solution research

approach from interview:

supply of lithium

demand of lithium

VS/

amount of raw Lithium resources global

amount of raw lithium resources global available

what is the soulution to this disparity? is there a disparity, if yes why?

what are the problems?

what could be a solution?

**pictures/ graphs in canva:**

**for ppp/ structure of pitch**

global overview where is lithium/ find this as a chart/ worldmap

* Australia: The largest producer, accounting for approximately 60% of global lithium production. Major mines include Greenbushes and others in Western Australia.
* Chile: Contributes around 20% of global production, primarily from the Salar de Atacama.
* China: Produces about 12%, with significant production from both brine and hard rock sources.
* Argentina: Accounts for roughly 6% of global production, mainly from salt flats.
* United States: Contributes about 2%, with operations primarily in Nevada.

current urge, geoploitics, war case study

lithium overview, graphs, short how and why mining crm

lithium supply and demand dynamics 10-15 y

impact for recycling li and not

challenges of li recycling

*→ leading to solution*

pitch business case

*prototype*

summary why this matters and move to circular economy, way forward

(sources, facs and figures)

as something like this on the market, differentiation as baseline for this case study

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## **Executive Summary**

### **1. Lithium Supply and Demand Dynamics**

#### **Current and Projected Scenario (Next 10-15 Years)**

* Production Growth: Global lithium production is anticipated to increase at an average rate of 20-30% annually to meet the **burgeoning** demand.
* **Demand Surge:** Driven primarily by the electric vehicle (EV) sector and energy storage systems (ESS), lithium demand is expected to account for 60-70% of total usage by 2035.
* **Supply-Demand Gap**: As of 2023, global demand (250,000 metric tons) outpaces production (120,000 metric tons). Without significant enhancements in production and recycling, this gap is projected to widen, resulting in:
  + Price Volatility (Schwankung): Increased lithium costs impacting EV and ESS pricing.
  + Supply Chain Bottlenecks: Delays in manufacturing lithium-dependent technologies.
  + Resource Scarcity: Heightened geopolitical tensions over limited lithium sources.

### **2. Importance and Impact of Lithium Recycling**

#### **Role of Recycling in Mitigating Depletion**

* Extended Resource Lifespan: Effective recycling can recover 50-70% of used lithium, significantly reducing dependence on new mining activities.
* Environmental Benefits: Minimizes ecological degradation, conserves water, and reduces the carbon footprint associated with lithium extraction.
* Economic Advantages: Lowers raw material procurement costs and stabilizes lithium market prices.

#### **Impact Analysis**

* With Recycling:
  + Increased Recycling Rates: Potential rise by 40-60%, contributing 100,000-150,000 metric tons of lithium annually.
  + Supply-Demand Balance: Alleviates the gap, enhancing market stability and supporting sustainable growth.
* Without Recycling:
  + Accelerated Resource Strain: Greater reliance on finite lithium resources, risking depletion within 50-100 years under current demand growth.
  + Environmental Degradation: Intensified mining leads to significant ecological harm and resource depletion.
  + Market Instability: Increased price fluctuations disrupt the growth trajectories of EV and renewable energy sectors.

### **3. Challenges in Lithium Recycling**

#### **Administrative and Operational Hurdles**

* Paperwork and Bureaucracy: Complex and time-consuming documentation impedes efficient recycling processes.
* Lack of Traceability: Difficulty in tracking lithium through the supply chain hinders effective recycling efforts.
* Green Compliance Burden Disparity:
  + Large Corporations: Equipped with resources to manage compliance.
  + Smaller Businesses: Struggle with limited resources, facing disproportionate pressures that risk profit margins and competitive viability.
* Transition Period Struggles: Operational friction as industries move toward a circular economy without fully integrated systems.

### **4. Proposed Solution: LithiumSync AI – Streamlining Lithium Recycling Compliance**

#### **Solution Overview**

LithiumSync AI is an intelligent, cloud-based platform designed to automate and simplify the compliance process for lithium recycling. Utilizing artificial intelligence and blockchain technology, LithiumSync AI addresses administrative burdens, enhances traceability, and ensures real-time monitoring to help businesses of all sizes adhere to sustainability regulations effortlessly.

#### **Key Features / Scope It**

1. Automated Documentation
   * AI-driven generation and submission of compliance forms.
2. Traceability and Monitoring
   * Blockchain integration for transparent tracking of lithium from extraction to recycling.
   * Real-time dashboards providing up-to-date status on recycled lithium streams.
3. Compliance Assistance
   * Automatic updates with the latest sustainability regulations.
   * Customized alerts for deadlines and required actions.
4. Scalability for All Business Sizes
   * Tiered pricing plans tailored for small, medium, and large enterprises.
   * User-friendly interface requiring minimal training.
5. Integration with Existing Systems
   * API connectivity for seamless integration with ERP, CRM, and supply chain management systems.

#### **Benefits**

* For Small Businesses:
  + Cost-Effective Compliance: Reduces financial and operational burdens.
  + Competitive Equality: Enables smaller players to meet sustainability standards without disproportionate costs.
* For Larger Corporations:
  + Efficiency Optimization: Streamlines large-scale recycling operations.
  + Enhanced Reporting: Comprehensive analytics supporting corporate sustainability goals.
* For the Environment:
  + Increased Recycling Rates: Simplifies processes, encouraging broader participation.
  + Reduced Environmental Impact: Decreases dependence on raw lithium mining.

#### **Market Opportunity**

* Global Lithium Market: Expected to reach $10 billion by 2030, with significant investments in recycling and sustainability solutions.
* Recycling Industry Growth: Projected **CAGR** of 25% over the next decade, driven by regulatory pressures and environmental awareness.
* Target Audience:
  + Recycling Facilities
  + EV Manufacturers
  + Energy Storage Companies
  + Consumer Electronics Firms
  + Smaller Businesses in Supply Chains

#### **Competitive Advantage**

* AI and Automation: Differentiates from traditional compliance solutions with intelligent automation.
* Comprehensive Traceability: Utilizes blockchain for unparalleled transparency.
* User-Centric Design: Specifically addresses the needs of smaller businesses.
* Scalability and Flexibility: Adapts to varying business sizes and evolving regulations.

### **5. Projected Impact of LithiumSync AI**

#### **With LithiumSync AI**

* Recycling Rates: Increase by 40-60%, significantly supplementing lithium supply.
* Supply-Demand Balance: Provides an additional 100,000-150,000 metric tons annually through enhanced recycling.
* Environmental Impact: Reduces carbon emissions and water usage linked to new mining.( number ?)
* Economic Stability: Stabilizes lithium prices, benefiting manufacturers and consumers. (in what ways?)

#### **Without LithiumSync AI**

* Recycling Barriers: Persistent administrative and compliance hurdles limit recycling efforts.
* Increased Supply Gap: Greater reliance on new mining exacerbates shortages and price volatility.
* Environmental Degradation: Heightened mining activities intensify environmental harm.
* Market Instability: Fluctuating lithium prices disrupt the growth of EVs and renewable energy sectors.

