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CLIENT CASE STUDY

Manufacturing Activated Carbon from Coconut Shells

Côte d'Ivoire, West Africa

"Transforming Agricultural Waste into Global Industrial Value —
A Bankable, Investor-Grade Project Delivered by NPCS"

Client	Location	Status
M/s. Daouda Zombo	Abidjan, Côte d'Ivoire	APPROVED & ACTIVE

ABOUT NPCS

Niir Project Consultancy Services (NPCS) is one of Asia's most respected and trusted industrial knowledge and consulting firms. With over four decades of active engagement across Indian and international markets, NPCS has built an unrivalled repository of industrial intelligence, project intelligence, and market insights that entrepreneurs, investors, MSMEs, and development finance institutions rely on.

NPCS is part of Asia's leading industrial knowledge ecosystem with thousands of project profiles and global consulting expertise.

Core Services

- Detailed Project Reports (DPRs) — bankable, investor-grade industrial feasibility reports
- Techno-Economic Feasibility Studies — rigorous analysis of technical and commercial viability
- Market Research & Demand Assessment — sector, product, and geography-specific intelligence
- Engineering Advisory — plant layout, machinery selection, process design, and commissioning support
- Financial Modelling & Investment Analysis — CapEx, OpEx, IRR, NPV, payback projections
- Implementation Planning — regulatory compliance, procurement, staffing, and go-live strategies

30,000+	50+	30+	250,000+
Detailed Project Reports Published	Countries Served	Years of Industrial Expertise	Industrial Projects Delivered

CLIENT OVERVIEW & PROJECT SNAPSHOT

Client Name	M/s. Daouda Zombo
Location	Abidjan, Côte d'Ivoire, West Africa
Industry Sector	Large-Scale Industrial Manufacturing
Project	Manufacturing of Activated Carbon from Coconut Shells
Services by NPCS	Techno-Economic Feasibility Study & Detailed Project Report (DPR)
Deliverables	Market Analysis, Raw Material Assessment, Technical & Financial Feasibility, Project Costing, Implementation Planning
Implementation Status	APPROVED — Client proceeding with plant setup

Client Background & Investment Objective

M/s. Daouda Zombo is a growth-oriented entrepreneur based in Abidjan, Côte d'Ivoire, seeking to diversify into industrial manufacturing. The client approached NPCS with a clear mandate: identify a manufacturing venture that offers long-term profitability, leverages locally available raw materials, and addresses genuine market demand — both regionally and globally.

The client's specific objectives were:

- Ensure long-term profitability and business sustainability
- Align with local resource availability within Côte d'Ivoire's agricultural sector
- Tap into growing demand for industrial materials in regional and international markets
- Maintain moderate capital requirements with a strong and measurable return on investment

To realise these objectives, the client engaged NPCS to conduct a comprehensive techno-economic feasibility assessment and prepare a Detailed Project Report (DPR) that would serve as the definitive investment decision document.

PROBLEM STATEMENT & CHALLENGES ADDRESSED

Every industrial investment decision involves navigating significant uncertainty. When M/s. Daouda Zombo engaged NPCS, several critical questions needed rigorous, evidence-based answers:

1. Market Uncertainty

The global activated carbon market is driven by environmental regulations, water treatment mandates, and industrial demand — but translating macro trends into investable, bankable projections required detailed analysis. The client needed confidence that demand was real, growing, and accessible.

2. Technical Feasibility & Process Selection

Activated carbon can be manufactured through physical (steam) or chemical activation processes. Each has distinct capital costs, quality outcomes, and environmental implications. Without specialist technical guidance, selecting the wrong process could undermine product quality or increase operating costs substantially.

3. Raw Material Supply Security

Côte d'Ivoire produces coconuts, but the availability of coconut shells as a consistent industrial feedstock required field-level validation. Historical volatility in agricultural supply chains raised questions about feedstock continuity.

4. Financial Risk Assessment

Estimating capital expenditure, operating costs, product pricing, payback periods, and returns in an emerging market environment demands rigorous modelling. Errors at this stage can misdirect investment or understate risk.

5. Regulatory & Implementation Complexity

Setting up a manufacturing plant in West Africa requires navigating environmental permits, industrial licensing, ISO certification pathways, and infrastructure considerations. Without expert guidance, such complexity can cause project delays and cost overruns.

BUSINESS OPPORTUNITY IDENTIFIED

After conducting a structured opportunity identification exercise, NPCS recommended the manufacturing of activated carbon from coconut shells as the optimal project for M/s. Daouda Zombo. The recommendation was grounded in the convergence of four strategic factors:

Why Activated Carbon from Coconut Shells?

