July 2025

Engineering & SDG research report

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Introduction

Engineering has traditionally been at the forefront of tackling complex challenges, so it is only natural that the discipline plays a central role in addressing some of the most pressing global issues identified by the United Nations Sustainable Development Goals (SDGs). This report explores the extent to which engineering is engaging in interdisciplinary collaboration to drive progress on these goals.

Through an analysis of research output, policy documents, available funding, and citation metrics, we show the reach of engineering-led efforts. Additionally, the report examines the broader global research landscape, highlighting interdisciplinary collaboration and identifying emerging research trends that are shaping the future of engineering and sustainable development.

Overview of SDGs and engineering

When the UN launched the SDGs in 2015, they set an ambitious agenda: end poverty, protect our planet, and create prosperity for everyone. Engineering, with its problem-solving approach and technological innovations, has the potential to be instrumental in addressing these challenges head-on.

Trend analysis

To examine how engineering research has evolved in response the SDGs, we leveraged SN Insights, a powerful analytics tool. This enabled us to track shifts in the engineering landscape across a range of publishers and research types, with a focus on SDG-related developments.

In collaboration with editorial colleagues at Nature Portfolio, we also gathered illustrative examples that highlight interdisciplinary collaboration and emerging trends gaining momentum.

For this report, we analyzed research output within the Field of Research (ANZSRC 2020) for Engineering (code 40) that includes at least one of the SDGs. SN Insights has implemented the UN SDGs as a classification scheme, covering areas of research associated with one or more SDGs recognizing that many of the SDGs are interrelated.

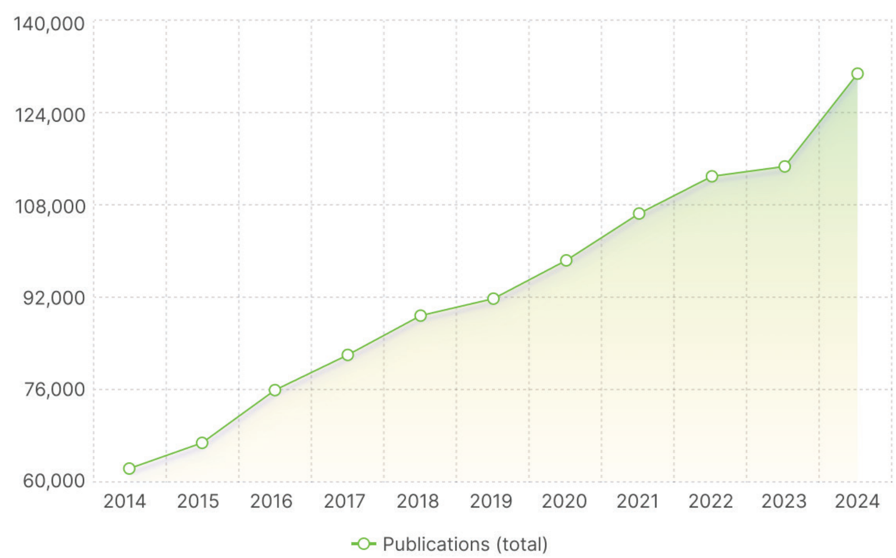
General research trends in engineering

To establish a baseline, we first examined overall engineering research output and found that it is steadily increasing.

Output: Engineering research has increased from 65,000 articles per year in 2014 to 130,000 articles in 2024.
Policy impact: Engineering research has a wider impact on national and international policy, too, with related policy documents up 47% – though this growth hasn't been as steady as research output with a dip in 2018 and 2019. This dip does not correlate with trends in the wider research output however the reason has not be identified. The dip in 2020 and 2021 is most likely attributed to the corona pandemic and is in line with other research categories.
Funding: Investors and funders are backing engineering innovation, increasing support from $14.68 billion to nearly $22 billion – a 50% boost that's fueling new discoveries.

"Engineering research output has more then doubled in the last 10 years"

Number of engineering publications by year



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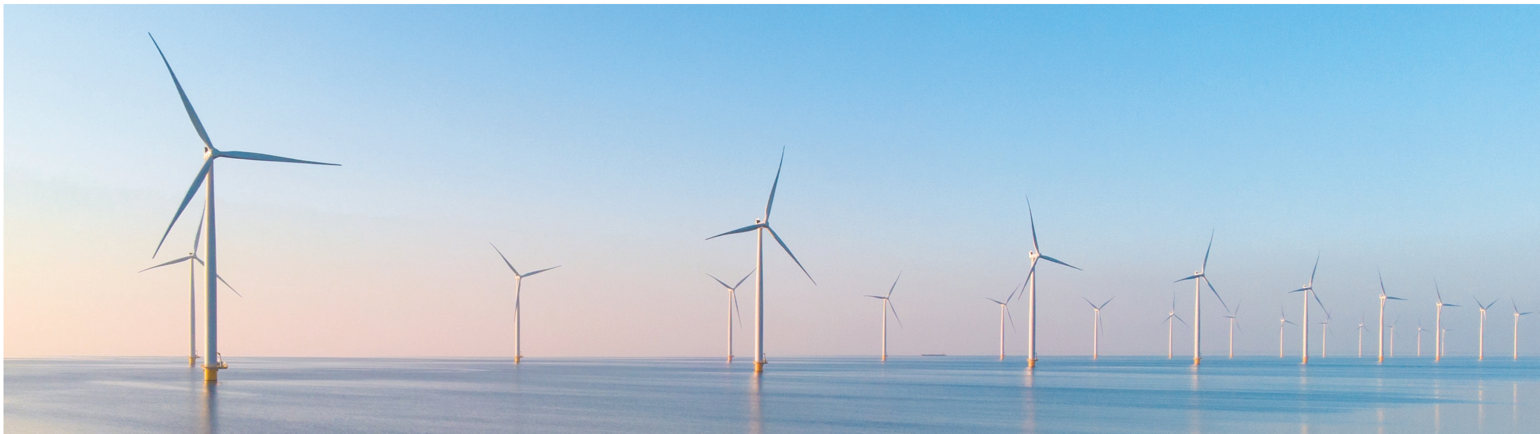
Exported: March 24, 2025
Criteria: Field of Research (SNZSRC 2020) is 40 Engineering



