

Circular Economy Analyzer: Polli-Bricks Answer Key

Raw Material Extraction

Include environmental and human health impacts:

Plastic is made from petroleum (crude oil), a fossil fuel that is found underground. People drill into the ground for petroleum, which can disrupt ecosystems and cause oil spills. Petroleum must be refined before it can be turned into plastic. The refining process uses energy and can also release air pollution, which has negative impacts on both the environment and human health.

Design

Huang and his team invented a way to reshape and strengthen melted plastic chips into building blocks. These polli-bricks have grooves so they fit together and lock in place securely. Air in the bricks insulates the building and keeps energy use low.

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Production

Plastic trash is chopped up and melted up into polli-bricks. A coating helps protect against fire and weather.

Distribution

More research is needed.

Use / Reuse

The building is made to withstand earthquakes, typhoons, and heat waves. The polli-bricks protect people inside the EcoArk from wind, rain, heat, and cold.

Recycling

The building is designed to last a long time. However, the plastic can be recycled again using the Trashpresso process of shredding, washing, drying, melting, and molding.

Wastes

Include environmental and human health impacts:

More research is needed. The collection, recycling, and production processes all use energy, which can cause pollution that has impacts on the environment and human health, but the Trashpresso recycling machine runs on solar panels.

Collection

One and a half million plastic bottles were required to build a nine-story building

More research is needed.

Repair

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1. What would a linear economy normally look like for this product? Draw a picture and/or describe in words.

Plastic is made from petroleum as described above → used to manufacture a plastic bottle → filled with a substance or product (soda, yogurt, shampoo) → thrown away or recycled

2. What makes this circular economy different from the linear economy you described in Question 1?

It is different from a linear economy because instead of throwing plastic bottles away, they get a second life as polli-bricks. The polli-bricks are designed to last a long time and not be thrown away.

3. How does the circular economy for this product help to reduce impacts on the environment, human health, and local community compared to a linear economy?

Drilling for petroleum, the raw material from which plastics are made, can be damaging to the environment. A circular economy allows plastic to be reused and recycled, which means less petroleum drilling needs to occur. It also keeps plastic out of landfills and out of the environment. All of the building and manufacturing equipment run on renewable energy, so they do not require fossil fuels and they do not contribute to climate change.

4. What kinds of rethinking and redesigning were necessary to move from the linear economy to the circular economy?

Arthur Huang and his team had to design the polli-bricks to be strong, durable, interlocking, and insulating. They had to invent processes and machinery to turn plastic bottles into polli-bricks, and they made the machines run on solar energy. They even designed the building itself to be low-carbon by using solar and wind energy!

5. Which steps in this circular economy are the strongest? For each step, identify why you think it is strong, and how it helps to minimize impacts on the environment or human health.

The recycling step is a strength in this circular economy, because the team designed an entire new recycling system with renewable energy just for their polli-bricks. Design is also a strength, because the bricks are designed to be very durable and to reduce overall energy needs in the building.

6. Which steps in this circular economy are the weakest? For each step, identify why you think it is weak, and how it could be improved to help minimize impacts on the environment or human health.

Areas of weakness are distribution, repair, and waste. There was little or no information about these steps in the article. Distribution can lead to waste if polli-bricks are transported on trucks using fossil fuels. We do not know if polli-bricks can be repaired or if any waste are created in the process.