
Europäisches Patentamt
European Patent Office
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50 years 1973 / 2023
EUROPEAN PATENT CONVENTION
Patents paving the way to a more sustainable future
epo.org

Foreword from the President

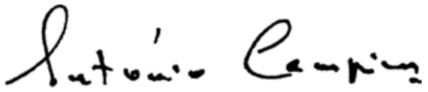
We have reached a turning point in history. We are confronted by unparalleled challenges that threaten sustainability including health crises, climate change, population growth, and wild-fires.

Innovation is essential in helping us to find solutions to these challenges, and IP rights play a key role in ensuring that society reaps the benefits of that innovation. Research proves that IP rights promote knowledge-sharing, empower individuals, and support economic development. Our studies show that IPR-intensive industries foster 82 million jobs in the EU, helping businesses large and small to create a more sustainable and brighter future.

The UN 2030 Agenda for Sustainable Development defines the world we are striving for and indeed need. In today's globalised economy, innovation, entrepreneurship, and patent knowledge-sharing are vital in delivering transformational ideas for sustainability. This comprehensive Highlight Report provides more detail about the EPO's main sustainability initiatives, with timely examples of how patent knowledge promotes innovation as a force for good and enables solutions to humanity's greatest challenges.

At the EPO, our core mission is to provide greater access to patent knowledge so that patents can play a full role in promoting innovative solutions to achieve the UN Sustainable Development Goals (UN SDGs). Digitalisation, bringing patent knowledge to the innovators' fingertips with just a few clicks, has powerfully driven accessibility to patent knowledge, from East to West, 24/7, ushering in new possibilities for ground-breaking inventions. This has, in turn, helped to enhance innovation's global impact and reduce inequalities by ensuring that every inventor, scientist, and researcher has access to high-quality patent knowledge resources. For example, the EPO's Espacenet provides free access to more than 140 million patent documents and in 2022 the Espacenet platforms received about 10 million visits.

By working together with innovators in the race to tackle global challenges, we will build a stronger global patent system that fosters innovation in sustainable technologies, brings us closer to our sustainability goals, and paves the way to a smarter, safer, and more sustainable world. We will also break down the barriers that prevent people from fully benefiting from the patent system. With sustainability as our guiding light, we join forces with innovators, investors, IP professionals, academic researchers, and policy makers, to share patent knowledge to help them solve humanity's greatest challenges. In this way, we also demonstrate how the patent system is a force for good, leading to greater understanding, transparency, and democratisation.



António Campinos,
President of the European Patent Office

Contributions to the UN Sustainable Development Goals (SDGs)

The EPO promotes innovation as a force for good: we support innovators in their efforts to solve global challenges and to contribute to the United Nations Sustainable Development Goals (UN SDGs) for a safer, smarter, and more sustainable world. Our joint studies with the EU Intellectual Property Office (EUIPO) on IPR-intensive industries prove that IP rights enhance innovation, foster jobs, and help businesses to grow. Roughly two thirds of the inventions for which SMEs have filed a patent application with the EPO are exploited for commercial purposes. In this way, IP rights promote a more sustainable economy and society.

UN SDG	TITLE
3 GOOD HEALTH AND WELL-BEING	Fighting coronavirus platform
	Cancer case studies
	mRNA technologies
5 GENDER EQUALITY	Women's participation in inventive activity
7 AFFORDABLE AND CLEAN ENERGY	Hydrogen patents for a clean energy future
	Clean energy platform
	Green techs in focus
	Innovation trends in electrolysers for hydrogen production
	Patents and energy transition
	Innovation in batteries and electricity storage
8 DECENT WORK AND ECONOMIC GROWTH	IPR-intensive industries and economic performance in the EU
	Intellectual property rights and firm performance in the EU
	Patents, trademarks and startup finance
9 INDUSTRY, INNOVATION AND INFRASTRUCTURE	Deep tech innovation in smart connected technologies
	Quantum computing
	Space-borne sensing and green applications
	Quantum technologies and space
	Cosmonautics
	Patents and the 4IR
12 RESPONSIBLE CONSUMPTION AND PRODUCTION	Code Fest on green plastics
	Patents for tomorrow's plastics
	Patents in additive manufacturing
	Innovation trends in additive manufacturing
13 CLIMATE ACTION	Firefighting platform
16 PEACE, JUSTICE AND STRONG INSTITUTIONS	The European patent system and the grace period

Each year the EPO focuses on certain UN SDGs. Global success depends on access to know-how and innovation trends such as those offered through the EPO's platforms, economic studies, insight reports, and more than 151 annual e-training sessions of the Academy.

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In pursuit of good health and well-being

The search for innovation that can counter the spread of diseases and save lives is essential for a sustainable world. This was more relevant than ever during the COVID-19 pandemic. The EPO Espacenet Fighting Coronavirus platform, released in June 2021, provides about 350 smart searches which help users navigate in a targeted way, through millions of patent documents in just a few clicks. These easily accessible searches, combining keywords and classifications, help innovators and decision-makers to identify quickly the most important inventions to tackle global pandemics.

