BLOCKCHAIN FOR A TRACEABLE, CIRCULAR TEXTILE SUPPLY CHAIN: A REQUIREMENTS APPROACH

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Inspired by circular economy, unintended consequences/impacts of textile supply chains, equity

Designed to imagine how this problem could be solved

Qualitative framework builds off:

- Existing blockchain traceability use cases + Existing circular solutions

Designed for **all stakeholders**: risk reduction & sustainability

- Policy makers – manage compliance requirements, long-term planning, data security
- Businesses – supply chain efficiency, compliance, customer loyalty, competitive advantage
- Consumers – empowered to make informed purchases, responsible care & disposal

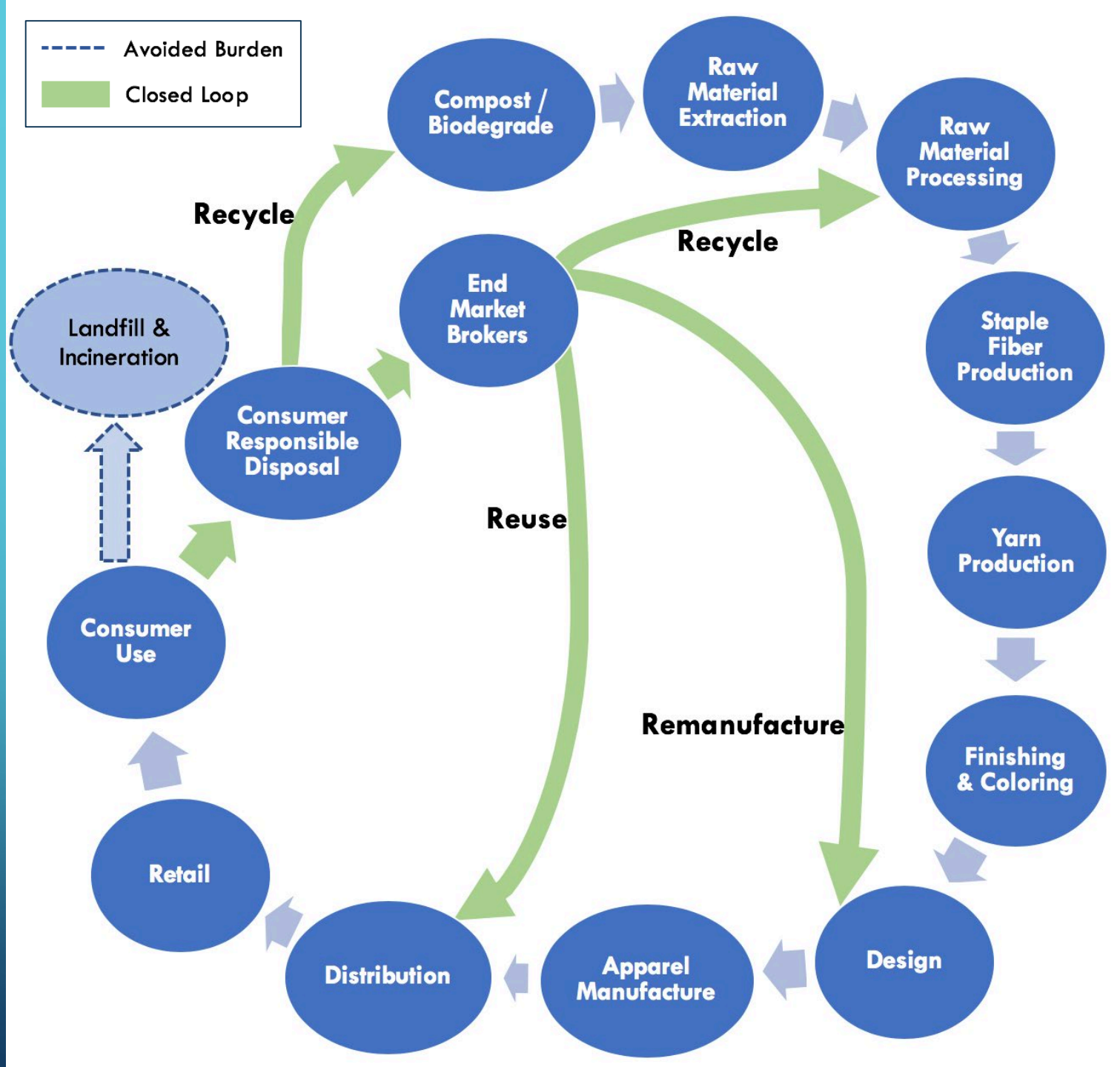
Sustainability metrics recorded on blocks in blockchain ecosystem

