

Waste to Wealth

The Circular Economy Advantage

Peter Lacy & Jakob Rutqvist

The Circular Economy
Advantage

Waste to Wealth

Peter Lacy

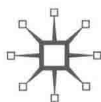
Global Managing Director, Accenture Strategy – Sustainability Services
and

Jakob Rutqvist

Manager, Accenture Strategy – Sustainability Services

accenture [>]strategy

palgrave
macmillan



© Peter Lacy and Jakob Rutqvist 2015
Foreword © William McDonough 2015
Foreword © Ian Cheshire 2015

All rights reserved. No reproduction, copy or transmission of this publication may be made without written permission.

No portion of this publication may be reproduced, copied or transmitted save with written permission or in accordance with the provisions of the Copyright, Designs and Patents Act 1988, or under the terms of any licence permitting limited copying issued by the Copyright Licensing Agency, Saffron House, 6–10 Kirby Street, London EC1N 8TS.

Any person who does any unauthorized act in relation to this publication may be liable to criminal prosecution and civil claims for damages.

The authors have asserted their rights to be identified as the authors of this work in accordance with the Copyright, Designs and Patents Act 1988.

First published 2015 by
PALGRAVE MACMILLAN

Palgrave Macmillan in the UK is an imprint of Macmillan Publishers Limited, registered in England, company number 785998, of Houndmills, Basingstoke, Hampshire RG21 6XS.

Palgrave Macmillan in the US is a division of St Martin's Press LLC, 175 Fifth Avenue, New York, NY 10010.

Palgrave is the global academic imprint of the above companies and has companies and representatives throughout the world.

Palgrave® and Macmillan® are registered trademarks in the United States, the United Kingdom, Europe and other countries.

ISBN 978–1–137–53068–4

This book is printed on paper suitable for recycling and made from fully managed and sustained forest sources. Logging, pulping and manufacturing processes are expected to conform to the environmental regulations of the country of origin.

A catalogue record for this book is available from the British Library.

Library of Congress Cataloging-in-Publication Data

Lacy, Peter, 1978–

Waste to wealth : the circular economy advantage / Peter Lacy & Jakob Rutqvist.

pages cm

Includes bibliographical references and index.

ISBN 978–1–137–53068–4 (hardback)

1. Sustainable development. 2. Economics. I. Rutqvist, Jakob, 1982–
II. Title.

HC79.E5L326 2015

338.9'27—dc23

2015012928

Typeset by MPS Limited, Chennai, India.

Praise for *Waste to Wealth*

'As *Waste to Wealth* shows with case studies of leading companies across industries, the circular economy model works increasingly well for our customers and for us. You have to shed your old habits and put in the initial effort to change, but it makes so much sense. We can engineer products for a longer usage; we can recoup the residual value once the economic life is over. The customer is foremost interested in the benefit of our products, so why not only sell them the benefit as a service, while we retain ownership and operate the technology. And what about you?'

– **Frans van Houten**, CEO, Royal Philips

'Circular economy, circular responsibility, circular advantage. So simple, yet so powerful. This book is a practical contribution to future proof your business models in an increasingly resource constrained world. Not hard to see that in the age of transparency, citizens of this world will demand this from all companies seeking a license to operate. Time to get on with it.'

– **Paul Polman**, CEO, Unilever

'We need to face it: in order to make our economic system really sustainable, it is inevitable that we redesign it. This book shows the steps we can make. We will need to switch from a Linear to a Circular Economy. This means much more than recycling. The Circular Economy is about new ways of creating value via innovation and new business models'

– **Feike Sijbesma**, CEO, Royal DSM

'*Waste to Wealth* captures the spirit of one of today's most significant business trends: the circular economy. Lacy and Rutqvist approach the topic in a straightforward and practical manner, underlining that the linear take-make-waste model is (or should be) on its way toward extinction. They clearly set out the need to unleash the true value and potential of materials, whether in their beginning-of-life, utilization, or end-of-initial-life phases. This approach has also inspired our work in the Carlsberg Circular Community, and I believe that any company pursuing sustainable growth can find valuable inspiration in this book.'

