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## Technical Proposal

### Integration of Web Inspection Technology into a Textile Supply Chain Decarbonisation Programme

#### Deployment of Shelton Vision WebSpector for Carbon Footprint Reduction

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## 1. Executive Summary

The global textile sector faces increasing regulatory, commercial, and environmental pressure to demonstrate measurable reductions in carbon emissions across the full fabric supply chain. While energy procurement and material substitution remain common strategies, significant carbon losses persist due to process instability, fabric defects, and downstream rejection.

This proposal presents a technical framework for integrating the WebSpector web inspection system throughout a textile manufacturing supply chain to enable **data-driven decarbonisation**. The approach converts continuous fabric inspection into a verified environmental monitoring function, allowing manufacturers and brand partners to reduce emissions by preventing waste rather than compensating for it after production.

The proposed system establishes inspection data as a central operational dataset linking fabric quality, energy consumption, water usage, and product carbon footprint.

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## 2. Project Objectives

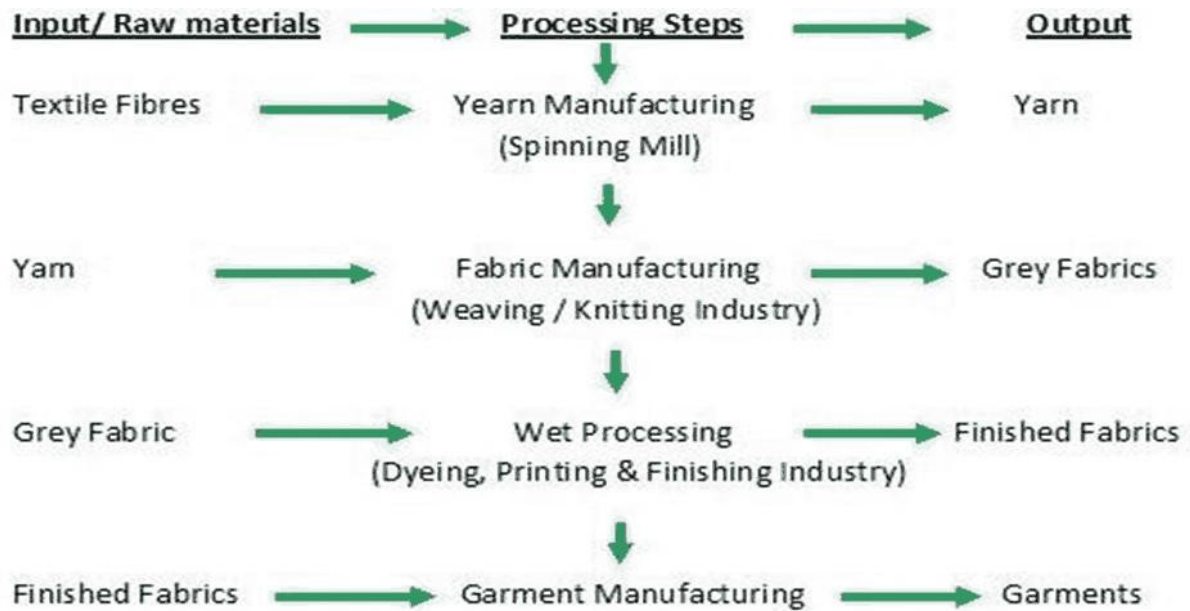
The project seeks to transform existing quality inspection infrastructure into a supply-chain carbon reduction mechanism. The primary objectives are:

- reduction of embodied carbon lost through defective fabric
- optimisation of dyeing and finishing energy consumption
- improved right-first-time production performance
- creation of traceable carbon metrics at fabric roll level
- integration of sustainability reporting across suppliers, converters, and brands

Rather than introducing new production machinery, the initiative enhances decision-making using inspection intelligence already generated during manufacturing.

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### 3. Textile Supply Chain Context









A typical textile fabric supply chain consists of sequential stages:

1. Fibre production and spinning
2. Fabric formation (weaving or knitting)
3. Dyeing and wet processing
4. Finishing and coating
5. Inspection and roll certification
6. Garment or technical product conversion

The majority of carbon emissions occur before final inspection due to fibre manufacture, heated dye baths, drying ovens, and chemical processing. When fabric defects are identified late in production, all upstream emissions embedded in that material are effectively wasted.

Current inspection processes confirm quality compliance but do not quantify environmental impact. This proposal introduces inspection-based carbon visibility across each supply chain stage.

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#### **4. Proposed Technical Solution**

The WebSpector system will be deployed as an integrated inspection and environmental intelligence platform operating across multiple manufacturing sites within the textile supply chain.

High-resolution cameras continuously monitor moving fabric webs, detecting defects and recording positional and statistical production data. Instead of treating this information solely as quality documentation, the system exports structured datasets describing fabric performance over time.