The Fighting Coronavirus platform supports the important work of clinicians, scientists, and engineers in finding solutions that can counter the spread of diseases and pandemics. This initiative also reflects the patent system's broader role of encouraging investment in scientific and technological breakthroughs for the benefit of all.

With the coronavirus pandemic hopefully behind us, this platform is still valuable for innovators pursuing solutions for good health, especially in the fields of vaccines, therapeutics, diagnostics and analytics, informatics, and technologies relating to the new normal. The platform was updated in July 2022 to reflect the latest changes in these technology fields and we plan to update it again in July 2023.

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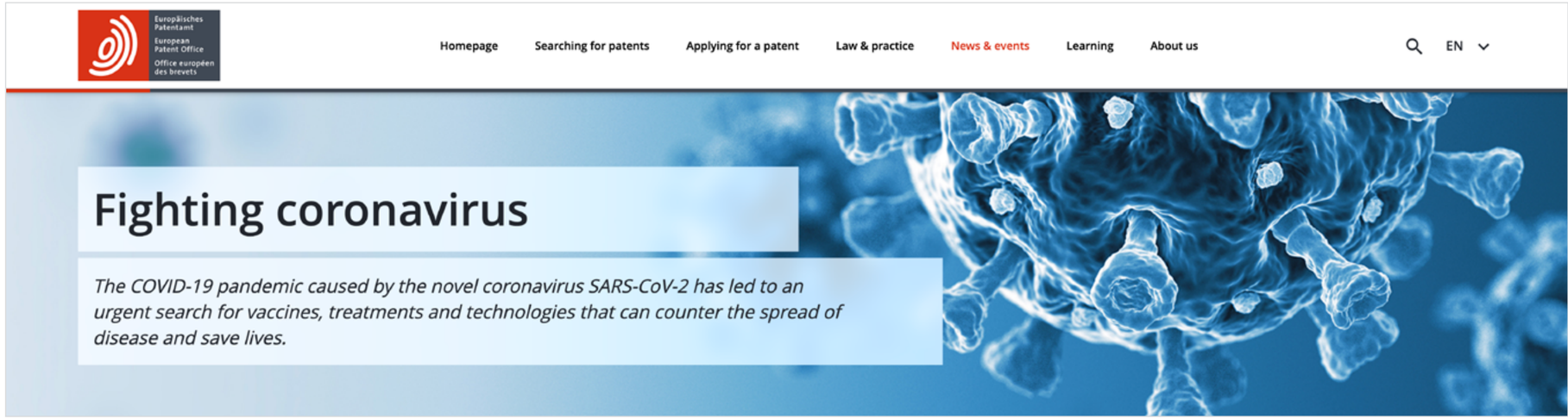

In May 2023, the EPO published three new case studies that showcase how patents can help grow businesses that create new technologies to detect, diagnose, and treat cancer. The World Health Organization estimates that cancer is a leading cause of death in over 100 countries for individuals under the age of 70, and as such, medical innovation is essential. Aimed at small and medium-sized businesses, researchers, and entrepreneurs, the case studies highlight best practices in managing intellectual property and strategies. They also help innovators to better navigate the patent system and other intellectual property rights to facilitate commercialisation of their technologies. The studies feature start-ups and spinouts from France, Austria, and Ireland that have developed innovative cancer diagnostic and/or treatment technologies. This publication complements the EPO's existing series of innovation case studies.

This report reveals that the growth of inventions in this subfield began well before the COVID-19 pandemic and has expanded remarkably over the past decade, surpassing growth rates in all other technology areas combined.

Additionally, in October 2023, the EPO published a patent insight report covering mRNA technologies, highlighting the significance of mRNA-based vaccines. This report reveals that the growth of inventions in this subfield began well before the COVID-19 pandemic and has expanded remarkably over the past decade, surpassing growth rates in all other technology areas combined. The report's timeliness is underscored by the recent Nobel Prize Physiology or Medicine awarded to mRNA pioneers Katalin Karikó (European Inventor Award Popular Prize Winner 2022) and Drew Weismann, whose work contributed to mRNA's understanding and the development of effective COVID-19 vaccines. Using publicly available patent data, the report offers insights into the mRNA-based vaccine field's development and underlines the sharp increase in patent filings dating back to the 1990s. Notably, patent applications are predominantly from the United States, Europe, and China. Europe holds a greater share compared to other emerging technologies like quantum technologies.

For gender equality

Breaking barriers and bridging the gap in inventive activities is essential for a fair and equitable sustainable world. The EPO promotes women in science, technology, engineering, and mathematics (STEM) through several initiatives. These include International Women's Day on 8 March each year, International Girls Day, our mentoring programme, and by recognising inspiring examples of women inventors excelling in different fields for more than 16 years with the European Inventor Award and since 2022 with the Young Inventors Prize.