– **Jørgen Buhl Rasmussen**, President & CEO, Carlsberg

'We already use more resources than the planet is capable of regenerating so we have to find ways to utilize less energy, water, materials, and resources in general. In the chemical industry we are searching for ways to close product life cycles, whether at the outset (by using renewable sources), or at the end (by using recyclable materials). We need radical innovation to develop new technologies and new business models. The circular economy is part of the solution and this book will help us to take another step in the right direction.'

– **Carlos Fadigas**, CEO, Braskem

'The relevance and importance of circular economy solutions are now being widely recognized. The circular economy is an extremely powerful model for facing many of today's challenges in terms of jobs, growth, resource efficiency, and the fight against climate change. Some businesses have led the way toward circularity, such as Suez Environnement, a first-mover and key player in this regard, notably in recycling and recovery. We now need all businesses to embark in this transformation. This is where this book can make a difference.'

– **Jean-Louis Chaussade**, CEO, Suez Environnement

'This book is a superb guide to what will become standard in 10 to 15 years. It says it all. As we protect food through improving shelf life, protect shipments through damage elimination, and protect life through hygiene at Sealed Air, we have long ago accepted that Sustainability was the new definition of quality. The circular economy is now our new definition of integrated value creation.'

– **Jerome Peribere**, President and CEO, Sealed Air

'Authors Lacy and Rutqvist show important leadership in the transition toward adaption of the circular economy. Their book illustrates that sustainability and the concept of circularity need not be perceived as costs to the private sector but rather as performance-drivers that provide strong competitive advantage. *Waste to Wealth* makes a compelling case for why "business as usual" is no longer a viable option in a time of scarce natural resources and constrained economic growth. A worthwhile read by any standard.'

– **Peder Holk Nielsen**, President and CEO, Novozymes

'Sustainability is a pre-requisite in the food industry. And the circular economy is a critical part of enabling sustainable agriculture and fishery to support a growing population. Adopting circular practices involves challenging existing values, finding new uses for what was "waste" and building an ecosystem for long-term competitive advantage. Tohoku, since the tsunami, is one example of circular innovation. The region has little in terms of resources, so it's perhaps ironic that it is now a hotbed of innovation in areas like high-tech vegetable factories, co-working spaces, and even work-sharing. It's exactly the kind of innovation that Japan should, and will excel at. Books like *Waste to Wealth* are pointing the way to a much more sustainable future for Japan and countries around the world.'

– **Kohey Takashima**, CEO and Founder, Oisix

'The 21st century is characterized by increased vulnerability. We have become more interconnected and interdependent than ever, and our responsibility, individual and collective, has enormously increased. It is clear that we must transform the way we produce and consume – the way we live – no matter whether we call it sustainability, green economy, resource efficiency, or circular economy. This book is a valuable contribution to the arguments behind this unavoidable journey.'

– **Janez Potočnik**, Co-Chair International Resource Panel (IRP),
former European Commissioner for Environment

'The development and scaling-up of circular economy needs a partnership of academia, government, and companies. Since the beginning of this century, China's government has played a role and done a lot to promote the circular economy in terms of policymaking, and for the next stage we need business to make things happen in practice. In this context *Waste to Wealth* is coming to us just in time. Understanding the five practical business models of the circular economy and their related disruptive technology will be of big help for China's business transition and for upgrading China's Circular Economy to a new level.'

– **Zhu Dajian**, Professor and Director, Institute of Governance for Sustainability,
Tongji University

This book is dedicated to: the World Economic Forum's Young Global Leaders community, the next generation of leaders who have inspired and supported us throughout. It is also dedicated to those who have come before us in shaping thinking and action on the circular economy. Finally and most of all, it is dedicated to Jack, Sam, Felix, and Henny, our four children. This book is ultimately for them and their bright future.

A Note from the Authors

We wrote this book to inform and energize you, the reader, about a clear way to gain your own advantage in a circular economy – a pro-growth, pro-business idea whose time has come. Our hope? Through practical books like this one, we will empower executives to make the circular economy a transformation comparable to globalization and the digital revolution – and indeed leveraging both of those two into a disruptive force that refocuses the lens on a new era of growth and innovation, where business success no longer hinges on exploitation of constrained natural and planetary resources, but instead creates a global economy capable of providing enough for all forever.

