

NIIR PROJECT CONSULTANCY SERVICES | NPCS

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## CLIENT CASE STUDY

# Liquid Carbon Dioxide Manufacturing Plant

*Transforming Industrial Gas Investment Vision into a Market-Validated Manufacturing Venture*

<p>CLIENT</p> <p><b>M/s Carbon N Co. Ltd</b> Republic of Korea</p>	<p>INDUSTRY</p> <p><b>Industrial Gas</b> Manufacturing Sector</p>
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## 01. About NPCS

Niir Project Consultancy Services (NPCS) is a globally recognized industrial consultancy organization with over 30 years of expertise in manufacturing project identification, feasibility assessment, and investment advisory.

*NPCS is part of Asia's leading industrial knowledge ecosystem with thousands of project profiles and global consulting expertise. The organization has successfully guided entrepreneurs, MSMEs, industrial groups, and large-scale investors across 50+ countries in establishing technically feasible and economically viable manufacturing ventures.*

### CORE SERVICES

- Detailed Project Reports (DPR)
- Techno-Economic Feasibility Studies
- Market Research & Demand Analysis
- Engineering & Technical Advisory
- Financial Modeling & Viability
- Implementation Planning Support

## 02. Why Clients Trust NPCS — By the Numbers

<p><b>30,000+</b></p> <p>Detailed Project Reports Published</p>	<p><b>50+</b></p> <p>Countries Served Worldwide</p>
<p><b>30+</b></p> <p>Years of Industrial Expertise</p>	<p><b>250,000+</b></p> <p>Industrial Projects Delivered</p>

### Trusted Across Industries

Food & Beverage Processing | Chemicals & Petrochemicals | Industrial Gases  
 Pharmaceuticals & Healthcare | Metals & Engineering | Renewable Energy  
 Agro-Processing | Construction Materials | Electronics & EV Components

## 03. Client Overview

Parameter	Details
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<b>Client Name</b>	M/s Carbon N Co. Ltd
<b>Location</b>	Republic of Korea
<b>Industry</b>	Industrial Gas Manufacturing
<b>Project Type</b>	Large-Scale Greenfield Investment
<b>Consultancy</b>	Techno-Economic Feasibility Study, Market Research, Financial Evaluation & Strategic Advisory
<b>Project Status</b>	Feasibility Reviewed — Proceeded to Implementation Planning

### Investment Objective

M/s Carbon N Co. Ltd approached NPCS with the objective of identifying and validating a large-scale manufacturing opportunity aligned with global industrial demand trends. The client's leadership team sought a credible, data-driven foundation before committing capital resources.

### Key Business Goals

- Identify a high-demand industrial product with diversified end-use applications
- Establish a sustainable, scalable manufacturing operation
- Leverage regional industrial infrastructure and feedstock availability in South Korea
- Ensure long-term profitability through professional feasibility evaluation
- Minimize investment risk with rigorous technical and financial analysis

## 04. Problem Statement & Investment Challenges

Industrial manufacturing investments inherently carry multiple categories of risk. Before engaging NPCS, M/s Carbon N Co. Ltd faced the following key challenges:

<b>Market Uncertainty</b>	Limited visibility into which industrial product category offered the strongest multi-year demand trajectory and growth potential in the Asia-Pacific region.
<b>Technical Complexity</b>	Industrial gas manufacturing requires specialized equipment — CO <sub>2</sub> purification systems, multi-stage compressors, liquefaction units — demanding deep technical expertise to evaluate correctly.
<b>Financial Risk</b>	Large greenfield plants carry significant capital outlay risk without validated project economics, IRR projections, and payback period analysis.

<b>Supply Chain Gaps</b>	Identifying reliable and cost-effective raw CO <sub>2</sub> feedstock sources — from industrial fermentation, petrochemical off-gas, or carbon capture — required specialist sourcing intelligence.
<b>Regulatory Complexity</b>	Industrial gas production facilities must meet stringent food-grade purity, safety, and environmental regulatory requirements across Korean and international standards.

## 05. NPCS Methodology & Strategic Approach

NPCS deployed its proven multi-phase consulting methodology to deliver a comprehensive, investor-grade feasibility assessment for M/s Carbon N Co. Ltd.

