AK EUROPA

POLICY BRIEF

3 / 2026 - Economic

The Rise of the Robots

Humanoid robotics: steering industrial transformation, human-AI collaboration, standards competition and social responsibility

Key Points

- In 2025, China produced around 15,000 humanoid robots – more than 30 times North America's output and over 150 times Europe's. China's early roll-out strategy is creating a self-reinforcing advantage in data and costs.
- Estimates suggest the global humanoid robotics market could reach approximately €250-650 billion. By 2050, a trillion-euro market comparable to today's automotive market is a realistic prospect.
- China holds around two-thirds of global robotics patents and has the most cost-efficient supply chain. Chinese models are already available from €14,000, while Western competitors plan entry-level prices of around €17,000-25,000.
- As robots become more common in daily life and the workplace, and as brain-computer interfaces (BCIs) advance, new ethical and social questions are emerging about how far these technologies can be used.
- Europe risks a structural dual dependence on Chinese robot hardware and US AI software. Without targeted industrial policy, Europe could become a sales market rather than a producer of this future technology.

Background

Humanoid robotics is becoming a strategic technology for the coming decades. China is pursuing a systemic approach that combines industrial scale-up, government coordination, open innovation platforms and international standard-setting. Humanoid robots are seen not simply as industrial tools, but as future infrastructure for manufacturing, care, logistics and public services. At the same time, China is working to shape global technology standards through international standardisation bodies such as ISO, IEC and ITU.

However, the strategic importance of humanoid robotics lies not only in individual robots themselves, but in the development of complete industrial ecosystems (McKinsey, 2026). These include:

- AI models and data platforms
- Sensors and actuators
- Semiconductors and high-performance computers
- Communications infrastructure
- Cloud and training systems
- Safety and industrial standards
- Testing and simulation environments
- Industrial mass production

Humanoid robotics is thus becoming a hub for future technologies, integrating a range of high-tech components.

European industry therefore faces a dual challenge: the risk of technological and industrial dependence on key components and standards, and the danger that social, labour-law and ethical concerns are subordinated to industrial competition. Europe needs an independent humanoid robotics strategy that brings together technological sovereignty, social innovation, democratic regulation and industrial competitiveness. Public investment, open innovation ecosystems, active standardisation policy and social standards embedded across the value chain will be essential.

Key Findings on Industrial Policy

1. Market potential: a trillion-market is emerging

Latest estimates suggest that the global humanoid robotics market could be worth around €250-650 billion by 2035 and reach €2-4 trillion by 2050, putting it on a scale comparable with today's global automotive industry. As the market grows, production costs are expected to fall sharply, with future operating costs estimated at around €2 per robot per hour. This would make humanoid robots economically viable across a wide range of applications (Roland Berger, 2026).

2. China's systemic approach to industrial and innovation policy

China aims to dominate this future market. Rather than supporting individual companies in isolation, it is pursuing a systemic innovation policy based on "disruptive design" (Musitz, 2025). This approach deliberately links technological development with infrastructure policy, regulation, funding, education and real-world use cases. Innovations are intended not only to reshape markets, but also to be deployed early in practical applications and backed by regulatory and infrastructural support.

In humanoid robotics, this approach is especially visible in public events such as the Robot Olympics and in everyday applications such as traffic safety and surveillance. Regional innovation centres, including Beijing's Innovation Centre for "embodied intelligence", are key drivers. There, companies, research institutions and developers collaborate on open humanoid robotics platforms. Core elements of the strategy include publicly funded AI and robotics platforms, shared training datasets, open-source models, state-backed test environments, coordinated industrial scaling, institutional knowledge transfer and public funding for high-risk technologies.

