Women's Environmental Network

briefing

Working for environmental justice through feminist principles

WEN
Ground Floor
20 Club Row
London
E2 7EY

T 020 7481 9004
F 020 7481 9114
info@wen.org.uk
www.wen.org.uk

Reg. Charity No. 1010397

Guide To Healthy & Environmental Flooring

This briefing aims to take consumers through the different available flooring options for their homes, giving an impartial view of the characteristics, benefits, and flaws of materials, and therefore helping to make appropriate choices. Information is given with regards to potential health impacts, lifecycle (including manufacture, transportation and installation), relative cost, and to which rooms different types of floors are best suited.

Unbiased Research

Research into healthy flooring is often undertaken by asthma and allergy organisations or by companies within the flooring industry. It can be contradictory and therefore confusing for consumers wishing to make the right decisions about how to furnish and decorate their homes in a healthy (both personal health and the health of the wider environment), ethical and affordable way. This briefing focuses, in an unbiased way, on what are healthy choices for you, your environment and the planet.

Life Indoors

Most people spend more than 90 per cent of their lives indoors nowadays.[1] The home environment has changed dramatically over the last 30 years with the influx of soft furnishings, fitted carpets, and central heating. Indoor ventilation has decreased; fresh air is exchanged at a rate 10 times lower than it was 30 years ago, which means that humidity, (good for the dust mites) as well as concentrations of pollutants and allergens, has increased.[2]

Fitted carpets

Fitted carpets still predominate in the UK despite trends for and against it over the years. 98 per cent of UK homes have wall-to-wall carpeting, whereas the figure is only 16 per cent in France and 2 per cent in Italy.[4] It is recognised that, although there are perceived and superficial advantages of comfort, insulation and noise reduction, the negative impacts, such as exposure to toxic fumes and house dust mites living and breeding in carpets causing allergies and asthma, cannot be discounted. The high use of fitted carpets in the UK correlates with high rates of childhood asthma, more so than any other European country.[5]
On average, the UK consumer replaces carpets every six years.[6] Many carpets contain non-biodegradable materials, and will clog up landfills for around 20,000 years.[7]

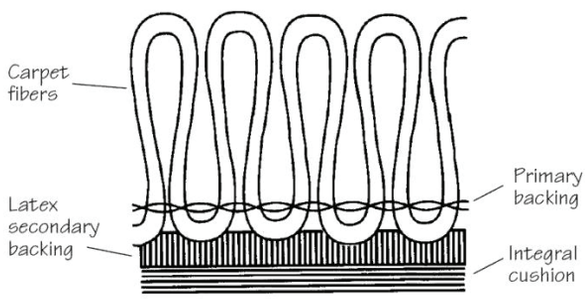

Fig 1. Carpet section[3]

Toxic for Babies

Babies, children, pregnant women and the elderly are particularly vulnerable to pollutants and toxins found in certain types of flooring, especially carpets. One national newspaper dubbed carpets "toxic sponges, sucking up dangerous amounts of chemicals".[8] Ott and Roberts, two highly respected scientists working in the field of indoor toxic pollutants, have now estimated that the average urban infant could ingest 110 nanograms of benzo(a)pyrene, the most toxic PAH (polycyclic aromatic hydrocarbon) per day.

This amount equals what a child would get from smoking three cigarettes.[9] The Healthy Flooring Network and Greenpeace UK published a report in 2001 showing that house dust is a major source of exposure to cadmium, lead and other heavy metals, as well as PCBs (polychlorinated biphenyls) and other persistent organic pollutants.[10] These chemicals are associated with damage to the nervous system, asthma, allergies and cancer.

Vacuuming carpets regularly with a high efficiency particulate air (HEPA) filter is essential to keep dust to a minimum. However, dust mites are not removed as they can cling to the fibres, as well as the chemicals, continuing to "off-gas" a long time.[11] It is better to remove the carpet altogether and replace it with smooth flooring if at all possible.

House Dust Mites

Fig 2. House dust mite

Dust mites are tiny creatures that make their homes in warm, humid, dusty areas such as carpets, mattresses, pillows, and other soft furnishings. Mite allergens can be found throughout the home environment although the greatest numbers of mites are found in carpets, while the highest concentration is in bedding.[12]

These creatures have adapted themselves to exist alongside us. They don't bite or live on people, but many asthmatics are allergic to an enzyme found in the dust mite faeces, known as mite allergens, and each mite produces about 20 faecal pellets per day. One square metre of carpet can contain up to 100,000 dust mites.[13]

They feed on the skin scales we shed and the fungi that grow on that skin. They have a life cycle of up to three months, and the female dust mite lays up to 300 eggs over this time period. No amount of vacuuming or cleaning can remove the mites, as they have suckers on their legs and grip tightly onto carpet fibres when threatened with a vacuum cleaner!

