Questions and Answers - PlasticRoad

Q1. Why is the PlasticRoad more sustainable than conventional road structures?

We expect that the PlasticRoad will last three times longer than conventional road structures. The expected lifespan of at least fifty years is based on the lifespan of other plastic products such as sewage pipes and plastic platforms.

Q2. What are the main advantages of the PlasticRoad?

- *Lightweight prefab construction*
- *Faster construction (months shorter) and less maintenance time*
- *Higher quality and a longer lifespan (homogeneous and prefab)*
- *Little to no maintenance required. The material is almost impervious to conditions such as the weather and weeds.*
- *The innovation is considerably more sustainable. PlasticRoad consists of 100% recycled plastic and is fully reusable. It is perfectly in line with the Cradle-to-Cradle philosophy and the principles of the circular economy.*
- *Double use of space. The hollow space in the design can be used to store water or as space for cables and pipes.*
- *The possibility of constant (traffic) safety and water drainage*
- *Everything in relation to the road can be made prefab (road markings, guardrail)*
- *The concept offers opportunities for further innovation. Examples include solar heated roads, light poles and traffic loop sensors.*
- *Contribution to the societal problem of plastic waste*

Q3. Is it possible to reuse the material of PlasticRoad?

It is possible to reuse the material, but the degree to which is currently being examined. The idea is to fabricate the PlasticRoad from plastic that usually gets incinerated. This makes the concept so appealing: plastic waste is given a new, high quality utility.

Q4. What about sound? Is driving on asphalt more or less noisy?

We'll have to wait and see. PlasticRoad certainly offers a number of opportunities when it comes to noise reduction. With asphalt, we are getting closer to optimal structures for minimal noise pollution. It'sactually much easier to produce this structure in plastic than

in asphalt. By pressing or printing the structure into plastic we can achieve optimal sound reduction. In the pilot (a bicycle path), this is not a relevant issue.

Q5. Won't the PlasticRoad act as a large resonance box?

This is unlikely to cause problems on a bicycle path. We will have to investigate whether this presents challenges for roads. At the same time, noise also provides an opportunity because sound energy can be used to generate power.

Q6. How feasible is it to actually produce PlasticRoads?

KWS Infra believes in the feasibility of the idea and we're making substantial investments for further research on the PlasticRoad. This research will have to reveal whether the concept is feasible in practice.

Q7. Won't the plastic be too slippery? What about wintertime?

There are several ways to tackle this problem. First, we will investigate whether we can make the plastic itself skid resistant. If this isn't possible, we could also apply sand or crushed stone to the surface of the PlasticRoad (by pressing or printing), thus providing the required roughness. Our goal is to integrate the roughness in the road itself.

Q8. Is it bad for the environment? Won't friction and wear release (microscopic) plastic particles that are dangerous for man and environment?

Sustainability and the environment are of paramount importance to KWS Infra. We are investigating to what extent wear will occur. It's a potential risk that we're taking into account. We don't expect that loose particles will cause major problems with the PlasticRoad. A wear layer or special coating should be able to prevent this. Research will have to show how durable the material is and what the consequences are. We're looking for the most sustainable option.

Q9. Is the PlasticRoad toxic in case of fire?

We can use a fire retardant or fire resistant coating to prevent this. Also, it's unsure how often this will be an issue and to what extent harmful substances will be released. We will research this. At first, we will look into the PlasticRoad as a bicycle path, where the chances of fire are considerably smaller (because there are no vehicles involved).

Q10. How new is this concept?

The concept has never been seen before in this form and with this choice of materials. This leads us to conclude that the concept is truly unique. The idea for the concept was conceived by two of our colleagues: Anne Koudstaal and Simon Jorritsma.

Q11. How was the idea conceived? (!)

The idea was conceived by looking at the problems that municipalities and we as contractors deal with. This includes societal problems, such as waste, combined with alternative materials for roads, as well as the future shortage of oil, which provides the most important component of asphalt: bitumen. Municipalities are looking for roads with little maintenance that last as long as possible. Other significant problems for municipalities are flooding (water storage), consolidations, cables and pipes. For contractors, asphalt is a great and sound product to build roads. However, contractors have to meet more and more demands concerning noise reduction, water permeability, and flatness. These questions and conditions were the inspiration which have led to the idea of the PlasticRoad.

Q12. Why is a PlasticRoad more sustainable than a traditional road? (!)

The idea behind the concept is that the PlasticRoad is produced from 100% recycled plastic: plastic that is currently being incinerated. This allows plastic waste to re-enter the chain at a much higher level and greatly reduces its carbon footprint. Moreover, the innovation is in line with the Cradle-to-Cradle philosophy of KWS Infra. And we expect that a PlasticRoad can be recycled again at the end of its lifespan and made into parts for a new PlasticRoad (circular economy). For example: while a plastic bag lasts for a few days, a PlasticRoad lasts more than fifty years! This way, plastic remains in the chain much longer and the natural resources used to produce plastic will be used much more effectively.
The plan is to place the PlasticRoad directly on a surface of sand. This removes the need for a foundation, as well as the current heavy construction that no longer needs to be produced. This means less transport to the construction site, but also less transport from the location where resources are extracted to the production plant. This significantly reduces the number of transport movements involved.

