

Conversations for tomorrow



Quarterly review
N°3 — 2021

**Intelligent Industry:
The Next Era of
Transformation**

#GetTheFutureYouWant

Insights from the Capgemini Research Institute

SUSTAINABLE OPERATIONS

Sustainability and climate change are now top of the global agenda. Today, successful manufacturers understand that environmental responsibility is an integral part of the manufacturing value chain, making stringent demands on organizations but also bringing significant business opportunities and benefits.

To understand where the manufacturing sector stands in terms of operational sustainability, we launched a comprehensive research program, surveying 480 executives from the business-facing side and the same number from the sustainability functions of large manufacturing organizations. The manufacturing industries surveyed include aerospace and defense, automotive, industrial and capital goods, high-tech, consumer products, pharmaceuticals, and medical devices. In addition, we conducted one-on-one interviews with sustainability leaders at a range of major manufacturers.

This research report offers answers to these key questions and examines four themes:

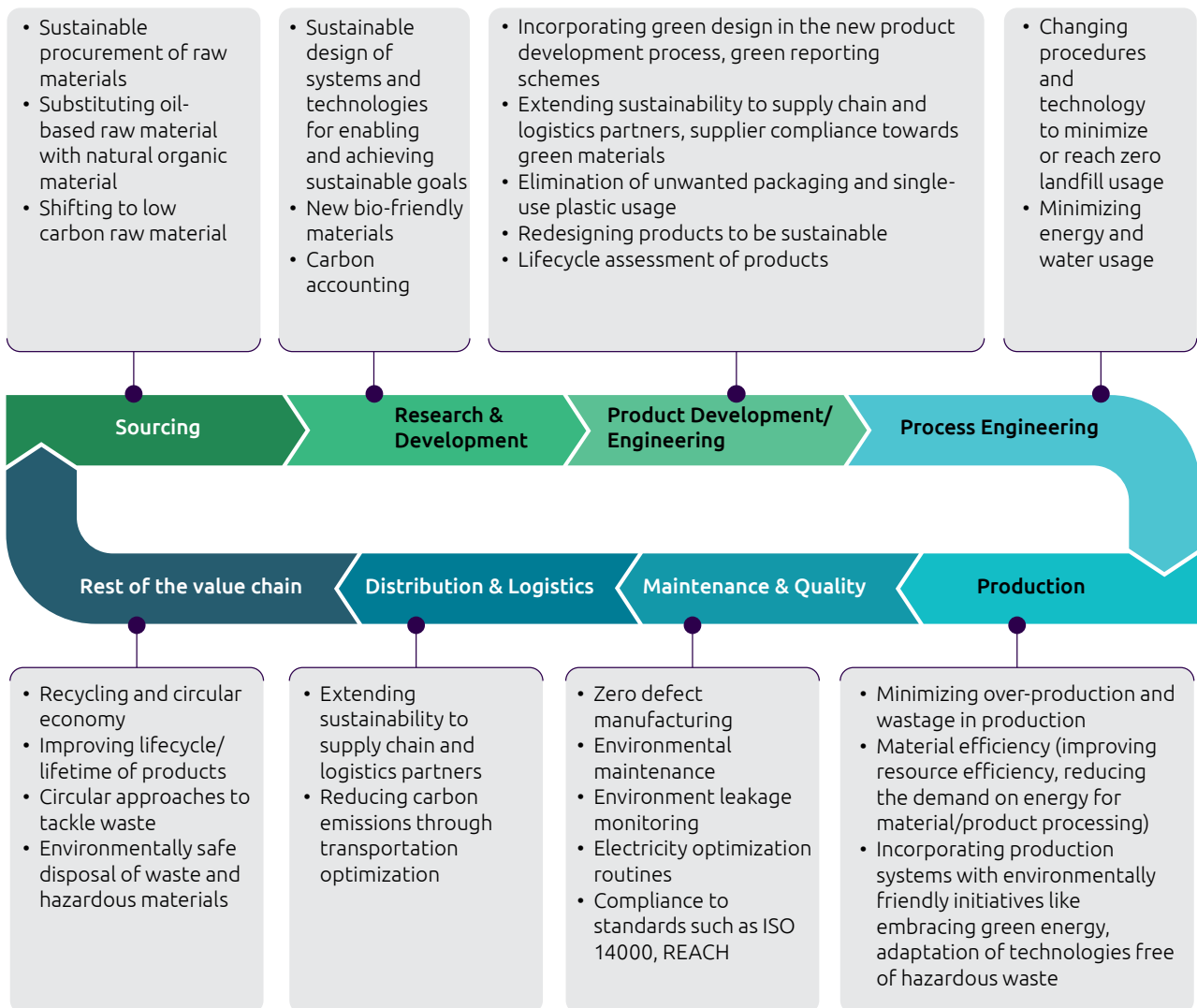
- What is 'sustainable manufacturing' and how does it constitute a major opportunity for manufacturers?
- Why are so few organizations on track to become sustainable manufacturers, despite the sector's high aspirations?
- How is technology helping manufacturers to achieve the goals set by their sustainability agendas?
- How can manufacturers reach their sustainability goals?