Number of engineering related policy documents

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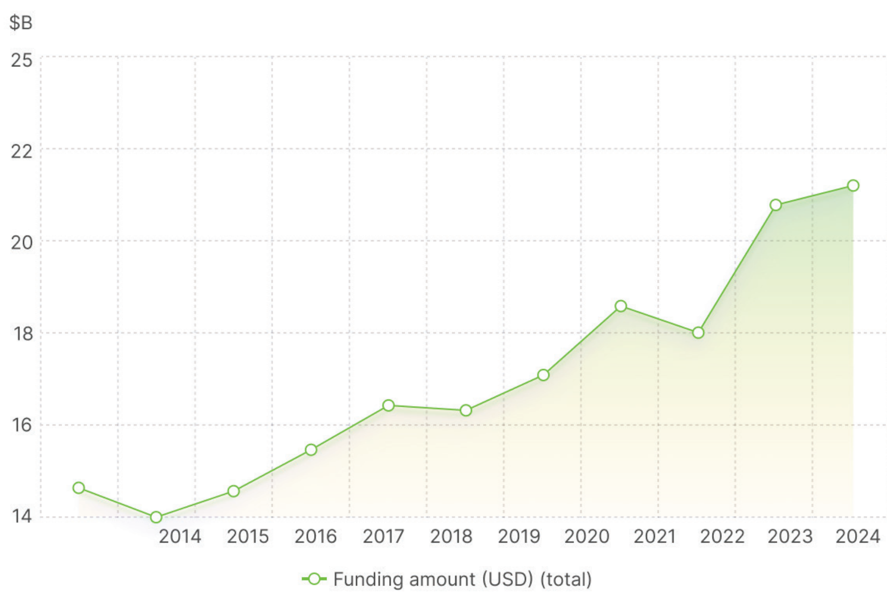
“Policy documents are up
47%”

Funding of engineering research ($1B)



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“Investment in engineering research has increased to
$22 billion”

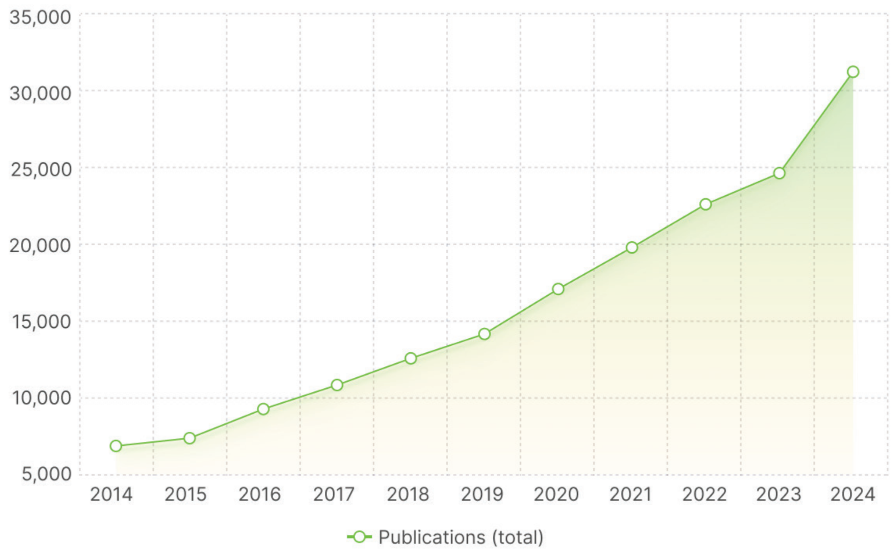
Trends in SDG-related engineering research

Next, we examined the same metrics when considering engineering research related to at least one of the SDGs. This shows that the growth appears to be even more pronounced.

Output: SDG-focused engineering research output has increased – growing more than three times faster than general engineering research with a 356% increase.
Policy impact: This research is influencing governance, with policy documents more than doubling (116% increase). The graph below shows how this compares to other research fields and engineering is leading the way.
Funding: Money follows impact. Funding for SDG engineering nearly doubled to $10.12 billion between 2014 and 2024. Funders recognize that this work matters.

These numbers highlight the value of engineering research in addressing the SDGs, with support from funding streams and application through policy documents.

SDG- related engineering research publications over time



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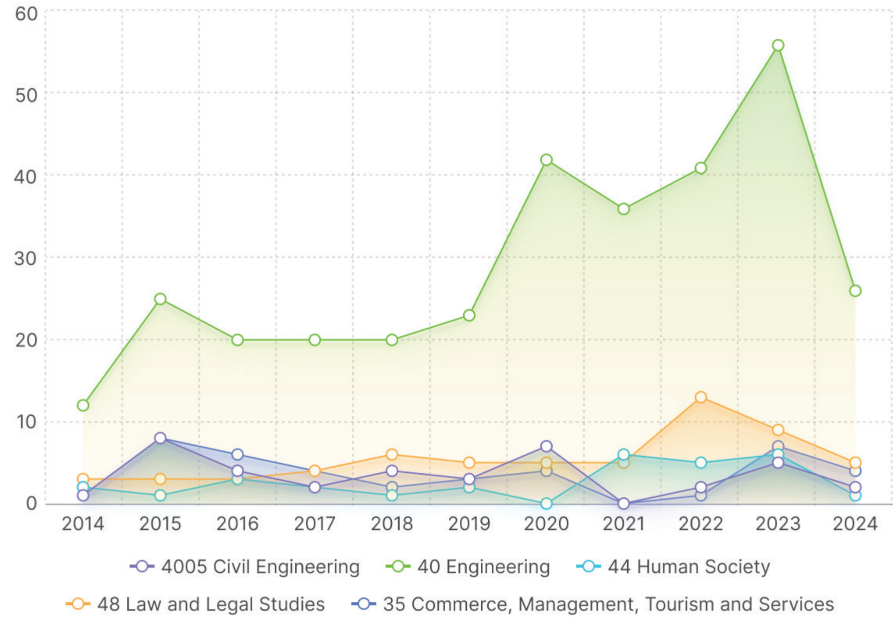
SDG-related engineering policy documents published over time



