

REDUCING CONSUMER FOOD WASTE USING GREEN AND DIGITAL TECHNOLOGIES

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LIST OF ACRONYMS AND ABBREVIATIONS

AC	Alternating current	NGO	Non-governmental organisation
AI	Artificial intelligence	OECD	Organisation for Economic Co-operation and Development
AP	Active Packaging	PCC	Pacific Coast Collaborative
AOA	Anatomy of Action	PCFWC	Pacific Coast Food Waste Commitment
BBE	Best before end	P2P	Peer to peer
B2C	Business to consumer	PPP	Public-private partnership
C2C	Consumer to consumer	QR code	Quick response code
CO₂	Carbon dioxide	RFID	Radio frequency identification
CO₂eq	Carbon dioxide equivalent	RRR	Reduce-Reuse-Recycling
CSR	Corporate social responsibility	SDG	Sustainable Development Goal
DC	Direct current	SME	Small and medium-sized enterprise
DEB	Data embedded barcode	UK	United Kingdom
EU	European Union	UN	United Nations
FAO	Food and Agriculture Organization of the United Nations	UNDP	United Nations Development Programme
FLW	Food loss and waste	UNEP	United Nations Environment Programme
GDP	Gross domestic product	UNFCCC	United Nations Framework Convention on Climate Change
GHG	Greenhouse gas	US	United States of America
H₂S	Hydrogen sulphide	WBCSD	World Business Council for Sustainable Development
ICT	Information and communications technology	WHO	World Health Organization
IDB	Inter-American Development Bank	WtE	Waste to energy
IFC	International Finance Corporation	WRAP	Waste & Resources Action Programme
IoT	Internet of Things	WRI	World Resources Institute
IP	Intelligent packaging		
IPCC	International Panel on Climate Change		
ISO	International Organization for Standardization		
ITC	International Trade Centre		
MSW	Municipal solid waste		
N₂	Nitrogen		
NFC	Near Field Communication		

EXECUTIVE SUMMARY

The world is facing a food-waste crisis. It is estimated that 931 million tonnes of food were wasted by households, retailers, restaurants and other food services in 2019 [1]. Around 61% of this waste occurs within households.

Reducing food waste offers multiple benefits for people and the planet, contributing to improving food security, cutting pollution, saving money, reducing the pressures on nature and climate, and creating opportunities for economy and society. It is for this reason that the UN's Sustainable Development Goal (SDG) 12.3 sets a clear target of halving per capita global food waste by retailers and consumers by 2030.

The UN Food Systems Summit in 2021 highlighted innovation as the key to transforming the way food is produced and disposed of. Green and digital technologies are playing an increasing role in reducing consumer food waste and driving food consumption towards more sustainable patterns. Cities in both developed and developing countries are well positioned to harness new opportunities arising from green and digital technologies.

