supervisors** represent **20%**, acting as a critical link between operational execution and management oversight.

Smaller proportions include **Senior Officers (8.57%)**, **Officers (5.71%)**, and **Executives (5.71%)**, who contribute mid-level operational and administrative perspectives related to GSCM implementation.

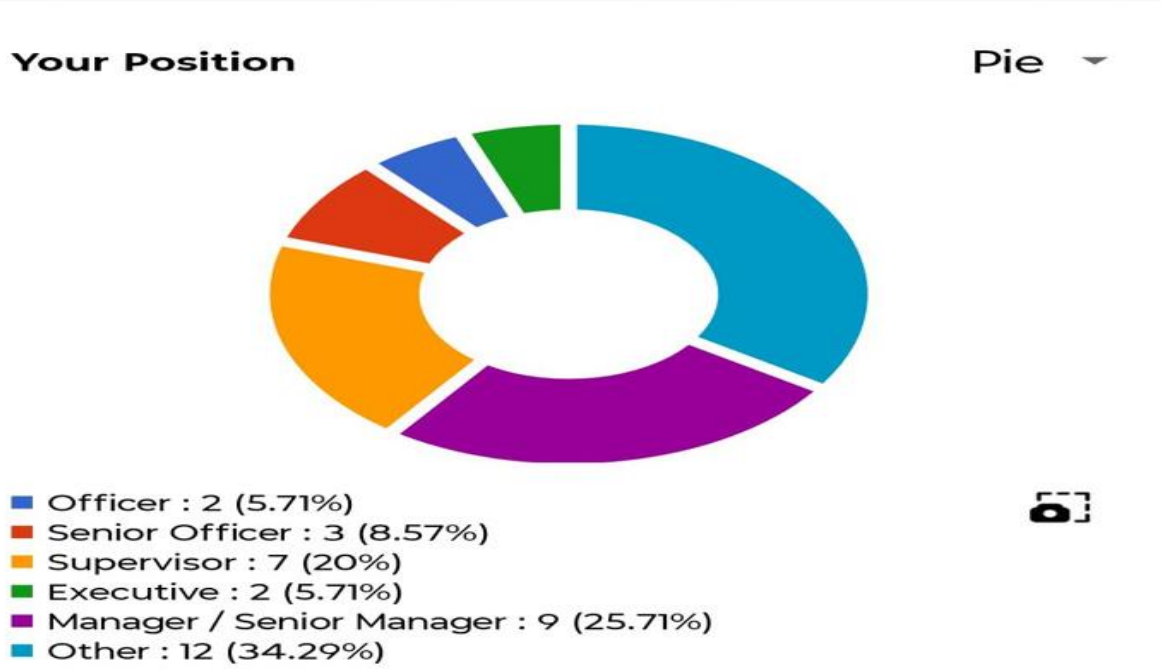
Data Analysis & Result (Position-wise)

Position Level	Frequency	Percentage
Officer	2	5.71%
Senior Officer	3	8.57%
Supervisor	7	20%

Executive	2	5.71%
Manager / Senior Manager	9	25.71%
Others	12	34.29%
Total	**35**	**100%**

Graph Presentation

A **pie chart** has been included to present the respondents' position levels, enabling a clear comparison between managerial, supervisory, and operational roles involved in GSCM practices at Anwar Group.



5.4 Data Analysis Perspective on Respondents' Work Experience Level

The distribution of respondents based on work experience reflects a well-experienced and knowledgeable sample. The largest proportion, **42.86%**, consists of employees with **more than 10 years of experience**, indicating strong familiarity with long-term supply chain operations and sustainability evolution within the organization.

Respondents with **5–10 years of experience** account for **22.86%**, while those with **1–3 years** represent **20%**. Employees with **less than 1 year** and **3–5 years** of experience constitute **8.57%** and **5.71%**, respectively. This balanced mix ensures that the study captures both seasoned expertise and contemporary operational viewpoints regarding GSCM practices.

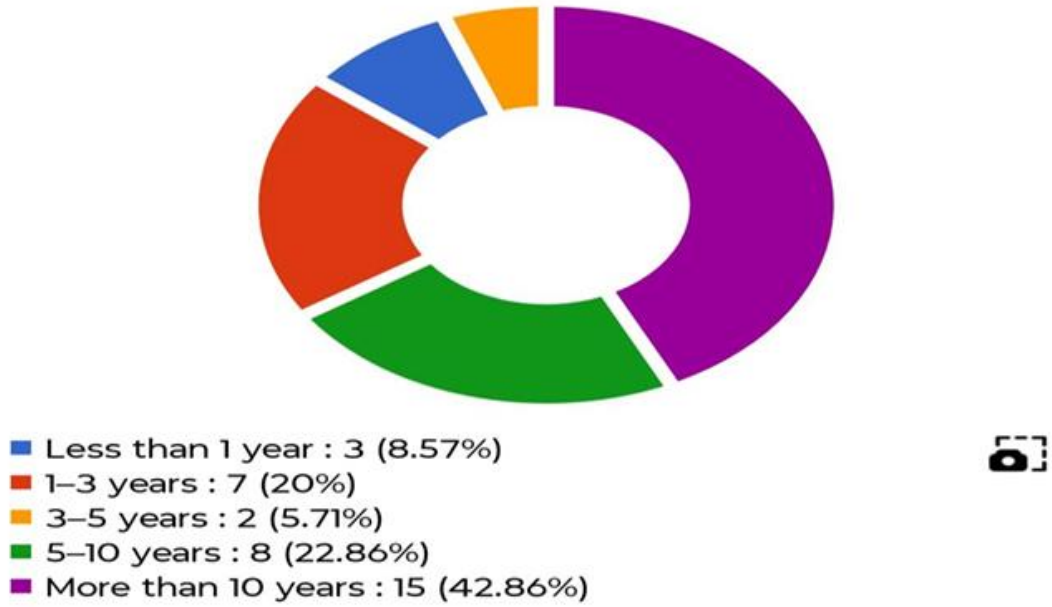
Data Analysis & Result (Experience-wise)

Work Experience Level	Frequency	Percentage
Less than 1 year	3	8.57%
1–3 Years	7	20%
3–5 Years	2	5.71%
5–10 Years	8	22.86%

More than 10 Years	15	42.86%
Total	**35**	**100%**

Graph Presentation

A **pie chart** has been used to illustrate respondents' work experience levels, demonstrating the dominance of experienced personnel and reinforcing the reliability of insights related to Green Supply Chain Management at Anwar Group of Industries.