Check the competition on the market, is there a similar approach?

### **6. Financial Projections and Implementation Strategy**

#### **Initial Funding Requirements/ do we agree with the numbers ? /**

Scope it more and make it for SMI or is it already?

* Development Costs: $1.5 million
* Marketing and Sales: $500,000
* Operational Expenses: $300,000 for the first year

#### **Revenue Projections (First 5 Years)**

| **Year** | **Subscribers** | **Revenue (USD)** |
| --- | --- | --- |
| 1 | 100 | $500,000 |
| 2 | 500 | $2.5 million |
| 3 | 1,500 | $7.5 million |
| 4 | 3,000 | $15 million |
| 5 | 5,000 | $25 million |

#### **Implementation Phases**

1. MVP Development: Core features and pilot testing with select recycling facilities and small businesses.
2. AI Enhancement: Improve document generation accuracy and incorporate predictive analytics.
3. Blockchain Integration: Implement secure traceability and establish partnerships with regulators.
4. Market Expansion: Launch B2B marketing campaigns, establish customer support, and scale operations.

## **Conclusion**

Addressing the lithium supply-demand gap is critical for sustaining the growth of the electric vehicle and renewable energy sectors. LithiumSync AI presents a t**ransformative solution by streamlining the recycling compliance process,** thereby **enhancing recycling rates and mitigating resource depletion**. By **reducing administrative burden**s and fostering a more **inclusive and efficient recycling ecosystem**, LithiumSync AI not only supports *environmental sustainability* but also *ensures economic stability* within the lithium market. This innovative approach positions the company to play a pivotal role in the *global transition towards a circular economy*, making it a compelling investment opportunity.

Key Takeaways:

* Long-Term Availability: Lithium is unlikely to be depleted in the foreseeable future, spanning multiple centuries under current resource estimates.
* Dynamic Factors: Production rates and demand are not static; ongoing changes can accelerate resource consumption or extend resource availability.
* Sustainability Measures: Recycling and technological innovations are crucial in managing lithium resources efficiently and mitigating environmental impacts.
* Continuous Monitoring: Regular updates to resource estimates, production capacities, and demand projections are essential for accurate depletion forecasting.

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### **1. Project Overview**

**Topic:***Electro-Waste & Recycling of Critical Raw Materials (CRM), with a focus on Lithium-Ion Batteries.*

**Objective:**

* Analyze the value chain of lithium-ion batteries (LiB) in the context of e-waste management.
* Propose systemic solutions to improve circularity, recycling efficiency, and compliance with regulations like the EU Battery Regulation and CRMA.

**Key Focus Areas:**

* Geopolitical dependencies (e.g., China’s role in CRM supply).
* Circular economy practices (urban mining, recycling infrastructure).
* Regulatory gaps and opportunities (Basel Convention, CRMA).

### **2. Background & Context**

#### **Global E-Waste Crisis**

* 420.3 million metric tons of e-waste generated globally (2014–2022), expected to double by 2050.
* Only 12% of electronics are recycled; 70% of landfill toxicity comes from e-waste.

#### **Lithium-Ion Batteries**

* Critical raw materials (CRM): Lithium, Cobalt, Nickel.
* Recycling challenges: Complex disassembly, hazardous components, low collection rates no homogeneity in design and regulations-> complication for recycling infrastructure

#### **Regulatory Frameworks**

* **Basel Convention**: Restricts hazardous waste exports to developing nations.
* **Critical Raw Materials Act (CRMA)**: EU regulation to secure CRM supply through recycling and circularity.
* **EU Battery Regulation (2027)**: Targets 70% lithium recovery from LiB.

**Key Challenges**

* Economic pressure: Mining is cheaper than recycling.
* Consumer responsibility gaps and lack of awareness.
* Compliance disparities between large and small companies.

### 

### **3. Internship Schedule & Tasks**

#### **Weekly Plan**

| **Week** | **Key Activities** |
| --- | --- |
| **W1** | Deepen topic understanding; Meetings with supervisor (Rea); Workshop. |
| **W2** | Value chain workshop; Define company roles. |
| **W3** | Focus on lithium-ion battery mapping and co-working. |
| **W4–W7** | Brainstorming, stakeholder interviews, and systems analysis, solution session |

#### **To-Do List**

* Map LiB value chain (DESTEP analysis).
* Research recycling technologies (e.g., black mass processing).
* Interview industry experts (Umicore, TNO, Fraunhofer).
* Prototype a solution (e.g., app for traceability).

### **4. Research & Analysis**

#### **Systems Mapping**

* **DESTEP Analysis**: Demographic, Economic, Social, Technological, Environmental, Political factors influencing LiB recycling.
* **E-Waste Flows**: Legal/illegal export routes from the Netherlands to Africa/EU.

#### **Value Chain Breakdown**

1. **Production**: CRM mining, battery manufacturing.
2. **Usage**: E-bike batteries, consumer electronics.
3. **End-of-Life**: Collection, dismantling, recycling.
4. **Reintegration**: Recycled materials re-entering supply chains.

#### **Key Data Sources**

* RMIS (Raw Materials Information System).
* IEA Reports on mineral demand.
* Philips Sustainability Reports.

### 

### **5. Stakeholder Interviews & Insights**

#### **Key Interviews**

* **Hannah Jung (TNO)**: Highlighted legal loopholes in e-waste exports and infrastructure gaps in Africa.
* **Thomas Fischer (Industry Expert)**: Discussed EPR models and operational challenges in recycling.
* **Umicore**

#### **Interview Themes**

* **Economic Incentives**: Profitability of recycling vs. mining.
* **Policy Gaps**: Inconsistent regulations across regions.
* **Innovation**: Second-life applications, AI in logistics.

### **6. Identified Challenges & Problems**

1. **Economic Barriers**: Low profitability of recycling due to cheaper mining.
2. **Regulatory Complexity**: Disproportionate compliance burden on SMEs.
3. **Collection Gaps**: Only 12% of LiB collected for recycling.
4. **Technological Lag**: No standardized processes for emerging battery types.
5. **Geopolitical Risks**: CRM supply monopolies (e.g., China, Russia-Ukraine lithium conflicts).

### **Umicore Recycling Group Interview**

### **Umnicore**

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### **Interview with Hannah Jung – TNO**

#### **Main Insights**

### E-waste is often falsely labeled as second-hand products when exported from Western countries. This makes the shipment legal under the pretense of fulfilling a need in African nations.

### These products are used in African countries until they reach a point where they have no further afterlife or value.

### PV (photovoltaic) installation is becoming more relevant, contributing to increased e-waste.

### E-waste in Africa is not recycled due to a lack of infrastructure; instead, it is stored and used to the point of no renewal.

