

# Our LEGO® Stories

## Episode 4: Making LEGO® Bricks Sustainable



### Introduction: What we'll cover in today's episode (00:00)

**Julie:** As children shape their world with LEGO® bricks, it's our responsibility as grownups to take care of the world they'll inherit. Here at the LEGO Group, we've set ourselves the ambition to make LEGO products from fully sustainable materials by 2030.

In this episode, we find out what our people are doing to meet this target, the obstacles we're working to overcome, and our brand-new prototype, which might just hold the key to a sustainable solution.

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**Nelleke:** The biggest challenge to my mind is that with every solution there will be trade-offs.

**Bistra:** I find it really very motivating to be at the front-end of material science and to be deeply involved in sustainability matters across the entire value chain of materials.

**Julie:** You're listening to Our LEGO® Stories. I'm Julie Foster and a proud member of the LEGO team.

**Loren:** And I'm Loren I. Shuster – another happy member of the LEGO team.

**Julie:** Take a peek into how we bring LEGO products to life and what we do to have a positive impact on the world in this new series brought to you by the LEGO Group.

Coming up in the show, Vice President of Materials Nelleke van der Puil shares with Loren the story behind the first LEGO brick prototype made from recycled PET. And Senior Project Manager in Materials R&D Bistra Andersen reveals what a typical day at the lab looks like on the hunt for sustainable materials.

First up, Tim Brooks, Vice President of Environmental Responsibility, explains to me why making LEGO bricks sustainable is about as far away from an off-the-shelf solution as it gets.

## **Chapter 1: Fully sustainable materials by 2030 (01:53)**

**Julie:** So, Tim, we've made this commitment to make our products from fully sustainable materials by 2030. Why is that so important to us?

**Tim:** Ultimately, we put children at the centre of our mission, and we say we want to inspire and develop the builders of tomorrow. We want to inspire children. And so, as a company, we need to be responsible with that future, saying, 'We're going to make these great bricks. They're going to help with learning through play, but in doing so, they can't jeopardise the future of the planet that we hold so dear'. That is really the reason why we've gone out: we need to, we want to, but we also know that children expect us to as well.

**Julie:** Can you give a little bit of a peek into how they push us to do better?

**Tim:** We are making these big goals. There's a lot of technical development. It can be quite daunting, and sometimes it's quite frustrating if we're not making the progress we hope. And then you get a letter that lands on your desk and it's 'Hey, dear Mr. Sustainability' or 'Dear Mr. LEGO' or sometimes 'Dear Tim, we really love what you're doing' or actually, often it's, 'We really want you to do better. We want you to do more in this area. We believe you need to solve this particular challenge.' Having the letters and the guidance and the input from children, you know, spurs us on to do more, to work harder to solve those challenges.

**Julie:** And how do we work with such a big ambition?

**Tim:** It's very complex. There are lots of moving parts. I think the best thing to do is to use the moonshot analogy. And where sustainability and sustainable materials work well with the moonshot is by setting that really big, audacious goal or 'BHAG' as people call it: 'a big, hairy, audacious goal'. And that's the same as the moonshot. Where it's different is the concept of sustainability isn't

as clearly defined as 'put a man on the moon by the end of the decade'. 'What is sustainability? What is a sustainable material?' is a bit more nuanced and harder to pin down.

**Julie:** Could you explain a little bit about what fully sustainable materials actually means to us? And how do we define it?

**Tim:** There isn't a definition that you can get off the shelf and say 'this is a material' or 'this is the way that you should treat LEGO bricks in sustainability'. So we had to work with a number of partners like **WWF** to really try and provide some broad guidance for what we believe a sustainable material is but allow some flexibility within that for delivery.

So, ultimately, on the brick side, it is a material that actually lasts a long time, and this was a discussion we had. Should the bricks last as long as possible, or should they somehow be biodegradable? And we felt the main benefit of LEGO bricks is this long-lasting durability multi-generational play.