5.5 Analysis of Green Procurement Management

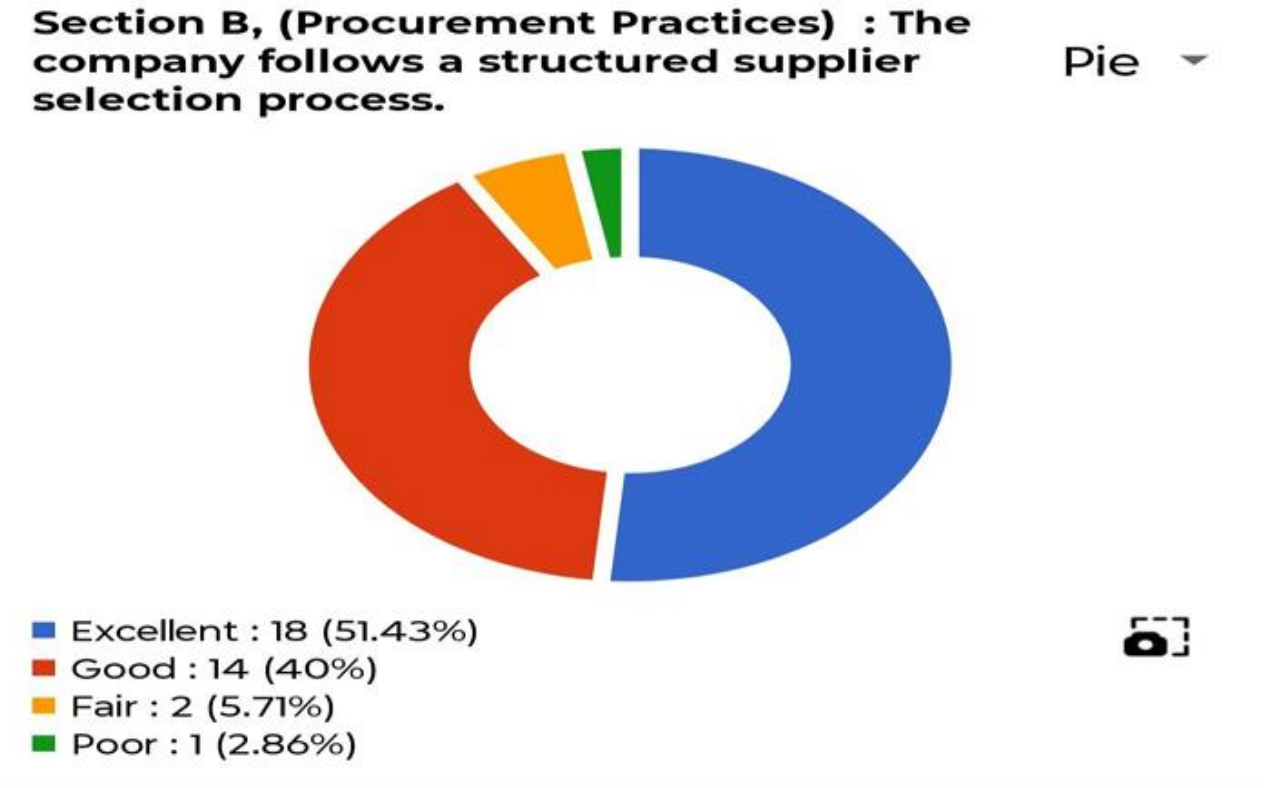
The findings demonstrate a highly positive perception of **green procurement practices** at Anwar Group of Industries. A combined **100%** of respondents either **Excellent (51.43%)** or **Good (40%)** that the organization follows structured, transparent, and environmentally responsible procurement procedures.

This strong agreement indicates effective supplier selection based on environmental compliance, ethical sourcing, and sustainability standards. Only **5.71%** of respondents remained Fair, while no respondents expressed disagreement, highlighting the overall confidence in the organization's green procurement framework.

Data Analysis and Result

Response	Frequency	Percentage
Excellent	18	51.43%
Good	14	40%
Fair	2	5.71%
Poor	1	2.86%
Total	**35**	**100%**

Graph Presentation



5.6 Analysis of Green Supplier Relationship Management

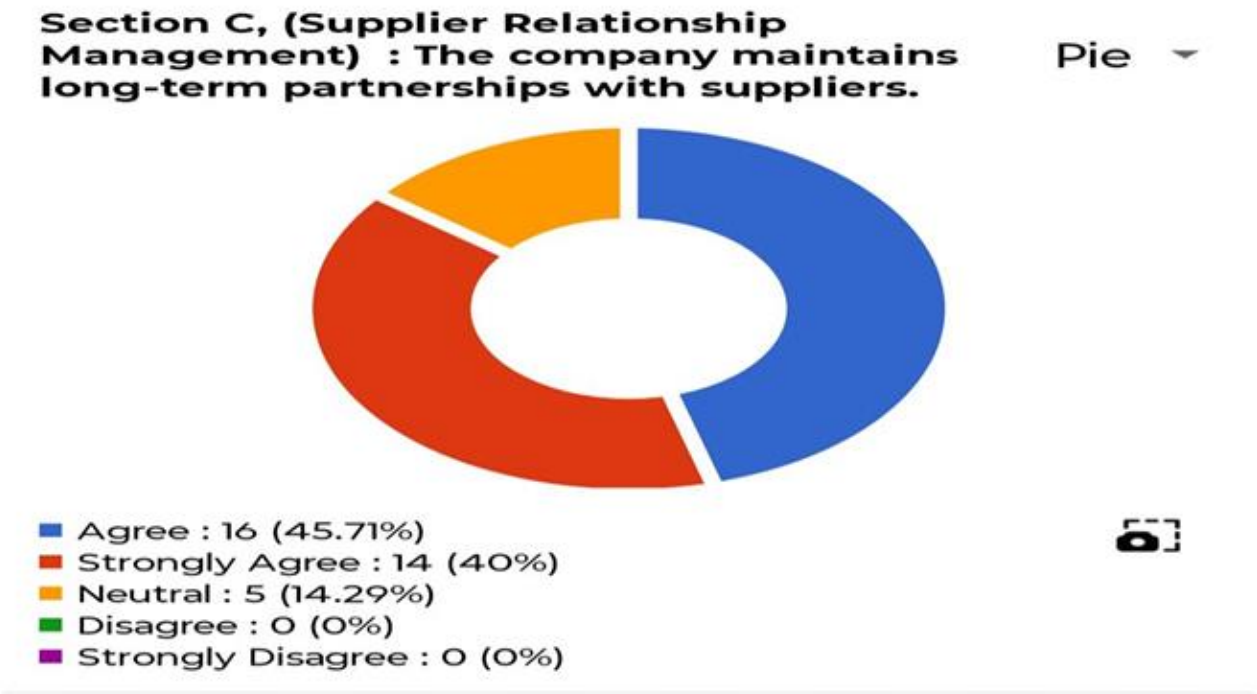
The results reflect a strong positive perception of **Green Supplier Relationship Management (GSRM)** practices. A combined **85.71%** of respondents agreed or strongly agreed that Anwar Group maintains long-term, collaborative, and environmentally responsible partnerships with suppliers.

These findings indicate effective communication, trust, and shared commitment toward sustainability goals. The **14.29% neutral responses** may indicate limited exposure to supplier evaluation processes. Notably, no negative responses were recorded.