### There are no established processing systems for e-waste in many regions.

### The increased use of electronics, especially batteries, is contributing to growing e-waste volumes but more are big maschieneries.

### In the Southern Hemisphere, markets are the main drivers of change, while in the Northern Hemisphere, policymakers and industry leaders hold the most systematic power.

### Product reuse occurs on a larger scale in African countries compared to Northern countries.

### Market prices drive change more than policies or ideals.

### Investing in preprocessing of e-waste could create new job markets.

### Waste compensation mechanisms could be explored as part of the solution.

### 

#### General Hurdles

### Low collection rates and inconsistent flows of e-waste hinder proper recycling.

### Recycling capacity is limited and often considered the weakest point within the “R-strategies” (e.g., reduce, reuse, recycle).

### Disassembly and sorting processes are both labor- and cost-intensive.

### Geopolitical interests complicate progress in global e-waste management.

### 

#### Possible Solutions

### Develop new markets and explore closing the loop (requires more research).

### Establish collection businesses for consistent and efficient e-waste management.

### Bridge the gap between sustainability and commercial viability.

### Focus on “doers” – local actors and entrepreneurs implementing practical solutions.

### 

#### Additional Notes

#### General Hurdles

### Low collection rates and inconsistent flows of e-waste hinder proper recycling.

### Recycling capacity is limited and often considered the weakest point within the “R-strategies” (e.g., reduce, reuse, recycle).

### Disassembly and sorting processes are both labor- and cost-intensive.

### The scale of battery production and innovation will influence future recycling capabilities and system development.

### Geopolitical tensions and shifting power dynamics are increasing the relevance of recycling. Dependence on internal material flows will become more critical for national resilience and autonomy

### **7. Proposed Solutions & Next Steps**

#### Short-Term Actions

* Policy Advocacy: Stricter EPR schemes and tax incentives for recyclers.
* Consumer Campaigns: Deposit schemes for battery returns.

#### Long-Term Strategies

* Circular Business Models: Battery leasing, material passports.
* Infrastructure Investment: Pre-processing hubs in Africa to create jobs.
* Technology Integration: Blockchain for traceability, AI for logistics optimization.

#### Feasibility Study

* Pilot a LiB collection app in the Netherlands (partnering with Stibat or Umicore).
* Analyze cost-benefit of urban mining vs. traditional recycling.

### **Problem: Product Inflow**

There is **a growing incentive to collect e-waste** due to **resource scarcity**. The valuable materials embedded in these products can be **retrieved through recycling**, creating **a potential business case** for circular practices. Establishing a business incentive around the recovery of critical resources could drive better collection and recycling efforts.

### **To Look Into:**

* **EPR (Extended Producer Responsibility)** – A policy approach where producers are responsible for the entire lifecycle of their products, including take-back, recycling, and final disposal.
* **Stichting Open** – Dutch organization managing the producer responsibility system for electrical and electronic equipment.
* **Stibat** – A Dutch organization responsible for the collection and recycling of used batteries.
* **Closing the Loop** – A company offering **waste compensation** services by collecting scrap phones in African countries to offset new device sales.
* **National Material Observatory (NMO) – TNO** Also referred to as **Nederlands Materialen Observatorium**, this initiative maps and monitors **value chains of critical raw materials** for the Netherlands, in collaboration with businesses and other partners.

**Landbell Group Interview with Thomas Fischer (EPR)**

[**Thomas Fischer (External): Position Papers - ERP Global**](https://teams.microsoft.com/l/message/19:meeting_MzVhYzg2MmItYmIxYS00YzM2LWFjOWYtYWM2MjhkZTU0MmY0@thread.v2/1743411662130?context=%7B%22contextType%22%3A%22chat%22%7D)

### **Interview Insights – Thomas Fischer**

#### **Problems**

1. Recycling vs. Mining  
    Mining remains more accessible and cheaper than recycling, making recycling a less attractive option from an economic standpoint.  
   * Incentive factor: There's a lack of financial motivation to invest in recycling.
   * Sustainability factor: Recycling ranks low on the R-hierarchy (e.g., Reduce, Reuse, Recycle), reducing its priority.
2. Low Collection Rates  
    Collection rates are not high enough to make mass recycling profitable or efficient, especially without consistent material streams.
3. Consumer Responsibility & Awareness Gap  
   * Consumers often lack awareness or believe the responsibility lies solely with producers or governments.
   * This mindset is rooted in capitalist systems, where the consumer's role in sustainability is downplayed.
4. **Regulatory Complexity & Compliance Disparity  
    There’s a lack of traceability and systemic structures to monitor and enforce regulations effectively.**
   * **This creates a “Green Compliance Burden Disparity”:  
      Larger corporations have the money, time, and personnel to comply with emerging sustainability regulations.  
      Smaller businesses, however, face disproportionate pressure due to limited resources, risking profit loss and being pushed out of competition.**
5. ✅ Term suggestion for this phenomenon:  
    Sustainability Compliance Inequality  
   OR  
    Environmental Regulatory Disparity  
    This describes the unequal burden smaller companies face when adapting to new environmental regulations compared to large corporations.
6. Inhomogeneous Waste Management Processes  
    Waste management practices vary greatly between regions and companies, leading to fragmentation and inefficiencies. (Especially in Europe)
7. Rapid Technological Change  
    New technologies are emerging faster than recycling systems can keep up, leaving many materials without end-of-life solutions.
8. Disjointed Communication Platforms  
    For materials like copper and others, communication systems are fragmented and not unified across industries or regions, making coordination difficult.
9. Transition Period Struggles  
    The current phase is a transition period, which poses significant challenges. We're not yet in a fully circular system, but we’re being pushed in that direction—causing friction across sectors.
10. Waste sector is not Homogenous (No einheitliche regulations europe wise)
11. Especially difficult fot battery market since all batteries are different
12. Prices control the market and viability

### **Trends & Push Factors**

* Long-Term Trend: The future is headed toward circularity.
* Push Factor:  
   A key motivator for adopting a circular economy is the desire to reduce dependence on geopolitical power structures in the supply chain by using recycled materials already in circulation.
* Lithium Market:  
   An emerging market for lithium highlights the importance of developing systems that can reintegrate collected materials into the value chain. This is dependent on CRM (critical raw material) market fluctuations and price trends.
* Companies are being pushed by external environmental and societal pressures to adopt sustainable practices.

### **Principles & Challenges**

* Polluter Pays Principle (PPP):  
   A policy framework where those responsible for pollution bear the costs of its cleanup and mitigation.  
  + Aims to internalize environmental damage.
  + ⚠️ However, implementation must be cautious to avoid reinforcing inequalities.
* Convenience vs. Accountability:  
   There's a systemic convenience in having no real consequences for unsustainable behavior, making meaningful change harder.