This book is the result of an intense two-year journey that would never have been possible without the amazing support of the World Economic Forum, its Young Global Leaders (YGL) community and, above all, the YGL Circular Economy Taskforce members and Peter's co-chairs in the Taskforce, David Rosenberg and Ida Auken. Its members are too numerous to mention, but they know who they are. We have singled out David and Ida as inspirational leaders not just from big business but as a leading entrepreneur and policy-maker, respectively – exactly the kind of change agents the circular economy will need to go to scale at speed.

Forewords

Sir Ian Cheshire



Perhaps the most remarkable thing about the circular economy today is that despite its radical challenge to existing systems and business models, it has moved rapidly from a specialist concept, discussed in the ivory towers of think tanks and academic institutions, to a mainstream movement beginning to be understood by businesses and governments alike.

A key catalyst in this move from the rhetorical to the practical is the arrival of the Internet of Things. The digital age has created an unparalleled level of connectivity of devices, systems, and services that make the waste-to-wealth business models discussed in this book not only possible but preferable over the traditional linear models. The examples are legion. From the much hyped

sharing platform models of Airbnb and Uber to the advances in extending from products to services with companies from clothing manufacturers (Mud Jeans) to automakers (Daimler, Renault, and BMW, among others), the circular economy holds the promise of business advantage.

Successes like these, featured in *Waste to Wealth: Creating Advantage in a Circular Economy*, prove this model offers a way forward out of the limits of our “take, make and dispose” system and create a sense of urgency as to why businesses need to start – today – to re-perceive their own business models through the lens of the circular economy. In doing so, companies can harness the business models, technologies and capabilities that will launch their own circular journeys to remain viable in this quickly shifting, much more innovative business landscape.

These are exciting times as we go deeper into a transformation no less dramatic, no less fundamental, than the shift from an agrarian to an industrial economy. It’s a period rife with invention. Companies that grasp the approaches described in this book and act on them before their competitors will gain from first-mover advantage. There’s no “one size fits all” answer, and few of us can totally blow up an entire business model in one go, but those stepping outside their existing models will find new opportunity and can use practical circular economy tools to secure real business advantage.

Sir Ian Cheshire
Former Group CEO, Kingfisher plc
January 2015

William McDonough



Job one of business is to support customers by producing benefits and assets for society, not liabilities and detriments. Unfortunately, especially in the last century, commerce has created a legacy of problems, the solutions to which are either deferred for generations or even fundamentally impossible within any reasonable number of human lifetimes. One might say our first industrial revolution linear production model – take, make, waste – has used unprincipled commerce as a weapon to wage unintentional war with the planet and all its creatures, and now, almost like a fearful retreating army, it is continuing to lay it all to waste. Any thinking person today recognizes the urgent calamity of climate change and pollution. Now is the time to fiercely and intentionally wage peace on the planet, with commerce as the only human institution big enough, creative enough and fast enough to be the engine of principled prosperity and beneficial change.

Design is the first signal of human intention, and exchange is the second. If we consider how most products are conceived and marketed today, companies and regulators still refer to a product's "lifecycle" and its "end of

life," which is often a short life story about sophisticated birth (attended by global supply chains) and crude, even hazardous death in the form of refuse piles and burial in land, in rivers, at sea or by cremation in burn piles or even "waste to energy" plants. These are old stories of "throwing things away" in a world with more than enough. But now, as we recognize the limited growth of constrained resources in a shrinking world, perhaps we can admit when seeing the Earth from space, "Away has gone away."

Fortunately, modern business and social leaders who develop Cradle to Cradle Certified™ products and use circular economy thinking offer customers the perpetual, safe and beneficial harvest of sources and resources of materials, energy, water and, especially, the urgent curiosity of creative people. Such models replace the urgent thoughtlessness of planned short-term obsolescence in a world of limits and constraints with the urgent thoughtfulness of planned long-term use and reuse in a world of abundance, opportunity and new business models.

