

Recycled plastic roads, bricks & more – yes or no? (benefits vs. risks)

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Engineers are producing strong alternatives to conventional cement, using plastic. They're saving money for [construction companies](#), while painting a greener future. Our planet is choking on waste that can create recycled plastic roads, bricks and more! But caution is needed too. This new form of eco-building design comes with risks that must remain under the microscope, to avoid causing more harm.

Plastic bottles, bags and jars.

Imagine walking on a footpath that's made out of the litter in your yellow bin?

This eco dream is happening right now in Queensland, thanks to engineering firm Fibercc and James Cook University scientists.

They've reinforced concrete with plastic waste, instead of steel mesh. [Fibercon](#) says its plastic fibres are 100% recycled, which is a new development in the area.

Their technology is building footpaths that normally feature steel.

The results?

Cheaper, faster and safer concrete.

They say their durable product saves time and money for construction companies, since it's easier to work with. This makes it more cost effective than conventional materials, like steel.

Our planet benefits too:

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Mind you, this is while putting 50 tonnes of litter to good use!

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On a global scale, steel making is a leading source of greenhouse gases.

Replacing steel concrete with salvaged plastic, on the other hand, lowers carbon emissions,

water wastage and fossil fuels.

No small feat, according to Fibercon CEO Mark Combe.

“The reductions we have achieved in CO2 emissions, are the equivalent of taking 214 passenger cars off the road for 1 year.”

This is supported by [calculations](#) from the United States Environmental Protection Agency.

Fibercon first used their revolutionary technique (called Emesh Fibres) in 2017.

Since then, they’ve reported a reduction of:

- 1000 tonnes of carbon
- 200 tonnes of fossil fuels
- 18 000 m3 of water

The [James Cook University research team](#), supervised by [Dr Rabin Tuladhar](#), found that reused plastic fibres create 90 per cent less carbon than steel production.

Mind you, this is while putting 50 tonnes of litter to good use!



Mr Combe says the team were driven by a desire to end the cycle of plastic waste.

“We have effectively recycled the plastic waste for 467 Australians.”

This is massive, when you think about how much plastic we use, on a day-to-day basis.

Consider this:

Every person in Australia creates an average 107 kilograms of plastic waste each year, according to a [2016 report](#).

Fibercon aims to put more of this litter to good use, by building pavements across Australia with virgin fibres. They're exploring other applications too. ^

"It's an exciting goal for us," Mr Combe said.

But wait, there's more to eco-building design than green footpaths...

Engineers and scientists are increasingly finding ways to put plastic waste into construction materials – with promising results.

Recycled plastic roads.

Recycled plastic bricks.

Recycled plastic houses.

There are many applications.

Our article looks at:

- [Economic benefits of recycled plastic building materials](#)
- [Sustainable impact on the environment](#)
- Examples of innovative plastic projects across the world:
 - [Recycled plastic roads trialled in Australia](#)
 - [Plastic asphalt roads withstand floods, monsoons and heavy traffic in India](#)
 - [Durable concrete made from hospital waste](#)
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 - [What happens when researchers blast plastic with gamma radiation?](#)
- [Ecological risks of this new method and the need for ongoing testing](#)

But first, let's explore why some in the construction sector already use recycled plastic for eco-building design.



Save money using recycled plastic waste in construction:

Construction companies are saving money, thanks to this long-lasting product. Engineers give recycled plastic building materials their tick of approval, for various reasons.

These include:

- Strong, lightweight and protects against moisture (especially [polyvinyl chloride](#)).
- Possible to produce a concrete that's 10 to 40 per cent lighter than conventional versions.
- Heavy-duty resistance against chemicals and solvents.
- Thermoplastics are flexible and can be reshaped easily.
- Effective insulation from the cold, heat and sound pollution.
- Energy leakage is prevented.
- Many plastic materials are fire resistant.
- Effective insulators for electricity.
- High durability and enduring, extending the life of concrete building materials.
- Plastic consumes less heat than metal.
- Recycled plastic roads handle extreme temperatures and heavy traffic well.
- Often cheaper than traditional cement mixes.
- Proven to reduce water absorption by 30 per cent, when added to concrete.