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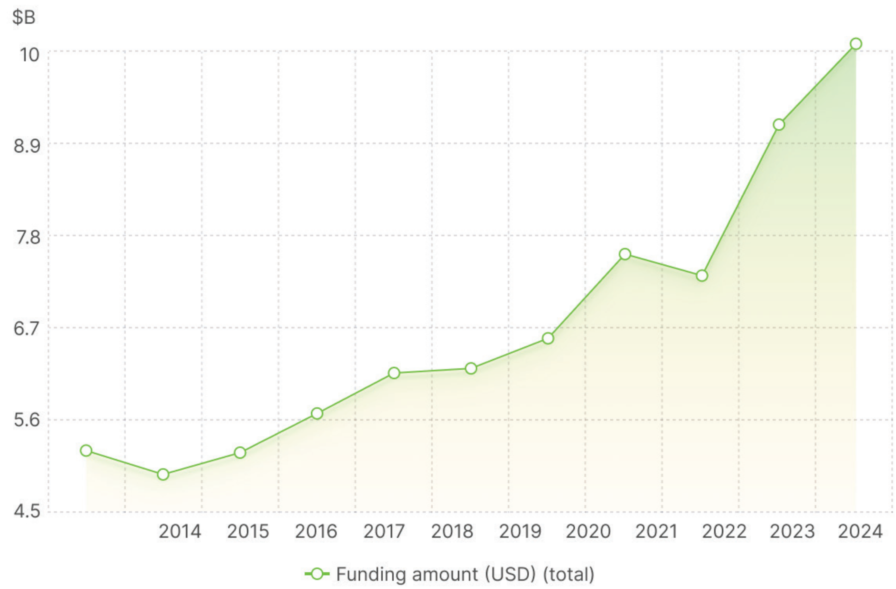
"SDG engineering research funding has increased by **93%***"*

SDG-related engineering research funding over time ($1B)



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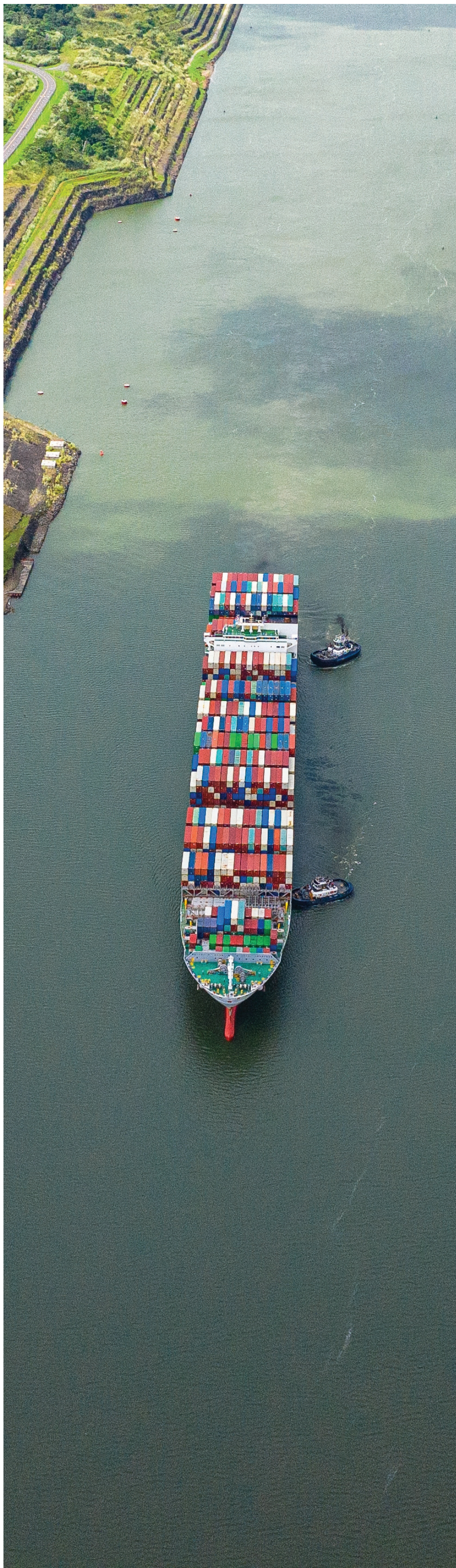
Impact of SDG engineering research

“More citations can mean a wider influence”

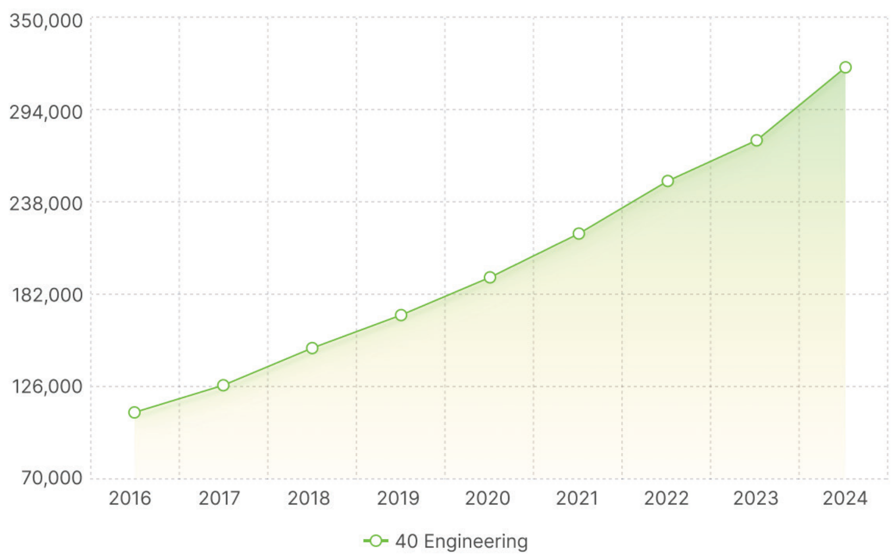
The impact of engineering research related to SDGs is evident in the rising number of citations and open access publications.

Citations: Citations indicate research impact by showing its influence on subsequent studies. A higher count reflects relevance and validation within the academic community. The results below show citations climbing steadily year after year.
Open Access: Between 2016 and 2024, 38% of all SDG-related engineering research was published as open access and is freely available to the public. These open-access sources account for 35% of the total citations. It may be surprising to some that the mean percentage of citations for all OA publications is lower than closed publications. It appears the open access citations advantage (OACA) is not evident in this subset which is in line with research but further analysis would be required to identify why.

More citations can mean a wider influence. More open access means more people can use these solutions. Research in this field is contributing to a more inclusive, collaborative community focused on solving our biggest challenges.