The aim is to sharply reduce development costs and speed up learning. This, in turn, broadens the range of applications and further lowers costs. Open source therefore becomes a decisive competitive factor. Platforms such as 'Huisi Kaiwu', 'RoboMIND' and the open-source humanoid 'Qinglong' give universities, start-ups and companies access to training data and development tools. This accelerates knowledge sharing, standardisation and scaling. Such controlled openness is part of an industrial policy strategy to strengthen national innovation capacity. So far, Europe has no comparable integrated open-platform ecosystem for humanoid robotics.

3. Standard-setting is becoming a question of geopolitical power

Humanoid robotics is closely tied to international standardisation. Standards set requirements for safety, interfaces, data formats, interoperability and certification. China is pursuing a long-term strategy to increase its influence in bodies such as ISO, IEC and ITU. Its aim is not only to secure global recognition for Chinese standards, but also to help shape future technology rules. Those who write the rules play a decisive role in shaping the market environment (Vogl, 2024).

Standardisation is therefore becoming a central arena of geopolitical competition. European industrial policy has often underestimated the strategic importance of technical standards. While China systematically sends experts to international standardisation bodies and strategically occupies positions in secretariats and working groups, Europe often acts in a fragmented way. In humanoid robotics, future standards could be decisive in shaping market leadership and technological dependencies.

4. Humanoid robotics is transforming labour markets and social infrastructure

The development and spread of humanoid robotics will significantly affect labour markets and social organisations. China's strategy shows that robotics is not treated solely as an industrial application. Instead, it is increasingly understood as social infrastructure, spanning fields from industrial assembly and logistics to healthcare, public services and domestic support. China is also using humanoid robotics to address demographic pressures. As its population ages, humanoid robots are intended to help close long-term gaps in care and support. By 2029, humanoid systems are expected to become part of the national elderly care system.

This example shows that these developments raise fundamental social and labour-market questions: which tasks should be automated, how will skill requirements change, how can data protection and security be ensured, and who will benefit from productivity gains?

Europe therefore needs its own response, grounded in its model of prosperity and values: a dedicated strategy for managing these developments, opportunities and risks. This requires a socially oriented robotics policy that does not assess progress solely through competition and efficiency.

5. Human-machine convergence: the case of brain-computer interfaces

Rapid advances in robotics and artificial intelligence are creating new possibilities for human-AI collaboration,

closely linked to the development of brain-computer interfaces (BCIs). BCIs can be invasive, requiring surgical implantation, or non-invasive, using wearable devices such as headbands. Their current applications are concentrated mainly in medicine and rehabilitation, where they support people with physical limitations affecting speech or movement. They are also used in leisure and everyday contexts, such as mentally controlled gaming and sleep regulation. In workplaces, BCIs are primarily intended to improve efficiency. China is currently one of the leading producers, alongside the USA – especially Neuralink – and plans to deploy BCI systems by 2027 in basic industries such as mining, nuclear energy and power supply for monitoring and control. Further applications include the military, where BCIs may improve reaction times and combat capabilities, and education, where pupils' concentration has already been monitored with BCI headbands – a practice that met strong public opposition (Vogl, 2025).

The emergence of these technologies raises important social and ethical questions, particularly around human autonomy and privacy. This is especially relevant to BCI systems' ability to monitor brain activity. Strong safeguards are needed to prevent unauthorised access and the manipulation of emotions. These protections should be supported by bans on discrimination and undue performance pressure, as well as a legally protected right to refuse BCI devices in the workplace. At the same time, employee participation and democratic decision-making should be strengthened when such technologies are introduced.

6. Europe risks strategic decline and new dependencies

Europe retains strong industrial capabilities in mechanical engineering, automation, sensor technology and industrial software. Yet it also faces major structural weaknesses, including fragmented innovation ecosystems, slow technology scaling and poorly coordinated industrial policy. Its limited ability to turn research breakthroughs quickly into industrial platforms and global market leadership is especially problematic. As a result, technological dependencies are growing in areas such as AI models, robotics platforms, semiconductors, cloud infrastructure and industrial standards. Over time, this could weaken both Europe's industrial value creation and its regulatory room for manoeuvre.