- **Coconut-shell carbons possess exceptionally large internal surface areas with a high proportion of micropores, making them among the most absorptive adsorbents available.** High Microporosity & Surface Area:
- **Coconut-shell activated carbon is extremely hard, generates minimal dust, and exhibits only 3–5% ash content — making it ideal for water purification and pharmaceutical applications.** High Hardness & Purity:
- **Coconut shells are an agricultural by-product. Utilising them in production creates a sustainable, circular economy supply chain while reducing agricultural waste.** Renewable Feedstock:
- **Physical steam activation avoids the use of corrosive chemicals, producing a cleaner, purer product aligned with global ESG and environmental compliance priorities.** Green Production Process:

Why Côte d'Ivoire?

Côte d'Ivoire's agricultural sector produces coconuts, and the government has actively signalled commitment to revitalising the country's coconut industry. An international summit held in Abidjan in September 2024, co-hosted with the International Coconut Community (ICC), brought together sector stakeholders and highlighted remarkable growth potential for the coconut sector. Government support for capacity building and downstream value addition ensures both raw material availability and institutional backing for manufacturing investments.

This policy environment creates a uniquely favourable investment climate — securing feedstock supply, attracting development finance, and aligning the project with national industrial development priorities.

OUR APPROACH & CONSULTING METHODOLOGY

NPCS deployed its structured, six-stage industrial consulting methodology to deliver a comprehensive, bankable project analysis:

Phase	Activity	Timeline	Status
Stage 1	Project Identification & Opportunity Mapping	Week 1–2	Completed
Stage 2	Market Analysis & Demand Assessment	Week 2–4	Completed
Stage 3	Raw Material Availability & Logistics Review	Week 3–5	Completed
Stage 4	Technical Feasibility & Process Selection	Week 4–6	Completed
Stage 5	Financial Modelling & Investment Analysis	Week 5–7	Completed
Stage 6	Implementation Planning & Strategic Advisory	Week 7–9	Completed

Stage-by-Stage Methodology Detail

Stage 1 — Project Identification: NPCS examined Côte d'Ivoire's resource base, agricultural production data, and economic development priorities. The team assessed comparative advantages and shortlisted activated carbon manufacturing as optimal for the client's stated objectives.

Stage 2 — Market Analysis: NPCS analysed global and regional demand patterns, activated carbon price trends, key end-use segments (water treatment, air purification, pharmaceuticals, gold recovery), and the competitive landscape. International trade data, ICC reports, and sector studies were synthesised.

Stage 3 — Raw Material Review: Field surveys and discussions with local producers confirmed sufficient coconut shell availability around Abidjan. NPCS cross-referenced ICC summit findings on sector revitalisation and modelled feedstock cost sensitivity.

Stage 4 — Technical Feasibility: NPCS evaluated physical (steam) and chemical activation technologies. The steam activation process was recommended for its lower environmental impact, higher product purity, and lower regulatory burden.

Stage 5 — Financial Modelling: Detailed cost models covering CapEx, OpEx, working capital, pricing benchmarks, cash flow projections, NPV, IRR, payback analysis, and sensitivity scenarios were prepared and stress-tested.

Stage 6 — Implementation Planning: NPCS prepared a phased roadmap covering site selection, equipment procurement, construction, commissioning, staffing, quality assurance (ISO certification), and regulatory compliance.

SCOPE OF SERVICES DELIVERED

NPCS delivered a comprehensive suite of consulting services as part of this engagement:

- ✓ Detailed Project Report (DPR) — bankable, investor-grade document
- ✓ Plant layout design and space utilisation planning
- ✓ Machinery selection — carbonisation furnaces, activation kilns, crushers, dryers, conveyors, screening and packaging systems
- ✓ Process flow documentation — step-by-step carbonisation and steam activation workflow
- ✓ Raw material procurement strategy — coconut shell sourcing and cost benchmarking
- ✓ Financial modelling — CapEx, OpEx, cash flows, NPV, IRR, payback projections
- ✓ Market validation — demand sizing, pricing analysis, competitive benchmarking
- ✓ Regulatory compliance roadmap — environmental permits, industrial licensing, ISO pathways
- ✓ Implementation roadmap — phase-wise project execution plan
- ✓ Export market strategy — U.S., EU, and regional West African opportunity assessment
- ✓ Strategic advisory — market positioning, branding, and offtake partnership recommendations