And the best part?

Construction companies can cut building costs AND support the environment, by using repurposed litter.

This win-win couldn't come at a better time.



How eco-building design helps the environment:

Our planet can benefit from the widespread creation of recycled plastic roads, bricks and other structures.

This is how:

- Plastic waste gets stored in building structures, so there's less landfill.
- Air quality becomes cleaner, thanks to a reduction in plastic incineration.
- Animals are safer because waterways and habitats are protected from excess waste.
- Carbon emissions and fossil fuels drop when reused polypropylene plastic replaces metal. This is because [five per cent of greenhouse gases](#) come from conventional cement production.
- By the same token, there are significant water savings.

Why embrace eco-building design? Plastic waste devastates:



More than 8 billion tonnes of plastic has been produced, since its creation a century ago.

Alarmingly:

Nearly all of it still exists today in [some form](#), since plastic was made to last forever: ^

- 9 per cent gets recycled
- 12 per cent is incinerated
- 79 per cent ends up in landfills or natural habitats

Our oceans are littered with millions of tonnes of plastic waste. This takes 50 to 600 years to break down, depending on the product.

“Without significant action, there may be more plastic than fish in the ocean, by weight, by 2050.”

The New Plastics Economy [report](#) by the Ellen MacArthur Foundation

Tragically, wildlife on the land and sea become entangled in plastic, or mistake it for sustenance. Our health is also threatened by the [leaching of toxic chemicals](#) into our water and food supply.

If you believe this problem is too widespread to tackle, you're not alone.

It's overwhelming.

Thankfully the construction industry is adding to solutions popping up in various Australian sectors, as the need for sustainability grows.

In July, Queensland committed to enforcing a plastic bag ban on retailers, joining most states and territories, except for NSW. Woolworths and Coles also pledged to phase out single-use plastic bags across the nation.

Good timing – considering that China is now [refusing to import 24 categories of foreign garbage](#), including some plastics. The rest of the world has little choice but to better manage their own trash now.

This begs the questions:

How is the construction sector rising to the challenge?

And are there any dangers to building with plastic waste? (more on this later)

Construction projects using recycled plastic building materials



Recycled plastic roads in Australia | cost-effective solution:

If you love the idea of walking on a footpath made out of plastic waste, wait until you drive on a road containing your trash.

Sutherland Shire is giving recycled plastic roads a test run, by resurfacing the Old Princess Highway in Engadine.

[Builders have started laying part of the road](#), which is made from an asphalt mix that contains plastic bags and glass. It's designed to withstand heavy traffic and handle extreme temperatures, while being cost competitive.

But they're not the first council in Australia to pioneer such a project, using cutting-edge technology. Melbourne's Hume City beat them to it – trialling the new form of asphalt earlier this year, with amazing results.

The durable 300-metre stretch of road on Rayfield Avenue uses an affordable and flexible “plastiphalt” mix that resists deformation and fatigue.

It contains THOUSANDS of plastic bags, glass bottles and toner from printing cartridges.

Consider the environmental impact:

This is equal to ten years of rubbish from the yellow bins on that street alone, according to Hume mayor Geoff Porter.

“We think that is something to be pretty proud of,” he told the Sydney Morning Herald.

Recycled plastic roads started in India | the test of time:

Plastic roads were first developed in India in 2001, by Dr Rajagopalan Vasudevan, who wanted to tackle pollution. He discovered that recycled polymer plastic is an excellent binder, flexible and surprisingly durable.

A tar road in the capital Chennai was one of the first to be built using shredded plastic tar. Fast forward to the present and more than 33, 800 kilometres feature the polymer technology.

