OPPORTUNITY 25

SCOPE TRANSITIONAL

UNCERTAINTIES

Technology, Systems

MEGATRENDS

Living with Autonomous Robots and Automation

TRENDS

Automation
Cross-sectoral partnerships
Human–Machine
International Collaboration
Mobilising Innovation

SECTORS IMPACTED

Agriculture & Food
Automotive, Aerospace & Aviation
Communication Technologies & Systems
Consumer Goods, Services & Retail
Cyber & Information Security
Data Science, AI & Machine Learning
Digital Goods & Services
Education
Energy, Oil, Gas & Renewables
Financial Services & Investment
Government Services
Health & Healthcare
Immersive Technologies
Infrastructure & Construction
Insurance & Reinsurance
Logistics, Shipping & Freight
Manufacturing
Materials & Biotechnology
Professional Services

What if sustainable development was central to robotics?

THE RESPONSIBLE ROBOT

Sustainable development drives robotics strategies and research, advancing sustainable agriculture, construction, disaster relief, and healthcare, aligning with global sustainable development goals.

WHY IT MATTERS TODAY

We are approaching an inflection point where various technologies – material science, battery life, network connectivity, and machine learning – will converge to make robots synonymous with social progress and problem-solving.[583] Next-generation robots will perform tasks with unprecedented precision and effectiveness.[584] They are also likely to be more affordable – the average cost of an industrial robot has fallen 50% over the past 30 years.[585]

Globally, robots and autonomous systems are projected to be adopted by 60% of companies by 2025.[586] Robots are already playing transformative roles in healthcare, agriculture, environmental sustainability, and construction.[587] Beyond these relatively more physical or industrial applications, robots can also fulfil intellectually demanding sustainable development needs, such as cooking meals,[588] providing education,[589] and even supporting the rule of law.[590] Globally, the robotics market reached approximately $25.2 billion in 2023 and is forecast to surpass $152.9 billion by 2033, growing with a CAGR of nearly 20%.[591]

Beyond their ever-improving affordability and physical functionality, robots' computational capabilities are enabling unparalleled human–machine cooperation and adaptability. The 2023 iteration of the AI for Good summit, the largest United Nations (UN) artificial intelligence (AI) event, showcased over 50 robots with uses in support of the UN Sustainable Development Goals (SDGs), most of which were capable of audibly and physically interacting with humans to better achieve their development objectives.[592] Neutral networks can allow humanoid robots to process and produce speech and facial expressions, responding seamlessly to humans or other stimuli.[593] The social robots market specifically is expected to grow from $5.64 billion in 2024 to $22.93 billion by 2029 at a CAGR of 32.4%.[594]

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OPPORTUNITY

With growing applications and shrinking costs, robotics can become central to sustainable development.[595] Engineers can design affordable robots that automate a range of essential development stepping stones, from eliminating weeds in agriculture without pesticides[596] to more efficiently building and repairing infrastructure for housing and transportation,[597] providing humanitarian relief moments after a disaster,[598] and assisting in medicine delivery and rehabilitation programmes.[599]

Shifting the focus of robotics research, learning, and design in universities and research institutions to SDGs rather than merely automating tasks can bring many economic and societal benefits, influencing where investments are made. Instead of being seen as mechanisms for replacing or assisting humans in tasks like agriculture, construction, surgery, or medicine delivery, they contribute significantly to global development. Assembled with the ability to adapt to diverse contexts[600] and communicate in any language, next-generation robots can work alongside humans to accelerate sustainable development progress both locally and globally.

BENEFITS

Across various geographies, affordable robotic platforms offer scalable solutions that address SDGs previously considered daunting.

RISKS

Market incentives and investments do not do enough to make robots affordable for countries most in need of solutions for sustainable development, widening existing development gaps and inequalities and inhibiting sustainable development instead of enabling it.