In addition, our EPO Chief Economist Unit (CEU) study Women's participation in inventive activity, published in November 2022, provides evidence on the presence of women inventors across different countries and time periods and in various technology fields. Although myriads of brilliant women innovators contribute to solving some of humanity's biggest challenges, there is still a gender gap that needs to be breached.

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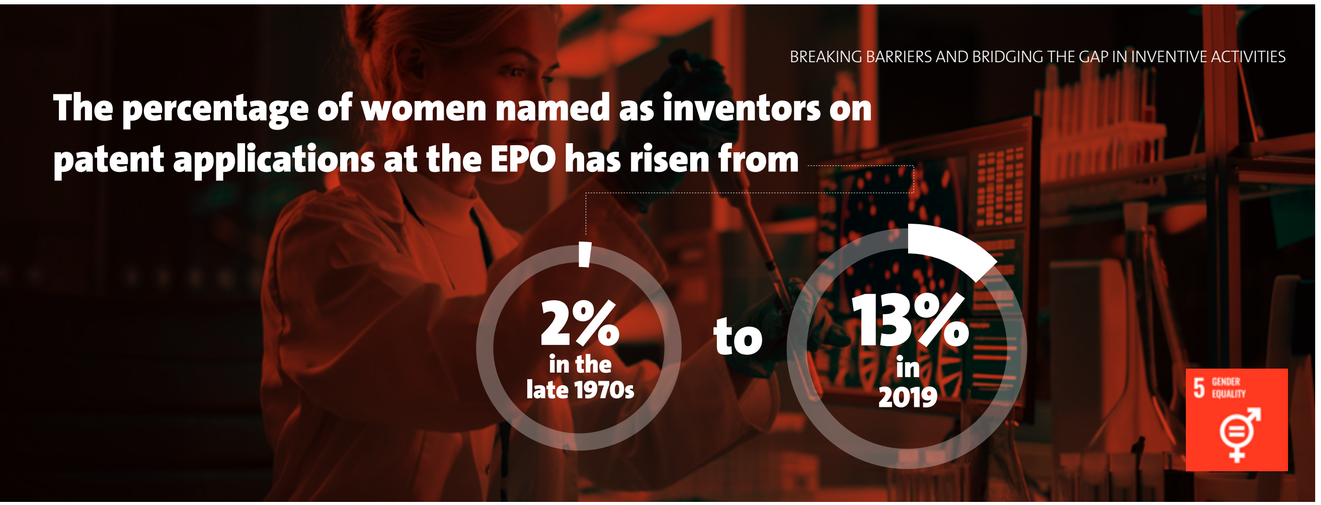
The good news for Europe is that the women inventor rate (WIR), which measures the percentage of female inventors among all inventors in patent applications each given year, has been increasing in EPO countries. From around 2% in the late 1970s it had reached more than 13% in 2019. Although the WIR in EPO countries is well above that in Japan (which was about 9.5% in 2019), it still remains below that of the United States (which is about 15%), and well below the rates in China (about 26.8%) and South Korea (about 28.3%). This denotes a lost opportunity for Europe's innovation performance.



Among the EPC member states, Latvia (30.6% in 2010-2019), Portugal (26.8%), Croatia (25.8%), Spain (23.2%) and Lithuania (21.4%) have the highest WIR values, while Germany (10.0%), Luxembourg (10.0%) and Austria (8.0%) have the lowest. Research institutions and the chemicals and life sciences sectors appear to have the highest levels of women innovators.

Unfortunately, there is a consistent trend of a decreasing share of women in total employment, PhD enrolment, PhD graduates in STEM, R&D personnel and researchers, and patenting. Women in EPO countries face increasing obstacles when progressing in STEM careers and this must improve.

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Patents paving the way to a more sustainable energy future

Climate change is driving innovation in clean energy. New technologies are being developed to safeguard our planet and meet the climate targets set out in the European Green Deal, the UN SDGs and the Paris Agreement. The EPO supports the race against climate change with various initiatives to promote affordable and clean energy innovation, including the publication of reports on trends in research.

Our CEU study on Hydrogen patents for a clean energy future, released in January 2023 in partnership with the International Energy Agency (IEA), shows that hydrogen production technology patents have massively shifted towards alternative, low-emission methods such as electrolysis.

The findings of this study include good news for Europe: first and foremost, that patenting related to hydrogen is led by organisations in Europe (28% of patents), followed by those in Japan (24%), and the US (20%).

Germany (11%), France (6%) and Netherlands (3%) rank top in Europe for patenting hydrogen technologies, and Europe has gained an edge in electrolyser manufacturing capacity.

