

# ***Part A: Initial Definition & Research for an on-chain marketplace platform for recycled plastic trading built on the Solana blockchain***

## **Idea Overview**

*Contribute to environmental conservation by designing and implementing an on-chain marketplace platform for recycled plastic built on the Solana blockchain, leveraging its high transaction throughput, low latency, and minimal energy consumption due to its Proof-of-History consensus mechanism, which offers significantly lower carbon footprint compared to other blockchains. The platform ensures scalable, transparent, and traceable transactions, as well as verifiable certificates for recycled materials, facilitating transactions between buyers and sellers of the three main post-consumer single-use plastic resins that generate the most global pollution: PET (Polyethylene Terephthalate), HDPE (High-Density Polyethylene), and PP (Polypropylene).*

## **Core Value Proposition**

The platform's core value proposition is to create a transparent, efficient, and environmentally sustainable marketplace for trading post-consumer plastic resins (PET, HDPE, PP). By utilizing Solana's blockchain, it ensures immutable records of transactions and material origins, providing buyers with verifiable data on quality and authenticity. Solana's technical advantages—Proof-of-History consensus which allows for a theoretical limit of up to 65,000 transactions per second and low fees,<sup>[1]</sup> as well as minimal energy consumption (0.00412 Wh per transaction)<sup>[2]</sup>—enable scalable and cost-effective operations. The platform issues verifiable plastic credits to support regulatory compliance (e.g., EU's Green Claims Directive) and promotes the circular economy by connecting buyers (e.g., manufacturers) with sellers (e.g., recyclers).

## Product-Market Fit

Given the increasing demand for recycled plastics driven by environmental regulations and sustainability goals, the platform addresses key industry challenges such as lack of transparency and verification in the supply chain. It is well-positioned to meet the needs of both sellers (recycling companies) and buyers (manufacturers needing reliable recycled materials), potentially filling a gap in the market for a dedicated, high-performance trading platform.

## Key Target Markets

Market Segment	Description	Relevance to Platform
Packaging Industry	Manufacturers of bottles, containers, and packaging materials using PET, HDPE, and PP.	Largest consumer of recycled plastics; needs traceable, high-quality resins for compliance.
Automotive Industry	Manufacturers using HDPE and PP for vehicle components like bumpers and interior trim.	Seeks sustainable materials with verifiable origins to meet environmental goals.
Textile Industry	Producers of polyester fibers from rPET for clothing and textiles.	Demands traceable rPET to support sustainable fashion and consumer preferences.
Construction Industry	Firms using recycled HDPE and PP for building materials like decking and insulation.	Values cost-effective, sustainable materials with blockchain-based verification.

## Competitor Landscape

Competitor	Description	Relevance to Project
PlasticFinder	An international marketplace for buying and selling recycled plastics, using blockchain to verify quality and origin.	Direct competitor with a blockchain-verified marketplace for recycled plastics, closely aligning with the project's focus on blockchain-based trading of recycled plastics.
Empower.eco	Facilitates Plastic Credit transactions and traceability solutions via a blockchain marketplace.	Operates in the blockchain ecosystem but focuses on plastic credits rather than direct trading of physical resins, making it a partial competitor.
Plastiks.io	Verifies plastic recovery and recycling, issuing digital certificates convertible to plastic credits using blockchain technology.	Focuses on certification and traceability rather than direct trading of physical resins, less aligned with the project's core trading focus.
Plastic Bank	A social enterprise with a global bottle deposit program, using blockchain for traceable plastic collection.	Emphasizes social impact and waste collection rather than industrial resin trading, making it a peripheral competitor.
Scrapo	The world's largest plastic recycling marketplace, connecting suppliers and buyers of recycled plastics and plastic scraps from 140 countries. Operates on a Web 2.0 platform.	Highly relevant as it closely mirrors the project's concept of a marketplace for recycled plastics but lacks blockchain integration, making it a key Web 2.0 competitor.
Precious Plastic Bazar	A peer-to-peer marketplace for buying and selling Precious Plastic machines, parts, raw materials, and recycled products. Charges a 5% transaction fee to support platform operations. Operates on a Web 2.0 platform.	Relevant but broader in scope, as it includes machinery and products beyond resins. Lacks blockchain, aligning with Web 2.0 competitors.
BaleBid	A global marketplace for trading recyclable materials, including plastics, paper, cardboard, textiles, and metals. Operates on a Web 2.0 platform with global server hosting for seamless trading.	Relevant as a marketplace for recyclables, including plastics, but its broader focus on multiple materials makes it less specialized than the project's plastic-specific vision. Lacks blockchain integration.