SDG-related engineering research citations over time



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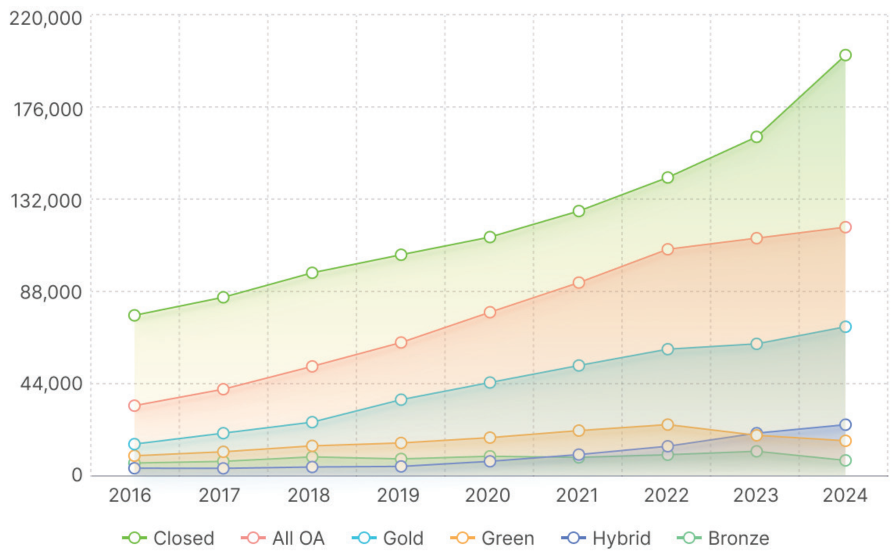
SDG-related engineering publications over time: Open access



Closed – *published in journal or book which requires a subscription or purchase to read.*
All OA – *all types of OA published research*
Gold – *freely available immediately on publication under an open license*
Green – *Usually freely available after embargo period, rights/re-use may be limited*
Bronze – *Free to read on the publisher page but lacks a clear identifiable license*
Hybrid – *Published in a subscription journal that allows open access publication of individual articles.*

SDG-related engineering research: OA comparison 2016 -2024

Research type	Publications	Citations	Citations (mean)
Closed research	1,121,237	21,844,564	19.48
All OA	702,584	11,918,118	16.96
Total (all research)	1,823,821	33,762,682	18.51

Top publishers by engineering/SDG output and Relative Citation Ratio (RCR)

Publisher	Publications	RCR* mean
Springer Nature	226,769	1.86
Elsevier	653,709	1.64
Wiley	110,035	1.61
American Chemical Society (ACS)	78,304	1.49
Royal Society of Chemistry (RSC)	44,674	1.29
MDPI	127,262	1.12
ASME International	49,767	1.04
Institute of Electrical and Electronics Engineers (IEEE)	560,458	0.86
Taylor & Francis	72,484	0.77

** The Relative Citation Ratio (RCR) indicates the relative citation performance of a publication when comparing its citation rate to that of other publications in its area of research. A value of more than 1.0 shows a citation rate above average. The article's area of research is defined by the articles that have been cited alongside it. The RCR is calculated for all PubMed publications which are at least 2 years old.*

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Global research landscape

Addressing the SDGs is a global priority, with significant contributions from various countries.

China leads in SDG engineering research, producing nearly a quarter of the total, followed by the US (13%) and India (6%). China emerged as a leading contributor to engineering research around 2010 and has maintained strong momentum since. Its engagement in SDG-related engineering reflects a focus on both economic development and sustainability.

India is emerging as a major player, with their SDG engineering research growing even faster than their general engineering output. This reflects a global shift – solving our planet's biggest challenges requires everyone's involvement.

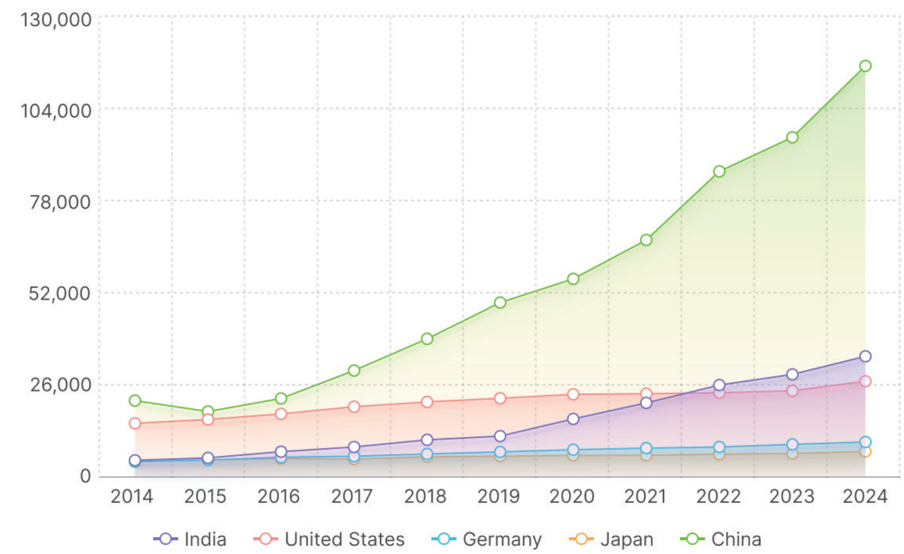
Top countries by research output:

24%
China

13%
United States

6%
India

Top SDG-related engineering research producing countries by number of pubications