- Environmental, economic, social, and functional

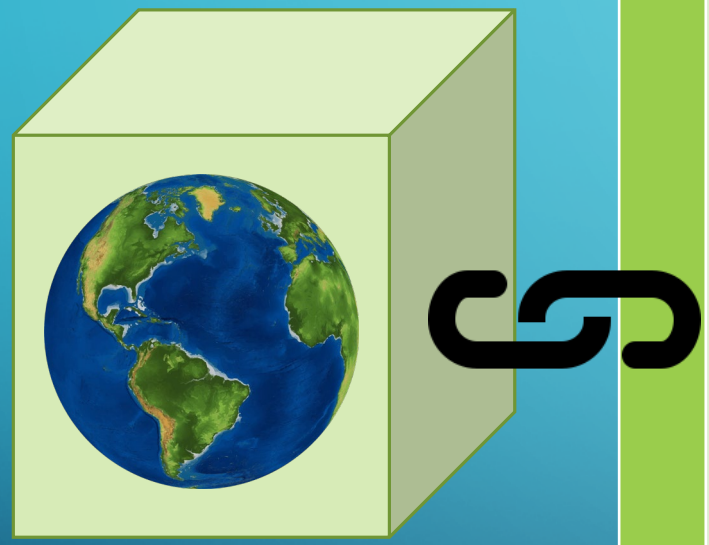
PREREQUISITE REQUIREMENTS

- Paradigm shift – from “take, make, waste” to proactive circularity design
- Retailer able to trace supply chain upstream
- Policy (traceability, recycled content requirements, polluter pays, EPR, GDPR)
- Downstream markets for materials
- Consumer demands sustainable solutions
- Stakeholder collaboration throughout value chain
- LCA data available
- KPI and data harmonization