### **Ideas for Solutions**

* Develop new markets that support circularity – further research needed.
* Encourage “closing the loop” business models.
* Strengthen the collection business sector for e-waste and used electronics.
* Focus on bridging the gap between sustainability and commercial benefit.
* Empower the "doers" – individuals and businesses taking practical action on the ground.
* Take-back programs – explore how to reduce friction and make them user-friendly and efficient.
* Alleviate the regulatory compliance burden for small businesses through:  
  + Standardized, simplified reporting tools.
  + Shared platforms or networks for compliance tracking.
  + Financial or policy incentives to support small enterprises.

**Ideas for Solutions**

* Development of New Markets  
   Encourage innovation and investment in circular business models that support "closing the loop."
* Collection Businesses  
   Establish local and scalable collection programs to improve e-waste flow consistency.
* Bridge Commercial and Sustainable Goals  
   Create economic incentives that align business interests with sustainability goals.
* Focus on Doers  
   Support hands-on actors and small innovators who are implementing solutions, rather than only strategists and policymakers.
* Take-Back Programs  
   Explore producer- or retailer-led return systems. These face barriers ("pains") like logistics and consumer participation but offer long-term value.
* Reduce Compliance Burden for SMEs  
   Solutions could include shared platforms, digital tools for monitoring, subsidies, or simplified reporting processes to ease the burden on small businesses

### **Key Problems and Insights from the Study on Critical Raw Materials (CRMs) Supply Chains**

#### **1. Key Problems Identified**

**A. Lack of CRM Awareness & Knowledge Gaps**

* Many companies, especially downstream (e.g., manufacturers), lack awareness of CRMs, their geological constraints, and their role in their own supply chains (SCs).
* Smaller firms often don’t track CRM usage systematically, leading to blind spots in risk assessment.
* Disconnect between geosciences (focused on extraction/processing) and SC management (focused on logistics/procurement) exacerbates knowledge silos.

**B. Supply Chain Complexity & Fragmentation**

* CRMs pass through long, multi-tiered SCs with limited transparency (e.g., conflict minerals, by-product dependencies).
* Geographic concentration (e.g., China dominates lithium refining) and geopolitical risks (trade embargoes, sanctions) create bottlenecks.
* Regulatory heterogeneity: ESG standards, carbon tracking (e.g., CBAM), and mining permits vary globally, complicating compliance.

**C. Misaligned Risk Perception & Resilience Strategies**

* Companies focus on short-term risks (price volatility, supplier stability) but overlook long-term geological risks (deposit quality, recycling limits).
* Resilience strategies (diversification, stockpiling) are often generic and fail to address CRM-specific challenges (e.g., lack of substitutes for lithium).
* Regulatory uncertainty (e.g., evolving EU Critical Raw Materials Act) discourages long-term investments in sustainable practices.

**D. Regulatory Compliance vs. Operational Realities**

* Sustainability regulations (e.g., CBAM, ESG reporting) are seen as burdensome, especially for SMEs lacking resources.
* Trade-offs exist between compliance costs (e.g., low-carbon smelting) and profitability, leading to minimal effort ("box-ticking").
* Policy gaps: Regulations don’t incentivize circular economy solutions (e.g., design-for-recycling, urban mining) effectively.

#### **2. Key Insights**

**A. Interdisciplinary Collaboration is Critical**

* Bridging geosciences and SC management can improve risk assessment (e.g., geologists advising automakers on material scarcity).
* Academia-industry partnerships could drive R&D in recycling tech and alternative materials.

**B. Transparency & Technology as Enablers**

* Blockchain/Digital tools (e.g., CRM passports) could enhance traceability beyond 1st-tier suppliers.
* Real-time dashboards for regulatory updates and SC disruptions would help companies adapt faster.

**C. Policy Recommendations**

* Harmonize global standards for ESG and CRM sourcing to reduce compliance complexity.
* Incentivize circular practices: Tax breaks for recycled materials, subsidies for mine-to-product vertical integration.
* Stable, long-term policies to encourage investment in sustainable mining/R&D.

**D. Resilience Requires Proactive Measures**

* Design-thinking: Products should be modular/easily disassembled to boost recycling rates.
* Secondary sourcing: Invest in urban mining and reprocessing tailings to reduce virgin material dependence.
* Supplier collaboration: Joint risk assessments with miners/refiners to preempt disruptions.

### 

### **3. Urgent Actions for Stakeholders**

| **Stakeholder** | **Recommended Actions** |
| --- | --- |
| **Businesses** | **Audit CRM dependencies; adopt tech for traceability; lobby for clearer regulations.** |
| **Policymakers** | **Align CRM policies with energy transition goals; fund recycling infrastructure.** |
| **Academia** | **Develop interdisciplinary CRM curricula; partner with industry on material innovation.** |
| **Investors** | **Prioritize ESG-compliant mining projects; support circular economy startups.** |

**Final Takeaway: The CRM crisis is a systemic challenge requiring integrated solutions. Companies that align geological awareness, SC resilience, and policy engagement will lead in the sustainable materials economy.**

## **Solution: Lycicle AI- Purpose: Fight Green Compliance Disparity**

### **1. Verifying the Need (Problem Validation)**

**Key Data to Include**

* **Regulatory Burden:**
  + **"70% of SMEs struggle with ESG compliance due to fragmented regulations" (source:** [**OECD**](https://www.oecd.org/)**).**
  + **Highlight the lithium battery recycling sector’s rapid growth and tightening regulations (e.g., EU Battery Regulation 2023, U.S. Inflation Reduction Act).**
  + **Cite penalties for non-compliance (e.g., fines, loss of contracts).**
* **SME Challenges:**
  + **"SMEs spend 30-40% of operational time on compliance paperwork" (source:** [**World Bank**](https://www.worldbank.org/)**).**
  + **Use quotes from interviews/surveys with recycling SMEs (e.g., "We lack resources to track ever-changing ESG rules").**

**Pitch Script Snippet:  
*“Lithium battery recycling is booming, but SMEs are drowning in complex, evolving ESG regulations. Our research shows 70% of recycling SMEs risk penalties due to non-compliance, costing them time and contracts. This is where our AI tool steps in.”***

### **2. Market Analysis**

**Key Points:**

* **Market Size:**
  + **"Global lithium battery recycling market to reach $23.7B by 2030 (CAGR 21.3%)" (source:** [**BloombergNEF**](https://about.bnef.com/)**).**
  + **Highlight growth drivers: EV adoption, EU/US regulations mandating recycling.**
* **Regulatory Landscape:**
  + **Map regions with strict ESG rules (EU, California, South Korea) vs. emerging ones (India, Southeast Asia).**
  + **Note lack of standardized guidelines, creating confusion.**
* **Competitors:**
  + **Mention existing ESG compliance tools (e.g.,** [**EcoVadis**](https://ecovadis.com/)**), but emphasize their focus on large corporations and high costs unsuitable for SMEs.**