Plastic Roads - Laying Procedure



According to [the Guardian](#):

“Every kilometer of this kind of road uses the equivalent of 1m plastic bags, saving around one tonne of asphalt and costing roughly 8% less than a conventional road.”

The road has withstood floods, monsoons, heat waves and heavy traffic, without deteriorating.

It almost seems too good to be true.

Some experts say there could be negative consequences in the long-term, such as the breaking down of plastic pieces into the soil and waterways. Read on, we'll explore this later.

Hospital waste to durable concrete in Australia:



Yes, you read that right.

Plastic used in life-saving dialysis treatment could extend the life of concrete, by guarding against corrosion.

[Deakin University researchers](#) are blending shredded plastic into their cement mix, in a radical experiment.

So far, so good:

This creates a durable and waterproof concrete, which absorbs 30 per cent less water than alternatives, as seen in initial tests.

Project leader [Dr Riyadh Al-Ameri](#) says the finding shows that recycled plastic can help concrete to resist corrosion. This is huge.

He's been nominated as one of [Australia's Most Innovative Engineers in 2018](#), as a result of his work.

"This award will encourage us to do more for our society and address one of the major issues we are suffering from – plastic waste."

"If we are able to facilitate production of new types of concrete that will offer better protection, give structures longer life and better performance, as well as help recycle plastic waste, that will be a great achievement."

Dr Riyadh Al-Ameri

And there's no shortage of single-use dialysis products to experiment with, that's for sure.

Dialysis treatments in Australia create 5,100 tonnes of plastic waste every year, according to Dr Katherine Barraclough from [Royal Melbourne Hospital](#), who collaborated on the project.

“With increasing numbers of people requiring dialysis in Australia and worldwide, we need to work out ways to reduce the costs of care delivery, as well as play our part in ensuring a healthy environment for future generations.” ^

People live in “LEGO HOUSES” made from recycled plastic bricks:



Colombia is facing two major problems:

The need to accommodate growing numbers of people in its cities.

AND

Plastic pollution – around 650 tonnes is thrown away each day in the capital Bogota alone.

Architect Oscar Mendez is tackling both issues by turning bottles, bags and rubber into durable bricks that build quality houses for people seeking shelter.

“Plastic is a problem everywhere, and people will always need a roof over their head,” he [told Forbes](#).

Two birds with one stone (or brick, you might say).

His company, [Conceptos Plasticos](#), works with communities across Colombia to build the sturdy, fireproof and earthquake resistant homes. These require little maintenance.

The recycled plastic bricks are put together like LEGO pieces – and quickly too! A two-story house can go up in five days and there’s no need to put adhesive on the interlocking structures.

To make this possible, the team:

- Encourage communities to collect old tires and plastic waste
- Clean the materials completely



Construction companies can save time and money, while building durable structures. This means paying less for transportation and labour, since builders are more productive with lightweight materials.

“If you can take, for example, 40 percent of the weight out of a building structure, the engineering loads that change on that and the reduced costs in engineering are enormous.”

[Pete Hutchinson](#), Enviroplaz research engineer

Sustainable construction that generates major savings for business owners? Tick and tick.

The best part for concrete companies:

They don't need to change much to make this reality.

A thermal mechanical process turns the waste into aggregate. It doesn't even need to be cleaned, according to founding director Peter Barrow.

“We don't take the labels off, we don't have to disassemble it or take any of the other components off it, we can use it in its entirety,” he [told the NZ Herald](#).

It could be another two years before this launches in New Zealand, since the recycled plastic bricks are still being tested.

Gamma radiation + plastic = stronger concrete | MIT research:

- Grind the recyclables into a gritty powder
- Mix and melt the substance into different shapes
- Show locals how to build the houses

^

It's worth noting the plastic mix will eventually biodegrade, but this will take more than 500 years.

This is a real life Lego house made for Colombia's homeless



Big savings for NZ companies, thanks to recycled plastic blocks:

Twenty years.

That's how long it's taken for New Zealand company Enviroplaz to create a lightweight polymer aggregate that's made out of plastic waste. It's called [Plazrok](#).