1 – WHAT SUSTAINABLE MANUFACTURING IS AND WHY IT IS A MAJOR OPPORTUNITY FOR ORGANIZATIONS

Defining sustainable manufacturing

The UN’s definition of sustainable manufacturing covers three important aspects of sustainability: **economic growth**, **social inclusion**, and **environmental protection**. These elements are interconnected, and all are crucial to the well-being both of individuals and societies.¹ This research focuses on the “environmental protection” pillar of the UN definition of sustainable manufacturing.

Figure 1: Sustainable practices across the manufacturing operations value chain

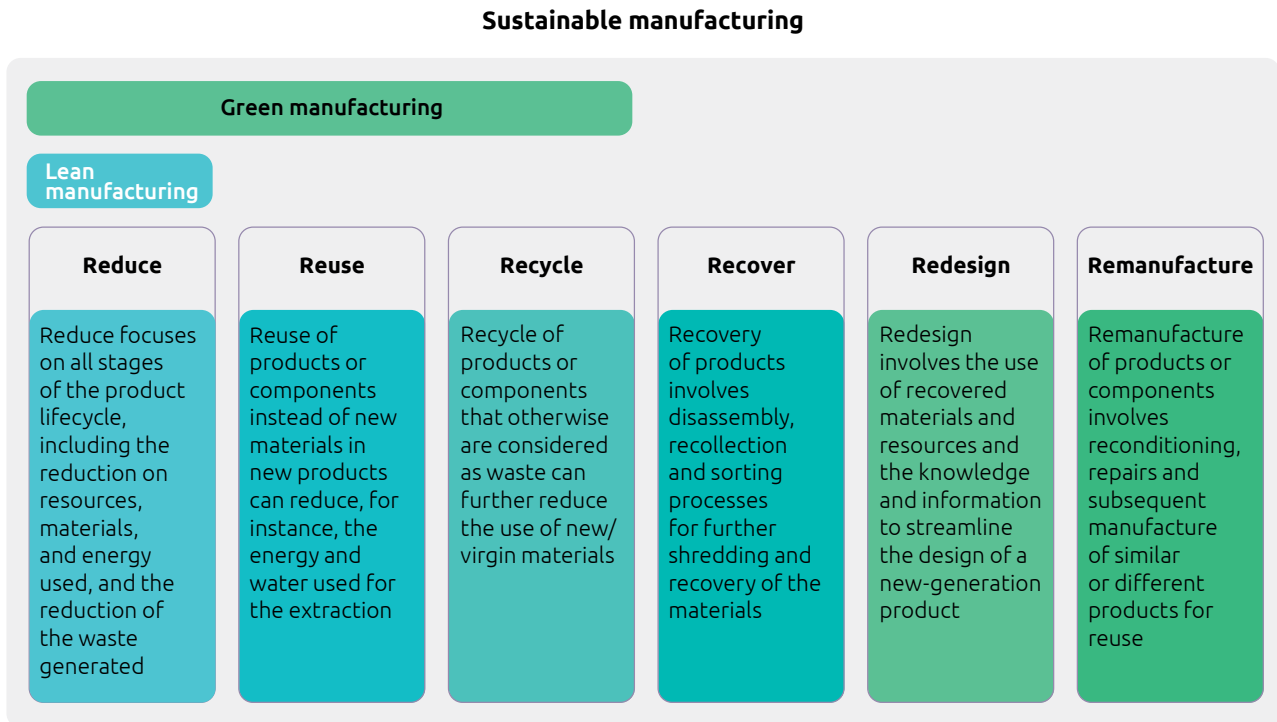