These developments show that successful robotics policy cannot be purely technological. It requires an integrated approach linking industrial, technology and innovation policy with social, labour market and education policy. Defensive regulation alone, or innovation funding driven only by market forces, will not be enough. Europe must strengthen strategic investment and coordinated platforms while using its normative strengths to guide technological development through social standards and clear regulatory frameworks. This is particularly important for democratic control, workers' rights, data protection, transparency and ethical standards. Together, these elements can support a distinct European competitive model that combines technological strength with democratic and social governance.

Demands

1. Develop an independent European response to rapid advances in robotics: This response must combine technological sovereignty, democratic oversight and social participation. Its goal should not be competitiveness alone, but the shaping of technological development in the public interest. This includes supporting knowledge transfer, shared training data and open-source platforms.

2. Shape standardisation proactively: Strengthen the presence of worker´s representations in ISO, IEC and ITU committees on robotics and AI, promote its own safety and interoperability standards for humanoid robotics and develop a coherent regulatory framework.

3. Strengthen supply chain sovereignty: Strategic components for humanoid robots, in particular for actuators, precision gears and AI chips, should be classified as critical infrastructure, with European production prioritised.

4. Use the public sector as an innovation driver: Public procurement, pilot projects, knowledge transfer and local authority applications can play a decisive role in scaling European robotics solutions.

5. Protect privacy and prevent total performance monitoring: Privacy protection must be a top political priority. This includes the right to opt out of new applications and safeguards against discrimination, unauthorised data access and emotional manipulation. These technologies must not be used to intensify performance pressure or surveillance through AI-driven efficiency analysis.

6. Strengthen co-determination and democratic governance: New forms of work or technologies for human-AI teaming should be subject to transparent, tripartite negotiations. They must not be used to increase performance pressure and monitoring through AI-driven efficiency analysis.

7. Prepare education systems and labour markets: The introduction of humanoid robots will change skills needs. Europe therefore needs forward-looking skills programmes, stronger co-determination rights when robotic systems are introduced and clear liability rules for AI-driven (physical) errors.

8. Define ethical guidelines: Humanoid robots could support many applications, but their use must follow clear ethical guidelines and involve workers and affected groups. This is especially important in sensitive areas such as healthcare and care services.

Literature

McKinsey (2026) Turning humanoid supply chain constraints into billion-dollar wins, https://www.mckinsey.com/industries/industrials/our-insights/turning-humanoid-supply-chain-constraints-into-billion-dollar-wins/ (accessed on 08.05.2026)

Musitz, Lia (2025) Zukunftsvision mit System. Von Chinas sektoralem Erfolg zur nationalen Strategie für Chinas Zukunftsindustrien. AK Wien. (A systematic vision for the future. From China's sectoral success to a national strategy for China's future industries, AK Vienna)

Roland Berger (2026) Humanoid Robots - The Convergence Moment for a New Market.

Vogl, Doris (2024) Chinas Normungsstrategie und digitalisierte Zukunftstechnologien. MWuG Nr. 260 (Materialien Wirtschaft und Gesellschaft), AK Wien. China's standardisation strategy and digitalised technologies of the future. MWuG No. 260, AK Vienna)

Vogl, Doris (2025) Chinas Position im Umgang mit Künstlicher Intelligenz mit dem Schwerpunkt auf Mensch-KI-Teaming in der Arbeitswelt, AK Wien. (China's position on artificial intelligence, with a focus on human-AI teaming in the workplace, AK Vienna)

Authors

Michael Soder
michael.soder@akwien.at

Peter Hilpold
peter.hilpold@akwien.at

Susanne Wixforth
susanne.wixforth@akwien.at

August 2026

AK EUROPA

The Austrian Federal Chamber of Labour (AK) is the legal body which represents the interests of approximately 4 million employees and consumers in Austria. It represents its members on all social, educational, economic and consumer policy-related issues at a national level and in Brussels at an EU level.