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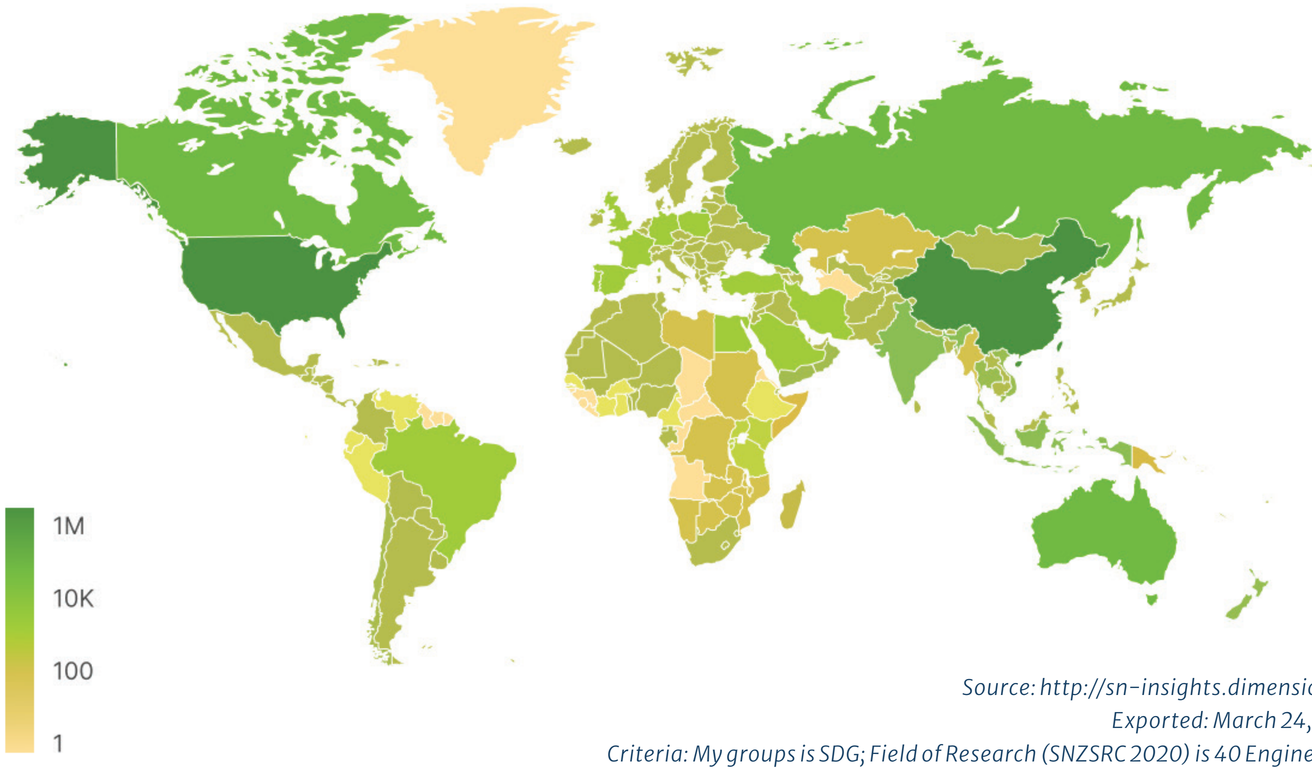
World map of research output



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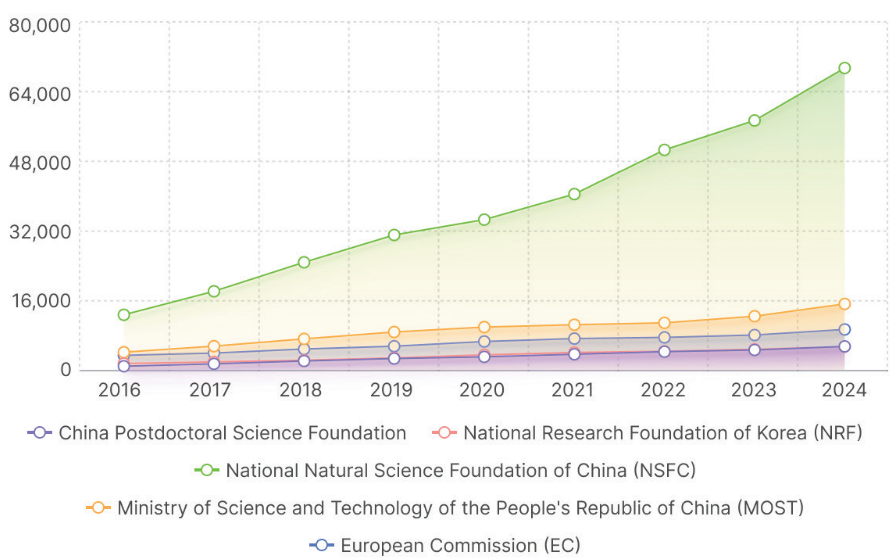
Funding sources

China is currently the largest contributor to engineering-SDG research funding, with European and South Korean funders also making substantial investments. Financial support for this work extends across multiple regions, underscoring the global commitment to advancing the SDGs.

Top funding agencies by number of publications



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Top research institutions

Taking a closer look at which institutions and organizations around the world are producing engineering-SDG research, we can see a truly global effort.

Chinese institutions dominate the raw output numbers, taking all top 10 spots. But when we look at research quality and public impact, we see a different picture. Using the Relative Citation Ratio (how often work is cited) and Altmetric Attention Scores (online mentions), top performers come from all over the world.

Top research organization by RCR

Name	Country	Publications	RCR (mean)
SLAC National Accelerator Laboratory (SLAC)	United States	873	4.88
Drexel University	United States	1,768	4.3
Menoufia University	Egypt	1,031	4.24
Stanford University (SU)	United States	6,186	3.37
Chitkara University	India	1,406	3.3
Electric Power Research Institute (EPRI)	United States	1,115	3.11
GLA University	India	1,334	2.97
Graphic Era University (GEIT)	India	1,083	2.97
Lovely Professional University	India	2,025	2.96
Harvard University	United States	2,941	2.95
École Polytechnique Fédérale de Lausanne (EPFL)	Switzerland	4,697	2.91
University of Adelaide	Australia	2,710	2.88
University of Liverpool	United Kingdom	2,102	2.88
Al Jouf University	Saudi Arabia	852	2.88
Mississippi State University (MSU)	United States	1,463	2.87
University of Notre Dame	United States	1,423	2.87
Mahatma Gandhi University (MGU)	India	984	2.82
University of Cyprus (UCY)	Cyprus	1,037	2.81
California Institute of Technology (CIT)	United States	2,094	2.77
Saveetha Institute of Medical And Technical Sciences (SIMATS)	India	3,095	2.69

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Top research organization by attention

The Altmetric Attention Score is a weighted count of all of the online attention Altmetric have found for an individual research output. This includes mentions in public policy documents and references in Wikipedia, mainstream news, social networks, blogs, and more.