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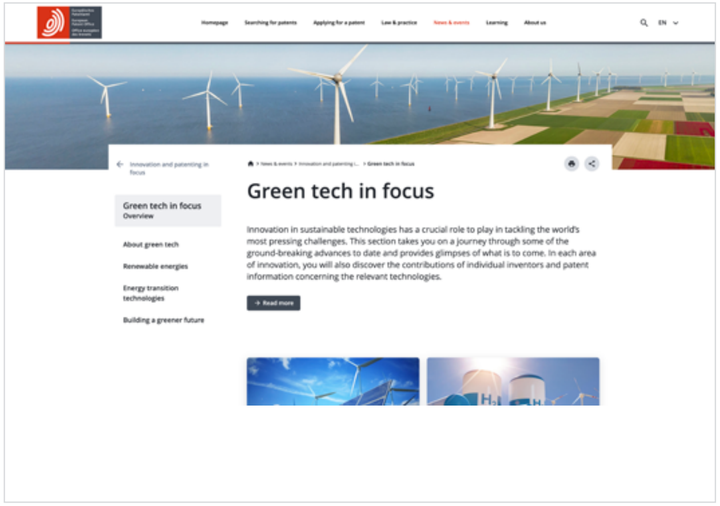
Among end-use applications, automotive continues to be the biggest focus of innovators. Other applications, such as long-distance transport, power generation and heavy industry, need to step up.

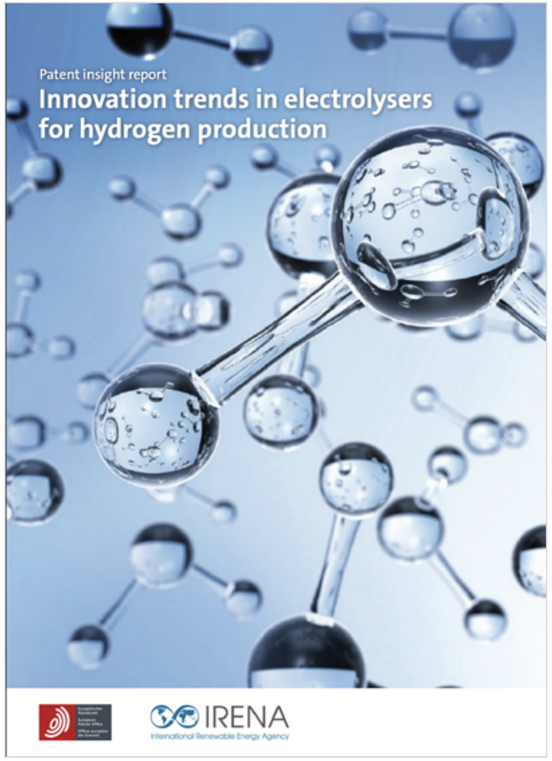
The study also found that patents enable growing businesses to secure financing: start-ups holding patents attracted about €5 billion in venture capital investment into hydrogen-related firms during the last decade.

In November 2022, the new Espacenet Clean energy technologies platform provided an initial selection of some 60 smart patent information searches aiming to help innovators in the race to tackle climate change. This platform is due to be extended in 2023.

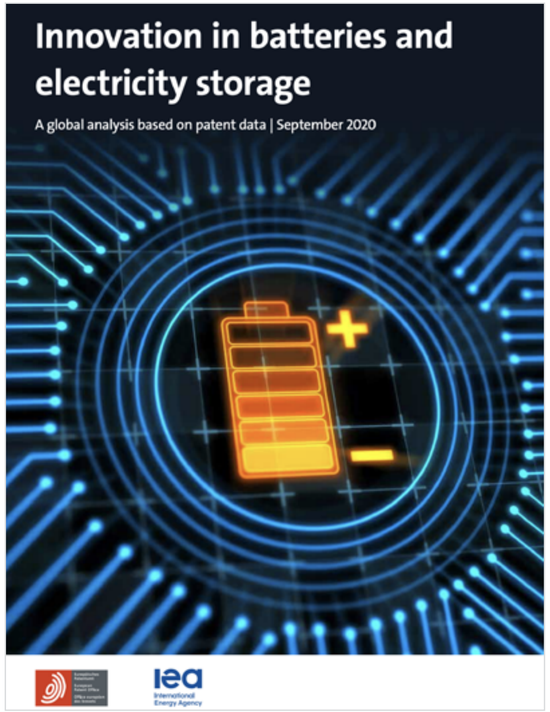
At the same time, the EPO's Green tech in focus webpage was released. This helps inventors focus on areas where innovation is most urgently needed in the areas of renewable energies, energy transition technologies, and building a greener future.



A patent insight report on Innovation trends in electrolysers for hydrogen production (October 2022) was published in partnership with the International Renewable Energy Agency (IRENA). This revealed patent filing trends in the exciting field of electrolysers for hydrogen production using water.



An EPO CEU study of April 2021, on Patents and the energy transition (in partnership with the IEA) examined the transition to low-carbon energy technologies across all sectors of the economy.