Key Deliverables Submitted to Client

Deliverable 1	Techno-Economic Feasibility Study Report
Deliverable 2	Detailed Project Report (DPR) — Full Volume
Deliverable 3	Financial Model with Sensitivity Analysis
Deliverable 4	Market Intelligence Report — Activated Carbon
Deliverable 5	Implementation Roadmap & Project Timeline
Deliverable 6	Machinery & Technology Specification Sheet
Deliverable 7	Raw Material Sourcing & Supply Chain Plan

TECHNICAL INSIGHTS: MANUFACTURING PROCESS

Step-by-Step Production Process

NPCS's technical team documented the complete manufacturing workflow for coconut-shell activated carbon:

1. **Raw Material Collection & Sorting:** Coconut shells are collected from local processors, sorted for size uniformity and quality, and cleaned to remove coir fibre and impurities.
2. **Crushing & Sizing:** Shells are crushed and graded into consistent particle sizes suited for the carbonisation process.
3. **Carbonisation (Pyrolysis):** Sized shells are fed into a rotary kiln or carbonisation furnace at controlled temperatures (400–700°C) in the absence of oxygen to produce char (raw carbon).
4. **Steam Activation:** The char is activated using superheated steam at 800–1,000°C in an activation kiln. Steam reacts with the carbon matrix to develop an extensive network of micropores, dramatically increasing surface area to 800–1,200 m^2/g.
5. **Cooling & Screening:** Activated carbon is cooled under inert atmosphere and screened into granular (GAC) or powdered (PAC) grades per customer specification.
6. **Quality Testing:** Product is tested for iodine number, methylene blue value, moisture content, ash content, and hardness against AWWA, ASTM, and ISO standards.
7. **Packaging & Dispatch:** Finished product is packed in 25 kg or 500 kg bags and prepared for domestic delivery or export.

Key Equipment & Machinery

Equipment	Function
Carbonisation Furnaces / Rotary Kilns	Core conversion of raw shells to char at 400–700°C
Steam Activation Kilns	High-temperature activation at 800–1,000°C with steam
Jaw Crusher & Hammer Mill	Shell crushing and particle size reduction
Vibrating Screens	Particle grading — granular and powder separation
Rotary Dryers	Moisture control before and after processing
Conveyor Systems	Material movement between processing stages
Cooling Systems	Controlled cooling of activated product under inert atmosphere
Packaging Line	Automated 25 kg / 500 kg bagging and sealing
Laboratory Equipment	Quality control testing — iodine number, ash, hardness

FINANCIAL & MARKET ANALYSIS

Market Demand & Growth Outlook

The global activated carbon market presents a compelling, multi-decade growth story driven by increasingly stringent environmental regulations, expanding water treatment infrastructure, and diversified industrial applications.

Market Indicator	Current Value	Projected Value	Growth Rate
Water Treatment Market (BIS Research)	USD 2.99 Billion (2024)	USD 7.85 Billion (2035)	9.1% CAGR
Chemicals & Materials Segment (IMARC)	USD 489.54 Million (2025)	USD 802.12 Million (2034)	5.64% CAGR
U.S. Import Price (Oct 2024)	USD 2,090 / MT	—	Stabilising
India Export Growth (2024)	+10.7% in Volume	+22.5% in Value	Strong Growth
Sri Lanka Export Growth (2024)	+13% in Volume	+20% in Value	Strong Growth

Investment & Project Economics

Financial Parameter	Estimate / Range
Plant Capital Expenditure	USD 15,000 – USD 1.5 Million (scale-dependent)
Manufacturing Cost per kg	Approx. USD 1.82 per kg
Total Product Cost per kg	Approx. USD 2.15 per kg
U.S. Import Price (benchmark)	USD 2,090 per metric ton (USD 2.09/kg)
Gross Profit Margin	35% – 45%
Net Profit Margin	15% – 20%
Internal Rate of Return (IRR)	Approx. 21%
Payback Period	Within 5 years
Net Present Value (NPV)	Positive (stress-tested at base-case volumes)

Cost Structure Breakdown

Cost Category	% of Total OpEx
Raw Material (Coconut Shells)	50% – 60% of total operating expenses
Utilities (Fuel, Power, Steam)	25% – 30% of total operating expenses

Labour & Administration	5% – 10%
Maintenance & Overheads	3% – 5%
Packaging & Transportation	3% – 5%

Demand Drivers

- Stricter global water quality standards — U.S. EPA PFAS limits, WHO drinking water guidelines
- Rising municipal water treatment infrastructure investment across Africa and Asia
- Demand from food & beverage, pharmaceutical, and gold recovery industries
- Emission control requirements driving air purification demand
- Government-driven sustainability and circular economy initiatives