## **Founder-Market Fit (FMF)**

The founder's background in international relations and experience with international organizations such as UNDP and NGOs focused on labor rights and child protection, provides deep insights into sustainability challenges and supply chain transparency, critical for the recycled plastics marketplace. His expertise in project management and stakeholder engagement, honed through coordinating diverse teams, is essential for managing the platform's development and fostering collaboration among recyclers, manufacturers, and regulators. Additionally, his growing technical skills in blockchain development, particularly with Solana, Anchor, and Rust, enable the creation of a scalable and efficient platform. His network, spanning sustainability advocates, recycling industry partners, and the Solana community, supports user acquisition and partnerships, while their passion for environmental impact and social good aligns perfectly with the platform's mission to promote a circular economy and reduce plastic pollution.

## ***Part B: Process Appendix: A detailed log of the entire journey, including initial idea, all prompts, AI outputs, research notes, analyses, and rationale for refinements from both Part A and Part B of the assignment.***

Your first step is to provide a 2-5 sentence overview of your capstone project idea:

*This was the initial idea overview: Contribute to environmental conservation by designing and implementing a marketplace platform built on the Solana blockchain, leveraging its high transaction throughput, low latency, and minimal energy consumption due to its Proof-of-History consensus mechanism, which offers significantly lower carbon footprint compared to other blockchains. The platform ensures scalable, transparent, and traceable transactions, as well as verifiable certificates for recycled materials, facilitating transactions between buyers and sellers of the three main post-consumer single-use plastic resins that generate the most global pollution: PET (Polyethylene Terephthalate), HDPE (High-Density Polyethylene), and PP (Polypropylene).*

### **1) Core Value Proposition & Product-Market Fit (PMF)**

AI Task: Prompt an AI: "Based on my idea [see *idea overview*], help outline the core value proposition and initial thoughts on product-market fit. What are 2-3 key value areas?"

#### **Key Value Areas**

- **Transparency and Traceability:** Blockchain-based records ensure the origin, quality, and transaction history of recycled plastics are transparent and immutable, fostering trust and enabling regulatory compliance.
- **Operational Efficiency:** Solana's high transaction throughput and low fees facilitate fast and cost-effective trading, suitable for large-scale operations.
- **Environmental Sustainability:** The platform promotes the circular economy by facilitating the trade of recycled plastics and operates on an energy-efficient blockchain, aligning with global sustainability goals.

Output: Write a synthesized paragraph defining your initial value proposition and PMF.

The platform's core value proposition is to create a transparent, efficient, and environmentally sustainable marketplace for trading post-consumer plastic resins. By utilizing Solana's blockchain, it ensures immutable records of transactions and

material origins, providing buyers with verifiable data on quality and authenticity. Solana’s technical advantages—up to 50,000 transactions per second, low fees, and minimal energy consumption (0.166 Wh per transaction)—enable scalable and cost-effective operations. The platform issues verifiable certificates to support regulatory compliance (e.g., EU’s Green Claims Directive) and promotes the circular economy by connecting buyers (e.g., manufacturers) with sellers (e.g., recyclers).

**Product-Market Fit**

Given the increasing demand for recycled plastics driven by environmental regulations and sustainability goals, the platform addresses key industry challenges such as lack of transparency and verification in the supply chain. It is well-positioned to meet the needs of both sellers (recycling companies) and buyers (manufacturers needing reliable recycled materials), potentially filling a gap in the market for a dedicated, high-performance trading platform.

**2) Key Target Markets**

**AI Task: Prompt the AI:** "For this value proposition [see *Value Proposition.*], suggest 2-5 key target demographics or market segments."

Output: Create a list of 2-5 potential target markets.