And also the fact that they're compatible since 1958 as well. You can buy any product off the shelf today, and it will fit together perfectly with any product that you've bought from the late 1950s onwards. That's an amazing durability and sustainability story in and of itself.

So it's a material that lasts a long time. It's a material that's made from sustainable chemistry. So all of the materials, they wouldn't harm the planet or humans in the way that they're created and put into bricks.

It's a material that doesn't create waste in the value chain. So very much harnessing the idea of the circular economy as well. It's a material that should be recyclable at the end of its long life. So, of course, it can't be too exotic a material going into the brick if it can't then be recycled properly at the end.

And it's a material that should have a lower environmental footprint at each iteration. We also agreed that we couldn't make these huge jumps all in one go and, again, using the man on the moon analogy, you have to chunk it up into a series of steps. NASA didn't just jump in a rocket and fly to the moon. They flew a little bit up, and then they flew a bit further and then they flew into earth orbit, and then they flew once around the moon and then they flew twice.

So it's really that we acknowledge we'll make a number of steps along the way. So each time, we've set minimum thresholds of the sort of improvement of CO2 and environmental impacts that we would expect to see.

And, as an example, we introduced the sugarcane-based polyethylene material, which has on average about a 20% lower CO2 footprint than the previous fossil-based material. So it's not 100%, but we felt that 20% was a very good step.

## Chapter 2: Progress in the sustainability arena (06:03)

**Julie:** Back in 2018, we used that sugarcane-based material to produce botanical elements, such as leaves and branches, which we called Plants from Plants. Let's hear a bit more from Plantus Maximus and his plant-based pals on the mission to protect the planet.

**Video insert<sup>1</sup>:** *The first LEGO plants made from plants have arrived, and new heroes are born. To overcome all obstacles, new superpowers are needed. Quick, activate your plant shield! Use your LEGO plants to build your own superhero and join the sustainability mission.*

**Julie:** So, Tim, that was three years ago. Why does it take so long for us to have more news to share about our progress in the sustainability arena?

**Tim:** Yeah, it's a very difficult challenge ultimately. We're looking at the technical capabilities of the material: does it actually work? Is it safe? Does it fit together? And a lot of the challenges we have on that technical capability is clutch power. So the brick will either not clutch, and it won't hold together to build these wonderful structures, or it'll clutch, and you can't get it apart. You need a pair of - a wrench - or a pair of pliers, as we would say in the UK, to undo it.

So we try and have a look at the technical capabilities. We have a look at the commercial reality - is the material available? Is it available in the volume that we need? Does it come from multiple suppliers so we can have a nice balanced and resilient supply chain?

We look at the consumer and the children and parents aspect of it. Is this something that they want? Is it something that they can identify with? Will they enjoy playing with this new sustainable material? And then, of course, last but not least, the sustainability. Is it more sustainable as a material in itself? And to what percentage is it more sustainable?

So balancing that technical aspect, the commercial aspect, the consumer aspect, and the sustainability aspect is the big challenge of why it takes a long time. We're finding materials that will max out on one of those or max out on two of those, but nothing ever maxes out on all four of those criteria. So we're then having to make a balance and a judgment about each material under consideration.

**Julie:** The new prototype that we're revealing is a LEGO brick made from recycled PET. So tell us a little bit about that and what you're most excited about as we reveal it to the world.

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<sup>1</sup> YouTube: [The First LEGO® Plants Made From Plants Have Arrived](#)

**Tim:** Yeah, so I'm excited about two main things. This is the first time we've shared prototypes of our work on LEGO bricks. It was very important to us to show our journey on sustainability, to show that we're working as hard as we can, and also to get feedback as well and input. So I think that's super exciting. And then, the material is what we call R-PET or RPET, which is recycled PET. For those of you not familiar, it's the material you'll find in soda bottles. It's super safe. It's a very durable material. And it's the first time we've ever used a recycled material in a prototype that we've released externally.

