



A briefing on the environmental performance of PVCu vs. wood windows, according to recent research, from the Wood Window Alliance.

May 2017

Background

In 2005, the WWF report “*Window of opportunity. The environmental benefits of specifying timber frames*” reviewed evidence on the lifecycle and environmental performance of wood versus PVCu windows, concluding that the overall environmental burden, across several factors, was significantly lower for wood than for PVCu.

More than a decade on, concerns about chemicals in our environment and the rising tide of plastic waste continue. So what does more recent research tell us about the environmental performance of PVCu and the steps the industry has taken towards mitigation of some of the material’s worst impacts? Does the use of wood for windows still rank as the better choice?

The Wood Window Alliance has reviewed new evidence to see what’s changed, and whether its members can still confidently present the environmental argument for wood windows.



Comparing impacts: wood vs. PVCu

Available studies show considerable concerns about the impact on the environment of PVCu windows remain, with the main ones being:

- **Consumption of fossil fuels:** PVC (a plastic) is a major user of fossil fuels – a non-renewable resource; plastics production accounting for 4% of global oil production¹.
- **Human toxicity:** PVC is made from Vinyl Chloride Monomer (VCM), a Class 1 human carcinogen². In a fire, PVC emits dioxins, as well as hydrogen chloride, which can cause respiratory disease.
- **Energy and emissions in manufacture:** VCM is made from chlorine, the production of which is energy and emissions-intensive³; 8.06 million tonnes of chlorine – roughly a third of Europe’s total chlorine production - was used to manufacture PVC in Europe alone in 2015⁴; the UK’s major chlorine plant in Runcorn has an overall energy consumption of over 250MW, roughly equivalent to the energy used by the city of Liverpool⁵.
- **The toxic legacy of recycling:** Efforts have been made to increase recycling rates for PVCu, with an estimated 15% of old PVCu windows recycled in 2013⁶. Paradoxically, recycled PVCu provides one of the main pathways for toxic legacy chemicals, such as cadmium and lead-based stabilisers, into new PVCu products. There is currently an EU derogation in place allowing for cadmium levels of 0.1% in rigid PVC products containing recovered PVC, due to be reviewed at the end of 2017.

These concerns have led many organisations, like the Cradle-to-Cradle Product Innovation Institute and Apple, to ban PVC or place it on a precautionary list⁷.

So, with some concerns still evident, how does wood compare?

Wood, when sourced from credibly certified, well-managed forest sources⁸ is:

- **Naturally renewable**⁹: and can provide environmental, social and economic benefits for the long term.
- **Healthy**: with wood windows using the latest environmentally-friendly water-borne coatings and preservatives containing no chemicals that conflict with Cradle to Cradle Certified™ Silver level requirements.
- **Biodegradable**: and can be recycled for new uses, or - as an end of life option - burned for energy.
- **A low carbon product type**: which contributes to a low carbon economy and climate stability through the action of carbon storage and carbon uptake provided by forests.

To ensure a sound contribution to good environmental (as well as social and economic) performance, windows made with wood from legal and sustainable sources should be supported by an FSC or PEFC Chain of Custody certificate to confirm the timber comes from a well-managed forest.

WWF actively calls for more businesses to understand the versatile nature of wood for modern product applications, and how commitment to sustainable sourcing helps deliver low environmental and social footprint goods to meet the growing demands that we place on forests and other resources.

In *What's New (and What's Not) With PVC*, leading US environmental architects Perkins+Will conclude:

*'Perkins+Will includes PVC on the Precautionary List because it presents hazards to people and the environment, beginning with its synthesis and continuing through its manufacture into products, use, and additional significant hazards during its disposal or recycling'*¹⁰.



Wood has many natural advantages. Made by nature, it's durable, versatile, aesthetically pleasing, biodegradable and, if forests are well managed, renewable. Some wood products have a long working life – wooden construction materials can last hundreds of years and are usually produced with less energy and pollution than those made from alternative materials like plastic and steel.

Nearly all types of solid wood can be reused. Wood can be salvaged and used again in modern décor, from furniture to flooring. Smaller, less valuable wood scraps can be collected and used to make particleboard and other composite products. Engineered wood products use wood efficiently and can be manufactured from fast-growing, underused and less expensive species.

Forest certification provides assurance that the wood in a product comes from a well-managed forest, with an audited chain of custody running from the forest floor to the customer.

We want more of the world's production forest to be certified to a credible standard – and WWF supports the Forest Stewardship Council (FSC) as the best system in use today.

Certification needs to expand significantly in regions, particularly the tropics, where forests suffer most from destructive forestry – so the application of timber into products like wood windows, including ensuring any tropical timber used is certified, can help drive a better future for global forests, and may make the difference between losing them, or keeping them standing and benefitting both people and nature.

Read more about forests at panda.org/livingforests

Aren't PVCu windows more practical than wood?