Data Analysis and Result

Response	Frequency	Percentage
Agree	16	45.71%
Strongly Agree	14	40%
Neutral	5	14.29%
Disagree	0	0%
Strongly Disagree	0	0%
Total	**35**	**100%**

Graph Presentation,



5.7 Analysis of Green Inventory Management

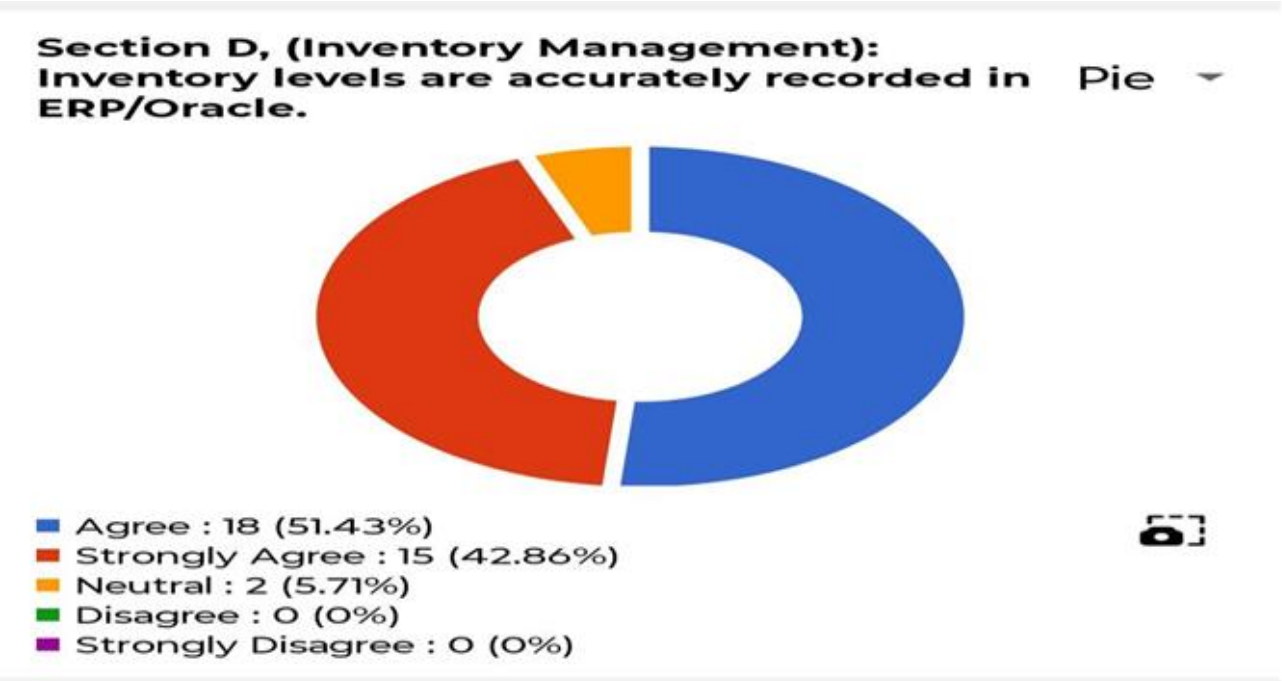
The analysis reveals an overwhelmingly positive perception of **green inventory management practices** within Anwar Group of Industries. A combined **94.29%** of respondents agreed or strongly agreed that inventory systems are accurately maintained through ERP/Oracle, supporting waste reduction, optimal stock levels, and efficient resource utilization.

Only **5.71%** of respondents selected neutral, and no negative responses were recorded, indicating strong confidence in inventory controls aligned with GSCM principles.

Data Analysis and Result

Response	Frequency	Percentage
Agree	18	51.43%
Strongly Agree	15	42.86%
Neutral	2	5.71%
Disagree	0	0%
Strongly Disagree	0	0%
Total	**35**	**100%**

Graph Presentation,



5.8 Analysis of Green Logistics and Transportation Management

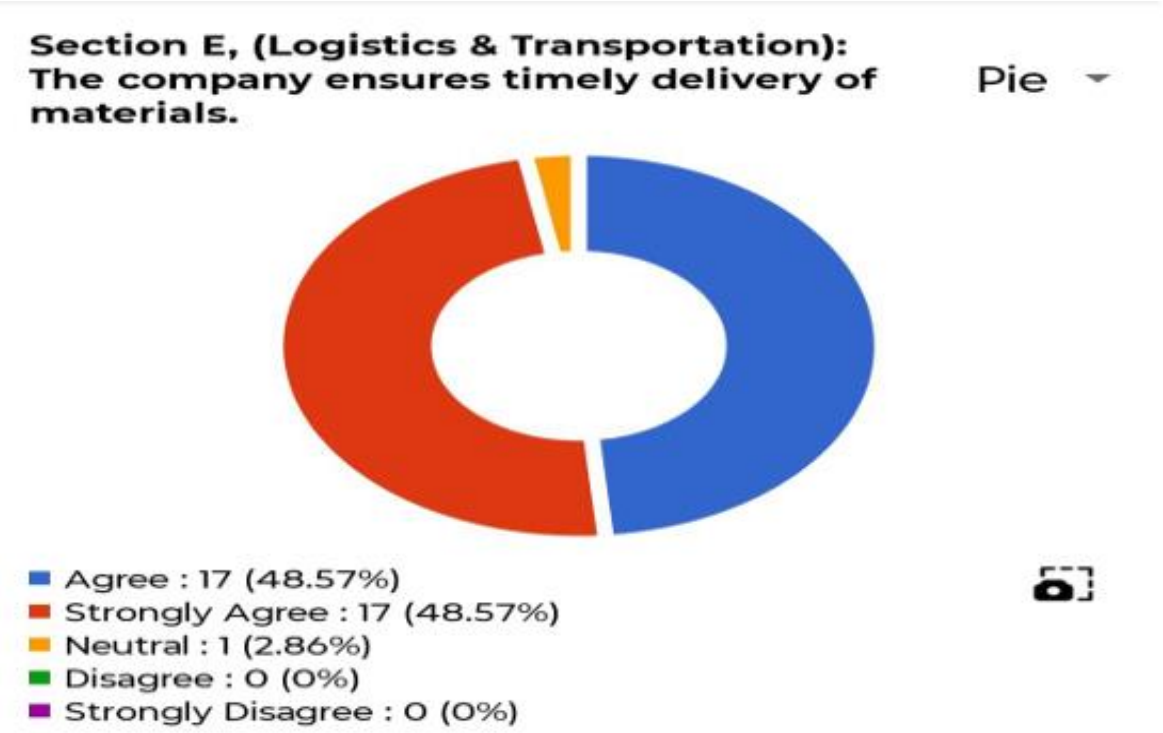
The findings reveal a very strong positive perception of **green logistics and transportation management** practices at Anwar Group of Industries. An equal proportion of respondents, **48.57% each**, agreed and strongly agreed that the company's logistics and transportation systems are effective and environmentally responsible. This results in a combined **97.14% positive response**, indicating near-unanimous confidence in the organization's ability to manage the movement of goods efficiently while minimizing environmental impact.

The emphasis on route optimization, timely delivery, fuel-efficient transportation, and reduced idle time contributes significantly to lowering carbon emissions and operational costs. Only **2.86%** of respondents selected the neutral option, suggesting minimal uncertainty or limited involvement in logistics operations. Importantly, no respondents expressed disagreement, confirming that green logistics initiatives are well accepted and effectively implemented within Anwar Group.