Note: In the above figure, “Rest of the value chain” covers product usage, disposal, and circular economy components. Source: Capgemini Research Institute.

¹ UN, The Sustainable Development Agenda, accessed October 27, 2021.

It is also important to note that sustainable manufacturing incorporates the 6R approach: Reduce, Recycle, Reuse, Recover, Redesign, and Remanufacture – rather than just focusing on waste elimination.²

Figure 2: The 6Rs of sustainable manufacturing



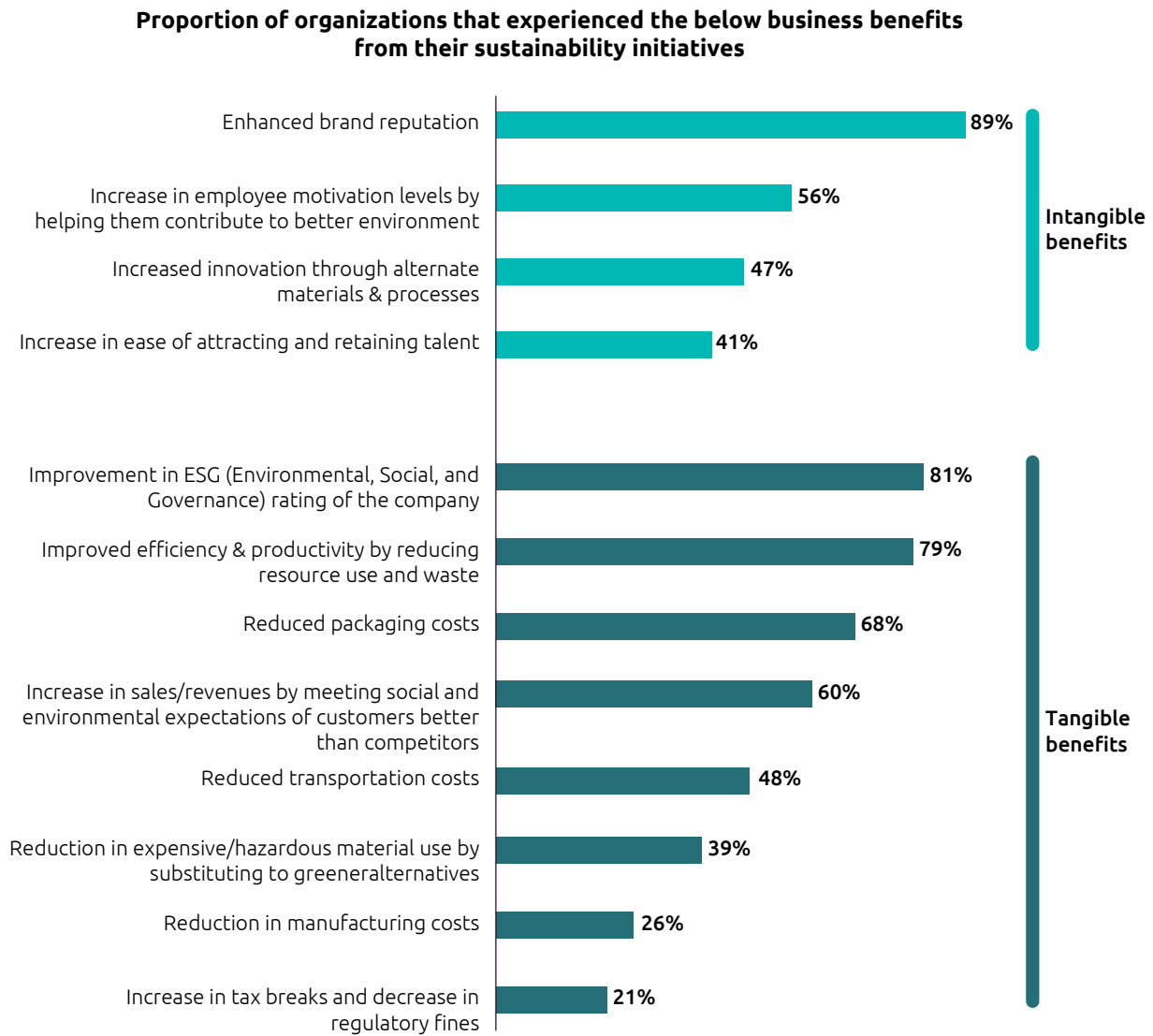
Source: Badurdeen, Fazleena & Jawahir, I.s. (2017). Strategies for value creation through sustainable manufacturing.