**Visual: A map showing global regulatory hotspots and market growth projections.**

### **3. Strengths & Weaknesses (SWOT Analysis)**

**Strengths:**

* **AI Advantage: Automates paperwork, updates in real-time with regulatory changes.**
* **Niche Focus: Tailored for lithium recycling SMEs (underserved market).**
* **ESG Incentive: Helps SMEs attract ESG-focused investors.**

**Weaknesses:**

* **Data Reliance: Requires constant regulatory updates (partner with legal firms?).**
* **Adoption Hesitancy: SMEs may distrust AI (mitigate with free trials/education).**

**Opportunities:**

* **Expand to other battery metals (cobalt, nickel) post-success.**
* **Partner with governments/NGOs promoting circular economies.**

**Threats:**

* **Regulatory changes outpacing tool updates.**

### **4. Impact Analysis**

**Quantify Benefits:**

* **“Saves 200+ hours/year per SME on compliance tasks.”**
* **“Reduces non-compliance risk by 80%, avoiding fines up to $500k/year.”**
* **“Frees time for core activities (e.g., scaling recycling capacity), boosting productivity by 15-20%.”**

**ESG Alignment:**

* **Link to UN SDGs (e.g., SDG 12: Responsible Consumption).**
* **Case Study: Pilot with a small recycler improved ESG ratings, securing a partnership with [Automaker X].**

### **5. Feasibility**

**Technical:**

* **Use existing NLP/AI frameworks (e.g., GPT-4 for document parsing) + regulatory databases.**
  + **Prototype already tested on EU Battery Regulation documents (accuracy: 92%).**

**Financial:**

* **Revenue Model: Subscription (**
* **200−**
* **200−500/month per SME).**
* **Costs: AI development (**
* **150k),legalpartnerships(**
* **150*k*),*legalpartnerships*(50k/year).**

**Operational:**

* **Partner with industry groups (e.g.,** [**Global Battery Alliance**](https://www.globalbattery.org/)**) for credibility.**

### **6. Scalability**

* **Phased Rollout: Start in EU/US, then expand to Asia.**
* **White-Labeling: License tool to governments for broader SME adoption.**
* **Future Features: Carbon footprint tracking, supply chain audits.**

### **Pitch Deck Outline**

1. **Hook: “SMEs drive 50% of lithium recycling but face a $2B compliance gap.”**
2. **Problem: Regulatory chaos in LiB recycling.**
3. **Solution: AI tool demo (show simplified compliance workflow).**
4. **Market Opportunity: Size, growth, competition gap.**
5. **Impact: Time/money saved, ESG benefits.**
6. **Feasibility: Prototype results, partnerships.**
7. **Ask: Funding for pilot, partnerships, or R&D.**

**Problem on a product level:**

**Problem on a systems level:**

Work Session 09.04.2025 Whiteboard x10

Rea Insights feedback 9.04.2024 wednesday

(see insights manolie notebook for later steps)

WHAT

relevant regulations impact SME with Lithium

geopolitical factors - problem VS Incentives / PUSH / Interview / background for futures

WHY

PainsBarriers:

LIB Recycling - ESG Compliance Landscape

* Green comüliance Disparity (Net Zero Goals etc.)
* SME business Business Compliance in LiB Recycling

Goal:

Reduce InequALITY and save time equal Money (Data see Chat Deepseek)

Theory/ Assumption:

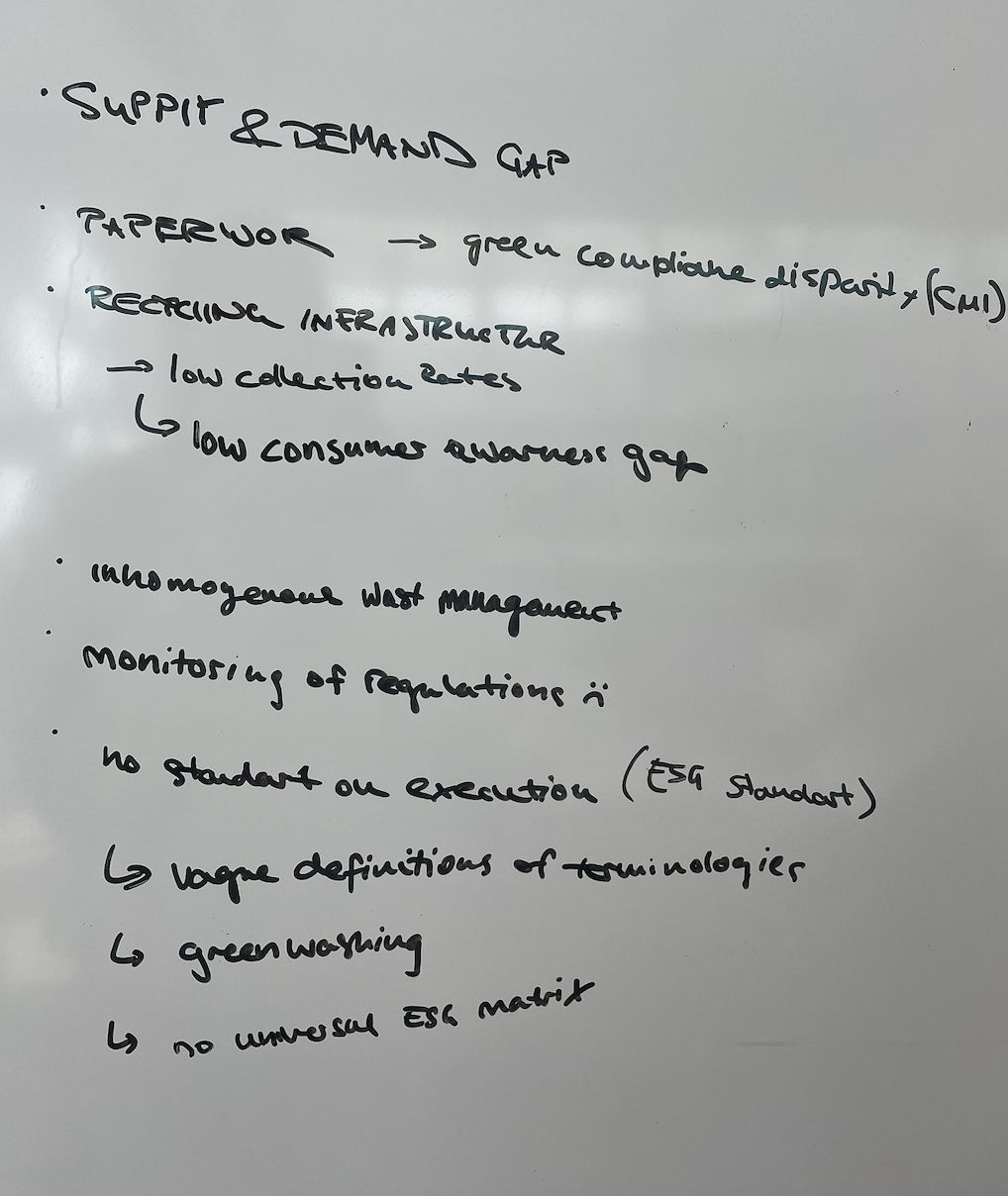
* we save a lot of time and energy by doing compliance research for SMEs through Ai
* we solve comüplexity in compliance to the regulations

→ leading to reduced barriers to profitability

→ ensure long-term competitiveness and resilience

→ enable higher productivity/efficiency

**Pains:**



### 

### **Refined Problem Statement and Solution Approach**

In face of the Energy Transition and the new growing market for the recycling sector. Especially in face of resource scarcity, Geopolitical tension and high market dependencies and ecological concerns, recycling becomes a very important change point for a proper and green energy transition.