In September 2020, an EPO joint study with the IEA on Innovation in batteries and electricity storage was a global analysis based on patent data that underlines the key role of battery innovation in the transition to clean energy technologies. This study showed that patenting activity in electricity storage has grown much faster than patenting activity in general over the past decade, indicating a burst of innovation in this area, spearheaded by lithium-ion (Li-ion) batteries, in particular for electric vehicles. According to the study, Japan and South Korea are leading the global battery technology race, pushing other countries to develop competitive advantages in specific parts of the battery value chain. Nickel-manganese-cobalt (NMC) cathode chemistry has seen the most innovative breakthroughs related to Li-ion batteries since the launch of mass-market electric vehicles, but potentially disruptive competitors are emerging outside the big companies and with more regional variation.

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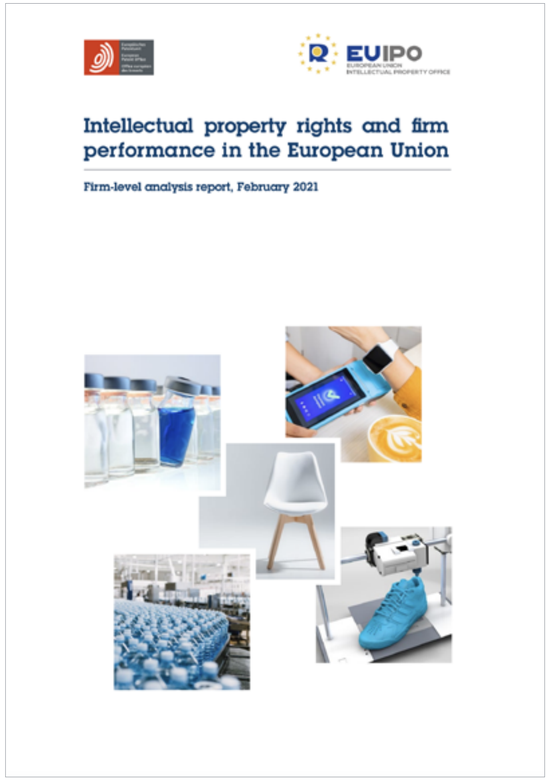
The transformative power of Intellectual Property

Research shows that IP rights contribute to the economic growth of the IP proprietor itself, the country where it is based, and the region as a whole.

The fourth edition of our joint study with the EUIPO on IPR-intensive industries and economic performance in the European Union, released in October 2022, showed that intellectual property fosters 82 million jobs in the EU. This edition of the study assesses the contribution to the European economy of industries that make an above-average use of IP rights. It covers a broad range of IP rights (patents, trademarks, designs, copyright, geographical indications, and plant variety rights) and considers multiple economic indicators, with a focus on Gross Domestic Product (GDP), employment, wages, and external trade.

The third edition of this joint study by EPO and EUIPO, published in February 2021, on Intellectual property rights and firm performance in the European Union, analysed the performance of SMEs and larger firms in the European Union with regard to their ownership and use of patents, trademarks, and designs. It showed that although only a small proportion of SMEs (about 9%) own or use patents, trademarks, or designs when compared to larger firms (about 60%), the advantage that these IPRs provide in terms of revenue per employee is far greater for SMEs (+68%) than for larger firms (+18%).



Furthermore, on the hot topic of commercialisation of inventions, the EPO scoreboards of European SMEs, universities, and public research organisations (PROs) aim to monitor the commercialisation of inventions that have been patented at the EPO by small applicants. On top of using patents to protect and market inventions, small applicants also leverage them to secure higher margins, license technology, establish collaboration agreements with partners and attract investors. Roughly two thirds (67%) of the inventions for which SMEs have filed a patent application with the EPO are exploited for commercial purposes, half of the time via collaborations with external partners, via technology transfer, or through co-operation agreements. Research institutions already commercialise more than one third (36%) of the inventions for which they have filed a patent application with the EPO. Licensing is by far their preferred commercialisation channel (70% of commercialised inventions). However, the main challenges to successful commercialisation of science-based inventions are lack of proof of concept and failure to find interested partners.

On top of using patents to protect and market inventions, small applicants also leverage them to secure higher margins, license technology, establish collaboration agreements with partners and attract investors.

The EPO launched its Observatory on Patents and Technology in October 2023 and to coincide with the launch, also published a joint study with the EUIPO on Patents, trademarks and startup finance. The publication emphasises the significant impact of patents and trademarks on the success of European startups. The report reveals that startups that have secured these intellectual property (IP) rights in their early stages are up to 10.2 times more likely, to successfully secure funding. To ensure the maximum impact of patents in facilitating access to finance, the EPO also released the Deep Tech Finder, a new free online tool enabling investors to easily find and assess European startups that have filed patent applications at the EPO.

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Contributing to industry, innovation and infrastructure

As we move into an increasingly digital world, space and satellite technology have become of crucial importance to sustainable development and economic growth. The communication technologies connect us to each other, while space technologies and earth observation technologies connect us to our planet and to space and allow us to have a better understanding of our ecosystem.

