

21st Century Recycling: Integrating New Technologies to Optimize Modern Recycling Systems

Plastics are a [versatile group](#) of materials that offer greater [sustainability benefits](#) than alternatives, including lower production emissions and less energy and water use. Effective recycling systems promote plastic products' continuous reuse and repurpose, unlocking their full potential. Researchers are currently trying to unlock the power of [modern technologies](#) such as blockchain and scannable QR codes to help everyone from producers to consumers access critical information about plastics' recyclability—a tool that would go far in increasing material circularity and [sustainability across the economy](#).

Tech Spotlight: Blockchain



Similar to a ledger in a checkbook or a bill of sale, [blockchain technology](#) is a **digital record of a product's history**. At each step in a product's lifecycle, a "block" of data is recorded about the item, including location, time and particular product details, among other useful information. Whereas other ledgers or databases can be altered or changed, blockchain is impermeable, offering **unparalleled traceability and security**.

Using blockchain and QR codes to improve modern recycling

Innovative plastics industry actors have created [TRACKCYCLE](#), a project that seeks to apply blockchain tracing to plastic products at a polymer level. At **all points throughout a plastic product's life cycle**, data can be **recorded in the blockchain**, including when it was manufactured, which polymer was used, when it was sold and how it was recycled.

Manufacturers use recycled polymers to produce new consumer products with scannable QR codes connected to the blockchain.

Material recovery facilities (MRFs) sort and recover usable materials.

Collected recyclables are transported to recycling facilities.



Tech Spotlight: QR Codes

Producers can **print QR codes on plastic products**, allowing consumers to access products' blockchain data and information about [local recycling facilities](#).



Consumers purchase sustainable, traceable products made from recycled plastics.

After use, processes like curbside recycling collect post-consumer plastic products.

Putting it together

Implementing blockchain technology into modern recycling systems would integrate **clear and secure product-level information** into the plastics supply chain, which could [improve material recovery efforts](#) by indicating which products are most likely to fall out of the recycling supply chain, helping to improve recycling systems.

Combined with QR codes, this technology could equip consumers to **intentionally select products with documented recycled material** and [increase recycling rates](#), promoting **greater material circularity** and optimizing modern recycling systems.