Peter Drucker pointed out that it is a manager's job to do something the right way – to be efficient – but it is the executive's job to do the right thing – to be effective. Companies today often issue reports about being less bad by reducing the amounts of materials, energy and water they use as well as having a goal of zero badness. But the important message here, of course, is it is time to actually eliminate the entire concept of waste itself, because why would a business intentionally make a thing that it can't sell or is a liability? So, as presented in *Cradle to Cradle* (2002) and more recently in *The Upcycle* (2012), co-authored with Michael Braungart, the idea of being less bad is to be encouraged while realizing the real power and hope will come from companies that execute on being more good – to make the world better faster, not just worse more slowly.

Cradle to Cradle-informed design and circular economy practices represent a fundamental shift in the first principle underlying the terms of commerce itself. They move us beyond the simplistic, self-centered question, "How much can I get for how little I give?" – the quantification of economic value in a shrinking world of limits and fear – and instead put first the richly informed and generous question, "How much can we give for all that we get?" – a new commercial qualification of human values in an ever-expanding world of abundance and hope.

From my perspective, abundance is, at its core, what *Waste to Wealth* is about: addressing every link in economic value chains and eliminating the concept of waste while creating the means and results for shared prosperity. It provides an essay of clues for the leaders of all human industries large and

small, helping them to redesign the supertanker of global business and set it not just on slower courses to the same destinations but on innovative courses to new places. The compass guiding it points to an honest awareness of what we wish to leave behind and what compels us and our children to create as we move forward. These enterprises see no incentive in being dragged down, even right or left; they are only full speed ahead, onward and upward, propelled by the joy of striving for continuous improvement. This is not easy for the same reason it's so important: it's going to take us all, and it's going to take forever. But then, that's the point.

Wherever you are on your own journey, *Waste to Wealth* can help guide you along the way.

William McDonough

Founder, McDonough Innovation

Co-author, *Cradle to Cradle: Remaking the Way We Make Things* and
The Upcycle: Beyond Sustainability—Designing for Abundance

Chair, World Economic Forum Meta-Council on the Circular Economy

December 23, 2014

Executive Summary

The transition to a circular economy may be the biggest revolution and opportunity for how we organize production and consumption in our global economy in 250 years. It is a radical rethink of the relationships between markets, customers, and natural resources. The circular economy also represents a huge opportunity for companies to create competitive advantage, or as we put it, "Circular Advantage," disrupting the way we produce and consume through innovative business models, digital technologies, and engineering, and the enabling capabilities that support these systems.

Our research indicates a \$4.5 trillion reward for turning current waste into wealth by 2030. That's not just waste in the traditional sense of rubbish, but the enormous underutilization of natural resources, products, and assets. It's about eliminating the very concept of "waste" and recognizing everything has a value.

What about creating a \$10 billion business renting property without using any energy, metal or other resources to build a single house? Increasing a company's gross profit by 50 percent while reducing material use by 90 percent, all by recovering and remanufacturing used components? Unlocking \$1 billion in previously wasted value by transforming material management in manufacturing? Or using a country's underutilized biomass resources to tap into an \$80 billion market for advanced chemicals and energy?

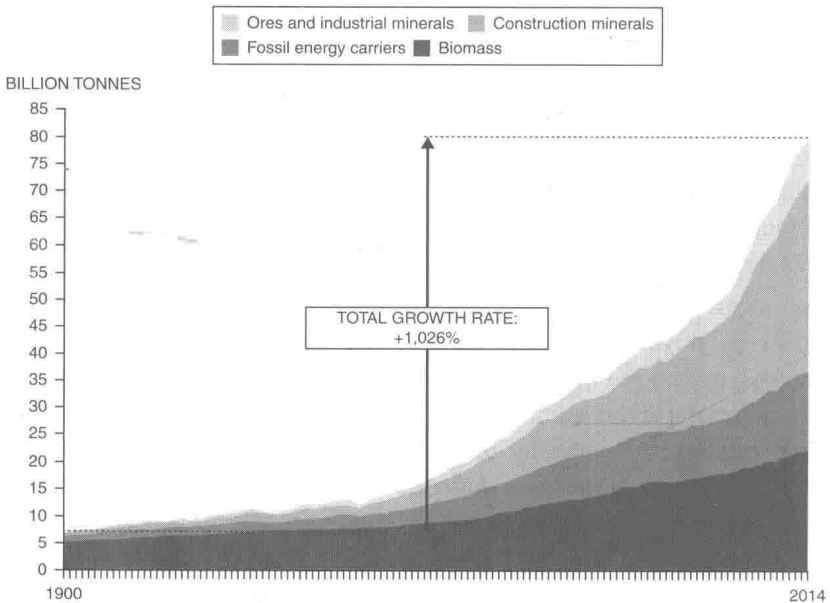
Global industry leaders as well as innovative start-ups are already beginning to reap huge rewards by tapping into these opportunities. And it's just the beginning. This book maps out how they're doing it and what other leaders can learn as they create their own circular advantage. We hope to transform the circular economy from an abstract concept into an easy-to-understand, practical and applicable business model for you.