Market Segment	Description	Relevance to Platform
Packaging Industry	Manufacturers of bottles, containers, and packaging materials using PET, HDPE, and PP.	Largest consumer of recycled plastics; needs traceable, high-quality resins for compliance.
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Textile Industry	Producers of polyester fibers from rPET for clothing and textiles.	Demands traceable rPET to support sustainable fashion and consumer preferences.
Construction Industry	Firms using recycled HDPE and PP for building materials like decking and insulation.	Values cost-effective, sustainable materials with blockchain-based verification.

**3) Competitor Landscape**

- **AI Analysis:** Prompt the AI: "Identify key competitors for a project with this value prop targeting these markets [See Value Prop and Target Markets sections]. What are potential weaknesses in their offerings?"

Competitor	Description	Relevance to Project
PlasticFinder	An international marketplace for buying and selling recycled plastics, using blockchain to verify quality and origin.	Direct competitor with a blockchain-verified marketplace for recycled plastics.
Empower.eco	Facilitates Plastic Credit transactions and traceability solutions via a blockchain marketplace.	Operates in the same ecosystem but focuses on credits rather than direct resin trading.
Plastiks.io	Verifies plastic recovery and recycling, issuing digital certificates convertible to plastic credits.	Focuses on certification and traceability, not direct trading of physical resins.
Plastic Bank	A social enterprise with a global bottle deposit program, using blockchain for traceable plastic collection.	Emphasizes social impact and waste collection, not industrial resin trading.

- Manual Research (Mandatory): Independently research competitors using web searches, social media, tech news, etc.

In the manual search, I found the same sites related to plastic recycling and blockchain technology that the LLM also found. On my part, I found the following sites that the LLM did not find, but I think this was because it focused on searching for sites related to blockchain and omitted in its report the sites that had nothing to do with that technology, for example:

<https://scrapo.com/> – this concept is the most similar to the project I have in mind but is based on Web 2.0

<https://bazar.preciousplastic.com/> – a marketplace focused not only on resins but also on machinery and final products.

<https://www.balebid.com/> – this is interesting, it's a marketplace but for all types of recyclables, paper, cardboard, glass, aluminum, it made me think to expand the scope of my project, perhaps in the future.

In this manual search, I found that some potential competitors use the concept of plastic credits: "Represent the collection, recycling, or proper disposal of a specific amount of plastic waste (e.g., 1 ton of plastic). They focus on reducing plastic pollution and improving waste management." This concept is similar to my initial idea of issuing certificates for the purchase and sale of recycled plastic, which encourages me to investigate further. If this is an industry-standard concept, it would

be better to adopt it rather than create a new one. The idea would be to issue these plastic credits in the form of SPL tokens.

Output: Create a combined list of competitors. Note which competitors the AI identified vs. missed. Briefly analyze the gaps you discovered versus what the AI found.

## Consolidated Competitor Landscape

Competitor	Description	Relevance to Project
PlasticFinder (LLM identified)	An international marketplace for buying and selling recycled plastics, using blockchain to verify quality and origin.	Direct competitor with a blockchain-verified marketplace for recycled plastics, closely aligning with the project's focus on blockchain-based trading of recycled plastics.
Empower.eco (LLM identified)	Facilitates Plastic Credit transactions and traceability solutions via a blockchain marketplace.	Operates in the blockchain ecosystem but focuses on plastic credits rather than direct trading of physical resins, making it a partial competitor.
Plastiks.io (LLM identified)	Verifies plastic recovery and recycling, issuing digital certificates convertible to plastic credits using blockchain technology.	Focuses on certification and traceability rather than direct trading of physical resins, less aligned with the project's core trading focus.
Plastic Bank (LLM identified)	A social enterprise with a global bottle deposit program, using blockchain for traceable plastic collection.	Emphasizes social impact and waste collection rather than industrial resin trading, making it a peripheral competitor.
Scrapo (LLM missed)	The world's largest plastic recycling marketplace, connecting suppliers and buyers of recycled plastics and plastic scraps from 140 countries. Operates on a Web 2.0 platform.	Highly relevant as it closely mirrors the project's concept of a marketplace for recycled plastics but lacks blockchain integration, making it a key Web 2.0 competitor.
Precious Plastic Bazar (LLM missed)	A peer-to-peer marketplace for buying and selling Precious Plastic machines, parts, raw materials, and recycled products. Charges a 5% transaction fee to support platform operations. Operates on a Web 2.0 platform.	Relevant but broader in scope, as it includes machinery and products beyond resins. Lacks blockchain, aligning with Web 2.0 competitors.