Sustainability initiatives are driving economic as well as environmental goals

Our research, however, shows that most organizations are seeing monetary and non-monetary benefits from sustainability initiatives.

² Badurdeen, Fazleena & Jawahir, I.s. (2017). Strategies for Value Creation Through Sustainable Manufacturing. *Procedia Manufacturing*, 8. 20–27. 10.1016/j.promfg.2017.02.002.

Figure 3: Proportion of organizations seeing business benefits from their sustainability initiatives



Source: Capgemini Research Institute, Sustainability in Manufacturing Operations, Business executives survey, February–March 2021, N=480 business executives.

Moreover, our research shows that more than nine in ten organizations have seen a reduction in waste and greenhouse gas emissions owing to sustainability initiatives. More than half have seen the carbon footprints of their partners reduced, as well as reduced water use.

2 – DESPITE HIGH AMBITIONS, FEW ORGANIZATIONS ARE ON TRACK TO BECOME SUSTAINABLE MANUFACTURERS

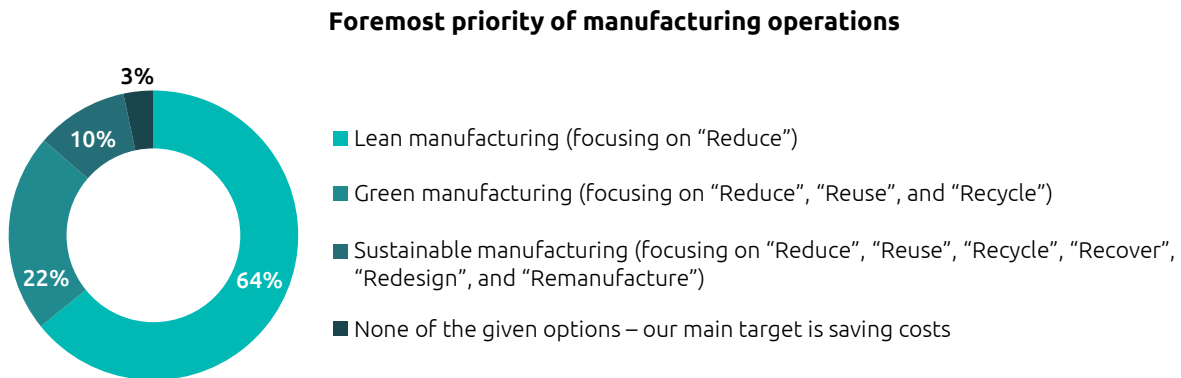
Manufacturers have set ambitious targets for the next decade; however only half of manufacturers aim to align with the Paris Agreement

One in five (20%) manufacturers are aiming to achieve carbon-neutral operations and two in five (40%) have set their sights on 100% renewable operations³ by the end of this decade.

In our research, we found that only 51% of organizations aim to align with the targets for contained temperature rises set by the Paris Agreement.⁴ Of these aligned organizations, only 58% are on track to achieve the targets set out in the agreement.