For society as a whole, the need is even stronger to enable economic growth and prosperity that do not, unlike our existing models and practices, depend on increasingly constrained energy and material resources. The circular economy

is, in our experience of working with and advising governments, international agencies and businesses, the only viable large-scale solution for prosperous, green and thriving global growth and human development.

“Business as usual” is heading for trouble – and, in fact, has been for quite some time. The indisputable fact: Earth’s resources are limited. Some, like precious metals, are for all intents and purposes very limited due to pervasive mining in the past 250 years – and they’re only getting more constrained. Others, like water, air and forests, are technically renewable but are increasingly stressed. Strong population growth, coupled with exploding demand among consumers for more goods and services, will exhaust them to the breaking point if current practices continue. Making matters worse, the current growth model still treats the impact of waste as a matter for “someone else” to deal with. Meanwhile, the planet’s ability to absorb and process this waste diminishes by the year.

Global Resource Use, 1900–2014



Source: Accenture analysis based on data from Fridolin Krausmann, Simone Gingrich, Nina Eisenmenger, Karl-Heinz Erb, Helmut Haberl and Marina Fischer-Kowalski, ‘Growth in Global materials use, GDP and population during the 20th century’, *Ecological Economics*, Volume 68, Issue 10, August 15, 2009, <http://www.sciencedirect.com/science/article/pii/S0921800909002158>.

The turn of the millennium saw the reversal of a 40-year-old pattern in which natural resource prices decreased steadily as growth increased. Between 2000 and 2014, this inverse relationship gave way to a positive one, as growth and real commodity prices rose in tandem over the period as a whole.¹ Even with

oil prices falling in record pace at the end of 2014 due to geopolitical factors and increased production of unconventional fossil fuels like oil shale and oil sands, the real price of oil in December 2014 was 50 percent higher than in December 2000.² Companies and broader economies can't proceed as if everything is rosy and the impending resource crunch is merely a mirage. The reality is that business operations today will soon mean not enough resources for growth and global prosperity tomorrow. Fifty percent of the world's population – approximately three billion people – lives on less than \$2.50 per day. Nearly five billion people live on less than \$10 per day.³ Any global growth model that does not invite these five billion people to share in the world's prosperity is not fit to consider, but any model that does account for them clearly requires a radical reformation of resource use. Something has to be done. And that something, we believe, is embracing the circular economy.

The circular economy as a concept has been around for a few decades. As it's known today, it refers to the decoupling of economic growth from the extraction and consumption of constrained natural resources, i.e., scarce resources with negative footprints, like fossil fuels or hard-to-recycle metals and minerals, where dependency creates a competitive disadvantage over time. Instead, "circular" approaches keep resources in productive use in the economy for as long as possible. For business, it's about turning waste into wealth. Importantly, "waste" here refers to more than just physical waste, i.e., rubbish. We see waste in four distinct forms:

1. **Wasted resources** are materials and energy that cannot be continually regenerated, but instead are consumed and forever gone when used.
2. Products with **wasted lifecycles** have artificially short working lives or are disposed of even if there is still demand for them from other users.
3. Products with **wasted capability** sit idle unnecessarily; for instance, cars typically sit unused for 90 percent of their lives.
4. **Wasted embedded values** are components, materials, and energy that are not recovered from disposed products and put back into use.