Therefore after analysing major pain points for recycling companies, talking to waste flow managers and compliance execution companies we have noted the following pain points:

### Low collection rates and inconsistent flows of e-waste hinder proper recycling.

### Recycling capacity is limited and often considered the weakest point within the “R-strategies” (e.g., reduce, reuse, recycle).

### Disassembly and sorting processes are both labor- and cost-intensive.

* insufficient infrastructure for recycling

**Potential and relevance:**

### The scale of battery production and innovation will influence future recycling capabilities and system development.

### Geopolitical tensions and shifting power dynamics are increasing the relevance of recycling. Dependence on internal material flows will become more critical for national resilience and autonomy

* Predicted numbers of E-waste in 20-40 years - ()

Our Goal and Service:

**We recognize**

A: Compliance

B: Collection

C: Infrastructure- Capacity

D: Network ? ( Missing people and collaboration within the Recyclers)

E: Job Opportunity that is not replacable by AI only 20-40 years from today!

Who can benefit from it:

Economic Value futures research: *Global battery and other e-waste recycling market size, valued at USD 864.44 billion in 2024, is expected to climb to USD 3325.41 billion by 2033 at a CAGR of 15.9% during the forecast period.* ***Source:****https://www.businessresearchinsights.com/market-reports/battery-and-other-e-waste-recycling-market-111725#menu1*

The transition is unavoidable, Other countries like China and Russia have the opper hand when it comes to CRM and the technologys of the future.

Therefore, it would be smart to invest wisely now! For the future

BCS who can imagine a world without technology anymore.

We as Project manager will initiate a Project with a different pilot phases in the different sectors, within the next 10 year to collect data on how each sector can benefit from the transition and collaboration support within the Recycling industry.

**Li-monti will- here name exact activity:**

**The Project**

We propose a 20 year project where recycling centers, networks and infrastructures will be built.

**Immediate Goal**

-Network-> build a network for different recyclers and people who want to join the industry to connect them on a global level and share new trends and emerging actions to take as a collective in the recycling sector.

We project manager will analyse common pain point, needs, best practices and actions points for the future and based on this information draft new project and initiative around them, promising a problem solving sector! Solutions found to a collective problem, will serve the collective.

Our Approach should be applicable for diverse recylers in some type and form- Blueprint

-Matchmaking system we link you with your:-Your Partner: Compliance, Recyclers, Logistics, Marketing, Engineers

We match the right services givers with the rights costumers. It could be Collection Sevices with recycling hubs or , complience firms with new recyclers or Marketing agents with recycling companies, website builders ect.

We will provide everything that a company needs service or employer wise and reduce the amount of research for the companies.

-Event

We will link and showcase relevant events on our platform

-General Update/Info Hub

**Long term next 20-50 years**

Transition Plan Draft:

Stage 1 of the Project:

Stage 2 of the Project:

Stage 3 of the Project:

**Why people should invest in us:**

-Relevance of the now for a better tomorrow, it requiers research and action at the same time

- Cost

Revenue Model:

Feasibility:

Impact:

Risk Factor:

**Project Summary: E-Waste Recycling Infrastructure Initiative**

**Overview:** This is a 20-year project aimed at building a robust network and infrastructure for e-waste recycling. The goal is to connect key players—recyclers, compliance officers, logistics providers, marketers, and engineers—through a centralized system supported by events, matchmaking tools, and an information hub. The project also includes a long-term vision spanning 20–50 years to transition to a more sustainable circular economy for electronic waste.

**Immediate Goals:**

* Establish a **network** of stakeholders.
* Create a **matchmaking system** to connect relevant partners.
* Host **events** to build awareness and collaboration.
* Launch a central **information and update hub**.
* Collaborate with partners across **compliance, recycling, logistics, marketing, and engineering**.

**Transition Plan (Draft):**

* **Stage 1:** Build foundational partnerships and launch the platform.
* **Stage 2:** Develop and implement infrastructure and matchmaking tools.
* **Stage 3:** Scale operations and refine systems with support from AI, managing all stakeholder interactions—legal, consulting, marketing, and more.

**Why E-Waste Recycling Matters:** E-waste is one of the fastest-growing waste streams globally. Recycling it properly helps recover valuable materials, prevents environmental damage, and supports a circular economy. The e-waste recycling market is evolving quickly, with major growth expected due to policy changes, technological advancements, and rising environmental awareness.

## **Li-Monti Pitch Preparation Document**

### **Business Case & Value Proposition**

**We help** small and mid-sized recyclers **solve** recurring compliance challenges, fragmented service access, and a lack of collaborative networks **by offering** a centralized platform that combines compliance updates, chat-based SaaS tools, and a matchmaking service.  
**So they can** save time, reduce costs, stay compliant, and access the partnerships and services needed to grow sustainably.

### **Starting Point**

* Build a network that continuously updates recyclers with relevant compliance policies. Features: Network, News, Know How - Business Hub
* Launch a **chat-based SaaS tool** that helps recycling actors understand and manage required documentation.
* Collect live data through the tool to:
  + Identify recurring pain points and missing services.
  + Match recyclers with people and solutions within the platform’s growing network.

### **Business Model – How It’s Profitable**

1. **SaaS Subscriptions (Tiered Model- Software as service)**
   * Free tier: Limited access to compliance updates and chat support.
   * Pro and Enterprise tiers: Full compliance monitoring, matchmaking services, support features, and reporting dashboards.
   * Recurring revenue from paying subscribers.
2. **Commission/Lead Generation**
   * When recyclers get matched with a service (logistics, compliance help, engineers), a commission or referral fee is charged.
   * Revenue grows as matchmaking increases in volume and value.
3. **Workshops & Strategic Consulting**
   * Revenue from paid workshops,(Training) digital toolkits, or consulting services that guide organizations through compliance and circular transition planning.