**Julie:** Check out our invitation to plastic bottles everywhere to help us recycle plastic into play.

**Video insert<sup>2</sup>:** *Attention plastic bottles, this prototype could be the shiny new you. Fed up of the side of the road, the bottom of the garden, being made a fool of on the internet. Well, as part of the LEGO Group's journey to make a positive impact on Planet Earth, we invite you, bottles, to join our first wave of prototype bricks made from plastic bottles. If you've ever dreamt of becoming a castle, a cat, an er... an iconic LEGO brick loved and reused by generation after generation, then this might be your chance to rebuild your life. Say goodbye to being blamed by a world that drunk you dry and threw you out, and hello to life as a prototype brick at our development lab in Denmark, where we're working to make all our bricks using recycled or renewable sources. Bottles, help us recycle plastic into play. Become a prototype brick today.*

### **Chapter 3: Our recycled PET prototype (10:18)**

**Julie:** 65% of our carbon emissions as a company are related to the material within the LEGO bricks themselves. Because they represent such a big chunk of our carbon footprint, it's a key focus of our sustainability efforts. Here's Nelleke van der Puij, Vice President of Materials, who shares more with Loren on the recycled PET prototype and the progress we've made.

**Loren:** Nelleke, can you tell us what's the background story behind the first LEGO brick prototype made from recycled PET?

**Nelleke:** When we started our investigations into more sustainable material for our products, we started off with a very broad scope. Initially, we looked mainly into materials that are made from biosources and are quite, I would say, exotic, and we tested many different material formulations.

And over time, we started to focus more on what recycled materials could bring to us. And one day, someone in my team came to me, and he said, 'I would like

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<sup>2</sup> LEGO.com: [From bottles to bricks](#)

to try PET'. And I was a bit surprised because PET is not this very special material. It is actually a material that is used in a lot of different applications, like carpets and garments and also in bottles for beverages.

I said, 'Yeah, I'm extremely interested in understanding if that could work.' And a couple of weeks later, he came back, and he showed me the first results. The bricks actually looked quite interesting. We came to the conclusion that this could be an excellent material to work with also because of these many applications that are out there. And we know that the industry in the future will be moving towards recycling all these plastics that have been used and they will go into a big loop.

So we think that we will be able to source PET from recycled sources in the future. And then we decided to really make this into a big effort. We started to look for partners that could help us with the development of this material into a formulation that would work with our bricks.

**Loren:** And was it really that quick? Was it a turnaround in weeks? One would imagine it would take years to develop a new prototype of a LEGO brick.

**Nelleke:** Yes. And actually, it did. We were a little bit optimistic when we started with this. We thought, 'okay, there are technical gaps that we need to solve', but as it turned out, it was actually much more difficult than we had anticipated. We've now invested three years of development into this. But we're now at a point where we really say 'yes, this could actually be applied in products'.

**Loren:** And, this is obviously a prototype, which means it's a pretty long way from mass production.

**Nelleke:** Yep.

**Loren:** What would it take to really get it ready for the market and for the scale of the amount of LEGO bricks and LEGO sets that children enjoy around the world every year?

**Nelleke:** Yeah. It sounded very optimistic, of course. I mentioned that it could be applied in bricks, but there are a lot of aspects that need to be developed for this material.

First of all, we're showing one shape, right? It's the two-by-four brick that everybody knows. And we can see there's very good potential of the material for other shapes in the LEGO sets. But we need to learn how to design with this material, and we need to design shapes and the moulds for it. So we need to make small adjustments in our designs in order to make it work. And it needs to be backwards compatible.

We also need to develop colours for it, so that it looks very much or the same as what we have today. And we also need to find out how we can produce in a stable manner with always the same high quality that everybody sees today in our bricks. And this material will require changes in how we mould and how we run our production, we know for sure. Once we have the keys to all of this, we need to start to create the moulds for the material and make all the changes in our production. It just takes a lot of time.

**Loren:** Nelleke, how are we joining forces with other companies, with universities, maybe even NGOs to really find new solutions in terms of more sustainable plastic that can be used in products that are as demanding as LEGO products are from a quality and a building experience perspective?