Dust mites like humid conditions and damp areas. In order to destroy mite populations, relative humidity (RH) should be kept below 50 per cent (RH) on a continuous basis. To check the humidity in your home, you can buy a hygrometer from your local DIY shop.

TIP: Choose washable, non-allergenic bedding, curtains and soft toys, and wash regularly in hot water (at least 55˚C). Tumble-drying will also kill dust mites. Freezing your pillows and soft toys for a day works, but you also need to clean them after freezing, as residues stay on the fibres.

Summary Table

A table showing in detail the positive and negative attributes of various types of flooring is shown on the following pages.

Favourable option	Avoid
FSC Certified: Solid or Engineered Wood	Any wood with any of five these certifications: SFI / CSA / PEFC / ISO / IBAMA (see Glossary)
"FSC Pure" and "FSC Mixed Sources"	
Reclaimed Hardwood, Salvaged Wood	Laminates
Solid or Woven Bamboo	Engineered Bamboo
Plain Cork Tiles or Click-together Cork Tiles	Self-adhesive Cork Tiles
Linoleum or Marmoleum	Vinyl
NR Natural Rubber	SBR Synthetic Rubber
Polyolefin Flooring	PVC
UK Ceramic Tiles	Imported Ceramic Tiles
Local Stone, Reclaimed Natural Stone	Marble, Limestone, Travertine specifically if travelled long distance
Rugs made of Coir, Jute, Seagrass, Sisal, Sisool, Wool	Wall-to-Wall Carpeting

Smooth Flooring

Smooth flooring, also known as hard flooring, describes wood, bamboo, laminates, natural linoleum, rubber, vinyl, and many different types of tiles, including cork, ceramic and stone.

The arguments for and against carpets and smooth flooring are manifold. The issues surrounding flooring may be more affected by affordability than health, or by environmental considerations, and ultimately determined by your personal situation. Whilst carpets may be problematic for asthmatics and those with Multiple Chemical Sensitivity (MCS), certain types of smooth flooring, such as laminates, contain toxic chemicals, often in the form of adhesives, which off-gas for a long time after installation and can cause health problems too.

Wood

Although wood is often seen as the most sustainable choice of floor, there are many pitfalls to be aware, such as if it comes from ecologically well-managed forests, whether it is certified and what kind of certification it has, whether sealants are used during the installation process, and so on.

Solid wood is generally more expensive than engineered wood as it comes from a single species, and is single plank. Engineered wood is considered by some to be a more environmentally friendly choice, as it is a more efficient use of resources – the high-quality wood is on top only so it can go further. However, when taking into account the glues and sealants (usually containing formaldehyde – a known carcinogen) that make up the various layers (see Fig.3), it is actually a poor choice, both from a manufacturing point of view as well as from a health point of view.

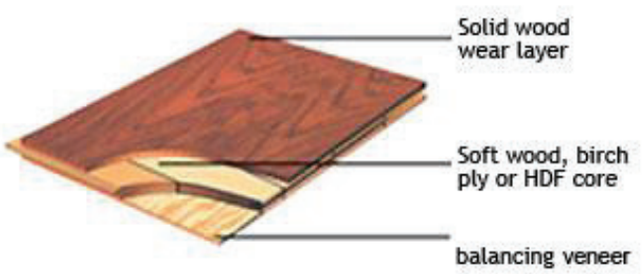

Fig 3. Engineered wood section

Bamboo

Bamboo floors have been heralded lately as the 'greenest' of floors due to them being rapidly renewable; the grass grows to maturity in 5 to 7 years, compared to 50 to 150 years for hardwoods.

On the plus side, it is considered that bamboo plantations sequester more carbon than hardwood forests, but on the negative side, the rate at which bamboo plantations are multiplying throughout Asia for economic gains raises concerns over loss of biodiversity, while over-harvesting produces inferior quality products.[14]

Certification is slow within the bamboo flooring industry, so it is hard to verify the manufacturers' processes until it gets to the shop floor.