BaleBid (LLM missed)	A global marketplace for trading recyclable materials, including plastics, paper, cardboard, textiles, and metals. Operates on a Web 2.0 platform with global server hosting for seamless trading.	Relevant as a marketplace for recyclables, including plastics, but its broader focus on multiple materials makes it less specialized than the project's plastic-specific vision. Lacks blockchain integration.
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#### 4) Founder-Market Fit (FMF)

- Manual Task: Write a brief paragraph detailing your background, skills, passion, and network relevant to this project idea.

With a background in international relations and experience in international development at UNDP, SRE, and NGOs focused on labor rights and child protection, I bring a unique perspective to the on-chain recycled plastics marketplace. My skills in project management and stakeholder engagement, honed through coordinating diverse teams, complement my growing expertise in blockchain development, developed through self-study of Solana, Anchor, and Rust, and active participation in the 2025 Q3 Turbin3 Builders Cohort. Driven by a passion for technological innovation, environmental impact, and social good, I am committed to leveraging Solana's scalable, energy-efficient blockchain to create transparent and sustainable solutions for the recycled plastics industry. My network spans sustainability advocates, industry partners in recycling, and the vibrant Solana blockchain community, fostering collaboration to build impactful, decentralized marketplaces.

- AI Task (Optional): Ask the AI: "Given my background [details], how might I frame my founder-market fit for this project idea [overview]?"

Founder Attribute	Relevance to Project
International Relations & NGO Experience	Provides insight into sustainability challenges and supply chain transparency needs.
Project Management & Stakeholder Engagement	Enables coordination of diverse stakeholders and management of platform development.
Blockchain Development Skills	Ensures ability to build a scalable, efficient platform using Solana, Anchor, and Rust.
Sustainability & Blockchain Network	Facilitates user acquisition, partnerships, and technical support for platform growth.
Passion for Impact	Aligns with the platform's mission, resonating with eco-conscious stakeholders.

- Output: An articulated paragraph describing your perceived FMF.

The founder's background in international relations and experience with international organizations such as UNDP and NGOs focused on labor rights and child protection, provides deep insights into sustainability challenges and supply chain transparency, critical for the recycled plastics marketplace. His expertise in project management and stakeholder engagement, honed through coordinating diverse teams, is essential for managing the platform's development and fostering collaboration among recyclers, manufacturers, and regulators. Additionally, his growing technical skills in blockchain development, particularly with Solana, Anchor, and Rust, enable the creation of a scalable and efficient platform. His network, spanning sustainability advocates, recycling industry partners, and the Solana community, supports user acquisition and partnerships, while their passion for environmental impact and social good aligns perfectly with the platform's mission to promote a circular economy and reduce plastic pollution.

### Adversarial Analysis & Refinement

1) Adversarial AI Task: Consolidate your outputs for Value Prop/PMF, Target Markets, and Competitors. Prompt the AI with a critical question.

- Example Prompt: "Critique my project's value proposition, target market, and competitive analysis [Paste relevant outputs]. Why might this not be a true blue ocean? What types of competitors might have been overlooked?"

Documentation: Record the full AI critique and write your initial analysis of its validity.

#### AI Critique:

- Strengths: The competitive analysis correctly identifies blockchain-based platforms as key competitors and highlights their focus on traceability or credits rather than direct trading. Solana's technical advantages (speed, cost, energy efficiency) position your platform to potentially outperform competitors using other blockchains (e.g., Ethereum, which has higher fees). The focus on PET, HDPE, and PP leverages their dominance in the recycled plastics market, with PET alone holding the largest share (Persistence Market Research(<https://www.persistencemarketresearch.com/market-research/recycled-plastic-market.asp>)).