Name	Country	Publications	Publications with attention (%)
University College London (UCL)	United Kingdom	4,916	57.22
University of Alicante (UA)	Spain	861	53.66
SLAC National Accelerator Laboratory (SLAC)	United States	873	51.89
Utrecht University	Netherlands	1,796	50.28
University of Chicago (UC)	United States	831	49.1
Autonomous University of Barcelona (UAB)	Spain	941	48.35
Harvard University	United States	2,941	48.28
University of Helsinki (UH)	Finland	894	47.76
Institute of Materials Research and Engineering (IMRE)	Singapore	1,131	47.39
Wageningen University & Research (WUR)	Netherlands	1,947	47.3
Joint Research Centre (JRC)	Italy	1,180	47.29
University of Santiago de Compostela (USC)	Spain	846	47.28
Yale University	United States	1,393	46.45
Suzhou Institute of Nano-tech and Nano-bionics (SINANO)	China	1,160	45
Helmholtz-Zentrum Berlin für Materialien und Energie	Germany	959	44.94
Italian Institute of Technology	Italy	887	44.64
Institute of Physics (IOP)	China	1,715	44.49
National Synchrotron Radiation Laboratory (NSRL)	China	990	43.33
National Synchrotron Radiation Research Center (NSRRC)	Taiwan	864	43.06
Rice University	United States	1,814	42.72

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Interdisciplinary research output

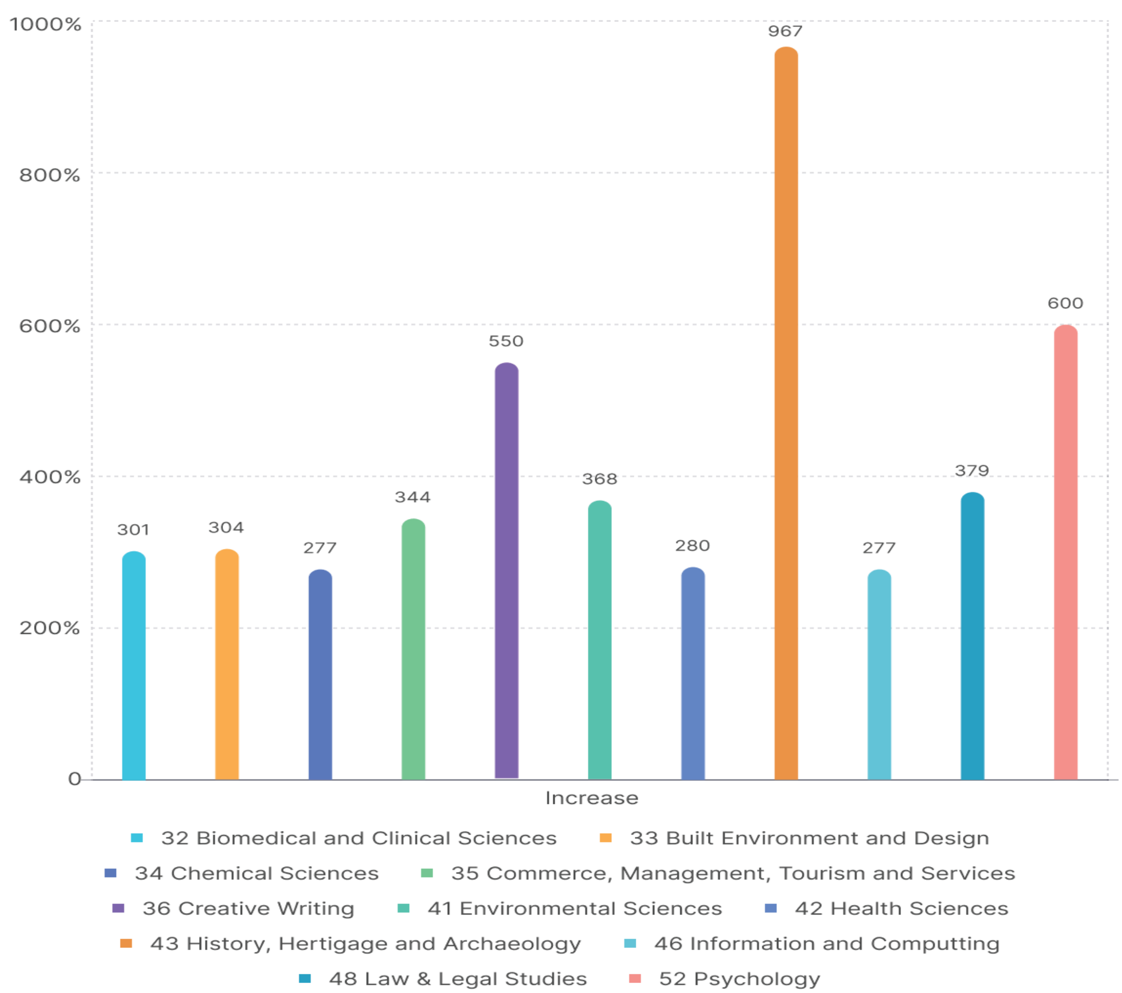
“*Interdisciplinary research has grown by* **258%**”

The SDGs span multiple disciplines, requiring research that is equally interdisciplinary. Collaborative efforts between engineers and experts from other fields have the potential to lead to more comprehensive and effective solutions.

Interdisciplinary research has grown by 258% between 2014 and 2024, outpacing the growth of engineering research overall (231%). This trend gives us a sense of a transformation in how problems get solved.

Two factors are driving this cross-disciplinary boom: new technologies that make collaboration easier, and dedicated interdisciplinary research centers that bring diverse experts together to foster collaboration.

Multidisciplinary research – Increase (%)