Fig 4. Bamboo species

TIP: Consider smooth flooring at entrances where dust and dirt is tracked in from outside and in 'wet' areas such as the kitchen and bathroom.

Types of Flooring

Type of Flooring	Eco Positives	Eco Negatives	Other Considerations
FSC Certified Solid Wood	Recylable and reusable	Sealants, if used, can produce harmful VOCs	Suitable for kitchen, lounge, dining room,
	Low embodied energy if sourced		Prices vary wildly
			Can be combined with underfloor heating
	Renewable source	Adhesives, if used for installation, can produce harmful VOCs	If sanding floorboards yourself, protect yourself from exposure to wood dust
	Biodegradable		
	Non-toxic		Requires sanding and re-oiling, depending on traffic and use, every 8-10 years
	Durable		
FSC Certified Engineered Wood	Limited recylcability and reuseability	Sealants, if used, can produce harmful VOCs	Suitable for kitchen, lounge, dining room, bedroom, study
	Low embodied energy if manufactured in the UK		Prices vary
	Renewable resource	Toxins to seal engineered wood together may off-gas for years.	Can be combined with underfloor heating
	Durable	Adhesives, if used for installation, can produce harmful VOCs	If sanding floorboards yourself, protect yourself from exposure to wood dust
			Requires sanding and re-oiling, depending on traffic and use, every 8-10 years.
Ceramic Tiles	Can have recycled content and be recyclable	Low embodied energy as far as extraction and processing are concerned, but energy-intensive to transport and often over large distances	Suitable for kitchen, dining room, bathroom
	Abundant natural resource		Low thermal resistance therefore ideal when combined with underfloor heating
	Non-toxic	Be wary of importing tiles, as this adds to embodied energy	Huge choice of colours, shapes and styles... can have matt/glazed/textured/embossed for anti-slip
	Extremely durable	Check adhesives for VOCs	Required skilled tiler so large areas can work out to be costly
Local, Reclaimed, Natural Stone, Marble, Limestone, Travertine	Recyclable and reusable	Imported stone adds to embodied energy	Easy maintenance
	Abundant natural resource		Suitable for kitchen, lounge, dining room, bathroom
	Non-toxic	Stone quarrying can degrade the landscape	Low thermal resistance therefore ideal when combined with underfloor heating
	Extremely durable	Sealants and adhesives can produce harmful VOCs	Can be time-consuming to source and limited to what's available at the time
PVC / Vinyl	Durable	Long-term emissions to soil if committed to landfill at end of life	Very cheap, but not recommended as substitute to carpets due to phthalates leaking our of floors and being linked to asthma and allergies
		Made from non-renewable fossil fuels	
		Petrochemicals refining is major source of GHGs, acid rain and toxins	
		Use of chlorine in manufacturing process presents risk to health	
	Easy maintenance	Phthalate and tributyltin content present serious risks to health[16]	
		Difficult to reuse. More phthalates are released as it degrades	
		Difficult to recycle. Incredibly toxic due to release of dioxins	
		PVC does not biodegrade for hundreds of years	

Types of Flooring

Type of Flooring	Eco Positives	Eco Negatives	Other Considerations
Laminates	Durable	Laminates are made up of 4 synthetic layers. The bottom layer contains aluminium oxide to give it its stability and resist moisture, and has been linked to respiratory illnesses	Underlay is usually needed which contain a variety of toxic chemicals that are used for insulation or water resistance and off-gas
		The core layer is made of HDF - high density fibreboard - a pressed wood product with toxic glues, often saturated in resin and can off-gas for a long time	
		The pattern layer uses thin paper printed with wood grain design and most often originates in China, adding to the embodied energy of the overall product	
	Easy maintenance	The top layer is made from melamine resin (melamine mixed with formaldehyde). Chronic exposure may cause cancer or reproductive damage. Also an eye, skin and respiratory irritant[17]	
		Not recyclable or reusable	
Carpeting	Could be recyclable and / or reusable	Wall-to-wall carpeting can harbour dust mites and trigger asthma and allergies	Not recommended for underfloor heating due to thermal properties of textiles
			Unsuitable for kitchens, bathrooms and dining rooms
			Wool carpets, if jute-backed, natural dyed, installed without adhesives and cleaned with plant-based cleaners are good eco option (except for asthma sufferers)
		Chemicals impact throughout lifecycle – including 'off-gassing' toxic fumes in the home	100% wool carpets are preferable from environmental perspective but harbour more dust mites and are more expensive than acrylic, nylon, polyester and polypropylene counterparts
	Abundant natural resource (IF USING 100% WOOL)	Carpets often treated with toxic cocktail for anti-static, anti-stain, anti-microbial, and moth-proofing	Carpet tiles are often made from recycled fibres and can be recycled at end of life. Good choice, as can rotate worn tiles or replace small sections that get damaged
		Carpet backing and underlay can be equally environmentally damaging and toxic	Chose felt, recycled polymer or recycled rubber underlay. Polyurethane should be avoided
			Can be reused as insulation or weed-barrier in gardens, particularly if jute (Hessian)-backed
Polyolefin Flooring (e.g. polyethylene and polypropylene)	Theoretically recyclable	Made from non-renewable fossil fuels	Used more often in commercial settings than domestic
	Low emissions in the manufacturing process	Off-gases harmful VOCs	
	Good sound absorption	Petrochemicals refining is a major source of greenhouse gases, acid rain and toxins	Easy maintenance
	Odour-free		
	Durable	Non-biodegradable	