CLOSING THE LOOP IN TEXTILE SUPPLY CHAINS

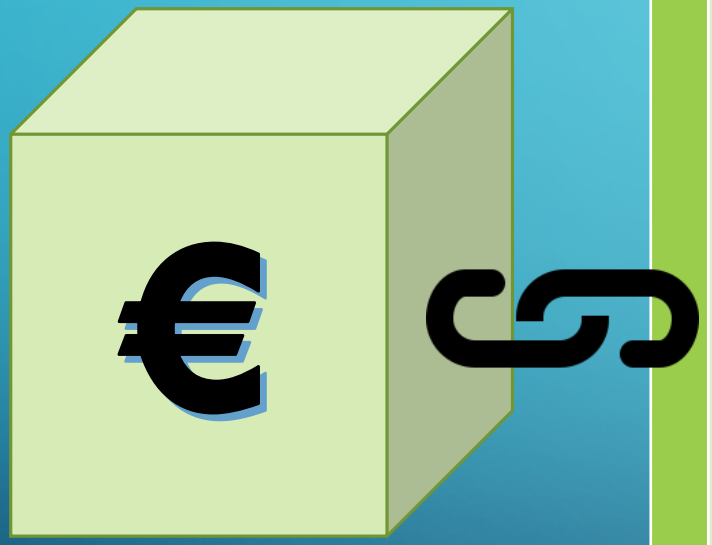


ENVIRONMENTAL METRICS TO RECORD ON BLOCKS



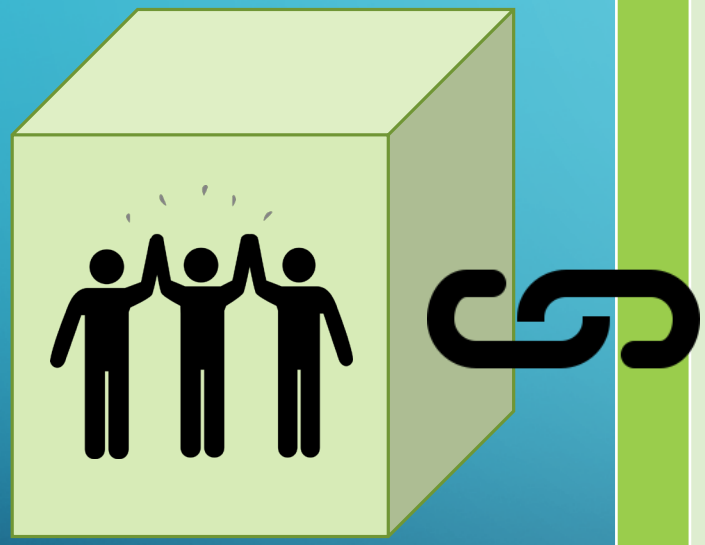
a. Relevant environmental certifications (e.g. – EU Ecolabel, FSC certification, chemical certifications like OEKO-TEX, GOTS, Cradle to Cradle);
b. LCA impact data;
c. Higg MSI impact data;
d. Raw materials used;
e. Chemicals used;
f. Amount of water used;
g. GHG emissions;
h. Waste, by-products, and co-products produced;
i. Biodegradable; compostable.

ECONOMIC METRICS TO RECORD ON BLOCKS



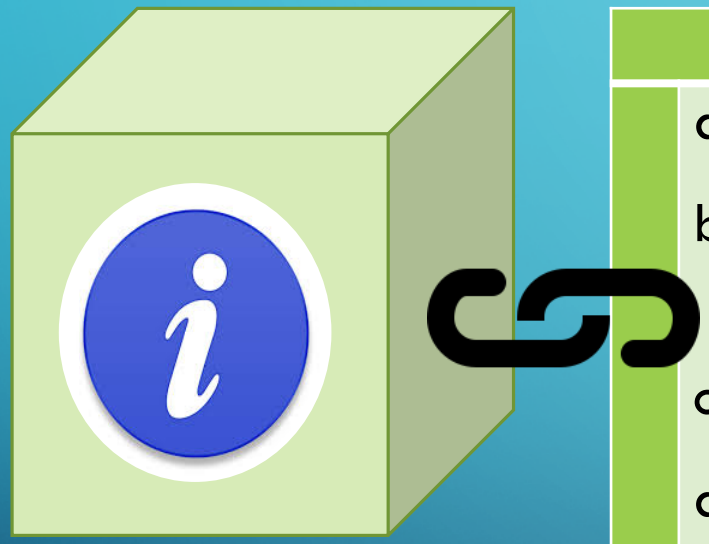
a. Smart contract – executed transactions (e.g. – payments and deliveries);
b. Bank access to network;
c. Insurance information;
d. Age of material or resource;
e. Market resource and commodities prices;
f. End markets for pre-determined materials.