4. Pain Point Mapping

### **Unique Selling Point (USP)**

* Combines project management with compliance tracking and B2B matchmaking in a unified platform.
* Offers a **human-centered and proactive approach** to system-level change, filling a gap in a fragmented sector.
* Launches with a **simple, accessible tool** that removes complexity from legal and paperwork-heavy tasks—freeing up recyclers to focus on operations.
* Positions itself as both **a service provider and transition facilitator**, actively guiding small players through evolving regulations and sustainability demands.

### **Realism & Feasibility**

* The problem is real and recognized: Small and mid-sized recyclers often lack capacity, time, and clarity to manage evolving compliance and sustainability expectations.
* The solution builds on existing models (SaaS, platforms, matchmaking), but applies them to a **highly underserved industry**.
* Rather than building expensive infrastructure up front, Li-Monti begins as a digital-first, service-oriented tool that grows with demand.
* Starts lean and focused (compliance + data collection + network) and gradually expands toward broader transition goals (pilots, partnerships, long-term impact).

### **Why Now?**

* The recycling sector is under pressure due to resource scarcity, geopolitical instability, and increasing electronic waste.
* E-waste is expected to grow drastically in the next 20–40 years.
* Governments are slow to adapt, while recyclers are struggling with operational gaps.
* Circular economy markets are expected to grow exponentially, especially in battery recycling.

### **Target Groups Who Benefit**

* Recyclers needing compliance help, documentation clarity, or service partners.
* Startups and small players who cannot afford in-house legal or compliance teams.
* Governments and agencies who want data insights for policy and capacity planning.
* Partners across logistics, compliance, software, and marketing sectors who want to connect to recyclers in need of support.

### 

### **Vision**

Tackle problems that are being faced by the collective, not in a fragmented way but by working together.

* A 20–50 year circular transition strategy starting with low-barrier entry tools.
* The iceberg model visual shows how we move from surface-level problems (compliance confusion) to deeper system issues (capacity gaps, missing infrastructure, poor collaboration).
* Li-Monti supervises solution-based projects launched by collective efforts across the sector, guided by real data and human need.

Li-Monti-Energy Transition Management Initiative

### **Li-Monti's Value Proposition**

stakeholders: We help recyclers, circularity innovators, and public sector actors

help: solve systemic barriers in battery recycling—

pain: such as lack of collaboration, funding, and time to act by …?

our service: offering a project-based platform that maps pain points, connects relevant stakeholders, and turns ideas into supervised pilot projects,

ESG compliance burden!!

outcome: so they can co-create scalable, impactful solutions that accelerate a truly circular energy transition.

Our Philosophy: Montessori- Help mir mi

### **Li-Monti's Unique Selling Point**

**Li-Monti is the first action-oriented collaboration platform that transforms overlooked system pain points in battery recycling into concrete, supervised pilot projects—by connecting small and mid-sized recyclers with the right minds, resources, and partners across sectors. ADDCHATBOT!!**

Unlike policy think tanks or isolated recycling initiatives, **Li-Monti combines data mapping, matchmaking, and project management** in one place—bridging the gap between knowledge and implementation at scale.

## 

## **Li-Monti: A Platform to Power Solutions in E-Waste and Battery Recycling**

### **The Problem**

The energy transition depends on better recycling systems, especially for lithium-ion batteries and electronic waste (e-waste). But today, the sector faces real bottlenecks:

* Collection rates are low and inconsistent
* Disassembly and sorting are labor-intensive and expensive
* Recycling infrastructure is underdeveloped
* Compliance is complicated and fragmented
* Small and medium-sized recyclers (SMEs) don’t have time, capacity, or money to solve these issues alone
* Governments often ignore or delay action on these problems

And yet—we **all want sustainable batteries and a circular economy**, right?

### **Our Response: Collective Action, Not Just Connections**

**Li-Monti** is not just another digital network or information platform.  
It’s a **project-driven action space** where people with **skills, motivation, and solutions** can tackle the pain points that matter—but that no one else is addressing.

### **🎯 Our Goal**

To **connect pressing recycling challenges with the people and resources needed to solve them.**

We do this by:

* **Mapping sector-wide problems** through interviews, data, and research
* **Identifying pain points** that governments overlook and SMEs can’t solve alone
* **Bringing together project managers, experts, engineers, students, and creatives** who want to contribute
* **Launching real-world projects** to test and implement solutions
* **Supervising and guiding** these projects through our platform

### **🛠️ What the Platform Offers**

1. **Problem Mapping + Data Collection**We gather insights directly from recyclers, waste managers, compliance firms, and local actors. This forms the living foundation of our action plan.
2. **Collaboration Engine**We match problems with project teams—linking SMEs with people who want to contribute: from compliance experts to designers, marketers, developers, and sustainability students.
3. **Project Launchpad + Supervision**The Li-Monti team coordinates and supervises project development to ensure traction, alignment, and impact. We don’t just suggest ideas—we help implement them.
4. **Events + Info Hub**To foster collaboration and visibility, we host events and maintain a dynamic knowledge base that tracks solutions, pilots, and emerging trends.

### **🔄 The Vision: A Long-Term Transition Plan (20–50 Years)**

This isn’t a short-term consultancy. We’re laying the groundwork for:

* A **resilient recycling ecosystem**
* **Cross-sector collaboration** that moves beyond policy silos
* **Workforce development** in areas where human labor is still essential and AI won't replace people any time soon
* A **blueprint for national and regional autonomy** in battery material recovery

### **📈 Why This Matters**

* **The global e-waste recycling market is booming**—from $864B in 2024 to a projected $3.3T by 2033
* **Recyclers are ready to act**, but lack capacity
* **Governments are slow to respond**, and critical raw materials (CRMs) are controlled by global powers like China and Russia
* **Jobs in disassembly and recycling will remain human-powered** for decades, making this a future-proof employment sector

### **💬 Why Support Li-Monti?**

Because we’re doing what no one else is doing:  
→ Turning **collective frustrations into collective action**.  
→ Empowering **those on the frontlines** of the circular economy.  
→ Designing projects that are **by the people, for the planet**, and **rooted in real needs**.

### **🚀 Ready to Join?**

Whether you're a student, engineer, compliance expert, logistics provider, or just someone who wants to help solve real-world problems—**Li-Monti gives you a place to act, not just talk.**

### **8. Appendice**

### 

### **Table of Contents**

1. **Project Overview**
2. **Background & Context**
3. **Internship Schedule & Tasks**
4. **Research & Analysis**
5. **Stakeholder Interviews & Insights**
6. **Identified Challenges & Problems**
7. **Proposed Solutions & Next Steps**
8. **Appendices**
9. **Mentoring Input**

#### **References**

* Basel Convention: [Link](https://environment.ec.europa.eu/)
* EU Battery Regulation: [Link](https://www.rijksoverheid.nl/)
* Philips Sustainability Report: [Link](https://www.philips.com/)

## 

## **Rea Mentoring**

[Rea Vaz: http://ecobat.com/our-business/ecobat-solutions/lithium-services/](https://teams.microsoft.com/l/message/19:meeting_NzM0OGFkODEtZDg2OC00NzJhLWE4YTktYmQwNGJmYTNlNmIw@thread.v2/1742371963708?context=%7B%22contextType%22%3A%22chat%22%7D)

sent on 19. March 2025 09:12

Key Themes!