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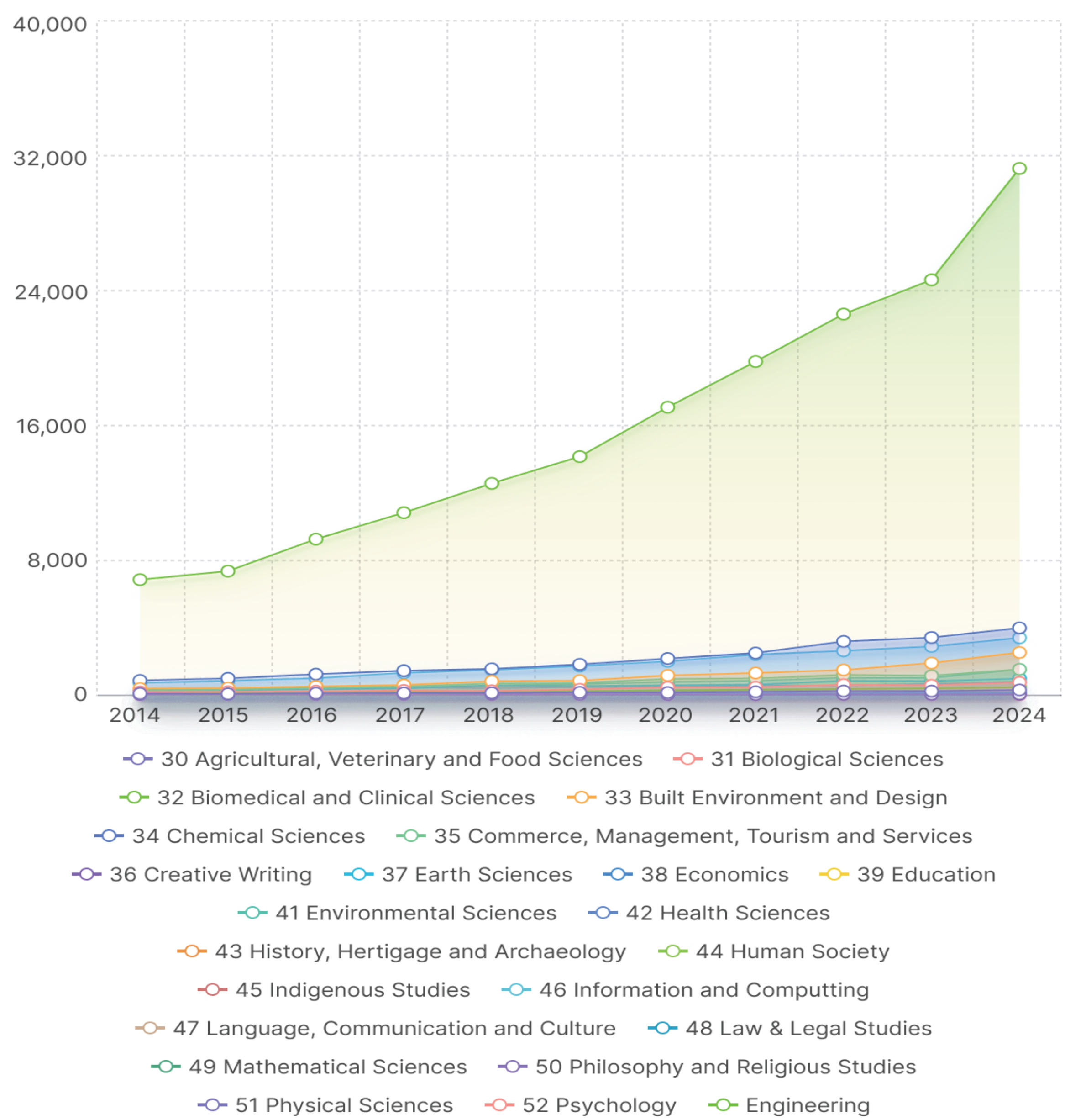
There are also see opportunities for better interdisciplinary collaboration. For example, there are inherent differences in epistemologies and research methods in electrical engineering and earth science. In terms of climate change, this divide slows progress towards long-term sustainability in global energy systems, prompting dialogues between the disciplines to enable effective interdisciplinary collaborations.

As with general multidisciplinary engineering research, engineering-SDG-related output has been ahead of other disciplines and continues to advance at a distinct pace over the 10-year period examined.

Multidisciplinary research – Through the years



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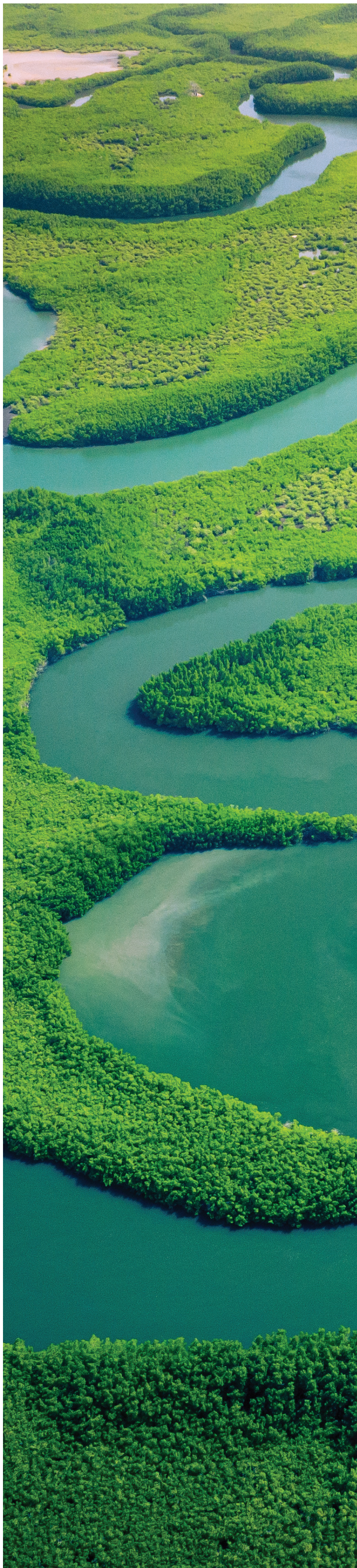
Impactful interdisciplinary collaboration



Today's engineers are breaking out of traditional boundaries, driving progress across the SDGs through collaboration.

When engineers collaborate with professionals from diverse disciplines, they can develop solutions with lasting impact. Here are some notable examplees - all featured in Nature Portfolio journals - that are influencing policy, advancing industries and enhancing quality of life.

Cutting aviation emissions by 2030

While planes are essential for global connection, they're major climate culprits. Our groundbreaking research brings aerospace engineers and atmospheric chemists together to tackle both CO_2 and non-CO_2 emissions. This work is already influencing international aviation standards and forms the cornerstone of our Cleaner Flight research collection, where we're leading the conversation on sustainable air travel.

Keeping life-saving equipment working where it's needed most

In resource-poor hospitals, 70% of medical equipment sits broken. Engineering World Health, featured in our Nature Biomedical Engineering spotlight, trains engineers to install and repair critical equipment worldwide. This practical application of engineering knowledge has restored functionality to medical equipment serving millions of patients – proving that sometimes the most important innovation is making existing technology work reliably. Read more here.

Engineering food security for a growing planet

With traditional agriculture struggling to feed 8 billion people sustainably, our Future of Food focus issue explored cutting-edge bioengineering solutions. From lab-grown proteins that increase plants' water-stress tolerance to nanotechnologies that improve crop photosynthesis, these innovations published in our journals are already attracting billions in investment. Beyond just genetic engineering, these approaches represent entirely new food production paradigms with dramatically smaller environmental footprints.

