Clear Labeling for Rattan: Enhancing Transparency to Improve Recycling Efficiency

1. Executive Summary

Rattan furniture is valued for its durability and style, but its end-of-life disposal poses environmental challenges. With rising sustainability demands and circular economy goals, there's increasing pressure for material transparency. To meet consumer and regulatory expectations, manufacturers must ensure their products are manageable and eco-friendly throughout their lifecycle.

Rattan furniture falls into two types—synthetic and natural—but both pose recycling challenges. Synthetic rattan, made from plastics like polyethylene, polypropylene, and PVC, lacks standardized labeling, hindering proper sorting and recycling. Natural rattan is often chemically treated in undisclosed ways, reducing its biodegradability. These identification issues complicate waste processing, leading to landfill disposal and missed opportunities for reuse.

This policy brief proposes a systematic approach to material transparency for rattan products, including clear and standardised labelling. Doing this we aim to achieve :

- enhance recycling efficiency and promote rattan furniture's long-term sustainability
- provide economic and reputational benefits to manufacturers
- support waste management businesses and recyclers in improved material handling

2. Approaches and Findings

In order to develop the policy brief the system of recycling and the materials were researched. Secondary data was put together to create a homogeneous explanation of the role of the materials in the system. Later the findings were analyzed and a policy proposal developed to be

implemented in the system and easen the recycling process through tackling the labeling process.

2.1 **Chemical Treatments and Their Implications**

To make rattan more resistant to environmental factors manufacturers usually use various chemical treatments to enhance the durability. When rattan undergoes these treatments the recyclability of the material gets compromised making the environmental impact bigger.

Findings of researches reveal that the most common treatments on rattan using chemicals are three: preservative, surface and impregnation treatments. These all aim to make the material more durable, stronger and more pleasant for the customers.

To increase the durability of rattan the material is treated with preservatives chemicals, these include fungicides and insecticides.

- Fungicides like sodium pentachlorophenate and copper sulfate prevent fungal infestations (Wikieducator, 2023)
- Insecticides such as dieldrin, lindane, and zinc chloride protect against insect attacks but may leave residues that affect biodegradability (ResearchGate, 2023).

Impregnation treatments for rattan aim to make it more durable when exposed to environmental factors. But as mentioned before, the implementation of these chemicals to enhance rattan's durability makes the end-of-life process of the products more complicated (Guo et al., 2025), this leads to the development and implementation of specialized recycling methods (MDPI, 2023).

The two most common impregnation treatments are:

- Resins like melamine-urea-formaldehyde which helps with water resistance (Bioresources, 2023)
- Lignosulfonates which enhances fire and heat resistance (MDPI, 2023).

Surface treatments include:

- Bleaching agents standardize the color of the material making it homogeneous throughout the whole piece of furniture (Wikieducator, 2023)
- Sulfur mitigation has the same effect on the material improving color uniformity (Open Knowledge FAO, 2023).

Both these methods introduce additional chemical exposure on the natural material (Open Knowledge FAO, 2023) altering the material's recyclability (Wikieducator, 2023).

To develop appropriate recycling pathways and safety consideration is important to understand and acknowledge the persistence of these chemicals on rattan.

2.2 Recycling Considerations for Natural and Synthetic Rattan

Rattan per se is a natural material and it is able to compost and degrade in nature, because of the chemical this process is not as smooth due to the residual preservatives in the rattan (USDA, 2023).

There are some methods to try and remove the chemical residue from the rattan once it gets disposed of , these methods include vinegar soaking, steam cleaning, sanding and sun drying the material (EPA, 2023; CARB, 2023). Not all these methods are proven to be completely efficient and others like steam cleaning can consume a lot of energy, posing the dilemma if it is still sustainable to steam it and remove the chemical to dispose of it.

Synthetic rattan is an alternative to natural rattan, instead of being harvested this one is made out of different types of plastics. This makes it more resistant, durable and versatile, but poses major limitations to its recyclability since plastic is not always as easy to recycle.

Usually synthetic rattan is made of composed plastics:

- PVC (Polyvinyl chloride)
- PE (Polyethylene)
- PP (Polypropylene)
- PU (Polyurethane)

Each one of these plastics requires a different recyclability process (Recycling Symbols, 2023). Certain plastics like PE and PP are easier to recycle, while others such as PVC or PU require specialized processes in order to be recycled correctly (London Recycles, 2023). For easier sorting of the plastics materials and then easier recycling process, standard plastic resin identification codes (♺-♺) needs to be implemented and incorporated into the labeling system for the materials to easen the sorting process (EU Labeling Guidelines, 2023).

3. Policy Recommendation

A. Mandatory Material Labelling for Rattan Products: Implement a clear and strict labeling system similar to existing material identification standards (e.g., ISO, EU labeling guidelines) to improve transparency (CLP Requirements, 2023).

B. Adoption of Sustainable Design Practices: Encourage manufacturers to use recyclable or biodegradable coatings on natural rattan and promote the use of highly recyclable plastic PP, and PE and discourage the use of PVC as it poses difficulty in recycling (eg. avoid treating rattan with chemical agents and opting for sustainable options, or implementing treatments strictly to improve durability).