Has all that experimenting been worth it?

You bet.

The results:

- 10 to 40 per cent lighter than concrete made with traditional stone aggregate.
- Compressive strengths that match conventional concrete.
- Potential seismic qualities and long-lasting, since it resists breakage and cracking.



Plastic has traditionally weakened the structure of cement: one reason it's not widely used as an ingredient.

But [researchers](#) from Massachusetts Institute of Technology have found a solution:

Radiation – in harmless doses.

They replaced 1.5 per cent of cement aggregate with powdered plastic that's been blasted with gamma rays, to change its structure.

The results?

Cement that's up to 15 per cent stronger than non-irradiated plastic concrete samples.

"Our technology takes plastic out of the landfill, locks it up in concrete, and also uses less cement to make the concrete, which makes fewer carbon dioxide emissions. This has the potential to pull plastic landfill waste out of the landfill and into buildings, where it could actually help to make them stronger."

Michael Short, assistant professor in MIT's Department of Nuclear Science and Engineering.

We've written about this [before](#), you might recall. It's worth mentioning again, since their study has now been published in the Waste Management journal (Jan 2018).

An [interesting read](#), if you'd like to find out more about the evolving journey of sustainable concrete!

Possible dangers of recycled plastic waste in eco-building design:



It's easy to get caught up in the rush of finding a sustainable solution that benefits construction companies too.

But this is a fairly new area, so we don't know everything. There's actually some concern that recycled plastic building materials could create problems in the long run.

For example, what happens to the plastic when it degrades after 500 years?

We won't be here to witness that, but it's worth asking for future generations.

Plastic doesn't simply disappear when turned into concrete, after all. It's simply hidden away. Over time it [breaks down into microparticles](#), which eventually leech into the soil and water. This could happen faster than we think.

There's also the fact that chemical additives need to be added to plastics, in order to make them fire proof, flexible and suitable for construction. What impact do these additives (some which are toxic) have on the environment? This is worth looking into.

Take the Sutherland Shire road trial, for example. The plastic has been completely melted into the bitumen, which might stop microbeads from escaping.

Even so, a report by Sutherland Shire states that [risks associated with the trial cannot be dismissed completely](#). Laying roads with plastic asphalt is a recent development, so field testing has been limited.

[Dr. Prabhakar Sharma](#) is from the School of Ecology and Environment Studies at Nalanda University. This topic is of particular interest in India, where plastic roads are becoming widespread.

He says rigorous testing is needed to make sure that plastic building materials don't harm the environment.

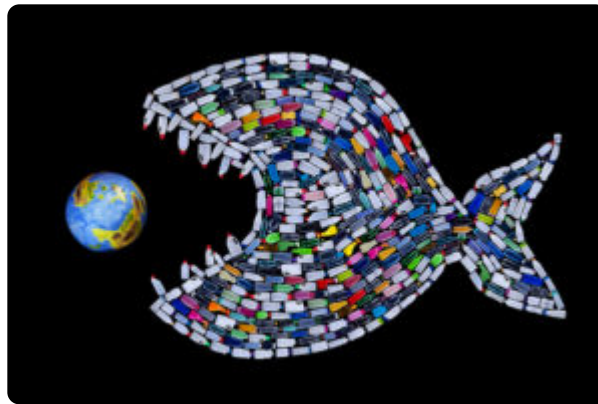
“There must be field-scale testing of plastic under different soil and climatic conditions (temperature and rainfall pattern), with particular attention to the release of micro-and nanoparticles from plastics and their long-term accumulation in soils and their effects on soil quality near the road and agricultural land. In addition, it is also important to explore their impact on air quality.”

[Hindustan Times](#)

Does this mean we shouldn't be building structures using recycled plastic?

No, but there needs to be ongoing research and testing, to make sure we unlock the benefits in safe and healthy ways.

After all, the last thing we want is to cause more harm than good, even with the best intentions.



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