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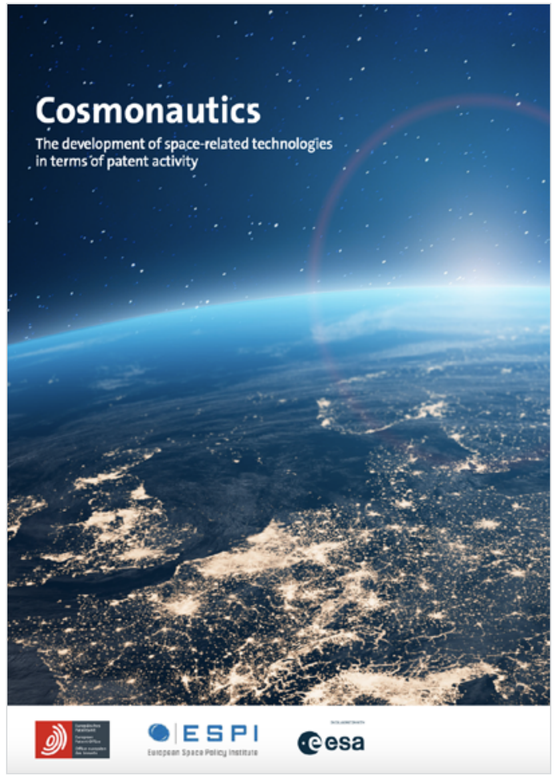
A joint study by the EPO with the European Investment Bank (EIB), Deep tech innovation in smart connected technologies, identified unique obstacles that small businesses face in developing advanced digital technologies in the EU. Despite impressive patent activity, Europe's small deep-tech businesses still have a long way to go in comparison to their US counterparts. While the US has 6 517 SMEs patenting in smart, connected devices, the EU with 2 634 has less than half that number. Moreover, SMEs in the US contribute to a larger share of overall patent activity relating to the Fourth Industrial Revolution (4IR) – 16% – compared to Europe, where they contribute to only 10% of the bloc's activity in the field. Furthermore, 57% of the EU's 4IR SMEs cite Europe as top market for growth and in fact 24% consider the US as their future primary market. About 80% of EU's 4IR SMEs have less than 50 employees and 42% are less than ten years old. Their activities span the healthcare, transport, and cleantech sectors, as well as data analytics, and they are frequently (44%) involved in manufacturing. Access to finance and lack of skilled talent are cited as barriers by three quarters of deep-tech SMEs in the EU and US.

The EPO patent insight report on Quantum computing, published in January 2023, provides an overview of recent trends in the field. It concludes that the number of inventions in quantum computing has increased exponentially in recent years.

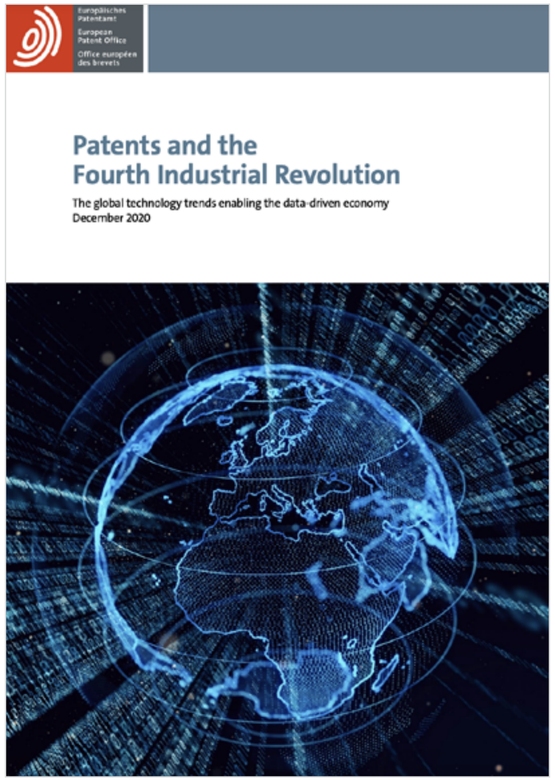
In July 2021, the patent insight report on Cosmonautics conducted by the EPO and the European Space Policy Institute (ESPI) in collaboration with the European Space Agency (ESA), took a giant leap forward and investigated the development of the technology of travel beyond Earth's atmosphere into outer space.



This joint report followed that on Quantum technologies and space released in November 2021, which provided insights into the patenting activities for quantum technologies relating to the space sector. These technologies are primarily used in secure communications, in time and frequency transfer, as well as in Earth observation and sensing.

The second joint patent insight report on Space-borne sensing and green applications released in October 2022, completed in partnership with ESPI and ESA, puts the spotlight on remote sensing data applications that can help to mitigate climate change (including weather forecasting, detecting pollution, protecting biodiversity, and monitoring the environment) as an indispensable tool for implementing green policies and objectives.

Lastly, on UN SDG 9, Industry, Innovation and Infrastructure, the EPO CEU study on Patents and the Fourth Industrial Revolution, published in December 2020, provided an insight into the fact that 4IR innovation has dramatically accelerated during the past decade with an average annual growth rate in patenting close to 20% from 2010 to 2018. In fact, innovation in the 4IR accounted for more than 11% of global innovation in 2018. The US remains the world leader in 4IR technology, while Japan and Europe are losing ground to South Korea and China. The dynamism of national industry champions and regional clusters in 4IR technologies could explain the domination of the US and the rise of South Korea and China in the 4IR innovation landscape.



