

GREEN AND DIGITAL TECHNOLOGIES can accelerate the fight against food waste

Technology flyer

The urgent challenge of food waste represents an open window for technological innovations. At all stages of the food value chain there is a need to introduce new technological solutions that can help prevent or re-use food surpluses or support the valorisation of unavoidable food waste through recycling or recovery. Technological innovation can also improve vertical collaboration between the adopter of the technology and other actors in the value chain as well as induce behavioural change among consumers towards less food waste.

Food waste-reduction technologies include both green technologies and digital technologies. They range from simple devices such as fridges and shopping apps via integrated supply-chain infrastructure such as cold chains to advanced food preservation, packaging and information technologies.

Digital tools have been developed in recent years that address food waste, covering a range of consumer-facing mobile apps, as well as intelligent devices using sensors, such as smart labels, the smart fridge, the smart bin, and the smart scale. In combination with innovative data analysis and management platforms, these tools can significantly enable the prevention and redistribution of food surpluses in households and among retailers, restaurants, and food service companies.

Addressing this important policy area, a new report «Reducing consumer waste using green and digital technologies» analyses how technologies can enable and accelerate interventions for reducing food waste. The report focuses on technologies addressing the prevention and re-use of food surpluses at the consumption stage, while emphasising that optimizing food-waste reduction requires a system-level perspective, which integrates technological and management options along the entire value chain, including end-of-life activities.

A rich collection of examples of technology deployment from around the world illustrates the analysis.

PREVENTION		
Type	Function	Description
Green	Thermal preservation	Refrigeration and cold chains
	Biological and bio-chemical preservation	Use of essential oils and natural extracts in active packaging
Green + Digital	Smartphone apps: Food planning, shopping, storage & cooking	Guide, track and inform consumers in food related choices to reduce food waste
Green + Digital + IoT	Smart packaging	Use of sensors and data carriers to monitor food quality
	Smart labelling	Use of data embedded barcodes (DEB) to improve information about food quality
	Smart storage and disposal	Wifi connected fridges and bins equipped with cameras and sensors to monitor food quality and food quantity
RE-USE		
Type	Function	Description
Green + Digital	Smartphone apps: Food sharing and redistribution	Different types of food sharing apps: Sharing for money, sharing for charity or sharing for the community

Overview of green and digital technologies addressing the prevention and re-use of food surpluses covered by the report.

Key findings

- Green and digital technologies are increasingly being used to prevent, reuse and recycle food waste, opening new opportunities for economy and society. Examples include technologies and innovations in thermal preservation, biological and bio-chemical preservation, solar-powered cold storage, active packaging, waste-to-energy and composting.
- Emerging digital technologies such as mobile applications and the Internet of Things provide innovative solutions for food-sharing, smart labelling, dynamic pricing, product traceability, intelligent redistribution, planning of shopping and meals, and smart storage.
- Technologies require an enabling environment to thrive and to fully unlock their potential in reducing consumer food waste. Most of the green tech solutions face challenges in upscaling and going beyond the ‘niche market’.
- Technologies alone will not solve the food-waste problem. Instead, applied in the right way, they can work as a powerful enabler and accelerator to support initiatives and instruments led by different actors and partnerships.
- A comprehensive and integrated approach is needed that links technology, policy, regulation, incentives, infrastructure, information and behavioural science in a way that makes them mutually supportive and complementary to each other.

UNEP DTU Partnership and United Nations Environment Programme (2021). Reducing Consumer Food Waste Using Green and Digital Technologies. Copenhagen and Nairobi.

The full report can be downloaded [here](#)

The report was produced in close collaboration between the United Nations Environment Programme (UNEP) and the UNEP DTU Partnership, and is a key output of the project ‘Build Back Better: Using Green and Digital Technologies to Reduce Food Waste at Consumer Level’ led by UNEP.

<https://www.unep.org/explore-topics/green-economy/build-back-better>



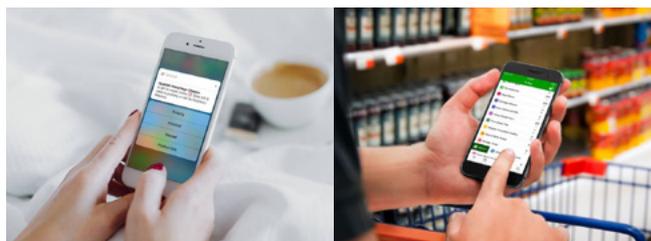
Reducing food waste in retail through dynamic pricing of perishable products. Source: Wasteless



The redistribution of surplus food is often enabled by mobile apps connected to data management platforms, sometimes using artificial intelligence. Source: Yindii



Enabling pay-as-you-throw food-waste recycling using smart scales and radio frequency identification (RFID) technology. Photo credit: Wikimedia



Using a mobile app to reduce food waste in households by allowing consumers to manage their food inventory and track expiry dates in due time. Source: CozZo App