Inspection data will be connected to manufacturing execution systems, plant energy monitoring, and sustainability analytics platforms. Each detected defect becomes a measurable environmental event linked to material, process conditions, and resource consumption.

The integration converts inspection from an endpoint activity into an upstream process control mechanism capable of influencing weaving stability, dye uniformity, and finishing efficiency.

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#### **5. System Integration Architecture**



Dashboard   Reports   Targets   Projections   Profile

## Emissions Dashboard

### Carbon Footprint

2,412,314t Co2e

Category	Value (t)
Transport	250t
Technology	175t
Buildings	125t
Manufacturing	150t
Other	30t

### Emissions by facility

Domestic   Overseas

MetroMold 32 units	101 136 kg
Steelcraft 15 units	42 000 kg
Innoforge 12 units	12 000 kg
Progo Log 6 units	3 000 kg

### Highest impact items

View all

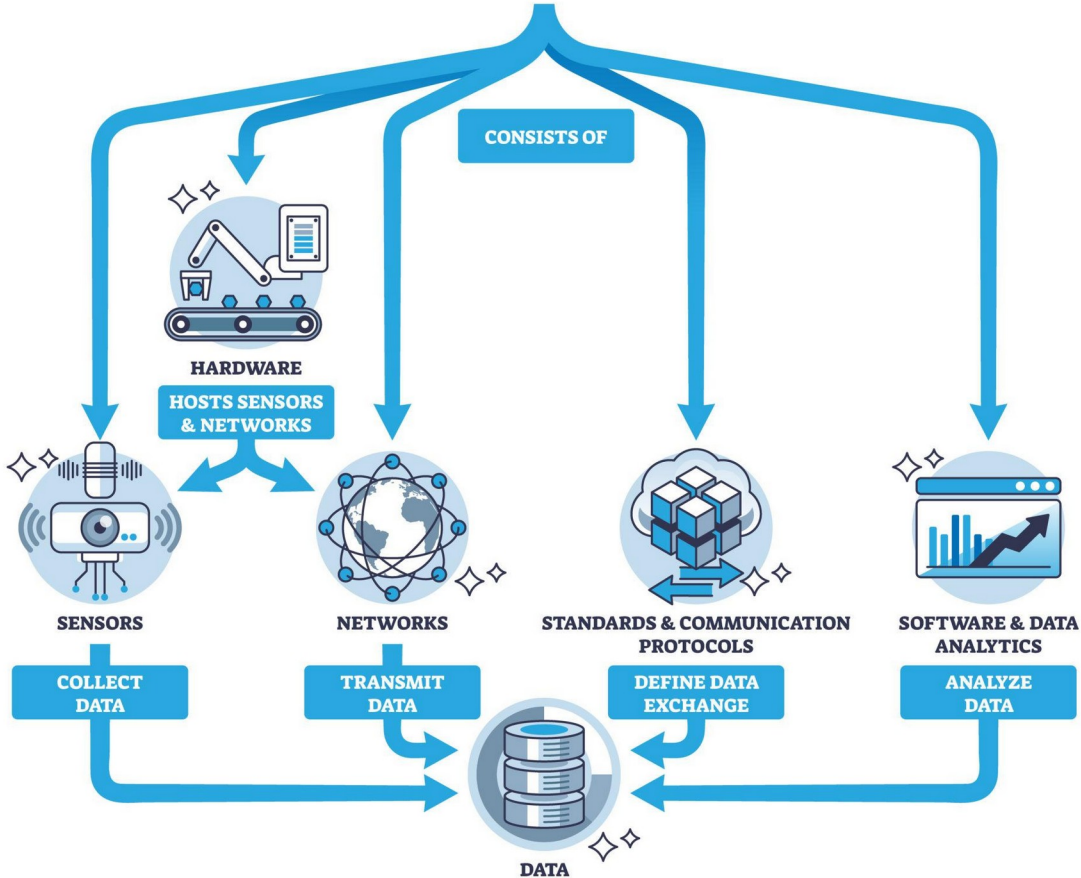
Purchased goods and services United States	101 136 kg
Fleet emissions China	51 136 kg