Data Analysis and Result

Logistics & Transportation	Frequency	Percentage
Agree	17	48.57%
Strongly Agree	17	48.57%
Neutral	1	2.86%
Disagree	0	0%
Strongly Disagree	0	0%
Total	**35**	**100%**

Graph Presentation,



5.9 Analysis of Green Information Sharing

The findings indicate a strongly positive perception of **green information-sharing practices** at Anwar Group of Industries. A substantial majority of respondents (**91.43%**) either agreed (**60%**) or strongly agreed (**31.43%**) that effective information sharing is taking place through integrated systems such as ERP and digital platforms.

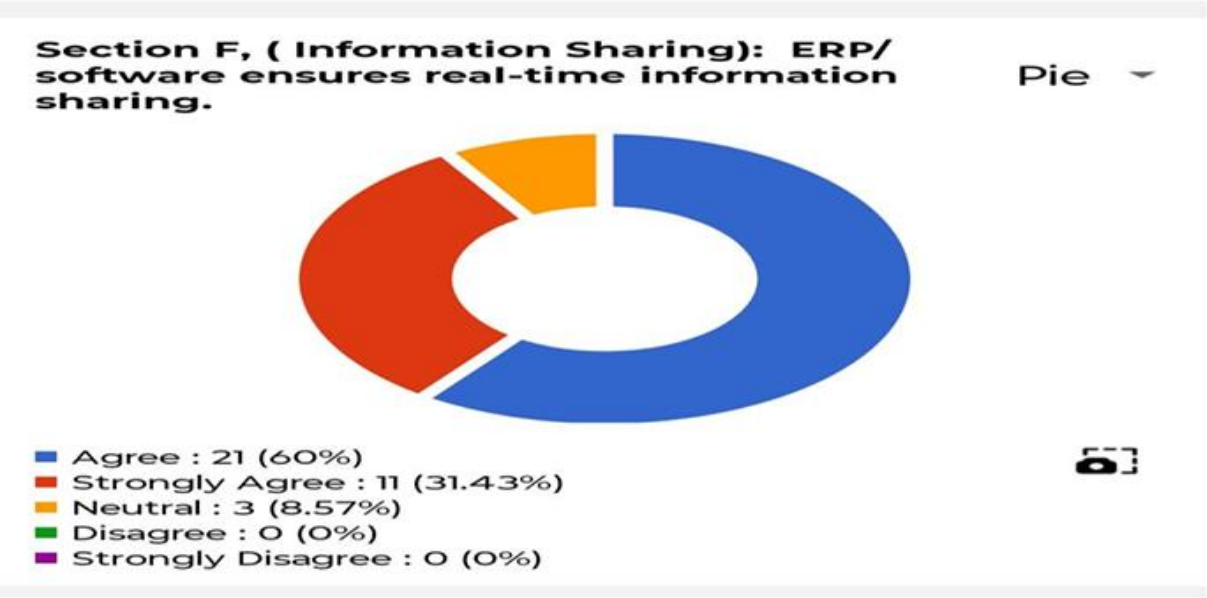
This high level of agreement suggests that Anwar Group has established robust communication mechanisms that support timely, accurate, and transparent information exchange across departments and supply chain partners. Such practices play a crucial role in reducing waste, improving coordination, enhancing traceability, and supporting environmentally responsible decision-making.

Only **8.57%** of respondents selected neutral, which may reflect limited exposure to information-sharing systems or uncertainty about their effectiveness. Notably, no respondents disagreed, demonstrating an absence of negative perceptions and reinforcing the reliability of information-sharing practices in supporting green supply chain coordination.

Data Analysis and Result

Information Sharing	Frequency	Percentage
Agree	21	60%
Strongly Agree	11	31.43%
Neutral	3	8.57%
Disagree	0	0%
Strongly Disagree	0	0%
Total	**35**	**100%**

Graph Presentation



5.10 Analysis of Green Technology Integration

The results reflect a generally positive perception of **green technology integration** within Anwar Group of Industries, though a noticeable minority expressed concerns. A combined **85.71%** of respondents either agreed (**60%**) or strongly agreed (**25.71%**) that technology is effectively integrated into organizational operations to support green supply chain practices.

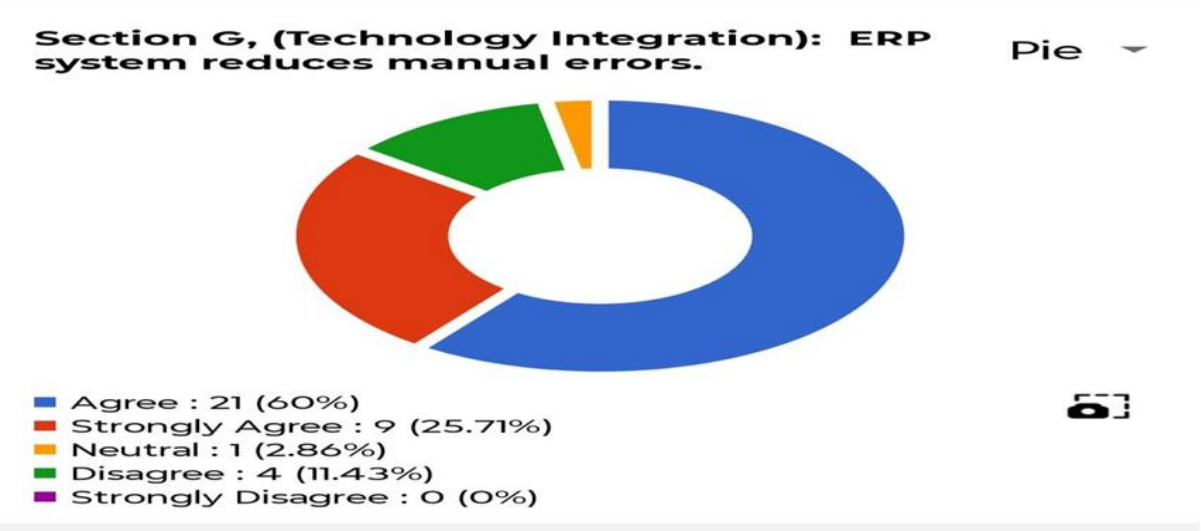
The adoption of ERP systems, automation, and digital monitoring tools contributes to improved efficiency, reduced manual errors, optimized resource utilization, and enhanced environmental compliance. These technologies support paperless operations, accurate inventory tracking, and energy-efficient processes.

However, **11.4%** of respondents disagreed, marking the first instance among the analyzed variables where dissatisfaction was observed. This indicates potential challenges such as insufficient training, outdated systems, limited accessibility, or inconsistent technology usage across departments. Addressing these gaps would further strengthen green technology adoption and maximize its benefits.