Q13. Is there enough available plastic?

A Plastic waste is a worldwide problem that gets increasingly more attention. An estimated eight billion kilograms of plastic is currently floating around in our oceans. And over 55% of all plastic waste is still being incinerated. In short, there is more than enough plastic for the construction of PlasticRoads.

Q14. What kind of partners are you looking for?

KWS Infra is looking for partners that believe in PlasticRoad and want to further develop the idea with us. We feel that collaboration is the key to actually realising this idea. We

are looking for partners in the plastics industry such as plastic recycling companies and producers of plastic. We are also looking for parties or research institutions (universities) whom have knowledge producing plastic. We also want to involve clients (municipalities, provinces, water boards, the state) in the development process to ensure that the final product fits their needs. KWS Infra is calling out to everyone that believes in this idea and might be able to contribute to its development to contact us. All applications will be assessed by KWS Infra based on their contribution and added value to the realisation of the project.

You can sign up with Anne Koudstaal or Simon Jorritsma.

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Q15. How will you collect the plastic?

To collect enough material for the production of the elements for the PlasticRoad, we are looking to use plastic from the oceans. We can turn this waste into roads. We're also looking at the option of collecting plastic waste at incineration plants in Germany and the Netherlands. It is a waste to burn plastic, when it's possible to reuse it and give it a new, high quality utility.

Q16. When will the first PlasticRoad be built by KWS Infra?

At the moment we are working hard on the business case for the PlasticRoad. We are researching the best way to produce the PlasticRoad. As soon as the idea is proved to be feasible, we can quickly arrange a pilot. The City of Rotterdam has already offered a pilot location where we can test the PlasticRoad. The pilot will start as soon as possible.

Q17. What is Infralinq?

Infralinq is a special department and an independent think tank within KWS Infra that focuses on innovation, sustainability and smarter products.

Q18. What other innovations is KWS Infra working on?

KWS Infra is working on several technical and process engineering innovations.

A recent innovation is Flow With The Glow. A material that is based on photoluminescence and can be used to make road markings and guide rails visible in the

dark without electricity. A good example of our process engineering innovations is the intelligent roller (smart material).

Recent innovations in the field of asphalt are KonwéCity, Sustainable ZOAB and the KonwéFlex. KonwéCity is a noise-reducing asphalt with a longer lifespan, sustainable ZOAB is a ZOAB-mix with 25% PR (old, reused asphalt), and Konwéflex is a crack-preventing layer of asphalt. Other examples: KonwéBio, KonwéCool, KonwéClear. Asphalt is greener and cleaner than some people may think. It is a natural product, consisting of stone, sand, and bitumen. On average, our asphalt consists of 50% recycled materials. Using the HERA-system we can even produce asphalt made of 100% recycled materials.

Q19. What are the risks?

As with any innovation, it is necessary to take stock of the pros and cons. Every innovation may encounter problems in its early stages. It will have to meet current regulations. But for now, we mainly see many opportunities for the development of PlasticRoads.

Q20. Can all types of plastic be used?

Any kind of recycled plastic can be used for the PlasticRoad. There are many different kinds of plastic that all have their specific properties. The PlasticRoad has to meet a number of functional requirements, just like traditional roads. Research with partners from the plastic and recycling industry will have to show which kinds of plastic and which combinations of plastic can be used.

Q21. How does prolonged exposure to the sun/UV affect the material?

The civil engineering sector already produces and uses several products that are made from recycled plastic. Examples include timbering, scaffolding, sheet piling, bridges and light poles made of plastic material. These products have no problems with prolonged exposure to the sun or UV-light.

Q22. The PlasticRoad consists of prefabricated parts. How will you connect these parts?

There are various ways to connect the prefabricated parts. Further research will have to reveal which method is the most suitable. This choice also depends on the final, optimal design.

Q23. Connecting the prefabricated parts will leave seams. How will you deal with these?

In road construction, seams play an important role too. Examples are concrete roads and joints. KWS Infra has the necessary experience and knowledge to deal with this. With our knowledge as well as the knowledge of our partners, we want to minimise the effects of seams.

Q24. Will the seams form a problem for water storage?

This is something that we will have to take into account when selecting the best way to connect prefabricated parts.

Q25. PlasticRoad is a lightweight construction. Won't the construction start to float when groundwater levels are high?

This challenge is a potential risk that we will take into account in the development of the PlasticRoad.

Q26. What are the first possible applications of the PlasticRoad?

We focus on urban areas and bicycle paths.

Q27. Have there already been trials?

No. We want to develop a prototype with appropriate partners to test and perform experiments. The result will be a test area. Several parties, including the city of Rotterdam, have already offered a location for this test area.

Core Sustainability Message VolkerWessels

VolkerWessels is building a better environment. But our activities are not silent and have impact on man, environment and society. With a team of fifteen thousand colleagues, we focus on achieving sustainable ambitions. This includes themes such as the supply chain, resource management, CO_2 emissions, and energy consumption. We want to minimise the negative impact on the environment through awareness and by using smart techniques and concepts. We take responsibility for future generations and avoid waste as much as possible.