**Nelleke:** When we made our initial announcement about our journey for, and our quest for, more sustainable materials, we received a lot of responses from start-ups, from large companies, universities, technology institutes, consultants, and also consumers that wanted to bring their great idea to us. And we've looked at them all, so we didn't discard anything in advance. And from this broad scope and initial investigations, we selected a number of partners that are complementary.

And I think that's very important to mention. We work with them because they are very good at, for instance, making formulations of plastics, or they help us to build knowledge about durability, or they can help us to look into how to source from different recycling streams. And, in addition, we're sharing our findings. We, of course, also contribute to this with our partners and, together, we work towards a common goal.

**Loren:** Could you share how you deal with, or navigate, the confidentiality versus what's open-sourced?

**Nelleke:** We've found great partners that develop with us, and we generate value for the both of us, right? By joining forces, we also mean that we learn a lot as we go along, and we have aligned our goals. So we're working towards the same point.

At the same time, we will have to be able to access the solutions that we generate in this collaboration, and therefore, in some cases, we have to file patents because we just want to make sure that we can still access it and it will not be blocked by anybody else.

But we also are very aware that you can only learn if you build trust, and we share our insights and learnings. So, in fact, we are very transparent about what we do towards all our partners, and they do the same with us.

**Loren:** In your view, Nelleke, what's the biggest challenge in making LEGO bricks more sustainable?

**Nelleke:** The biggest challenge to my mind is that with every solution, there will be trade-offs. There will be disadvantages. It's not all perfect, and we will have to be able to navigate those trade-offs. So it may be, for instance, that the appearance of the brick will be slightly different. Or the readiness of the supply chain for our solutions will be less than what we have today. Or we have to change our production. To the first point - the appearance of the products - we are well aware that we are dealing with the iconic LEGO bricks and that we need to safeguard the beloved brick to the best extent possible.

**Loren:** How do you lead your team in that type of an environment, where there's so much ambiguity yet so much ambition?

**Nelleke:** I have the privilege to be working with a team that is curious. All of them are hyper-motivated to contribute to this exciting journey and to make a positive impact. And they also know that we are working with an adaptive challenge.

So, I nurture continuous dialogue about the bigger perspective of everything that is happening around us in the world, where the industry is likely to move — understanding the opportunities and putting the pieces of the puzzle together. What would that picture look like in so many years from now? And we also have regular dialogues about how we can bring these opportunities into our program. So what is our contribution to this?

And, in addition, I give them the internal perspective that I get from our conversations with stakeholders that maybe they don't see in their daily work. And, together, we continuously work on the bigger picture and the steps towards our goal, which is a big motivator for all of us.

And ever since I started this journey with the team, we've worked on a culture in which we are comfortable with the idea that failure is an opportunity to learn. And that we will succeed if we continue to build on our learnings and that there are many ways to get to the end goal. Uncertainty is almost a given. We lean on each other, and by that, we feel very comfortable in addressing these challenges.

## **Chapter 4: Experiments in the lab (18:11)**

**Julie:** Bistra Anderson is part of Nelleke's team and has been with the LEGO Group throughout our journey to make LEGO bricks sustainable. She gave me a peek into her work testing potential new materials for future LEGO products as



well as what keeps her motivated to keep on trying even when things don't quite work out as planned.

**Julie:** So Bistra, what does a typical day at the lab look like for you?

**Bistra:** A day in the lab is a day full of experiments. This could be experiments to measure certain mechanical properties, like we do it on standard test elements according to international standards. We apply some force and try to destroy the element to figure out where is the borderline, what kind of failure and fracture patterns we see in the material – because we want to avoid brittle materials and potential product safety issues in the future. We also do tensile experiment where we can stretch the material and identify what is the tensile strength of the material. We can measure the friction properties and evaluate the clutch force of the materials.

These are the technical types of testing that we perform, so we can prove that we have good play experience and also safe and durable products.

At the same time, we need to keep an eye on the sustainability characteristics of the material, such as the feedstock and the environmental impact, which is calculated by applying the life cycle assessment methodology.