- Weaknesses: The analysis underestimates the competitive landscape by overlooking platforms like **PCX Markets**, which launched a recycled plastics marketplace in July 2025, offering PET, HDPE, and PP in forms like flakes and pellets, directly competing with your platform ([Sustainable Plastics](<https://www.sustainableplastics.com/news/pcx-launches-recycled-plastics-marketplace>)). Oceanworks, a global marketplace for recycled plastics, also competes by serving brands in packaging and textiles with a focus on ocean-bound plastics ([Oceanworks](<https://oceanworks.co>)). Additionally, traditional resin brokers (e.g., RecycleBlu, [[recycleblu.com](https://www.recycleblu.com)])(<https://www.recycleblu.com>)) and regional marketplaces (e.g., PlasticsMarkets.org in North America,

[plasticmarkets.org](https://www.plasticmarkets.org)) were not considered, despite their role in connecting buyers and sellers without blockchain. These platforms may have established relationships and lower barriers to entry for non-tech-savvy users.

### Why This Might Not Be a True Blue Ocean?

A true blue ocean strategy involves creating a new market space with little to no competition. However, your project operates in a competitive "red ocean" due to:

- Direct Competitors: PCX Markets and Oceanworks already offer marketplaces for recycled plastics, targeting the same resins (PET, HDPE, PP) and industries (packaging, textiles). PCX Markets, for instance, sources recyclates from audited partners in Southeast Asia, offering both resin trading and plastic credits, which overlaps with your value proposition ([Sustainable Plastics](https://www.sustainableplastics.com/news/pcx-launches-recycled-plastics-marketplace)).
- Evolving Blockchain Platforms: Platforms like Circulor, which focuses on supply chain traceability for plastics, could expand into trading functionalities, as seen in their partnerships with TotalEnergies ([Plastics Engineering](https://www.plasticsengineering.org/2025/03/how-blockchain-is-transforming-plastic-waste-management-008320/)). This potential expansion reduces the uniqueness of your platform.
- Traditional and Regional Players: Non-blockchain marketplaces and brokers (e.g., RecycleBlu, PlasticsMarkets.org) compete by offering established networks and simpler interfaces, appealing to users unfamiliar with blockchain. Regional platforms in Europe, Asia, or North America may also dominate local markets, limiting your global reach.

### Overlooked Competitors:

- Regional Marketplaces: Platforms like PlasticsMarkets.org in North America or similar exchanges in Europe and Asia, which connect buyers and sellers of scrap plastics, may not use blockchain but have established user bases ([PlasticsMarkets.org](https://www.plasticmarkets.org)).
- Traditional Resin Brokers: Companies like RecycleBlu and Nexeo Plastics act as intermediaries for recycled resins, leveraging extensive networks without the complexity of blockchain ([RecycleBlu](https://www.recycleblu.com), [Nexo Plastics](https://www.nexooplastics.com)).
- Plastic Credit Platforms with Potential Expansion: Empower and Plastic Bank, while focused on credits, could integrate resin trading, especially as brands seek integrated solutions ([Empower](https://empower.eco), [Plastic Bank](https://plasticbank.com)).
- Chemical Recycling Innovators: Companies like Veolia (PlastiLoop) and BASF, which produce recycled resins through advanced recycling technologies, may develop their own trading platforms or partner with existing ones ([Fortune Business Insights](https://www.fortunebusinessinsights.com/recycled-plastic-market-102568)).

2) Refine Project Definition: Analyze the AI critique and refine your Value Proposition, Target Market, and Competitor sections based on the valid points raised. Document your rationale for all changes.

Analysis of LLM Critique Validity:

- Valid Points: The AI correctly identifies the competitive landscape, particularly PCX Markets and Oceanworks, as direct threats. The emphasis on overlooked traditional brokers and regional platforms is valid, as these are significant in the recycling market

([RecycleBlu](https://www.recycleblu.com),

[PlasticsMarkets.org](https://www.plasticsmarkets.org)).

- Less Relevant Points: The LLM's suggestion that Circular might expand into trading is speculative, as their focus remains on traceability.

3) Critique & Refine FMF:

- AI Prompt: "Critique my founder-market fit [Paste FMF paragraph]. What makes it potentially weak? How could I strengthen my positioning?"

Critique of Founder-Market Fit:

What Makes It Potentially Weak:

1. Limited Direct Industry Experience:

- While your international development experience provides sustainability insights, you lack direct experience in the plastics recycling industry. Understanding resin quality standards (e.g., food-grade certification), pricing dynamics, and logistical challenges (e.g., contamination rates) is critical for designing a user-centric platform. For example, PCX Markets' success relies on its deep industry knowledge and audited recycling partners ([Sustainable Plastics](https://www.sustainableplastics.com/news/pcx-launches-recycled-plastics-marketplace)).