UNSDG 13 |

Responsible consumption and production for a greener tomorrow

Getting rid of plastic waste is one of today's key sustainability challenges. Innovation in green plastics is needed more than ever. The EPO supports inventors, investors, and policy makers in the race to achieve zero waste through three main initiatives:

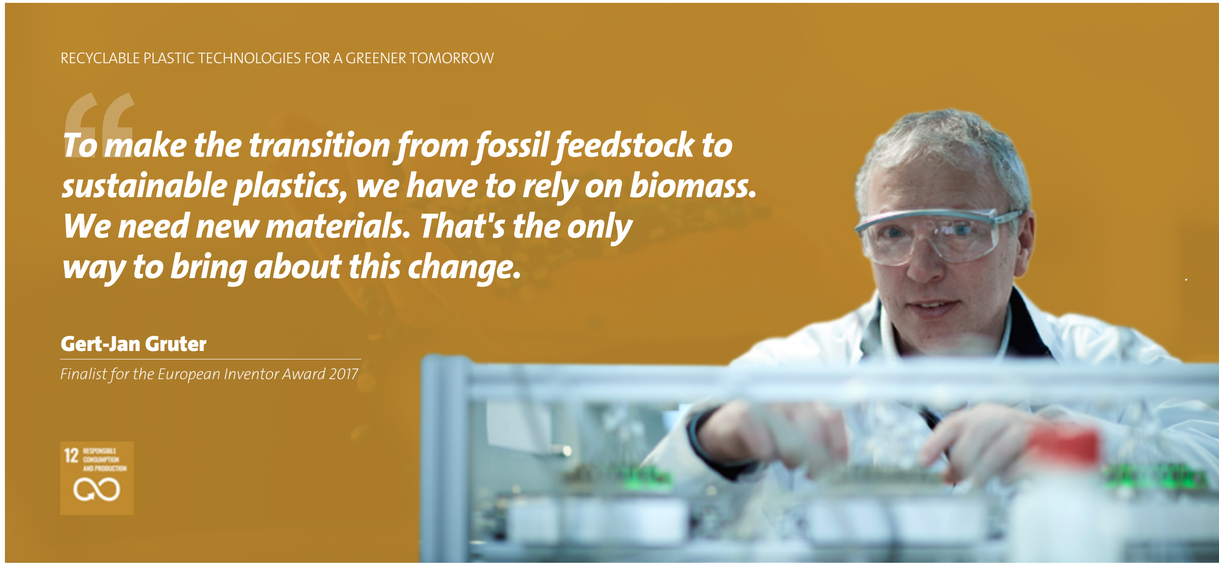
The study focused on the future of plastics and how new technologies can help to forge a more sustainable future.

The CodeFest on Green Plastics was a coding competition to develop creative and reliable artificial intelligence (AI) models for automating the identification of patents related to green plastics and making the know-how contained in patents concerning green plastics more readily available to innovators everywhere.

This CodeFest built on the EPO CEU study on Patents for tomorrow's plastics, released in October 2021. The study focused on the future of plastics and how new technologies can help to forge a more sustainable future. New technologies are indeed helping to recycle waste plastic or create bioplastics that quickly decompose, as well as providing alternatives to fossil sources to make new plastics e.g. from plants and fungi. The US and Europe stand out as global innovators for a circular plastics industry. Chemical and biological recycling generated the highest level of patenting activities. Fundamental research is key to further progress in chemical and biological recycling. Europe's good performance in this respect shows the potential to bring new technologies to market. For example, bioplastics provide alternatives to conventional fossil raw materials and rapidly emerging technologies allow for novel designs of durable plastic materials.

Furthermore, the EPO CEU Study Patents in Additive Manufacturing, published in July 2020, revealed the trends in 3D printing technologies, demonstrating that innovation in additive manufacturing (AM) increased at an average annual rate of 36% from 2015 to 2018, with more than 4 000 patent applications for inventions relating to AM filed at the EPO in 2018 alone. Europe and the US have a strong lead in AM innovation, with 47% (Europe) and 35% (US) of all AM inventions for which a patent application was filed with the EPO since 2010. The biggest sectors for AM patent applications are health, energy, and transportation.

Similarly in September 2023, the EPO published the CEU study Innovation trends in additive manufacturing. The study revealed that patenting activity in 3D printing technologies is surging at eight times the rate of all other technologies. It also highlights the transformative impact of AM technology, particularly in the health/medical and transportation sectors. Unlike the 2020 study, which focused on Europe and European patents, this one adopts a global perspective using international patent families (IPFs).



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Together for climate action

The Firefighting technologies platform supports the vital tasks of fire prevention and firefighting, wildfire control and forest restoration. This is the third Espacenet platform and reflects the importance of making vital technical knowledge easily accessible, thereby enabling innovators to find solutions to global issues.