Comprehensive focus on sustainability is lacking, with the majority focusing on lean manufacturing

Figure 4: Most manufacturers are still focused on traditional lean manufacturing



Source: Capgemini Research Institute, Sustainability in Manufacturing Operations, Sustainability executives survey, Business executives survey, February–March 2021, N=480 organizations.

³ Carbon neutrality indicates that the operation has neither net greenhouse gas emissions nor a carbon footprint. This can be achieved either by eliminating emissions or through offsetting.

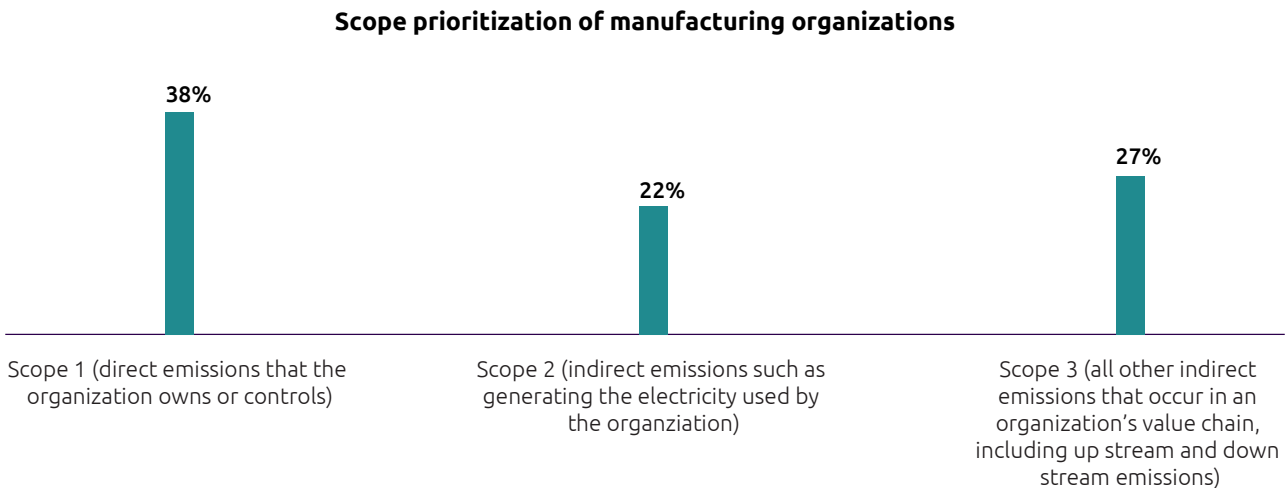
⁴ NRDC, "Paris Agreement aims to limit the global temperature increase in this century to 2°C above pre-industrial levels while pursuing the means to limit this increase to 1.5°C," Paris Climate Agreement: Everything you need to know, February 2021.

Maturity of sustainability practices across the value chain is low

We asked business executives about their sustainability priorities in terms of different functions. The product development and engineering function receives the most attention when it comes to sustainability initiatives (48% make this area a priority), followed by production (44%).

The strongest emphasis is given to Scope 1 emissions (direct emissions that the organization owns or controls), but less attention is given to Scope 2 (indirect emissions caused by, for example, generating the electricity used by the organization) and Scope 3 (all other emissions generated within an organization’s value chain, including upstream and downstream emissions).⁵

Figure 5: Scope 1 is the main priority for manufacturing organizations



Source: Capgemini Research Institute, Sustainability in Manufacturing Operations, Business executives survey, February–March 2021, N=480 business executives.

Lack of alignment between business and sustainability executives hinders progress

Alignment is an issue across the environmental agenda; only one in five organizations agrees that sustainability is fully integrated into the manufacturing strategy.

It is also an issue between stakeholders within an organization. In our research, we examined the extent to which business-facing executives and their sustainability-focused peers are aligned on key areas of sustainability. We found a lack of alignment was an issue both at an organizational level and in terms of the importance of sustainability for different functions.

⁵ Greenhouse Gas Protocol. FAQ. https://ghgprotocol.org/sites/default/files/standards_supporting/FAQ.pdf, PDF file.