Phase	Activity	Key Deliverables & Actions
Phase 01	<b>Project Identification</b>	Evaluated multiple industrial sectors; shortlisted liquid CO <sub>2</sub> based on demand-supply analysis, capital efficiency, and Korea-specific industrial advantages.
Phase 02	<b>Market Analysis</b>	Assessed global and regional liquid CO <sub>2</sub> market demand across food processing, healthcare, metal fabrication, and chemical industries. Validated growth trajectory and competition landscape.
Phase 03	<b>Technical Feasibility</b>	Evaluated CO <sub>2</sub> purification and liquefaction technologies, plant layout options, machinery specifications, utility requirements, and raw material sourcing strategies.
Phase 04	<b>Financial Modeling</b>	Prepared project cost estimates, projected revenue streams, profitability analysis, IRR computation, payback period evaluation, and break-even analysis.
Phase 05	<b>Risk Assessment</b>	Identified key investment risks -- market, technical, regulatory, and supply-chain -- and developed mitigation strategies for each.
Phase 06	<b>Implementation Strategy</b>	Provided strategic recommendations on plant capacity, logistics infrastructure, distribution channel development, and phased expansion roadmap.

## 06. Scope of Services Delivered

✓ Techno-Economic Feasibility Study	✓ DPR Preparation & Documentation
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✓ Plant Layout Recommendations	✓ Machinery & Equipment Selection
✓ Financial Modeling & Projections	✓ Market Validation & Demand Analysis
✓ Raw Material Sourcing Strategy	✓ Implementation Roadmap
✓ Risk Analysis & Mitigation Plan	✓ Strategic Advisory Support

## 07. Project Execution Timeline

Phase	Activity	Timeline	Status
Phase 1	Initial Consultation & Requirement Mapping	Week 1–2	Completed
Phase 2	Sector Screening & Opportunity Shortlisting	Week 2–4	Completed
Phase 3	Liquid CO <sub>2</sub> Deep-Dive Market Research	Week 4–6	Completed
Phase 4	Technical Feasibility Assessment	Week 6–9	Completed
Phase 5	Financial Modeling & Viability Analysis	Week 9–11	Completed
Phase 6	Risk Assessment & Mitigation Planning	Week 11–12	Completed
Phase 7	Report Compilation & Client Presentation	Week 12–14	Completed
Phase 8	Implementation Planning & Next Steps	Post-Report	In Progress

## 08. Technical Insights — Manufacturing Process

Liquid carbon dioxide production follows a well-established industrial process involving gas sourcing, purification, compression, and cryogenic liquefaction. NPCS evaluated the following production pathway for the client's facility:

Step	Process Stage	Description
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Step 1	<b>Raw CO<sub>2</sub> Sourcing</b>	Industrial fermentation, petrochemical off-gas, or carbon capture units supply raw CO <sub>2</sub> feedstock.
Step 2	<b>Compression</b>	Raw gas is compressed using multi-stage compressors to increase pressure for purification.
Step 3	<b>Purification</b>	Gas passes through activated carbon beds and chemical scrubbers to remove impurities and moisture.
Step 4	<b>Liquefaction</b>	Purified CO <sub>2</sub> is cooled under pressure via refrigeration systems until it liquefies (-17°C to -30°C).
Step 5	<b>Quality Control</b>	Liquid CO <sub>2</sub> is tested for purity — food-grade (99.9%+) or industrial-grade standards are applied.
Step 6	<b>Storage</b>	Liquefied CO <sub>2</sub> is stored in pressurized insulated tanks at the plant facility.
Step 7	<b>Distribution</b>	Bulk tankers, ISO containers, and cylinders distribute the product to industrial and food clients.

### Key Machinery & Equipment

⊗ Multi-Stage Reciprocating Compressors	⊗ Activated Carbon Purification Units
⊗ Plate Heat Exchangers / Refrigeration Systems	⊗ Pressurized Insulated Storage Tanks
⊗ CO <sub>2</sub> Quality Analyzers (Purity Meters)	⊗ Filling Stations (Cylinders & Bulk Tankers)
⊗ Safety Monitoring & Control Systems	⊗ Utility Infrastructure (Power, Water, Air)

## 09. Financial & Market Analysis

### Global Market Overview

Market Metric	Data Point	Significance
<b>Global Market Value (2025)</b>	USD 9.47 Billion	Strong existing demand base
<b>Projected Market (2035)</b>	USD 14.03 Billion	Sustained 4% CAGR growth
<b>Alternative Forecast (2030)</b>	USD 9.23 Billion	Driven by F&B demand
<b>CO<sub>2</sub> Industry (2033)</b>	USD 20 Billion	Broader CO <sub>2</sub> commercial growth
<b>Asia-Pacific Share</b>	Largest & Fastest Growing Region	Korea well-positioned
<b>Food &amp; Bev Consumption</b>	70%+ of Total Demand	Key revenue driver