C. **End-of-Life Instructions from the manufacturer:** Supply instructions to the customers for the waste process of the products. (e.g., “Compostable after treatment” or “Recyclable under Code ♳ PP”, disposal guidance via QR codes)

4. Benefits of Implementation

- **Improved recycling efficiency:** Clear labelled materials will allow recyclers to accurately sort synthetic rattan by plastic type and determine the proper recycling methods. This reduces contamination in recycling streams and increases material recovery rates.
- **Environmental sustainability:** By improving recyclability and allowing proper disposal methods, it will help reduce the number of rattan waste going to landfills. This supports a circular economy and reduces the environmental footprint of rattan furniture production.
- **Regulatory Compliance and Market Advantage:** Manufacturers who follow clear labelling standards will be better positioned to meet changing sustainability rules, such as EU labelling directives and national waste management plans. This compliance can serve as a market differentiation, attracting environmentally concerned customers.
- **Consumer Awareness and Responsible Disposal:** Informative labelling will enable consumers to make environmentally responsible decisions while purchasing, maintaining, and disposing of rattan products. Providing precise disposal instructions ensures that materials are properly disposed of at the end of their lives.
- **Economic and Business Incentives:** Increased efficiency in material recovery and waste management can result in cost savings for recyclers and manufacturers participating in take-back or repurposing initiatives. Additionally, businesses that

establish sustainability commitments may attract environmentally concerned customers and investors.

5. Conclusion and Call to Action

The implementation of a clear labeling system for rattan materials is a necessary step towards the future of sustainability, enhancing recyclability and reducing waste for the furniture industry. By ensuring transparency of material compositions, manufacturers will be able to support a circular economy while also aligning with regulatory requirements.

For these initiatives to be successful, collaboration between multiple stakeholders is crucial. We urge:

- Manufacturers ought to implement clear labelling procedures, comply with existing material identification standards, and incorporate recycling instructions into their product design.
- Recycling facilities and waste management companies cooperate with policymakers to establish effective sorting and processing techniques for labelled rattan materials.
- Government regulators must develop clear norms and incentives for appropriate labelling and disposal, assuring conformity with sustainability goals and waste reduction targets.

By taking early action, the rattan industry can set the standard for responsible manufacturing and disposal procedures, benefiting both the environment and the economy. We encourage industry stakeholders to start establishing labelling protocols, look into partnerships for sustainable end-of-life management, and work towards a more transparent and circular material economy.

References

Bamboo and Rattan/Rattan/Course-2 Unit-7 - WikiEducator. (2025). Wikieducator.org. https://wikieducator.org/Bamboo_and_Rattan/Rattan/Course-2_Unit-7?utm_source=chatgpt.com

Business.gov.nl. (2022). Business.gov.nl. https://business.gov.nl/regulation/classification-labelling-packaging-chemical-substances-mixtures/

Edwin. (2024, March 12). *Save the planet from plastic - Originalhome*. Originalhome. https://originalhome.nl/impact-stories/save-the-planet-from-plasticbottle-caps/

Elvara Windra Madyaratri, Apri Heri Iswanto, Deded Sarip Nawawi, Lee, S. H., & Widya Fatriasari. (2022). Improvement of Thermal Behavior of Rattan by Lignosulphonate Impregnation Treatment. *Forests*, *13*(11), 1773–1773. https://doi.org/10.3390/f13111773

European Commission. (2023). *Access2Markets Labelling and packaging*. Trade.ec.europa.eu. https://trade.ec.europa.eu/access-to-markets/en/content/labelling-and-packaging

FAO Knowledge Repository. (2025). Fao.org. https://openknowledge.fao.org/items/c7b7bb3f-5ab6-4603-9ed8-9438a6110f80

Guo, Z., Tian, Z., Liu, Y., Ding, L., Jiang, S., Wu, W., Zhang, C., Han, X., & Duan, G. (2025). A review of cellulose and lignin contained rattan materials: Structure, properties, modifications, applications and perspectives. *International Journal of Biological Macromolecules*, *290*, 139081. https://doi.org/10.1016/j.ijbiomac.2024.139081

Kuwayama, T., & Gilman, J. (n.d.). *Measurements of VOCs in the SoCAB: Chemical Characterization and Impacts on Potential Ozone and PM Formation Final Report Contract No. 20RD002 Prepared for the California Air Resources Board and the California Environmental*

Protection Agency. Retrieved March 28, 2025, from https://ww2.arb.ca.gov/sites/default/files/2024-01/IV.%201%20-%20DFR%20NOAA%2019RD008%20-%20Toshi%20Shang.pdf

Recycling symbols explained. (n.d.). London Recycles. https://londonrecycles.co.uk/recycling-101/recycling-symbols-explained/

Recycling Symbols Explained. (n.d.). Www.recycle-More.co.uk. https://www.recycle-more.co.uk/what-can-i-recycle/recycling-symbols-explained

U.S. Department of Agriculture. (2015, March 23). *Refrigeration & Food Safety | Food Safety and Inspection Service*. Www.fsis.usda.gov. https://www.fsis.usda.gov/food-safety/safe-food-handling-and-preparation/food-safety-basics/refrigeration

2023 International Decontamination Research and Development Conference Proceedings | US EPA. (2024, September 23). US EPA. https://www.epa.gov/emergency-response-research/2023-international-decontamination-research-and-development-conference