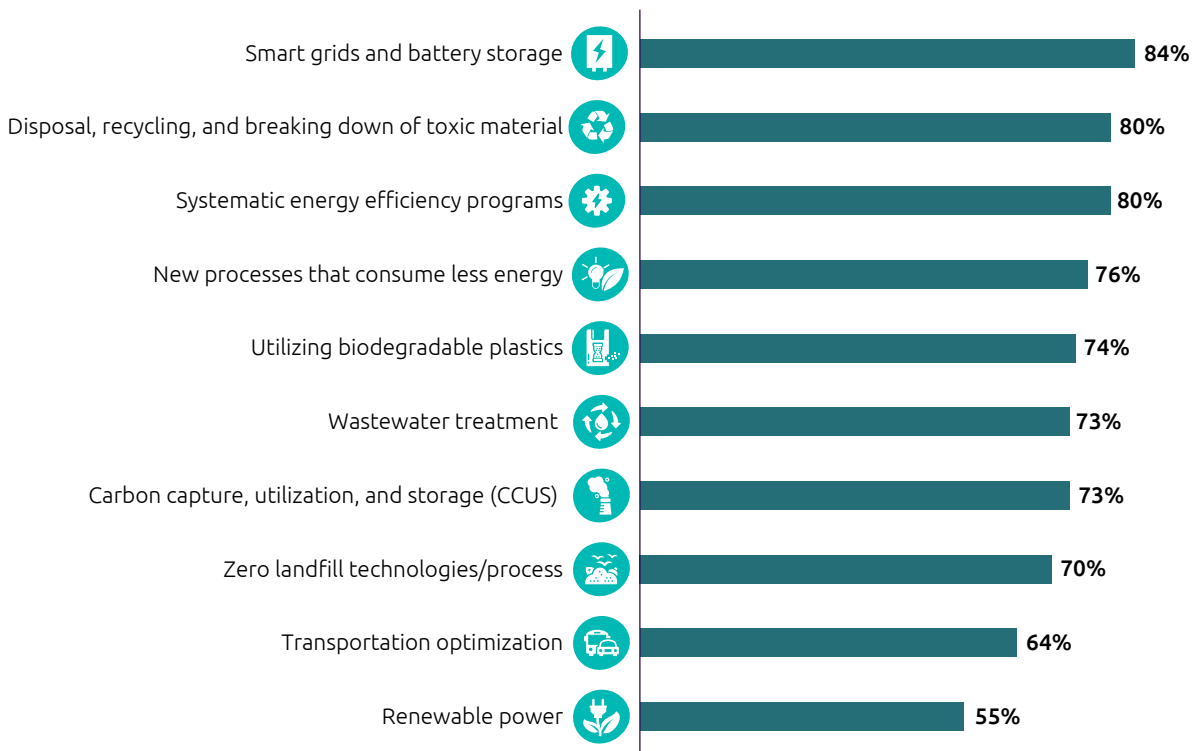
3 – HOW TECHNOLOGY IS HELPING MANUFACTURERS TO ACHIEVE THE GOALS OF THEIR SUSTAINABILITY AGENDA

Technology is playing a key role in sustainability initiatives

Manufacturers have wide-ranging sustainability agendas. As Figure 6 shows, 84% have smart grids and battery storage on the agenda. Similarly, 73% are focusing on wastewater treatment, as well as Carbon Capture, Utilization, and Storage (CCUS), which help in mitigating the level of CO₂ emissions.

Figure 6: Top initiatives on the manufacturing sustainability agenda

Top ten areas of focus for improving sustainability



Source: Capgemini Research Institute, Sustainability in Manufacturing Operations, Sustainability executives survey, February–March 2021, N=480 sustainability executives.

Technology will be key to driving progress across the agenda. Our research shows that more than half of organizations say technology is a core focus of their sustainability strategy.