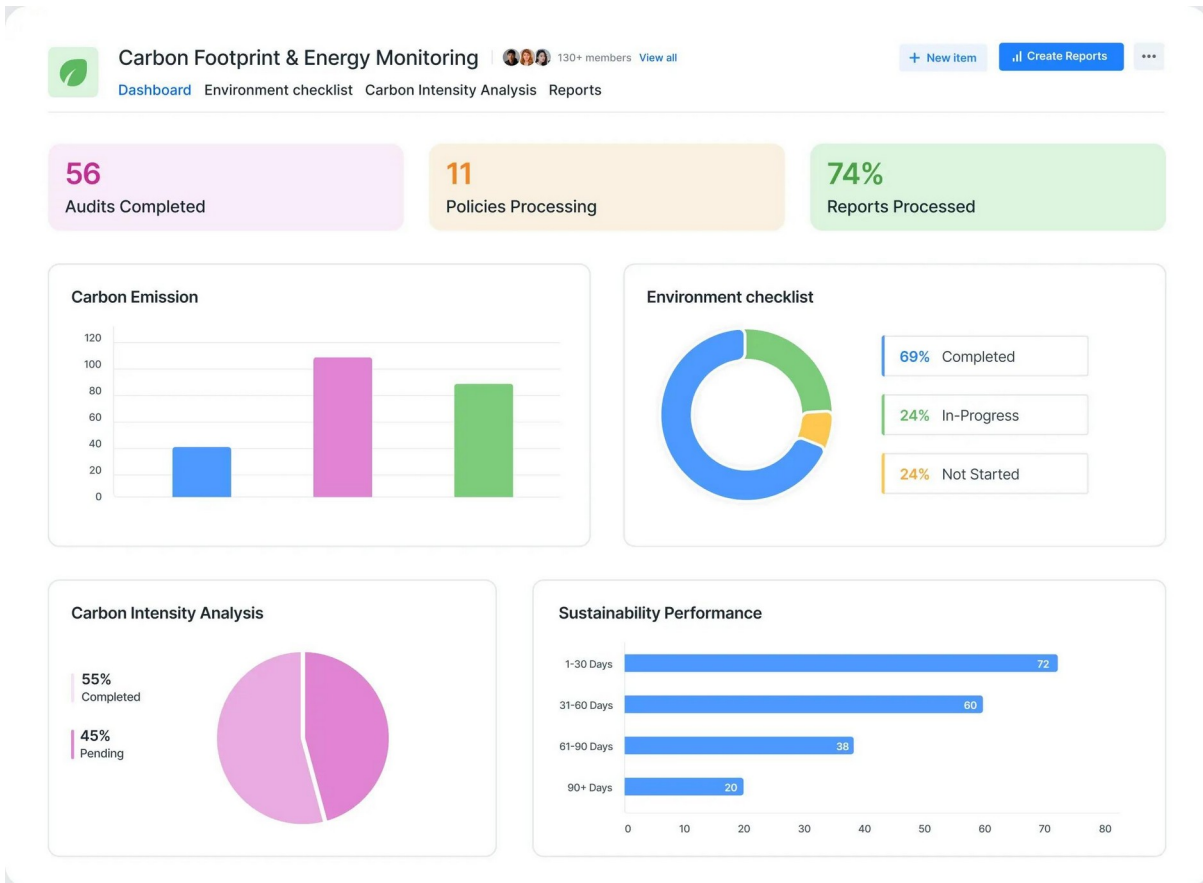
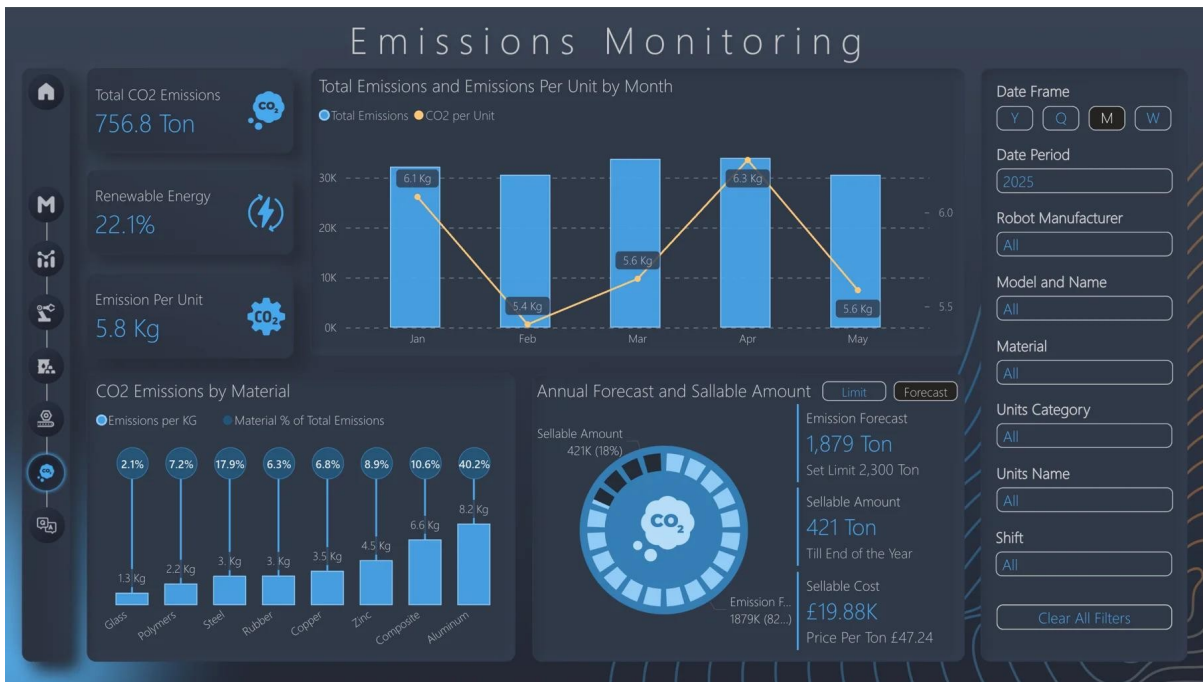
### Notifications