Data Analysis and Result

Technology Integration	Frequency	Percentage
Agree	21	60%
Strongly Agree	9	25.71%
Neutral	1	2.86%
Disagree	4	11.4%
Strongly Disagree	0	0%
Total	**35**	**100%**

Graph Presentation



5.11 Analysis of Sustainability and Ethical Supply Chain Management

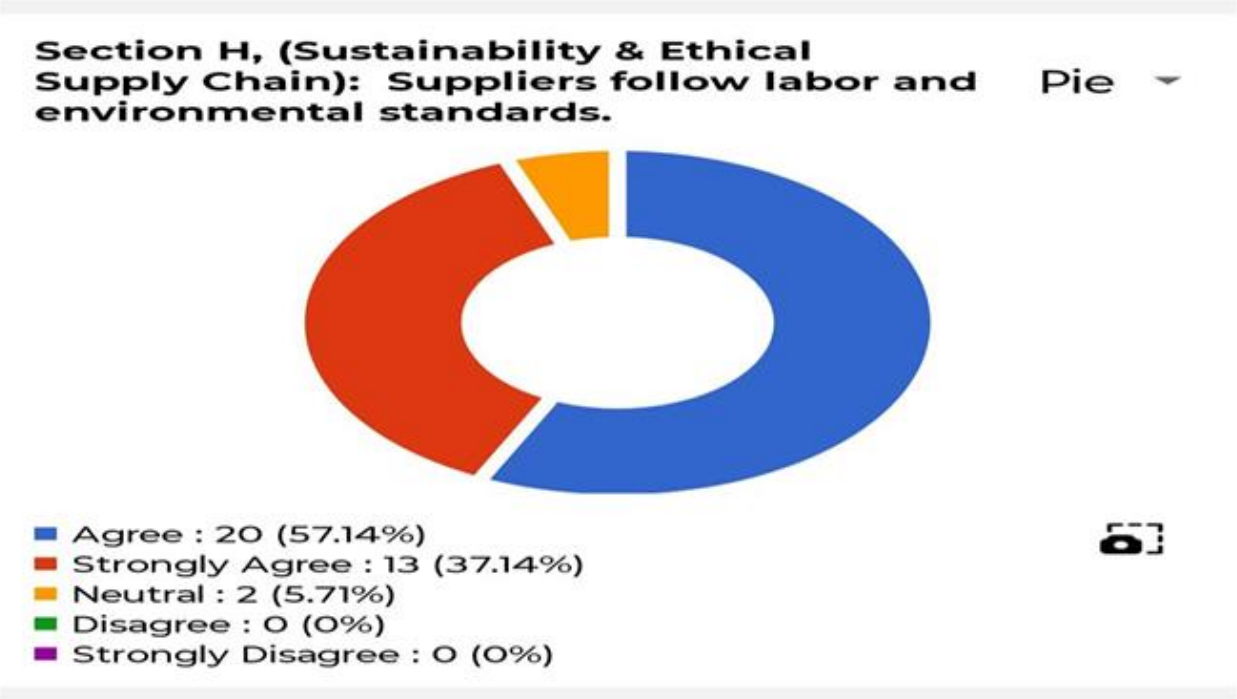
The analysis shows an overwhelmingly positive perception of sustainability and ethical practices within Anwar Group's supply chain. A combined **94.28%** of respondents either agreed (57.14%) or strongly agreed (37.14%) that sustainability principles and ethical standards are actively implemented.

This reflects strong organizational commitment to environmental protection, ethical sourcing, compliance with labor standards, and responsible supplier behavior. No negative responses were recorded, reinforcing the credibility of Anwar Group's sustainability initiatives.

Data Analysis and Result

Sustainability & Ethical SCM	Frequency	Percentage
Agree	20	57.14%
Strongly Agree	13	37.14%
Neutral	2	5.71%
Disagree	0	0%
Strongly Disagree	0	0%
Total	**35**	**100%**

Graph Presentation



5.12 Analysis of Quality Management

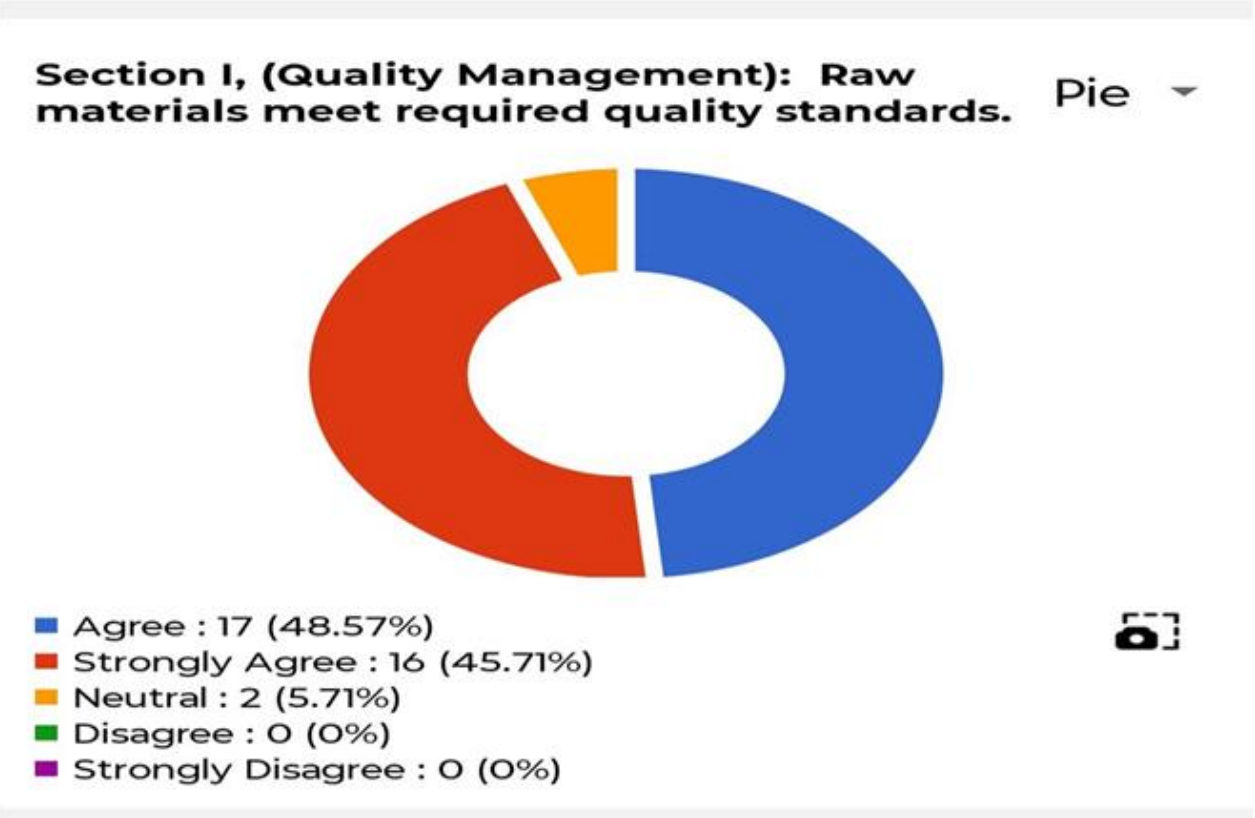
The findings demonstrate a strong and consistent positive perception of quality management practices within Anwar Group's green supply chain. A total of **94.28%** of respondents agreed or strongly agreed that quality management systems ensure compliance with environmental and operational standards.

This indicates effective monitoring of raw materials, production processes, and supplier quality assurance, which supports sustainable production and reduces waste.