So you can imagine that it's quite different types of evaluations being done on each material candidate. And it requires the involvement and the contribution of many different internal stakeholders in the LEGO Group to prove if a material is suitable or not and if it fulfils our technical and sustainability requirements.

**Julie:** So this is obviously a huge challenge. And I can imagine there are lots of wins, but also failures along the way. Is there ever any moment that you lose faith in this project?

**Bistra:** Like in many other R&D type of projects, there are ups and downs during the project lifetime. As a research person, I have also experienced days with some tough technical challenges or results far away from my expectations. But I have never lost faith in the project because the challenges we faced or the failures we made are actually a great opportunity for learnings.

**Julie:** And what is your biggest learning moment so far?

**Bistra:** There are days where we have some kind of negative surprises. I could probably highlight the fact that, for example, in one of the projects, we really managed to close many of the technical gaps during the material development. It was a bio-based material. Great. But at a certain point, we realised that the material has a higher environmental impact, meaning it would release higher amounts of CO<sub>2</sub> emissions than the current materials we're using in the bricks.

So that means just because something is labelled as 'bio', it's not always good for the environment and the planet. So it's another learning and experience that I will never forget.

**Julie:** And, lastly, what makes you most proud of your job?

**Bistra:** Materials are at the heart of every LEGO toy and play experience. So that's why I feel lucky and extremely privileged to be part of the sustainable materials initiatives and to drive systematic change in the industry, in the LEGO Group, to make a difference to the world kids will inherit from us.

So I find it really very motivating to be at the front-end of material science and to be deeply involved in sustainability matters across the entire value chain of materials. I really enjoy working closely with many great chemical and material experts from well-recognised international companies, which has similar sustainability agendas, like the LEGO Group.

And I feel energised in my daily work by creating sustainable material solutions one step at a time because it fully supports our [planet promise ambition](#).

**Julie:** We're still on our journey to make LEGO bricks fully sustainable by 2030. And while the answer isn't always clear, we're always learning, and we're determined to meet our ambition and do our part to protect our planet for today's children and future generations.

You've been listening to Our LEGO Stories with me, Julie Foster.

**Loren:** And me, Loren I. Shuster.

**Julie:** Talking about what we do to make LEGO bricks sustainable were Tim Brooks, Nelleke van der Puil and Bistra Anderson.

This podcast is brought to you by the LEGO Group. Stay tuned for future episodes of Our LEGO Stories on our website, Apple Podcasts, Spotify or wherever you get your podcasts. And please rate and subscribe so we can welcome more listeners.

## Explore more

### Mentioned in the podcast episode:

- [WWF partnership](#): Since 2014, we have been part of the Climate Savers Programme, WWF's global platform that engages business and industry on climate and energy. The intention of the program is to inspire a change in the way companies think about climate solutions.
- [Plants from Plants video insert](#): The First LEGO® Plants Made From Plants Have Arrived.
- [From bottles to bricks video insert](#): Attention plastic bottles! Feeling empty? We get it, but life doesn't have to be trash! Join us and start over as one of the prototype LEGO bricks we're currently developing using recycled plastic from bottles. Because bottles deserve better.

### New prototype LEGO® brick from recycled plastic

- [The LEGO Group reveals first prototype LEGO® brick made from recycled plastic](#)
- [From bottles to bricks](#): visit the campaign page on LEGO.com to learn more about our latest step in our sustainability journey to make LEGO products from sustainable materials.

### About Us – Sustainability

- [Children](#): The power of play. When children play they can build valuable life skills while having fun. Learning through play enables children to solve problems creatively, boosting confidence and resilience.
- [Sustainability](#): Together, we can rebuild the world. We're playing our part in building a sustainable future and creating a better, brighter world for our children to inherit. Find out how we're joining forces with others to have a lasting impact and inspire the children of today to become the builders of tomorrow.
- [Environment](#): Making a positive impact. We want to play our part in building a sustainable future and making a positive impact on the planet our children will inherit.

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