2. Emerging Technical Expertise:

- Your self-study of Solana, Anchor, and Rust, while promising, is still developing. Building a robust marketplace with smart contracts, tokenization, and oracle integration requires advanced technical skills. Delays or errors in development could undermine credibility.

3. Network Gaps:

- Your network includes sustainability advocates and the Solana community but may lack deep connections with key recycling industry players (e.g., Veolia, Coca-Cola) or manufacturers. Established competitors like Oceanworks have partnerships with brands and recyclers, giving them a head start ([Oceanworks](https://oceanworks.co)).

4. Commercial Focus:

- Your passion for social and environmental impact is a strength, but the recycled plastics market prioritizes cost efficiency, supply reliability, and compliance. Without a strong focus on these commercial needs, the platform may struggle to attract large manufacturers or compete with cost-focused brokers like RecycleBlu.

## How to Strengthen Your Positioning:

### 1. Gain Industry-Specific Knowledge:

- Conduct targeted research or interviews with recyclers and manufacturers to understand their pain points (e.g., supply chain inefficiencies, quality assurance). For example, explore how Veolia's PlastiLoop addresses resin quality ([Fortune Business Insights](<https://www.fortunebusinessinsights.com/recycled-plastic-market-102568>)).

- Attend industry events like Circular Economy Week ([circularweek.com](<https://circularweek.com>)) or join associations like the Plastics Recycling Association ([plasticsrecycling.org](<https://plasticsrecycling.org>)) to gain insights and credibility.

### 2. Enhance Technical Skills:

- Accelerate your blockchain development by building a prototype or contributing to Solana-based projects. Focus on mastering smart contract development with Anchor and integrating oracles (e.g., Switchboard, [Switchboard Docs](<https://docs.switchboard.xyz/>)) for delivery verification.

- Leverage the Turbin3 Builders Cohort for mentorship and peer feedback to ensure your MVP meets technical standards.

### 3. Expand Industry Network:

- Connect with recyclers (e.g., PlastiLoop, KW Plastics) and manufacturers (e.g., PepsiCo, H&M) to validate your platform and secure early adopters. For example, pitch to brands with sustainability goals, like Coca-Cola's 50% recycled content target ([Fortune Business Insights](<https://www.fortunebusinessinsights.com/recycled-plastic-market-102568>)).

- Partner with regional recycling firms or NGOs in underserved markets (e.g., Latin America, Africa) to differentiate from competitors like PCX Markets, which focus on Southeast Asia.

### 4. Validate with Users:

- Conduct surveys or pilot tests with potential users to refine features, such as pricing models or certification processes. For example, ask recyclers about their challenges in accessing buyers or manufacturers about their need for traceable resins.

- Develop a low-fidelity MVP to gather feedback, ensuring the platform meets user needs for cost, speed, and usability.

### 5. Differentiate the Platform:

- Highlight Solana's cost and speed advantages to undercut competitors' fees. Emphasize energy efficiency to appeal to eco-conscious brands ([Crypto Carbon Ratings Institute](https://carbon-ratings.com/)).

- Offer unique features, such as integrated logistics support or compliance tools for EU regulations, to stand out from PCX Markets and Oceanworks.

- Target niche markets, like small-scale recyclers in developing regions, to address underserved segments and align with your social impact goals, similar to Plastic Bank ([plasticbank.com](https://plasticbank.com)).

#### 6. Collaborate with Competitors:

- Explore partnerships with platforms like Empower or PlasticFinder to integrate their credit or certification systems, reducing competition and leveraging their networks ([Empower](https://empower.eco), [Innovation Origins](https://innovationorigins.com/en/blockchain-based-system-reveals-recycled-plastics-history-using-a-qr-code/)).

- Action: Analyze the feedback and refine your FMF section. Document the rationale.

The FMF critique is accurate in highlighting limited industry experience and technical depth as risks, given the complexity of the recycling supply chain and blockchain development, but also provides relevant comments on how to improve FMF positioning.

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[1]

<https://www.independentreserve.com/blog/knowledge-base/exploring-solana-a-next-generation-blockchain-platform>

[2] <https://solana.com/news/energy-use-report-september-2024>