Virtual replicas driving real-world improvements

Digital twins – virtual models that mirror physical systems in real-time – are revolutionizing industries from manufacturing to urban planning. Research published in our journals has overcome key challenges in model accuracy and data completeness, enabling digital twins to predict failures before they happen and optimize systems while running. While still evolving, this technology is already saving companies millions in maintenance costs and reducing energy consumption in smart buildings.

Outlook

What is the future direction of SDG engineering engineering? Nature Portfolio editors, who closely track emerging trends, have identified four key areas positioned for advancements.

Sustainable and resilient infrastructure: Focus on infrastructure that can withstand, prepare for, recover from, and adapt following disruptions.

Frugal bioengineering: Emphasis on accessibility, affordability, and robustness in bioengineering solutions.

AI in biomedical research: Rapid growth in AI applications for drug discovery, disease diagnosis, and treatment optimization.

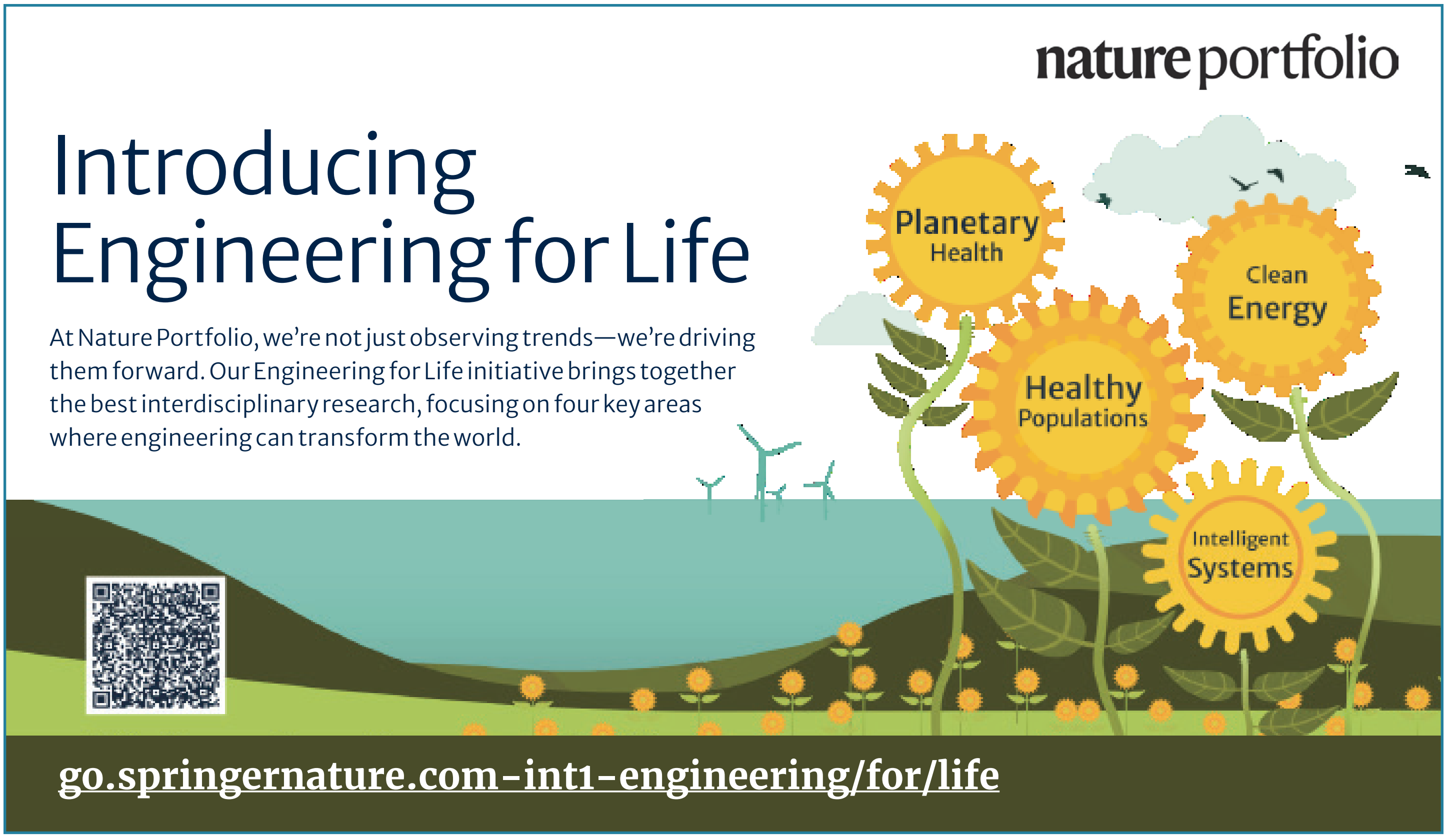
Digital twins: Development of a "whole digital twin" concept for application within manufacturing, healthcare, construction, automotive and aerospace.

Conclusion

Looking ahead, AI integration, sustainable design principles, and frugal engineering are expected to shape the next generation of innovative solutions.

Springer Nature remains committed to facilitating this global dialogue by publishing research that translates ideas into impactful advancements.

The data highlights engineering's growing role in advancing the SDGs, with significant increases in funding, research output, and interdisciplinary collaboration. As these trends continue, engineers are well-positioned to contribute to addressing global challenges.



Sources

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Read article Langham-Putrow, Bakker, Riegelman. Is the open access citation advantage real? A systematic reviewof the citation of open access and subscription based articles. Plos.One (2021).

Read Sharma, Akansha, and Amresh Kumar Ray. "Collaborative Expertise in Sustainability Reporting and Assurance: Harnessing Multidisciplinary Synergies for Enhanced Outcomes." Navigating Trust in Sustainability Reporting and Assurance, edited by Saleh F.A. Khatib and Alhamzah F. Abbas, IGI Global, 2025, pp. 31-62.

Go to article Ruan, J., Xu, Z. & Su, H. Towards interdisciplinary integration of electrical engineering and earth science. Nat Rev Electr Eng 1, 278–279 (2024).

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Read article Wu, J., Liu, H., Chen, W. et al. Device integration of electrochemical biosensors. Nat Rev Bioeng 1, 346–360 (2023).

Read article Lee, Y., Gao, W. Non-invasive hormone monitoring with a wearable sweat biosensor. Nat Rev Bioeng 3, 190–191 (2025).

Read article Kim, J., Yoo, S., Liu, C. et al. Skin-interfaced wireless biosensors for perinatal and paediatric health. Nat Rev Bioeng 1, 631–647 (2023).