With over 8 300 km² of EU land burned by wildfires in 2022 alone, this platform is valuable for innovators looking for solutions to detect, prevent and extinguish fires, and for protective equipment and post-fire restoration. The platform went live in May 2023 and currently provides 30 ready-made search queries on topics such as aerial detection technologies, transportable hydraulic infrastructures, respiratory apparatuses for firefighters and soil stabilisation.

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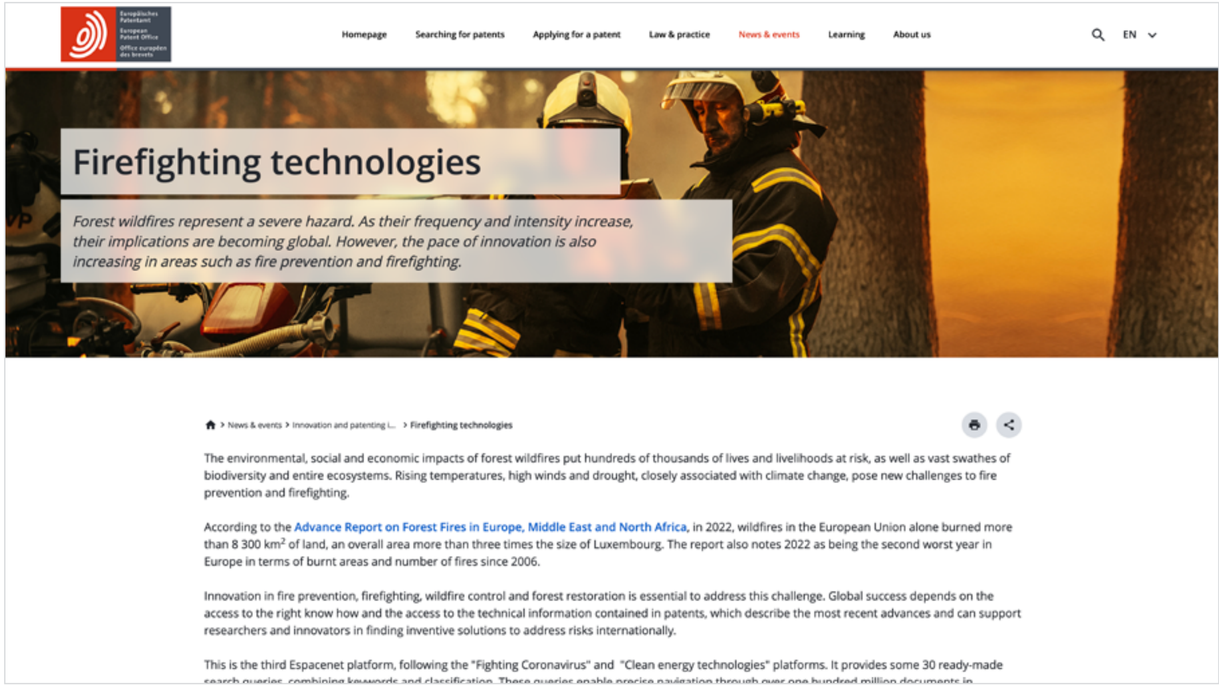

Building strong institutions

The EPO CEU study on The European patent system and the grace period from June 2022 found that European EPO applicants generally manage to comply with the novelty requirement, although universities experience more frequent issues than other entities due to pre-filing disclosures.

In the few cases where it occurs, failure to comply with the strict novelty requirement under the EPC may have serious economic consequences. Data shows that the strict novelty requirement creates problems for applicants in approximately 10 000 cases a year. Consequently, if the EPC made provision for a grace period, the baseline potential volume of EP-application-related requests invoking the grace period can be estimated at approximately 10 000 annually. This corresponds to 6% of European patent applications filed in 2021. While an unrestricted grace period in Europe would introduce significant legal uncertainty into the European patent system, a declaration requirement and prior user rights could help preserve the balance in the system.

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Conclusion

Innovation and intellectual property play significant roles in the quest for sustainable development. The EPO sustainability initiatives highlighted in this report demonstrate how viewing sustainability objectives through the lens of innovation contributes to the UN SDGs. At the EPO, we ensure that every scientist, innovator, and entrepreneur have access to high-quality patent knowledge resources that can help them take their ideas to market. And, by building a network of expertise with innovators, investors, and IP professionals worldwide, we aim to democratise knowledge and unleash the true power of patents in finding innovative solutions to unprecedented challenges.

The EPO sustainability initiatives highlighted in this report demonstrate how viewing sustainability objectives through the lens of innovation contributes to the UN SDGs.

The impact of inventions on human progress through technological revolutions is clear. We now have an opportunity to influence these revolutions in a way that supports sustainability. It is an opportunity we simply cannot afford to miss. Let us use the power of patents and join forces to create a better and brighter future for everyone, everywhere.

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