Data Analysis and Result

Quality Management	Frequency	Percentage
Agree	17	48.57%
Strongly Agree	16	45.71%
Neutral	2	5.71%
Disagree	0	0%
Strongly Disagree	0	0%
Total	**35**	**100%**

Graph Presentation



5.13 Analysis of Customer Relationship Management (CRM)

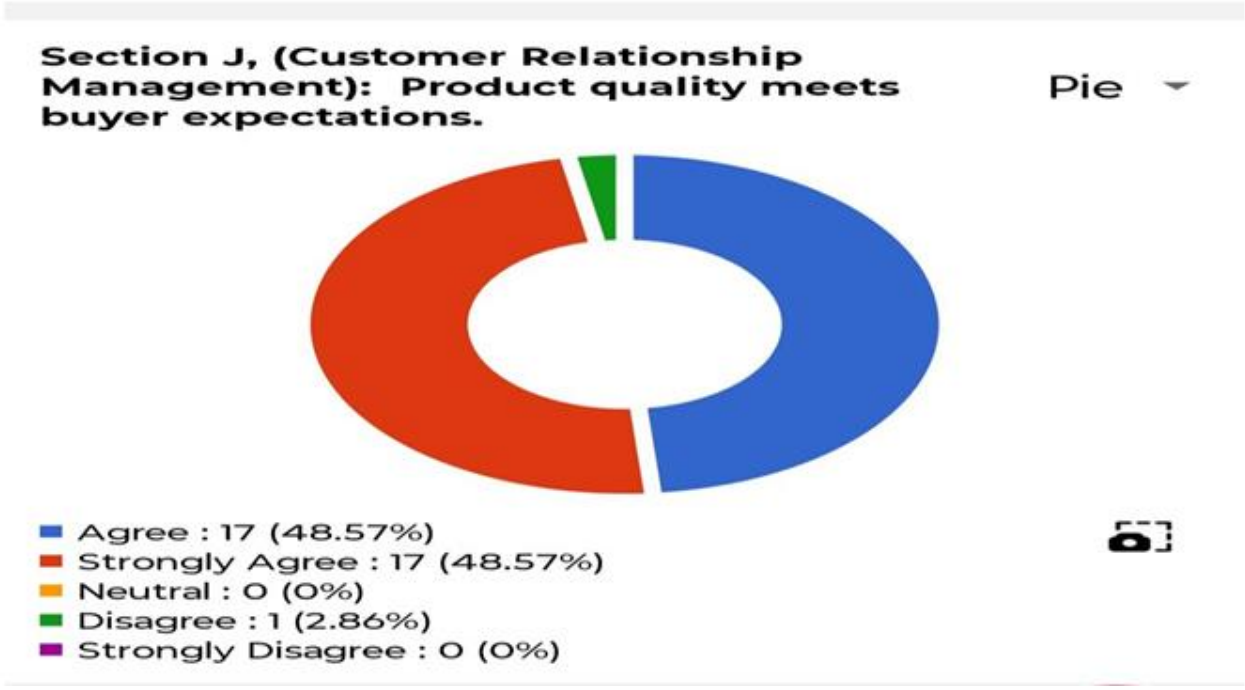
The results indicate an exceptionally positive perception of CRM practices at Anwar Group. A combined **97.14%** of respondents either agreed or strongly agreed that effective CRM systems are in place to meet customer expectations, ensure product quality, and maintain long-term buyer relationships.

Only 2.86% expressed disagreement, while no neutral responses were recorded. This demonstrates Anwar Group's strong customer-centric approach, which supports sustainable growth and market competitiveness.

Data Analysis and Result

Customer Relationship Management	Frequency	Percentage
Agree	17	48.57%
Strongly Agree	17	48.57%
Neutral	0	0%
Disagree	1	2.86%
Strongly Disagree	0	0%
Total	**35**	**100%**

Graph Presentation



Chapter-Six

Discussion

6.1 Summary of Key Findings

This study reveals several important findings regarding the implementation and effectiveness of **Green Supply Chain Management (GSCM)** practices at **Anwar Group of Industries**.

- The study finds that green procurement and supplier selection practices are generally effective; however, maintaining consistent quality and environmental compliance across all suppliers remains a challenge due to variation in supplier capabilities and standards.
- Anwar Group demonstrates a strong commitment to sustainable sourcing, including environmentally responsible materials and compliance with regulatory requirements, though continuous monitoring of supplier sustainability performance requires further strengthening.
- Local sourcing strategies help reduce lead time, transportation costs, and carbon emissions; however, challenges such as price volatility, seasonal availability, and dependency on specific suppliers still exist.
- The organization has successfully implemented ERP-based systems that enhance supply chain visibility, inventory accuracy, and real-time tracking, contributing significantly to waste reduction and operational efficiency.
- Compliance with local and international environmental, safety, and quality regulations requires extensive documentation, audits, and certifications, which occasionally slow procurement and logistics processes.
- The use of multiple suppliers increases procurement flexibility and risk diversification, though it may raise operational costs. Long-term contracts and bulk purchasing agreements help mitigate these costs.
- The study identifies a strong dependence on a diverse network of local and international suppliers, which ensures continuity of supply but necessitates improved risk management planning.
- The need for enhanced supply chain risk management is evident, particularly in response to disruptions caused by natural disasters, market instability, regulatory changes, and supplier financial risks.

6.2 Discussion on Green Supplier Relationship Management

The findings confirm that **long-term, trust-based supplier relationships** play a vital role in improving GSCM performance at Anwar Group of Industries. The organization's emphasis on supplier evaluation, performance monitoring, and collaborative planning supports quality assurance, on-time delivery, and environmental compliance.

Effective **Green Supplier Relationship Management (GSRM)** enables Anwar Group to align supplier practices with its sustainability goals, including reduced waste, responsible sourcing, and ethical operations. These findings are consistent with prior GSCM literature, which emphasizes that strong supplier collaboration reduces procurement risks, minimizes disruptions, and improves overall supply chain resilience.

In an industrial manufacturing context, reliable and environmentally compliant suppliers ensure uninterrupted production, regulatory compliance, and long-term cost efficiency, making GSRM a strategic asset rather than a purely operational function.

6.3 Discussion on Green Inventory, Logistics, and Information Management

The study highlights that **green inventory management, logistics efficiency, and information sharing** are closely interconnected and jointly strengthen supply chain sustainability at Anwar Group.

The use of **ERP and digital inventory systems** enables accurate stock control, minimizes excess inventory, reduces material wastage, and improves warehouse efficiency. These practices directly support environmental sustainability by reducing unnecessary resource consumption.

Green logistics initiatives, such as optimized route planning, efficient vehicle utilization, and improved delivery scheduling, contribute to reduced fuel consumption and lower carbon emissions. Furthermore, **real-time information sharing across departments** enhances coordination, faster decision-making, and proactive problem resolution.

Overall, the integration of technology-driven GSCM practices improves operational agility, reduces lead times, and supports environmentally responsible supply chain operations.

6.4 Discussion on Customer Relationships and Organizational Performance

Although Anwar Group primarily operates in an industrial manufacturing environment, **customer relationship management (CRM)** remains a critical element of sustainable supply chain performance.

The study finds that consistent communication, reliable delivery schedules, quality assurance, and responsiveness to customer requirements significantly enhance customer trust and long-term business relationships. By integrating customer feedback into supply chain planning, Anwar Group strengthens its ability to meet market demands while maintaining sustainability standards.