Types of Flooring

Type of Flooring	Eco Positives	Eco Negatives	Other Considerations
Solid or Woven Bamboo	Recyclable and reusable	High embodied energy due to transport	Suitable for kitchen, lounge, dining room, bedroom, study
		Low quality adhesives used often contain formaldehyde. Binders and finishers often contain toxic chemicals	
	Renewable resource		
		Equipment in factories often emit combustion gases	
	Biodegradable	Mould visible on inferior products indicates processing not carried out fast enough	Less expensive than hardwoods and just as easy to install
	Durable	Most commonly grown and manufactured in China. Hard to follow manufacturers' processes and establish credibility	Floating or glue-down methods of installation. Nail- and staple-down methods not recommended.
Cork Tiles	Low embodied energy as far as extraction and processing are concerned	Cork is produced primarily in Portugal and has to be imported to UK, increasing its embodied energy moderately	Huge variety of colours
	Non toxic		Suitable for family rooms, bedrooms, kitchen, home office. To avoid potential problems with humidity and abrasive dirt, cork is not recommended for bathrooms, basements and hallways
	Durable		Represents good value in terms of product cost and installation
	Thermal and insulation properties	Self-adhesive tiles often include formaldehyde	Not ideal to combine with underfloor heating, as thickness must NOT exceed 10mm as it is an efficient insulator
	Biodegradable	All cork tiles need to be sealed. Sealants need to be selected carefully, as many produce harmful VOCs, which can off-gas for a long time	Prone to scratches and yellowing. Protect floor from direct sun, and big changes in temperature and humidity.
	Renewable resource		
	Can use own water-based glues for plain tiles and no glue at all for click-together tiles		Has more limited lifespan than wood. Need to add new top-coat fairly regularly to prolong lifespan
Linoleum or Marmoleum	Can have recycled content and be recyclable	CH4 (methane) emissions from fertiliser used in linseed production[15]	Suitable for kitchen, bathroom, dining room, stairs, kids rooms
			Some natural linoleum can be around 20% cheaper than marmoleum, but is unlikely to be as 'green'
	Durable		Can be combined with underfloor heating
		Off-gassing from adhesives	Huge range of colours and styles
	Non toxic		Extremely easy to clean and maintain
			Mineral pigments used for the rich colours can stain over time if used in bathroom
	Renewable resource		True linoleum is made by oxidising linseed oil, and the resulting paste is mixed with pine resin and wood flour, then heated, run through rollers, and backed with jute
	Biodegradable		Vinyl is often called lino but is synthetic and toxic. Be wary of fakes
			Marmoleum is the first floor covering to recieve the Asthma & Allergy Friendly™ certification

Types of Flooring

Type of Flooring	Eco Positives	Eco Negatives	Other Considerations
100% Natural Rubber	Down-cyclable and reusable	Non 100% rubber floors can include PVC, chlorine-based ingredients, plasticisers or halogens - check contents!	Suitable for kitchen, bathroom, dining room, stairs, kids rooms
	Renewable resource		Prices are similar to lino and marmoleum
	Non-toxic		Can be combined with underfloor heating
	Very durable	Incineration generates toxic fumes	Huge choice of colours and textures
	Sound absorption properties		Extremely easy to clean and maintain
			Professional installation can be expensive, and DIY installation requires some skill
Rugs	Recyclable and reusable	Vulnerable to moisture, so may be unsuitable for certain rooms in the house	Tight-weave rugs are preferable
	Abundant natural resource		
	Non-toxic		
	Easy to wash or clean and maintain	May involve child labour - research companies before purchasing	Natural grass or vegetable fibre rugs, such as sisal, coir, seagrass or jute, are obtainable from sustainable sources
	Naturally anti-static		
	Extremely durable		