Over the last 20 years or so, many have been persuaded to replace their old draughty wood windows with PVCu double-glazing to save money on heating bills and time on maintenance.

There is no difference in energy-efficiency between new PVCu and wood windows, as the energy-efficiency of the window is determined by the glazing unit; and both are available with double or triple glazing as standard.

All windows need maintenance, with a six-monthly wash down and lubrication of the hardware. But maintenance of today's engineered wood, fully factory-finished timber windows has been reduced to a typical 8-year re-coating with minimal preparation, so the frequent repainting and extensive preparation required for old timber windows is a thing of the past¹¹.

One of the big advantages of wood windows is that they can be easily redecorated – and of course repaired if necessary.

So whilst PVCu frames might seem cheaper, wood frames are the better investment for long-term value, even taking maintenance into account, because of their longer life¹².



The Wood Window Alliance has commissioned a series of studies to highlight the performance of wood windows made to their standards.

A report by Heriot Watt University¹² showed that WWA frames:

- **Are carbon negative:** and that each wood window used instead of a PVCu window saves an estimated 160kgs CO₂e over its lifetime
- **Last twice as long as PVCu:** with normal maintenance, a factory-finished wood frame can be expected to last around 60 years, roughly twice as long as a PVCu frame.
- **Have lower LCA impacts than PVCu:** for example, with the PVCu frame impacts indexed at 100, the timber frame has an index of 2 for human toxicity and 3 for fresh water aquatic ecotoxicity.

A feasibility study by SGS Search showed that no chemicals in a typical WWA timber window frame conflict with Cradle to Cradle Certified™ level requirements, and that a typical WWA wood window can meet the overall Cradle-to-Cradle Certified™ Silver level¹³.

		RESULTS OF CRADLE TO CRADLE CERTIFIED™ FEASIBILITY STUDY				
QUALITY CATEGORY		BASIC	BRONZE	SILVER	GOLD	PLATINUM
	MATERIAL HEALTH			✓		
	MATERIAL REUTILIZATION				✓	
	RENEWABLE ENERGY & CARBON MANAGEMENT				✓	
	WATER STEWARDSHIP			✓		
	SOCIAL FAIRNESS				✓	
OVERALL CERTIFICATION LEVEL				✓		

Mock-up of scorecard for Cradle to Cradle feasibility study¹³

So all the evidence suggests that, if you want to make the minimum impact on the environment, while improving the performance of your home, you should choose wood windows.

Find out more from us

All WWA members offer Chain of Custody certification for FSC and PEFC sourced wood windows, and are able to supply Environmental Product Declarations (EPDs) as evidence of their environmental impact. They can help you understand how to care for your new beautiful wood windows, as they bring light, life and warmth to your home.

Contact us for more information about wood windows, and our members at www.woodwindowalliance.com

Sources

¹ British Plastics Federation: http://www.bpf.co.uk/press/Oil_Consumption.aspx

² Janet Kielhorn et al, “Vinyl Chloride: Still a Cause for Concern,” Environmental Health Perspectives 108, no. 7 (2000): 580

³ [Ad de Buck, Maarten Afman, Delft, 2011](#)

⁴ [The Alliance for Sustainable Building Products, February 2017, uPVC windows through the life cycle](#)

⁵ <http://www.its-ltd.co.uk/projects/ineos-chlor-improves-energy-efficiency-36.aspx>

⁶ [Waste Management World](#)

⁷ These include: The Cradle-to-Cradle Product Innovation Institute; the US Green Building Council; a number of US cities, including New York City; Google; Apple; Nike; Volvo; and Perkins+Will Architects. http://www.chej.org/pvcfactsheets/PVC_Policies_Around_The_World.html

<http://www.c2ccertified.org/resources/detail/cradle-to-cradle-certified-banned-list-ofchemicals>

⁸ The UK Government recognizes FSC (Forest Stewardship Council) and PEFC (Programme for the Endorsement of Forest Certification) certification as proof of the legality and sustainability of forest sources. To claim sustainability, wood products need to have FSC or PEFC Chain of Custody certificates. All WWA members can supply windows and doors with these certificates.

⁹ <http://foresteurope.org/state-europes-forests-2015-report/>

¹⁰ [A Perkins+Will White Paper, 2016, What’s New \(and What’s Not\) With PVC](#)

¹¹ [Wood Window Alliance, 2016, Maintenance Guidelines for Timber Windows](#)

¹² [Dr Gillian F. Menzies, Institute for Building and Urban Design, Heriot Watt University, June 2013, Whole Life Analysis of timber, modified timber and aluminiumclad timber windows: Service Life Planning, Whole Life Costing and Life Cycle Assessment](#)

¹³ [SGS Search Consultancy, March 2017, Cradle to Cradle Feasibility Study on wooden window frames for the British Woodworking Federation](#)