## Financial Highlights

Financial Parameter	Estimated Range / Indication
Project Scale	Industrial-grade liquid CO <sub>2</sub> plant
Capital Investment	Moderate — competitive vs. petrochemical plants
Revenue Streams	Multi-sector: food, beverage, healthcare, chemicals
Payback Period	Typically 4–7 years for industrial gas plants
IRR Indication	Attractive double-digit returns expected
Market CAGR	~4% globally (liquid CO <sub>2</sub> , 2025–2035)
Market Value (2025)	USD 9.47 Billion (global liquid CO <sub>2</sub> )
Market Value (2035)	USD 14.03 Billion (projected)
Key Driver	Food & beverage demand (70%+ of consumption)

## Investment Opportunity Summary

### Why Liquid CO<sub>2</sub> Delivers Attractive Returns

- Multi-sector demand insulates against single-industry downturns
- Food-grade CO<sub>2</sub> commands premium pricing vs. industrial-grade supply
- Carbon capture integration creates future feedstock cost advantages
- Long-term supply contracts with beverage and food manufacturers ensure revenue predictability
- Korea's industrial infrastructure reduces capex on utilities and logistics
- Export potential to neighboring Asian markets adds revenue upside

## 10. Results & Business Outcomes

### Business Impact

- Investment decision backed by verified market data
- Technology selection validated by engineering experts
- Capital requirements clearly mapped pre-financing

### Strategic Benefits

- Entry into high-growth industrial gas manufacturing
- Diversified revenue across food, healthcare, chemicals
- Alignment with global CO<sub>2</sub> utilization trends

<p><b>Risk Mitigation</b></p> <ul style="list-style-type: none"> <li>• All major investment risks identified proactively</li> <li>• Regulatory compliance pathway clearly charted</li> <li>• Feedstock strategy developed to reduce supply risk</li> </ul>	<p><b>Long-Term Positioning</b></p> <ul style="list-style-type: none"> <li>• Strong positioning in Korea's industrial gas market</li> <li>• Platform for specialty and medical-grade CO<sub>2</sub> expansion</li> <li>• Scalable plant design for incremental capacity growth</li> </ul>
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## 11. Client Testimonial

*“Niir Project Consultancy Services demonstrated exceptional expertise in identifying a viable, market-validated industrial manufacturing opportunity for our organization.*

*Their comprehensive techno-economic feasibility analysis, deep market intelligence, and structured strategic guidance gave our leadership team the confidence to move forward decisively with the liquid carbon dioxide manufacturing project.*

*NPCS delivered everything we needed — technical clarity, financial validation, and a clear implementation pathway. We strongly recommend their consultancy services to any serious industrial investor.”*

— Management Team, M/s Carbon N Co. Ltd | Republic of Korea

## 12. Why Choose NPCS for Your Industrial Project?

<p style="text-align: center;">★</p> <p style="text-align: center;"><b>Proven Track Record</b></p> <p>45+ years of delivering bankable DPRs and feasibility studies across 50+ countries. 30,000+ project reports published.</p>	<p style="text-align: center;">★</p> <p style="text-align: center;"><b>Data-Driven Insights</b></p> <p>Every recommendation is backed by quantified market data, technical benchmarks, and financial modeling — not assumptions.</p>	<p style="text-align: center;">★</p> <p style="text-align: center;"><b>Global Market Reach</b></p> <p>Deep understanding of industrial markets across Asia-Pacific, the Middle East, Africa, and emerging economies.</p>
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 <b>End-to-End Support</b> From initial opportunity identification through DPR preparation to implementation planning — NPCS supports every stage of the project lifecycle.	 <b>Risk Mitigation First</b> NPCS's feasibility framework systematically identifies, quantifies, and addresses investment risks before capital is deployed.	 <b>Sector Depth</b> Specialists across industrial gases, chemicals, food processing, pharmaceuticals, EV components, engineering, and more.
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## 13. Conclusion

The M/s Carbon N Co. Ltd engagement demonstrates NPCS's ability to transform an open-ended investment objective into a focused, market-validated, and financially sound manufacturing strategy.

Through structured project identification, in-depth market intelligence, rigorous technical feasibility evaluation, and comprehensive financial modeling, NPCS delivered a clear investment roadmap for one of industrial gases' most strategically important products — liquid carbon dioxide.

The client's decision to proceed with implementation planning reflects the confidence that NPCS's consultancy work instills in serious investors. By combining deep industry knowledge with a data-first advisory approach, NPCS continues to power industrial investment decisions across the globe.

### Strategic Value Delivered

- Investment confidence built on verified market data and financial modeling
- Technical clarity on manufacturing processes, machinery, and plant requirements
- Risk exposure minimized through systematic feasibility assessment
- Implementation roadmap enabling organized, phased capital deployment
- Long-term growth trajectory supported by carbon capture and utilization trends

## READY TO BUILD YOUR NEXT INDUSTRIAL PROJECT?

*Partner with Niir Project Consultancy Services to transform your investment idea into a profitable manufacturing venture.*

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