Ask Suppliers These Questions

When specifying your new eco-friendly floor, be sure to get answers to these important questions:

- Was the extraction of the raw materials done in such a way that natural habitats were not degraded in the process?
- Was there as little ecological damage as possible caused in manufacturing and transporting the product?
- Are the workers working under healthy and humane conditions and being paid fairly?
- Have the waste materials been reclaimed, re-used or recycled?
- Once installed, does the product release any harmful chemicals into the air in your home?

What You Can Do At Home

Here are some things you can do to help reduce the allergens in your home. This may help to relieve allergy sufferers of their symptoms and substantially reduce the risk of infants becoming sensitised in the first place.

- Wipe your feet. A good doormat will eliminate some of the outside dust from being tracked inside. Consider removing your shoes before you enter the house.
- Use the sun to air soft furnishings and bedding and floor mats. Dust mites will perish when exposed to two hours of ultraviolet light.
- If you have pets, consider keeping them outside or confined to just one room. As much as we love them, they can exacerbate asthma by shedding an asthma triggering dander, so keep them off soft furnishings and out of the bedroom.
- Strong odours, fumes and perfumes at home or in the workplace may make asthma worse. Use environmentally friendly products; contact WEN for details. Encourage asthma sufferers to avoid areas being painted or cleaned until the smell is gone.
- Ventilation is important to prevent the build up of toxins.
- If you can't remove carpet, try and clean it often and thoroughly using a good quality HEPA filtration vacuum - although it won't remove dust mites, it will effectively tackle animal allergens and other dust particles. Traditional vacuum cleaners may just re-circulate the smaller dust particles back into the atmosphere.
- Dispose of wet carpet that has been wet for over a day, as it is likely to have mould and mildew contamination that is very difficult to control. Rather than risk breeding these allergens or exposing people to toxic treatments, most experts recommend removing the wet carpet.
- Clean old carpet before removal as it will contain dust and dirt that can be released back into the building when it is pulled up. After removal, clean the space underneath, as dust and contaminants may be trapped.
- Choose plants that can clean the air for you: look at Wolverton's 'Eco-Friendly Houseplants' and 'How To Grow Fresh Air' for recommendations of 50 plants that purify air from 25 years of research by Nasa.

Glossary of Terms

Certification: SFI - Sustainable Forestry Initiative
CSA - Canadian Standards Association
PEFC - Program for the Endorsement of Forest Certification.
ISO - International Standards Organisation
IBAMA - Program of the Bazilian government
All of the above certifications are questionable. Most do not have meaningful environmental standards, enforcement mecha-nisms, or methods of tracking wood through supply chain to keep out illegally logged material.

Downcycling: The process of converting materials into new materials of a lesser quality, e.g. office paper into toilet paper. Most recycling is in fact downcycling.

Embodied Energy: All the energy invested in a product lifecycle including extraction, processing, manufacturing and transportation.

Engineered Wood: Made up of multiple layers pressed together with toxic glues and sealants.

FSC: Forest Stewardship Council. The 'Gold Standard' certification label for sustainably harvested wood products. Can be FSC Pure or FSC Mixed Sources. Product MUST have FSC logo on. The only certification that is supported by environmental groups worldwide.

Formaldehyde: Used as adhesive, bonding agent and solvent.Colourless strong-smelling gas that can cause watery eyes, burning sensation in eyes and throat, nausea, fatigue and respiratory damage, disturb menstrual cycle above 0.1 parts per million. Asthma sufferers, children, the elderly, and pregnant women are particularly vulnerable to exposure. Known to cause several types of cancer.

Harvested Wood: Clear-cutting land from traditional industrial forestry destroys forests, although the practice has somewhat lessened from 20 years ago. Wood should be harvested sustainably so as not to cause habitat damage or reduce biodiversity and release carbon into the atmosphere.