Together all this waste adds up to the biggest economic opportunity of our time. Finding business solutions to turn waste into wealth not only makes financial sense but also enables growing businesses and economies without growing the need for increasingly constrained natural resources. It would effectively move us away from resource-based growth to a new era of performance-based growth. In the process not only waste but the very concept of waste will be eliminated, with the realization that every resource has a potential value beyond its current use.

While some elements of the circular economy (such as recycling) are well known, others are more obscure. But the fact is, circular principles that

emphasize a more rational use of resources are logical responses to the current “linear” model’s shortcomings, with its “take, make, waste” focus.

The numbers bear it out. Our research and analysis reveal that by 2030 the linear growth model’s inability to deal with growing demand for resources will result in a gap of eight billion tonnes between supply of and demand for constrained natural resources, nearly equalling the total resource use in North America in 2014. In the most likely scenario we have modelled, this translates into \$4.5 trillion of lost growth by 2030, ballooning to \$25 trillion by 2050. This is after adjusting for the assumption that rising commodity prices will drive resource-efficiency improvements and speed development of new types of resources. In other words, if the circular economy can replace the linear economy and decouple growth from constrained resource use – our research shows it can – it can also unlock \$4.5 trillion in additional economic output by 2030.

This will happen while simultaneously improving the customer value proposition – that is, requiring no customer trade-offs between what is desirable in the short term and what is viable in the long term. On the contrary, companies in a circular economy enable customers to make the most out of products; facilitate trade between users; supply services that monetize goods not in use; offer convenient buy-back solutions; and sell services instead of products. To deliver this, companies will need to learn more about how products are used, what customers really value and how they interact. Digital technologies are enabling this interaction at a scale and level of efficiency never seen before. One example is the newfound scalability and convenience of car sharing that monetizes reductions of wasted capacity. When waste is turned into wealth, the benefits will be shared between companies and customers alike.

At the high level there are three fundamental drivers of the circular economy:

1. **Resource constraints** – because the current economy is wasteful and does not leave enough resources for all forever.
2. **Technological development** – because the introduction of new technologies, notably digital innovations (see box), is making the circular economy increasingly attractive and viable for businesses.
3. **Socio-economic opportunity** – because decoupling constrained resources from growth not only enables inclusive growth but also empowers customers to squeeze the most value out of products and assets.

The book you are about to read is, we believe, the first to tackle head-on the issue of *how* companies, governments, and economies can address the issues

just mentioned and turn waste into wealth at the levels of companies and entrepreneurs. While other books have admirably called attention to the problems facing the current growth model, we explore practical solutions to those problems and the role of business, society and customers in fostering enterprise and innovation. Based on exhaustive research we conducted on more than 120 companies in 2013 and 2014, as well as on in-depth interviews with 50 executives and thought leaders, practical experience with myriad Accenture clients, and economic analysis and modelling, we have devised a highly practical approach that companies can follow to begin capitalizing on the “circular advantage.” We explore our insights and our approach in four sections.

DIGITAL TECHNOLOGIES ACCELERATING THE CIRCULAR ECONOMY

Similar to most big transformations throughout history, technology is playing a leading role in scaling the circular economy. The most fundamental operational difference in a circular economy compared to a linear one is that resources are managed extensively into, within and back from markets, in addition to the conventional resource-management focus on extraction and production. Digital technology (including cloud, mobile, social, machine-to-machine communication and big data analytics) is enabling this management and its monetization while also collecting data that can be analyzed to drive innovation and improve the customer proposition over time. Some of the strongest contributions and examples of digital technologies in this context are:

Smarter asset use: How can businesses use existing assets to deliver services instead of growing resource consumption? This is a pressing concern for mobility in urban areas where space is an issue. Enter MyWays, piloted by global logistics giant DHL. It's a mobile app and delivery service connecting people who need parcels delivered with people who can deliver them. Instead of putting more vehicles on roads, MyWays matches supply with demand using movements people are already making. A parcel is added to MyWays digitally using a tracking number. The receiver specifies the delivery address and his or her willingness to pay. Others can now find the job through the app, reserve it, pick up the parcel at a DHL service point and deliver it. During