Digital technologies for sustainability are adopted by many and deliver significant benefits

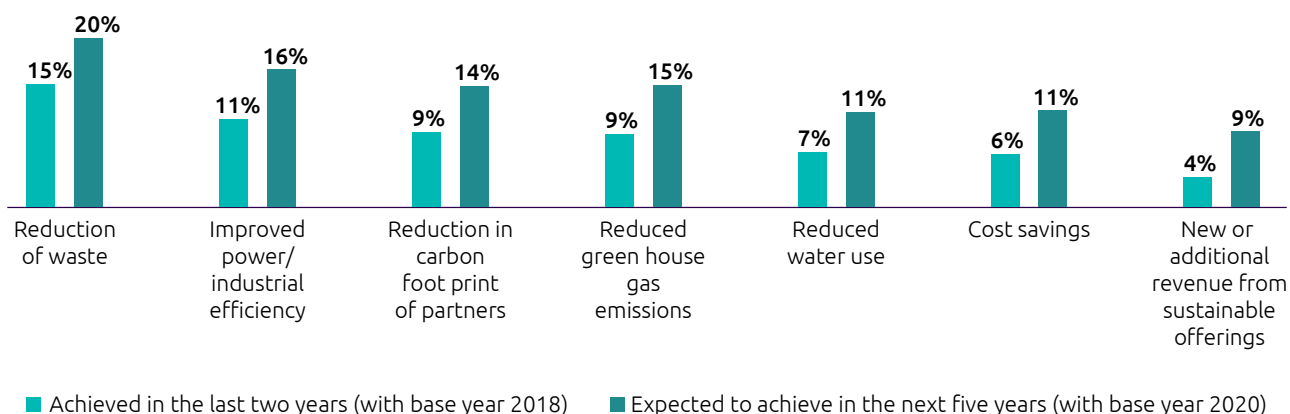
Our research shows significant adoption of key technologies to drive sustainability in manufacturing operations:

- 73% are adopting automation
- 68% AI/machine learning
- 60% data analytics

This take-up reflects the potential of these technologies. As Figure 7 shows, for example, scaled use of technologies has resulted in a 15% reduction in waste, on average, over the past two years.

Figure 7: Digital technologies enable numerous sustainable benefits

Average sustainability benefits from scaled digital technologies



Source: Capgemini Research Institute, Sustainability in Manufacturing Operations, Business executives survey, February–March 2021, N=480 business executives.

4 – HOW MANUFACTURERS CAN REACH THEIR SUSTAINABILITY GOALS

Based on our analysis of manufacturers’ responses, and drawing on our experience in working with major players in this area, we have identified the top sustainable practices/applications within each of the 6R areas.

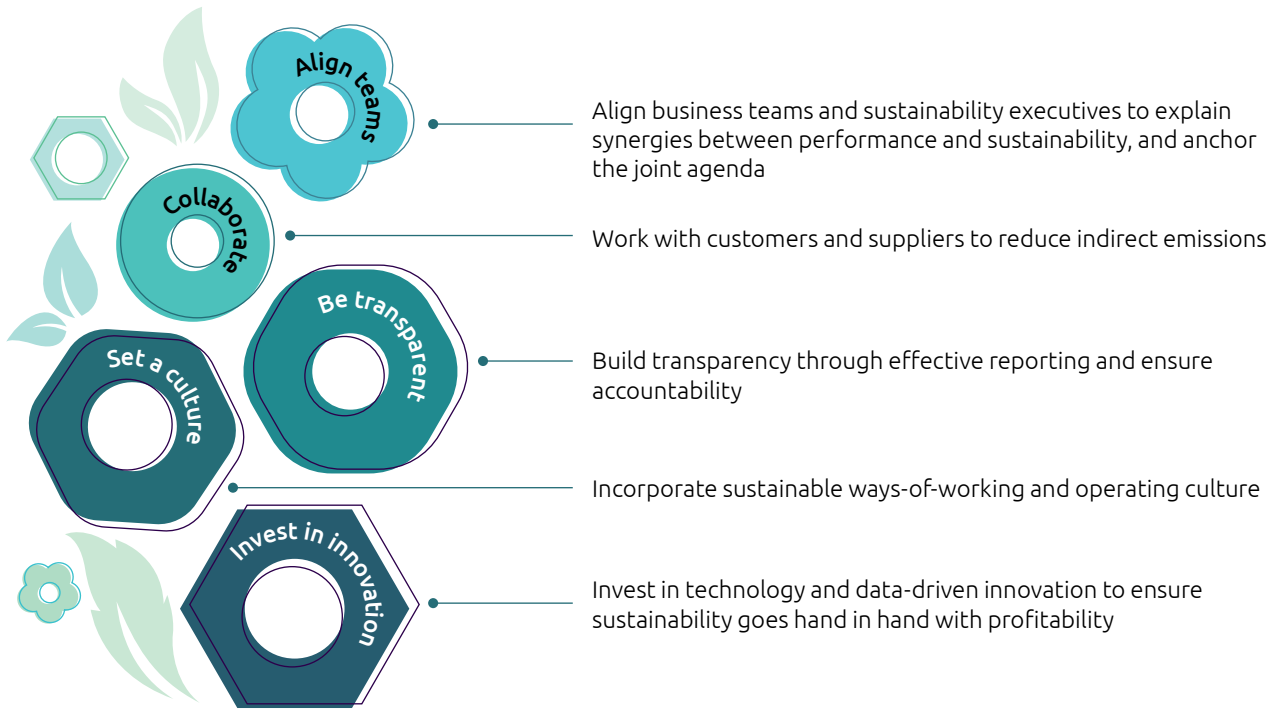
Figure 8: Top applications that deliver the greatest benefits