SOCIAL METRICS TO RECORD ON BLOCKS



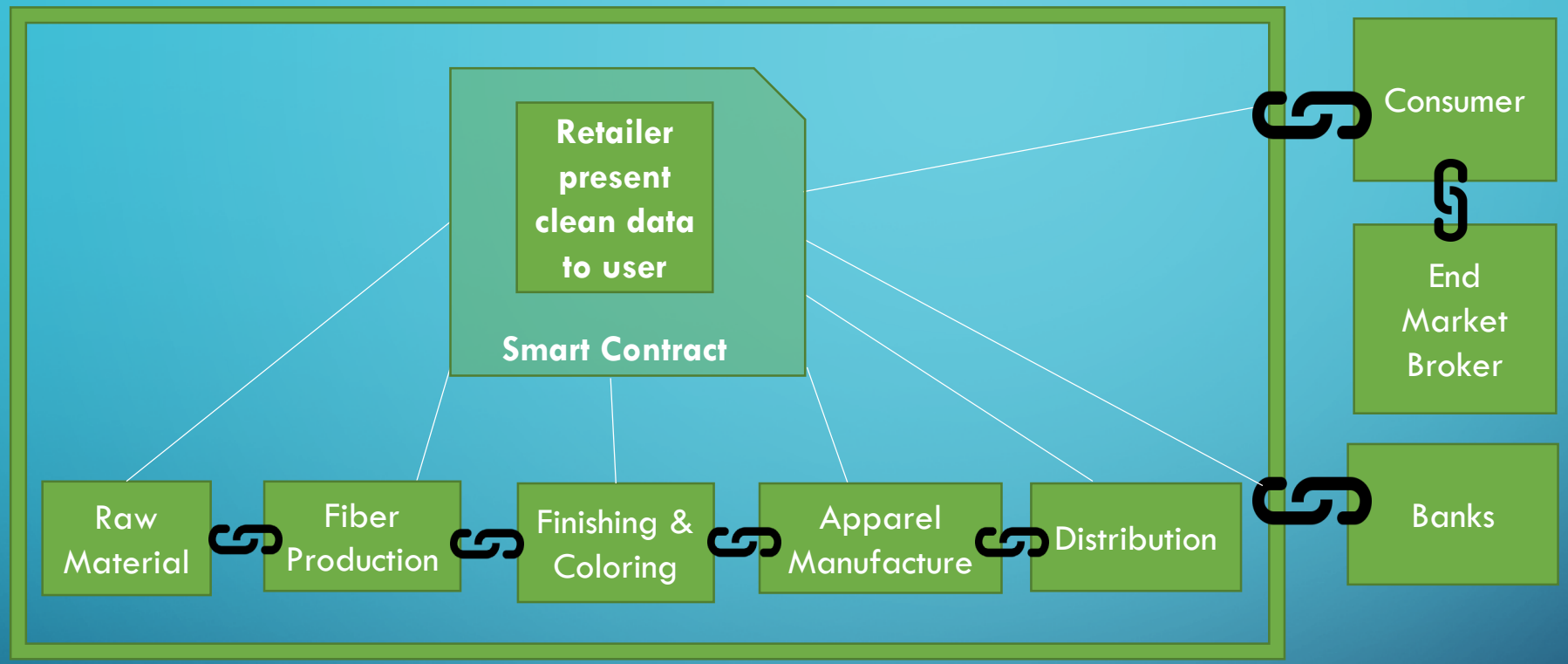
a. Relevant certifications (e.g. – Fair Trade, GOTS, OEKO-TEX, SA8000);
b. Living wages (120 percent of minimum wage);
c. Worker age & hour restrictions; freedom to organize;
d. Gender equality;
e. Responsible care instructions;
f. Responsible disposal instruction;
g. Customer loyalty program with retailer.

FUNCTIONAL METRICS TO RECORD ON BLOCKS



a. Intended use;
b. Capabilities (e.g. – heating, cooling, data tracking, water resistant, antimicrobial, UV protection);
c. Design For *X* (e.g. – environment, disassembly);
d. Warrantee information;
e. Repair information;
f. Quality control information.

RETAIL FACILITATOR



USER INTERFACE

Garment label + QR code info

- Story Map/Product Provenance
- Impact Data
- Responsible Care & Disposal Info
- Incentives / Loyalty Rewards

Thank you!

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EXTRA SLIDES

BLOCKCHAIN – DISTRIBUTED LEDGER TECHNOLOGY

Pros	Cons
Creates 'trustless' consensus about which data are stored in the system	Nascent
Shift from data push to data pull	Energy demands of public blockchains
Management tool - traceable and immutable transactions Case study examples: government, pharmaceuticals, diamonds, port logistics, food, luxury fashion	Expensive
Smart contracts	Private blockchains are arguably antithetical to why this tech was created
4 'P's: can mix & match • public vs private (who can access) • permissioned vs permissionless (who can read/write data)	Can be undermined by quantum computing
Configured to assume there's bad actors and proactively combats their ability to disseminate false information	Can be manipulated if more than 50% of network (private blockchains) is controlled
Most secure ledger technology available: distributed storage	Unit level traceability can be difficult

PROBLEM STATEMENT

Opaque (untraced) supply chains = risk

1. Economic Risk (perverse incentives, commodity system market failures, lost value)
2. Environmental Risk (waste, freshwater resources, abiotic resource depletion, chemicals, land use, global warming)
3. Social Risk (social justice, worker safety & rights, gender equity, distributed justice, consumer awareness)

Who is impacted? - Mainly developing countries, Asia

What is the driving force of the system? - Developed affluent countries, fast fashion

How is this happening?

- Globalization – varying labor & raw material resources
- Lack of traceability requirements
- Policy

Who says these things are problems?

- Value: intergenerational ethics, equity, social justice, sustainability principles
- Analyze: system dynamics (feedback!), complexity science, accept tradeoffs