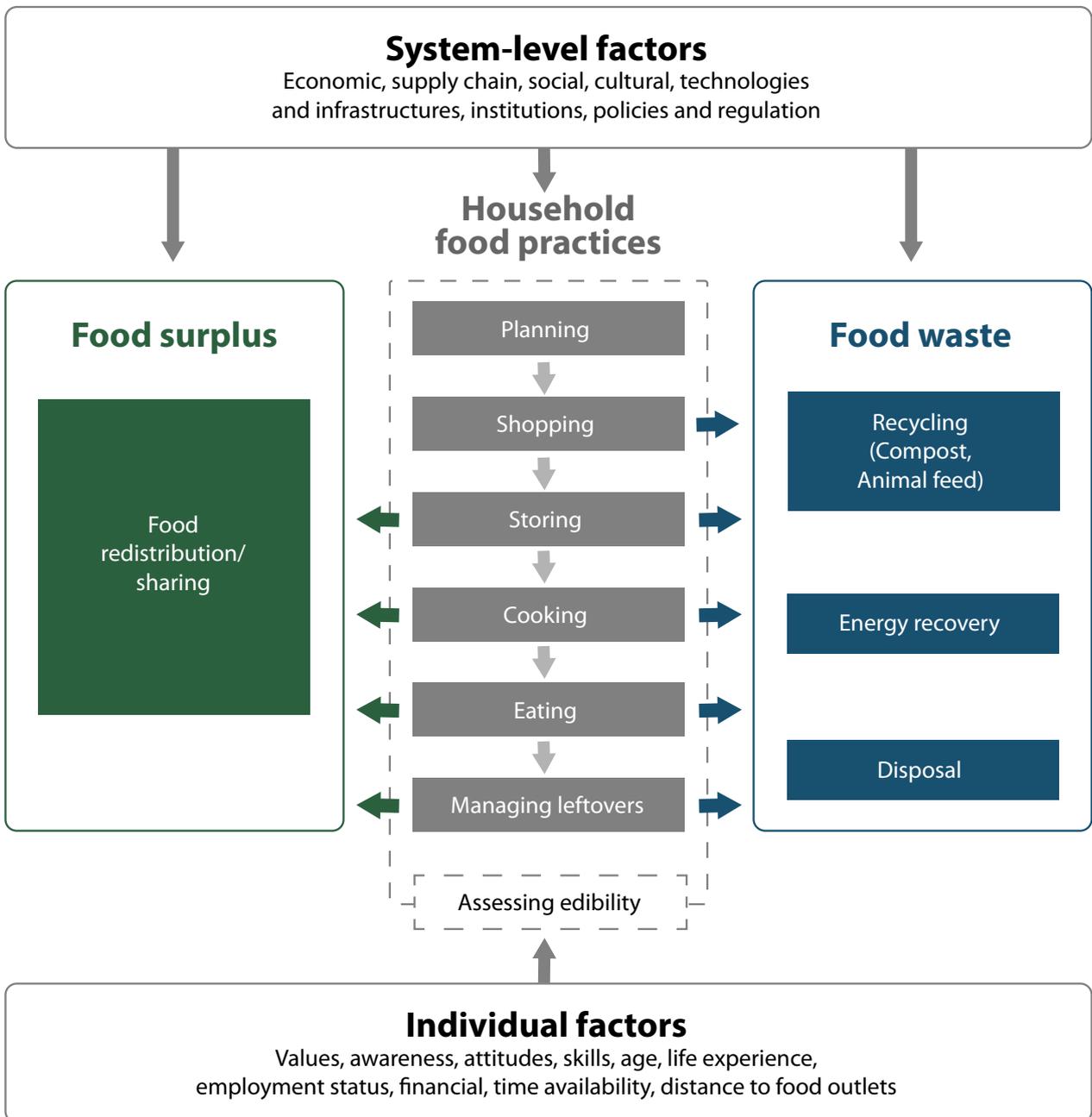
This report provides an overview of the causes of consumer food waste and the opportunities for reducing it through different means: behavioural change, technological solutions, and public and private initiatives to mitigate the problem. This study aims to improve understanding of how green and digital technologies could be used to reduce consumer food waste and what could be done to further unlock this potential. By combining global research cutting across multiple disciplines with city case studies, it aims to provide a comprehensive and integrated approach to support countries and cities in combating food waste and in 'Building Back Better' a more sustainable economy.

Key findings and messages

- **Consumer food waste is driven by intertwined factors at multiple levels** (individual, household, society) **embedded in everyday practices.** These factors include attitudes, knowledge, skills, values, gender, income and living standards, markets, prices, and social and cultural practices, among others. Food-waste interventions thus need to take full consideration of how different factors affect the social practices (e.g., household food practices) that make up peoples' everyday lives.
- **There is a large gap in data and in assessing consumer food waste,** including current status, its economic, social and environmental costs, and future trends. Data for cities is even scarcer, making it difficult to diagnose the problem. None of the five cities covered in this report (Bangkok, Belgrade, Bogotá, Doha and Kampala) has official data systems to measure and analyse consumer food waste. Better data is urgently needed to improve our

understanding of consumer food waste, to support the design and implementation of targeted interventions, and to track progress in achieving related SDG targets.

- **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, composting, recycling and upcycling. Emerging digital technologies such as the Internet of Things and mobile applications provide innovative solutions for food-sharing, smart labelling, dynamic pricing, product traceability, intelligent redistribution, planning of shopping and meals, and storage. The list is non-exhaustive, and some measures concerning them have been implemented in the five cities covered in this report.



Food surplus and food waste are generated through households' everyday food practices. Factors at the individual, food-system and social levels influence these practices and the management of the food surplus and waste.

EXECUTIVE SUMMARY

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

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