Report  
Create a monthly report

[Add report](#)

# INDUSTRIAL INTERNET OF THINGS





The proposed architecture establishes a continuous data pathway:

**WebSpector Inspection System → Plant MES → Energy & Resource Monitoring → Supply Chain Carbon Platform**

Inspection outputs are synchronised with:

- electrical consumption data
- steam and thermal energy usage
- water consumption records
- chemical dosing systems
- production batch identification

This configuration allows environmental performance to be analysed at the level of individual fabric rolls, manufacturing shifts, or supplier facilities.

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## **6. Carbon Reduction Mechanisms**

### **6.1 Prevention of Embodied Carbon Waste**

Fabric rejection represents accumulated emissions from fibre creation through finishing. By identifying defect patterns earlier in production, WebSpector enables corrective action before significant quantities of fabric become non-conforming.

The system supports early detection of weaving instability, contamination, and dye variation, allowing operators to stabilise processes during production rather than after completion of full batches. Reduced rejection directly lowers carbon intensity per accepted metre of fabric.

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### **6.2 Optimisation of Dyeing and Finishing Energy**

Defect trend analysis provides indirect measurement of thermal process performance. Variations in shade uniformity or coating consistency frequently correlate with unstable temperature control, excessive drying, or incorrect chemical application.

By correlating inspection data with process parameters, facilities can reduce overdrying, eliminate repeat dyeing operations, and optimise machine speed relative to fabric stability. These improvements reduce gas consumption, electricity demand, and water heating requirements without altering production capacity.

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### **6.3 Predictive Maintenance Across Suppliers**

Because inspection data is continuous, recurring defect signatures can indicate equipment degradation across multiple supply chain partners.

Analysis enables predictive maintenance scheduling for looms, finishing rollers, and tension control systems.

Preventing mechanical deterioration avoids prolonged production of defective material and reduces energy-intensive restart cycles common in textile manufacturing.

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#### **6.4 Supply Chain Carbon Transparency**

The integration enables calculation of environmental performance indicators such as:

- carbon emissions per metre of fabric
- water intensity per accepted roll
- waste-carbon ratio by supplier
- energy consumption linked to quality variation

These metrics can be shared securely with downstream brands, enabling verified sustainability claims and improved supplier benchmarking.

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### **7. Implementation Strategy**

The project will be executed in phased deployment.

Initial implementation installs WebSpector inspection at key process points, typically post-weaving and post-finishing. Data connectivity is then established with plant production systems and resource monitoring infrastructure.

Following data stabilisation, carbon conversion models are introduced, translating defect measurements into embodied emission values using recognised fibre emission factors and plant energy data.

A final optimisation phase applies analytics across the supply chain, allowing collaborative performance improvement between mills, finishers, and garment manufacturers.

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### **8. Expected Outcomes**

The integration is expected to deliver measurable reductions in textile manufacturing emissions through operational improvement rather than capital-intensive equipment replacement.

Anticipated outcomes include reduced fabric waste, lower thermal energy consumption, improved production stability, and establishment of auditable product carbon footprints. The system also provides a foundation for compliance with emerging environmental reporting standards and digital product passport requirements.

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## **9. Strategic Significance**

Decarbonisation within textiles is increasingly dependent on verifiable operational data. Inspection systems represent one of the few technologies capable of monitoring production continuously across diverse manufacturing environments.

By positioning WebSpector as both a quality assurance and environmental intelligence platform, textile manufacturers can transition from reactive sustainability reporting to active carbon reduction embedded within everyday production decisions.

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## **10. Conclusion**

This proposal demonstrates that integration of a web inspection system into a textile supply chain offers a practical pathway toward measurable decarbonisation. Rather than treating sustainability as a separate initiative, the approach embeds carbon awareness directly into fabric manufacturing operations.

The WebSpector system provides the technical foundation for reducing emissions through improved process control, waste prevention, and transparent environmental measurement across the textile value chain.