These findings align with GSCM research, which suggests that customer-focused green supply chains enhance corporate reputation, market competitiveness, and long-term profitability. Effective CRM also supports adaptability to changing regulatory and environmental expectations, reinforcing sustainable organizational growth.

6.5 Risk Management in Green Supply Chain Management

Risk management emerges as a critical component of GSCM at Anwar Group of Industries.

- The organization recognizes the importance of identifying and mitigating **supply chain risks**, including supplier failure, quality deviations, environmental non-compliance, and logistics disruptions.
- Collaborative relationships with suppliers allow early identification of potential risks and the development of **contingency and mitigation plans**.
- However, the study indicates the need for more structured and proactive **green risk management frameworks**, particularly in addressing climate-related risks, transportation disruptions, regulatory changes, and supplier dependency.

Strengthening green risk management practices will enhance supply chain resilience and ensure continuity of sustainable operations.

6.6 Overall Impact of GSCM Practices on Organizational Performance

The overall findings demonstrate that the implementation of **Green Supply Chain Management practices** has a significant positive impact on the performance of **Anwar Group of Industries**.

Integrated GSCM functions—including green procurement, supplier collaboration, inventory optimization, green logistics, information sharing, and customer relationship management collectively contribute to:

- Cost reduction
- Improved operational efficiency
- Reduced environmental impact
- Enhanced customer satisfaction
- Stronger regulatory compliance

The study confirms that GSCM is not merely an operational tool but a **strategic capability** that strengthens competitiveness, sustainability, and long-term organizational success. Adopting and continuously improving GSCM practices is therefore essential for Anwar Group to maintain leadership in an increasingly environmentally conscious and competitive industrial environment.

Chapter-Seven
Recommendations & Conclusion

7.1 Recommendations

Based on the findings and discussions of this study, the following recommendations are proposed to further strengthen **Green Supply Chain Management (GSCM)** practices at **Anwar Group of Industries**:

- Strengthen **green supplier relationship management** through strategic partnerships, long-term contracts, and regular environmental performance evaluations to ensure consistent quality and sustainability compliance.
- Collaborate with suppliers to promote **sustainable sourcing practices**, reduce dependency on single-source suppliers, and encourage the adoption of eco-friendly materials and processes.
- Implement advanced **green inventory management techniques**, such as Just-In-Time (JIT) and Vendor-Managed Inventory (VMI), to minimize excess stock, reduce material wastage, and lower holding costs.
- Enhance **green logistics and transportation management** by optimizing delivery routes, consolidating shipments, improving vehicle utilization, and adopting fuel-efficient or low-emission transportation modes.
- Invest further in **digital supply chain technologies**, including ERP upgrades, real-time tracking systems, and data analytics tools, to improve supply chain visibility, accuracy, and decision-making.
- Develop and implement a comprehensive **Green Risk Management Framework** to identify potential environmental, operational, and supply chain risks and establish mitigation and contingency plans.
- Foster a culture of **continuous improvement and sustainability awareness** across supply chain operations by encouraging innovation, waste reduction initiatives, and employee participation in green practices.
- Strengthen **interdepartmental communication and coordination** to ensure seamless information sharing between procurement, production, warehouse, logistics, and finance functions.
- Conduct regular **performance audits and environmental compliance reviews** to assess the effectiveness of GSCM practices and identify opportunities for improvement.
- Establish and strengthen a **customer relationship management (CRM) system** that integrates sustainability considerations, ensuring reliable delivery, quality assurance, and customer satisfaction.
- Adopt **lean and green operational practices** to reduce waste, improve process efficiency, and minimize environmental impact across production and logistics activities.
- Invest in **employee training and development programs** focused on green supply chain concepts, environmental regulations, safety standards, and digital skills.
- Develop a long-term **sustainable supply chain strategy** aligned with national environmental regulations, ISO standards, and global sustainability goals, including carbon emission reduction and resource efficiency.

7.2 Conclusion

This study provides a comprehensive analysis of **Green Supply Chain Management practices at Anwar Group of Industries** and highlights the critical role of sustainability-oriented supply chain strategies in enhancing organizational performance.

The findings confirm that **effective green supplier management**, supported by long-term collaboration and environmental compliance, significantly improves supply reliability, quality consistency, and risk reduction. Additionally, the adoption of **green inventory and logistics practices**, supported by digital systems and process optimization, contributes to cost efficiency, reduced waste, and lower environmental impact.

The study also demonstrates that **information technology and data-driven decision-making** play a pivotal role in improving supply chain visibility, coordination, and responsiveness. Furthermore, customer-focused green practices strengthen trust, long-term relationships, and corporate reputation.

In conclusion, the research establishes that **Green Supply Chain Management is not merely an operational approach but a strategic capability** for Anwar Group of Industries. By integrating environmental responsibility with operational efficiency, Anwar Group can achieve sustainable growth, regulatory compliance, and long-term competitiveness in an increasingly environmentally conscious business environment.

As global sustainability expectations continue to rise, organizations like Anwar Group must remain proactive, innovative, and adaptive in their GSCM practices to address emerging challenges and capitalize on future opportunities.

Bibliography

Books

Chopra, S., & Meindl, P. (2021). *Supply Chain Management: Strategy, Planning, and Operation (7th ed.).* Pearson Education.
https://www.pearson.com/en-us/subject-catalog/p/supply-chain-management-strategy-planning-and-operation/P200000006589
Christopher, M. (2016). *Logistics and Supply Chain Management (5th ed.).* Pearson Education.
https://www.pearson.com/en-gb/subject-catalog/p/logistics-and-supply-chain-management/P200000003350
Elkington, J. (1997). *Cannibals with Forks: The Triple Bottom Line of 21st Century Business.* Capstone Publishing.
https://www.wiley.com/en-us/Cannibals+with+Forks%3A+The+Triple+Bottom+Line+of+21st+Century+Business-p-9781841120843
Kaplan, R. S., & Norton, D. P. (2001). *Strategy-Focused Organization.* Harvard Business School Press.
https://store.hbr.org/product/the-strategy-focused-organization/10090

Reports

Anwar Group of Industries. (2023). *Annual Report and Corporate Sustainability Practices.*
https://www.anwargroup.com (Official website – reports section)
ISO 14001:2015 – Environmental Management Systems
https://www.iso.org/standard/60857.html
ISO 45001:2018 – Occupational Health and Safety Management Systems
https://www.iso.org/standard/63787.html

Journal Articles

Adams, S. M., Sarkis, J., & Liles, D. (1995).
The development of strategic performance metrics.
Engineering Management Journal, 17(1), 24–32.
https://doi.org/10.1080/10429247.1995.11414690
Beamon, B. M. (1999).
Designing the green supply chain.
Logistics Information Management, 12(4), 332–342.
https://doi.org/10.1108/09576059910284159
Carter, C. R., & Rogers, D. S. (2008).
A framework of sustainable supply chain management.