RESULTS & OUTCOMES

The NPCS consulting engagement delivered measurable, strategic, and financial outcomes for M/s. Daouda Zombo:

Business Impact

- ✓ Investment decision supported by rigorous, evidence-based analysis — client moved from idea to approved project within 9 weeks
- ✓ Bankable DPR accepted by client as definitive investment and implementation guide
- ✓ Financial model validated IRR >21% and payback within 5 years — investment confidence established
- ✓ Export market access identified — U.S., EU, and regional West African markets validated

Risk Reduction Achieved

- ✓ Raw material supply risk mitigated through sourcing strategy and ICC-backed sector revitalisation data
- ✓ Technical risk eliminated through process selection (steam activation) and equipment specification
- ✓ Market risk reduced through multi-segment demand validation across water treatment, pharma, and industrial sectors
- ✓ Regulatory risk addressed through compliance roadmap covering environmental permits and ISO certification

Strategic Positioning

- ✓ Client positioned as first mover in coconut-shell activated carbon manufacturing in Côte d'Ivoire
- ✓ Project aligned with Côte d'Ivoire's national coconut sector revival and industrial diversification goals
- ✓ ESG-aligned investment profile — renewable feedstock, clean process, circular economy contribution
- ✓ Domestic and export market duality provides revenue resilience and growth optionality

Client Decision & Current Status

After reviewing NPCS's comprehensive feasibility report and financial analysis, M/s. Daouda Zombo formally approved the project recommendation. The client has initiated steps to secure land near Abidjan, engage equipment suppliers, and negotiate raw material procurement agreements with local coconut processors. NPCS continues to provide implementation support and strategic advisory.

CLIENT TESTIMONIAL

NPCS's Detailed Project Report exceeded our expectations. It not only highlighted a viable manufacturing opportunity but also provided clear financial projections, technical specifications and risk mitigation strategies. The team's understanding of local resource dynamics and global market trends gave us confidence to proceed. We look forward to continuing this partnership as we bring our activated-carbon plant to life.

— M/s. Daouda Zombo | Investor, Abidjan, Côte d'Ivoire

WHY CHOOSE NPCS

NPCS is not merely a report-generation firm. We are strategic investment partners for entrepreneurs, MSMEs, and institutional investors entering industrial manufacturing. Here is what distinguishes us:

Differentiator	What It Means for You
Proven Industrial Expertise	30+ years of active consulting across 50+ countries and 250,000+ projects across virtually every manufacturing sector
Global Market Intelligence	Proprietary database of 30,000+ DPRs and market studies providing unmatched benchmarking and pricing intelligence
Data-Driven Feasibility	Rigorous, evidence-backed analysis — no assumptions, no generalisations; every projection is grounded in verifiable data
End-to-End Support	From initial concept and feasibility to implementation planning, equipment sourcing, and market entry — NPCS covers every stage
Risk Mitigation Focus	Our methodologies explicitly identify and quantify technical, market, financial, and regulatory risks — and provide concrete mitigation strategies
Bankable Deliverables	NPCS reports are accepted by banks, development finance institutions (DFIs), and government agencies as credible investment documents
Sector Agnosticism	NPCS covers chemicals, food processing, pharma, agro-processing, renewable energy, textiles, engineering, minerals, and more

CONCLUSION

This case study illustrates how NPCS helps investors transform promising ideas into structured, fundable, and executable industrial projects. By leveraging local resource strengths, applying rigorous analytical methodologies, and delivering actionable, investor-grade documentation, NPCS enabled M/s. Daouda Zombo to make a confident, informed investment decision.

The activated carbon manufacturing project in Côte d'Ivoire exemplifies NPCS's philosophy: every industrial investment decision deserves the highest standard of analysis, the deepest market intelligence, and the most practical implementation guidance available.

With Côte d'Ivoire's coconut sector revival underway, global activated carbon demand growing at sustained rates, and the project delivering projected IRR exceeding 21%, M/s. Daouda Zombo stands well-positioned to build a commercially successful, environmentally responsible, and strategically differentiated industrial enterprise.

READY TO BUILD YOUR NEXT INDUSTRIAL PROJECT?

Partner with Niir Project Consultancy Services (NPCS) to transform your investment idea into a profitable industrial venture.

Website	www.niir.org | www.entrepreneurindia.co
Email	info@niir.org
Phone	+91 9097075054

Whether you are evaluating a new product line or assessing a greenfield manufacturing venture, NPCS provides end-to-end industrial consultancy — from market intelligence and technical analysis to financial modelling and implementation planning.