* Doing the hard things now! Why it pays off to go the extra mile.
* Taking the Initiative
* Treat people with dignity (Approach to Problems)
* Asking Questions, lead with Curiosity

## **9.Learnings**

* AI Usage
* Professional Conduct ( Prepare for Call/Intevriew/Follow up and Connection)
* Networking
* Working with wicked Problems
* Our Challenges and how we managed them

**10.Sources**

#### **Additional Resources**

* YouTube Links: Storytelling with Data, AI in Recycling.
* Academic Papers: Recycling chains for LiB (ScienceDirect).

### **1. Government & Regulatory Bodies**

* **Basel Convention**:  
  <https://environment.ec.europa.eu/topics/waste-and-recycling/waste-electrical-and-electronic-equipment-weee_en>
* **Dutch Government (Critical Raw Materials)**:  
  <https://www.rijksoverheid.nl/actueel/nieuws/2025/02/12/nederland-gaat-leveringsrisicos-kritieke-grond-stoffen-beter-in-de-gaten-houden>
* **EU Waste Shipment Regulations**:  
  <https://environment.ec.europa.eu/topics/waste-and-recycling/waste-shipments_en>

### **2. Industry & Recycling Companies**

* **Philips Sustainability Reports**:  
  <https://images.philips.com/is/content/PhilipsConsumer/Campaigns/CO20180412-Assetlibrary/Supplier-Sustainability-Performance-SSP-brochure-v181026.pdf><https://www.philips.com/a-w/about/environmental-social-governance/downloads.html>
* **Circular Industries (Contact)**:  
  <https://www.circular.industries/contact.html>
* **Landbell Group**:  
  <https://landbell-group.com/how-can-we-help-you/>
* **Umicore**:  
  <https://www.epea.com/en/news>

### **3. Research & Academic Papers**

* **Critical Raw Materials in Li-ion Batteries (PDF)**:  
  <https://www.innoenergy.com/uploads/2023/01/critical-raw-materials-in-li-ion-batteries.pdf>
* **Recycling Chains for Lithium-Ion Batteries (ScienceDirect)**:  
  <https://www.sciencedirect.com/science/article/pii/S0301420721001233>
* **Fraunhofer ISI (Battery Recycling)**:  
  <https://www.isi.fraunhofer.de/en/presse/2023/presseinfo-11-recycling-lithium-ionen-batterien-europa.html>

### **4. Tools & Data Sources**

* **RMIS (Raw Materials Information System)**:  
  <https://rmis.jrc.ec.europa.eu/>
* **PBL Netherlands Environmental Assessment Agency**:  
  <https://www.pbl.nl/uploads/default/downloads/pbl-2021-potential-effects-of-dutch-circular-economy-strategies-on_low-and-middle-income-countries_4312.pdf>
* **NREL Battery Recycling Supply Chain Analysis**:  
  <https://www.nrel.gov/transportation/battery-recycling-supply-chain-analysis.html>

### **5. News & Media**

* **OilPrice.com (Lithium Geopolitics)**:  
  <https://oilprice.com/Metals/Commodities/Russias-Control-of-Ukrainian-Lithium-Mines-Threatens-Europes-Green-Energy-Shif.html>
* **YouTube (Lithium & AI in Recycling)**:  
  <https://m.youtube.com/watch?v=kBNjbgDvvdg>[https://m.youtube.com/watch?v=r5\_34YnCmMY&pp=ygUWU3Rvcnl0ZWxsaW5nlHdpdGggZGF0YQ%3D%3D](https://m.youtube.com/watch?v=r5_34YnCmMY&pp=ygUWU3Rvcnl0ZWxsaW5nlHdpdGggZGF0YQ%253D%253D)[https://m.youtube.com/watch?v=R9OHn5ZF4Uo&pp=yglZSG93iGRvZXMgYWkgd29yayBncHQqz3JleQ%3D%3D](https://m.youtube.com/watch?v=R9OHn5ZF4Uo&pp=yglZSG93iGRvZXMgYWkgd29yayBncHQqz3JleQ%253D%253D)

### **6. NGOs & Observatories**

* **TNO Material Observatory**:  
  <https://www.tno.nl/nl/over-tno/nieuws/2022/3/nederlands-materialen-observatorium/>
* **IUCN NL (CRMA & Human Rights)**:  
  <https://www.iucn.nl/en/news/what-does-the-critical-raw-materials-act-mean-for-nature-and-human-rights>

### **7. Miscellaneous**

* **Interpol Report on E-Waste & Organized Crime**:  
  *[Incomplete Google URL]*
* **Storytelling with Data (YouTube)**:  
  <https://m.youtube.com/watch?v=r5_34YnCmMY>
* **General YouTube Links**:  
  [https://m.youtube.com](https://m.youtube.com/)

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   *Mineral Commodity Summaries 2023: Lithium*.  
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   *Lithium Reports 2023*.  
   Retrieved from [Benchmark Mineral Intelligence Lithium Reports](https://www.benchmarkminerals.com/insight/lithium/)
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   *Global EV Outlook 2023*.  
   Retrieved from [IEA Global EV Outlook 2023](https://www.iea.org/reports/global-ev-outlook-2023)
4. International Lithium Association.  
   *Lithium Statistics and Trends 2023*.  
   Retrieved from [Ion Li-Ion Information](https://www.li-ion.info/statistics/)
5. Roskill.  
   *Global Lithium Supply Analysis 2023*.  
   *Note: Roskill reports are typically available through subscription or purchase. Visit* [*Roskill Information Services*](https://roskill.com/) *for more details.*
6. International Energy Agency (IEA).  
   *Trade and Markets for Critical Minerals*.  
   Retrieved from [IEA Critical Minerals](https://www.iea.org/reports/trade-and-markets-for-critical-minerals)
7. McKinsey & Company.  
   *The Future of Lithium: Understanding Supply and Demand Dynamics*.  
   *Note: McKinsey reports can be accessed through their official website or by contacting their research department.*
8. World Economic Forum (WEF).  
   *Circular Economy in the Lithium Supply Chain*.  
   Retrieved from [WEF Circular Economy](https://www.weforum.org/)
9. Environmental Protection Agency (EPA).  
   *Lithium Recycling and Environmental Impact*.  
   Retrieved from [EPA Lithium Recycling Information](https://www.epa.gov/)
10. Scientific Publications and Journals.
    * Various articles on lithium resource management, recycling technologies, and market projections.  
      *Examples include journals like "Journal of Cleaner Production," "Resources, Conservation & Recycling," and "Sustainable Materials and Technologies."*

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