IAQ: Indoor Air Quality. Term referring to the air quality within buildings as it relates to the health and well being of its occupants. Measuring IAQ measures the amount compounds released into the space by different materials, particulates, mould and microbial contaminants.

MCS: Multiple Chemical Sensitivity is severe allergy-like reaction to many different kinds of pollutants including solvents, VOC's, perfumes, smoke, pollen, dust mites, and dander.

Off-gas: Off-gassing is the tendency of many chemicals to volatilize, or let off molecules in a gas form into the air.

Pressed Wood: Particleboard, plywood, OSB (oriented strand board), MDF and HDF.

Reclaimed Wood: Manufactured wood that is remanufactured into new wood products e.g. timbers from old buildings that need to be remilled.

Salvaged Wood: Direct reuse of wood products e.g. salvaged doors.

Solid Wood: Solid Wood flooring is milled from timber and each plank is a single species and a single piece of wood throughout its thickness and width. It is commonly available unfinished and factory pre-finished and the standard thickness is 19mm.

Upcycling: Converting materials from one use to another use of higher environmental quality, e.g. wooden pallets into furniture.

VOCs: Volatile Organic Compounds. Chemicals that become gas at room temperature. Harmful to health. Formaldehyde is a common VOC.

Woven Bamboo: Shredded into fibres and mixed with resin and compressed into solid blocks. Harder and denser than solid bamboo.

Stockists

Wood and Bamboo
www.timbernatural.com/
www.ewtimber.co.uk/ [English woodlands timber]
www.plyboo.com/ [formaldehyde-free bamboo flooring, and only company to obtain FSC certified bamboo]
www.reclaimedfloorboardsuk.co.uk/
www.reclaimed.uk.com/
/www.admonter.at/en/home.html
www.kahrs.com/uk/Consumer/AboutKahrs/commitments/Pages/Certifications.aspx
www.junckers.co.uk/?pageid=H3210

Cork
www.corkfloor.co.uk/

Linoleum/Marmoleum
www.forbo-flooring.co.uk/

Rubber
www.nora.com/uk [100% NR]
www.dalsouple.com/ [100% NR]
www.therubberflooringcompany.co.uk/[Part synthetic SBR, part natural NR, and part recycled rubber]

Tiles and Natural Stone
www.firedearth.co.uk/

Natural Carpets and Rugs
www.alternativeflooring.com/
www.crucial-trading.com/en/default.aspx
www.thenaturalflooringcompany.com/
www.millikencarpet.com [recycled carpet tiles]

Multiple Flooring Types
www.eco-flooringltd.co.uk/[bamboo, Marmoleum, carpet, cork]
www.urbaneliving.co.uk/ [wood, bamboo, Marmoleum, cork, natural carpets & rugs]
www.ecora.co.uk/ [natural stone & wood]

Underfloor Heating
www.variotherm.at/en/
www.jupiterunderfloorheating.com/system_ideal_eco.php

Carpet Underlay
www.texfelt.co.uk/product_envirolay.html [Envirolay 100% recycled fibres]

Companies researched by the author may change after going to press and therefore no responsibility is taken by WEN for stockists and services recommended

Useful Contacts

Allergy Information
www.actionagainstallergy.co.uk/
www.healthy-house.co.uk/
http://multiplechemicalsensitivity.org/

Campaigning Organisations, Certification Bodies, Health and Safety
www.greenpeace.org.uk/ - Greenpeace
www.foe.co.uk/ - Friends of the Earth
www.fsc-uk.org/ - Forest Stewardship Council
www.lhc.org.uk/ - London Hazards Centre

Sustainable Building Products & Resources
www.constructionresources.com - materials and systems for sustainable building
www.material-lab.co.uk/ - Place to source materials and discuss projects
www.greenspec.co.uk/ - Comparison of environmental impact of materials
www.aecb.net/ - Association of Environmentally Conscious Builders
www.ethical-junction.org - Directory of ethical suppliers
www.livingethically.co.uk/ - Shopping directory promoting organic and ethical lifestyles

About WEN
Women's Environmental Network is a registered charity educating, informing and empowering women and men who care about the environment. It researches and campaigns on environmental and health issues from a female perspective.

Individual membership (women & men)
£20 ordinary
£12 unwaged
£40 supporting Affiliate membership (organisations)
£35-150 depending on size.

Produced by Julia Haltrecht, from the original report by Helen Lynn. Designed and edited by Jo Budd & Victoria Minnear