International Journal of Physical Distribution & Logistics Management, 38(5), 360–387.
https://doi.org/10.1108/09600030810882816

Diabat, A., & Govindan, K. (2011).
An analysis of the drivers affecting the implementation of green supply chain management.
Resources, Conservation and Recycling, 55(6), 659–667.
https://doi.org/10.1016/j.resconrec.2010.12.002

Govindan, K., Sarkis, J., & Zhu, Q. (2011).
Green supply chain management: A review and bibliometric analysis.
International Journal of Production Economics, 133(1), 1–15.
https://doi.org/10.1016/j.ijpe.2010.08.010

Linton, J. D., Klassen, R., & Jayaraman, V. (2007).
Sustainable supply chains: An introduction.
Journal of Operations Management, 25(6), 1075–1082.
https://doi.org/10.1016/j.jom.2007.01.012

Mentzer, J. T., et al. (2001).
Defining supply chain management.
Journal of Business Logistics, 22(2), 1–25.
https://doi.org/10.1002/j.2158-1592.2001.tb00001.x

Sarkis, J. (2003).
A strategic decision framework for green supply chain management.
Journal of Cleaner Production, 11(4), 397–409.
https://doi.org/10.1016/S0959-6526(02)00062-8

Seuring, S., & Müller, M. (2008).
From a literature review to a conceptual framework for sustainable supply chain management.
Journal of Cleaner Production, 16(15), 1699–1710.
https://doi.org/10.1016/j.jclepro.2008.04.020

Srivastava, S. K. (2007).
Green supply-chain management: A state-of-the-art literature review.
International Journal of Management Reviews, 9(1), 53–80.
https://doi.org/10.1111/j.1468-2370.2007.00202.x

Appendices:

Appendix A: Survey Questionnaire

Survey on Green Supply Chain Management (GSCM) Practices

This survey is conducted for academic and organizational improvement purposes to assess the implementation of Green Supply Chain Management (GSCM) practices in Anwar Group. All responses will remain confidential and will be used only for research and improvement initiatives.

Section A: Respondent Information

Department

- Procurement
- Store & Inventory
- Production / Operations
- Commercial
- Quality Assurance
- Logistics & Transportation
- Environment, Health & Safety (EHS)
- Others: _____

Designation

- Officer
- Senior Officer
- Supervisor
- Executive
- Manager / Senior Manager
- Others: _____

Experience in Industry

- Less than 1 year
- 1–3 years
- 3–5 years
- 5–10 years
- More than 10 years

Section B: Green Procurement Practices

The company follows an environmentally responsible supplier selection process.

- Excellent
- Good
- Fair
- Poor

Suppliers are evaluated based on environmental compliance and certifications.

- Strongly Agree
- Agree
- Neutral
- Disagree

- Strongly Disagree

Preference is given to suppliers providing eco-friendly raw materials.

- Strongly Agree
- Agree
- Neutral
- Disagree
- Strongly Disagree

Long-term supplier contracts help reduce waste and cost.

- Strongly Agree
- Agree
- Neutral
- Disagree
- Strongly Disagree

Section C: Green Supplier Relationship Management

The company maintains long-term relationships with environmentally responsible suppliers.

- Strongly Agree
- Agree
- Neutral
- Disagree
- Strongly Disagree

Supplier environmental performance is monitored using KPIs.

- Strongly Agree
- Agree
- Neutral
- Disagree
- Strongly Disagree

The company collaborates with suppliers to reduce environmental impact.

- Strongly Agree
- Agree
- Neutral
- Disagree
- Strongly Disagree

Supplier training or guidance is provided on sustainability practices.

- Strongly Agree
- Agree
- Neutral
- Disagree
- Strongly Disagree

Section D: Green Inventory & Material Management

Inventory records are accurately maintained using ERP systems.

- Strongly Agree
- Agree
- Neutral
- Disagree
- Strongly Disagree

Excess inventory and material wastage are minimized.

- Strongly Agree
- Agree
- Neutral
- Disagree
- Strongly Disagree

FIFO/FEFO practices are followed to reduce material loss.

- Strongly Agree
- Agree
- Neutral
- Disagree
- Strongly Disagree

Barcoding/RFID systems improve inventory accuracy and reduce waste.

- Strongly Agree
- Agree
- Neutral
- Disagree
- Strongly Disagree

Section E: Green Logistics & Transportation

The company plans logistics routes to reduce fuel consumption.

- Strongly Agree
- Agree
- Neutral
- Disagree
- Strongly Disagree

Environment-friendly vehicles or fuel-efficient transport is encouraged.

- Strongly Agree
- Agree
- Neutral
- Disagree
- Strongly Disagree

Shipment tracking systems reduce delays and emissions.

- Strongly Agree
- Agree
- Neutral
- Disagree
- Strongly Disagree

Transportation cost and carbon footprint are monitored regularly.

- Strongly Agree
- Agree
- Neutral
- Disagree
- Strongly Disagree

Section F: Green Information Sharing & Integration

ERP systems ensure real-time information sharing across departments.

- Strongly Agree
- Agree
- Neutral
- Disagree
- Strongly Disagree

Digital documentation reduces paper usage.

- Strongly Agree
- Agree
- Neutral
- Disagree
- Strongly Disagree

Information sharing helps reduce operational errors and rework.

- Strongly Agree
- Agree
- Neutral
- Disagree
- Strongly Disagree

Section G: Green Technology Integration

Technology helps reduce energy consumption in operations.

- Strongly Agree
- Agree
- Neutral
- Disagree
- Strongly Disagree

SCM software improves demand forecasting and reduces overproduction.

- Strongly Agree
- Agree
- Neutral
- Disagree
- Strongly Disagree
-

Automation helps minimize waste and operational cost.

- Strongly Agree
- Agree
- Neutral
- Disagree
- Strongly Disagree

Section H: Environmental Sustainability & Compliance

The company complies with national environmental laws and regulations.

- Strongly Agree
- Agree
- Neutral
- Disagree
- Strongly Disagree

Energy-efficient machinery and processes are used.

- Strongly Agree
- Agree
- Neutral
- Disagree
- Strongly Disagree

Waste, scrap, and emissions are properly managed and controlled.

- Strongly Agree
- Agree
- Neutral
- Disagree
- Strongly Disagree

The company actively works to reduce carbon emissions.

- Strongly Agree
- Agree
- Neutral
- Disagree
- Strongly Disagree

Section I: Green Quality Management

Raw materials meet both quality and environmental standards.

- Strongly Agree
- Agree
- Neutral
- Disagree
- Strongly Disagree

Defective products and rework are minimized.

- Strongly Agree
- Agree
- Neutral
- Disagree
- Strongly Disagree

Continuous improvement initiatives focus on sustainability.

- Strongly Agree
- Agree
- Neutral
- Disagree
- Strongly Disagree

Section J: Green Customer Relationship Management

Products meet customer quality and environmental expectations.

- Strongly Agree
- Agree
- Neutral
- Disagree
- Strongly Disagree

Customers value the company's environmentally responsible practices.

- Strongly Agree
- Agree
- Neutral
- Disagree
- Strongly Disagree

Customer feedback is used to improve green supply chain practices.

- Strongly Agree
- Agree
- Neutral
- Disagree
- Strongly Disagree

Survey Link:

https://docs.google.com/forms/d/e/1FAIpQLSeqgDi8D7iUqnGbjCJbj_4lGsNNiOU7h5bZ9AxxzxC2nhu52w/formResponse