Type	Top applications
 Reduce	<ul style="list-style-type: none"> • Reducing carbon footprint of operations through green hydrogen and renewable power • Improving material utilization through additive manufacturing and precision manufacturing in metal fabrication • Reducing transport carbon footprint by environmentally focused inventory management. • Reducing composite plastics and non-recyclable materials
 Reuse	<ul style="list-style-type: none"> • Reusable transport packaging by constructing durable materials using metal, plastic, and wood that is designed to achieve multiple uses • Use of returnable/reusable plastic boxes and shipping containers • Building rainwater harvesting reservoirs or replenishing underground water reserves.
 Recycle	<ul style="list-style-type: none"> • Using recyclable packaging material • Collecting and recycling scrap from customer processes • Recycling wastewater • Recycling process waste heat for environmental heating
 Redesign	<ul style="list-style-type: none"> • Incorporating green chemistry in product safety • Incorporating environmentally oriented materials selection and sourcing sustainable materials • Redesigning products to remove fossil fuel feedstock sources (such as plastics) • New transportation networks supported by network design technologies and use of alternate transport methods • Redesigning systems using simulation platforms and data collected along the full life cycle to optimize direct and indirect impacts • Designing products in such a way that they can be remanufactured and incorporate lifetime-extension services • Implementing functional approach and embracing the opportunity to change the business model to improve the environmental impact and at the same time, taking the opportunity to identify new innovative products and services
 Recover	<ul style="list-style-type: none"> • Being part of industrial waste exchanges that recover waste from a given industry to provide material of value to another industry • Collaborating with third-party vendors to recover as much waste as possible from site locations • Recovering the energy stored in residual material by turning waste into a fuel for manufacturing processes or equipment designed to produce energy
 Remanufacture	<ul style="list-style-type: none"> • Reclamation of used durable materials, such as steels, and products that can be reused in future manufacturing processes • Taking back end-of-life products from customers so as to disassemble and use them in the remanufacturing process • Offering repurposed/reused products as a service offering • Building retrofitting service lines for extending the usable lifetime of products.

Source: Capgemini Research Institute, Sustainability in Manufacturing Operations, Sustainability executives survey, February–March 2021, N=480 sustainability executives along with Capgemini expert analysis.

We have identified five success factors that are critical to maximizing the results from these applications, and driving the sustainability agenda.

Figure 9: Five success factors for achieving sustainability goals



Capgemini Research Institute analysis.

For details on the research methodology and to read the full report, please visit:
<https://www.capgemini.com/research/sustainability-operations/>

