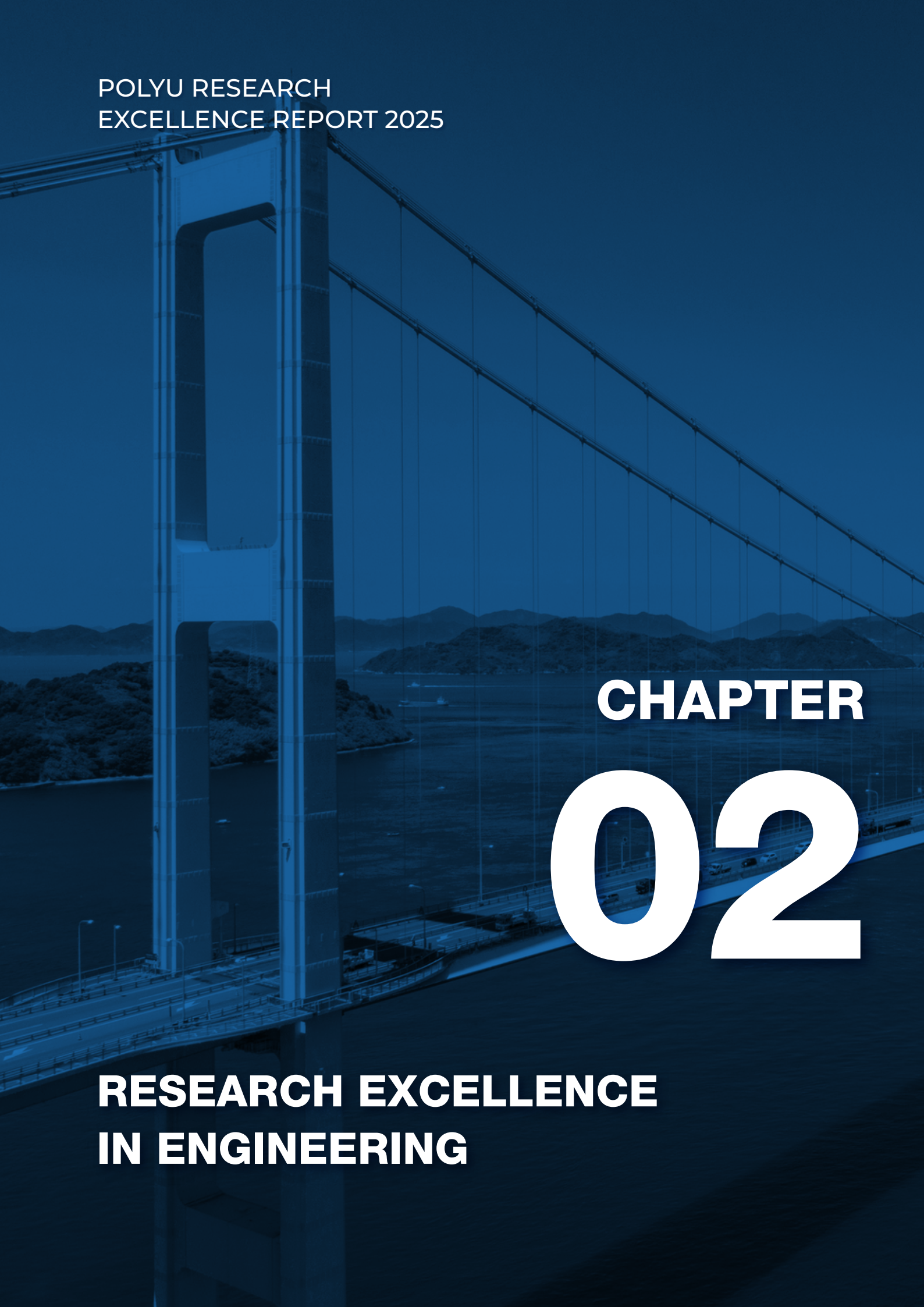

CHAPTER

# 02

# RESEARCH EXCELLENCE IN ENGINEERING

# CHAPTER 2
# RESEARCH EXCELLENCE IN ENGINEERING

**PolyU is globally acclaimed for its engineering excellence. By reimagining and shaping technology development in promoting sustainable engineering, PolyU has consistently ranked among the Top 10 institutions for engineering globally.**

## 2.1 OVERVIEW OF POLYU ENGINEERING

This chapter will explore PolyU's overall performance in engineering, as well as detail some of its achievements in civil engineering, built environment, advanced manufacturing and geomatics research.

### Global ranking

Since its founding, PolyU has become a leading institution for engineering education and research both locally and internationally. In **the U.S. News & World Report Best Global Universities Rankings 2025-2026, PolyU ranked sixth globally in Engineering**.[25] The two faculties, the Faculty of Engineering and the Faculty of Construction and Environment, with their nine departments, are dedicated to advancing knowledge in various research areas within engineering.

### Scholarly output and impact

Between 2020 and 2024, PolyU increased its number of publications in engineering by 68%. This increase has surpassed the growth rate for engineering-related publications in Hong Kong and APAC. By 2024, PolyU contributed to 38% of Hong Kong publications in engineering (Figure 18).

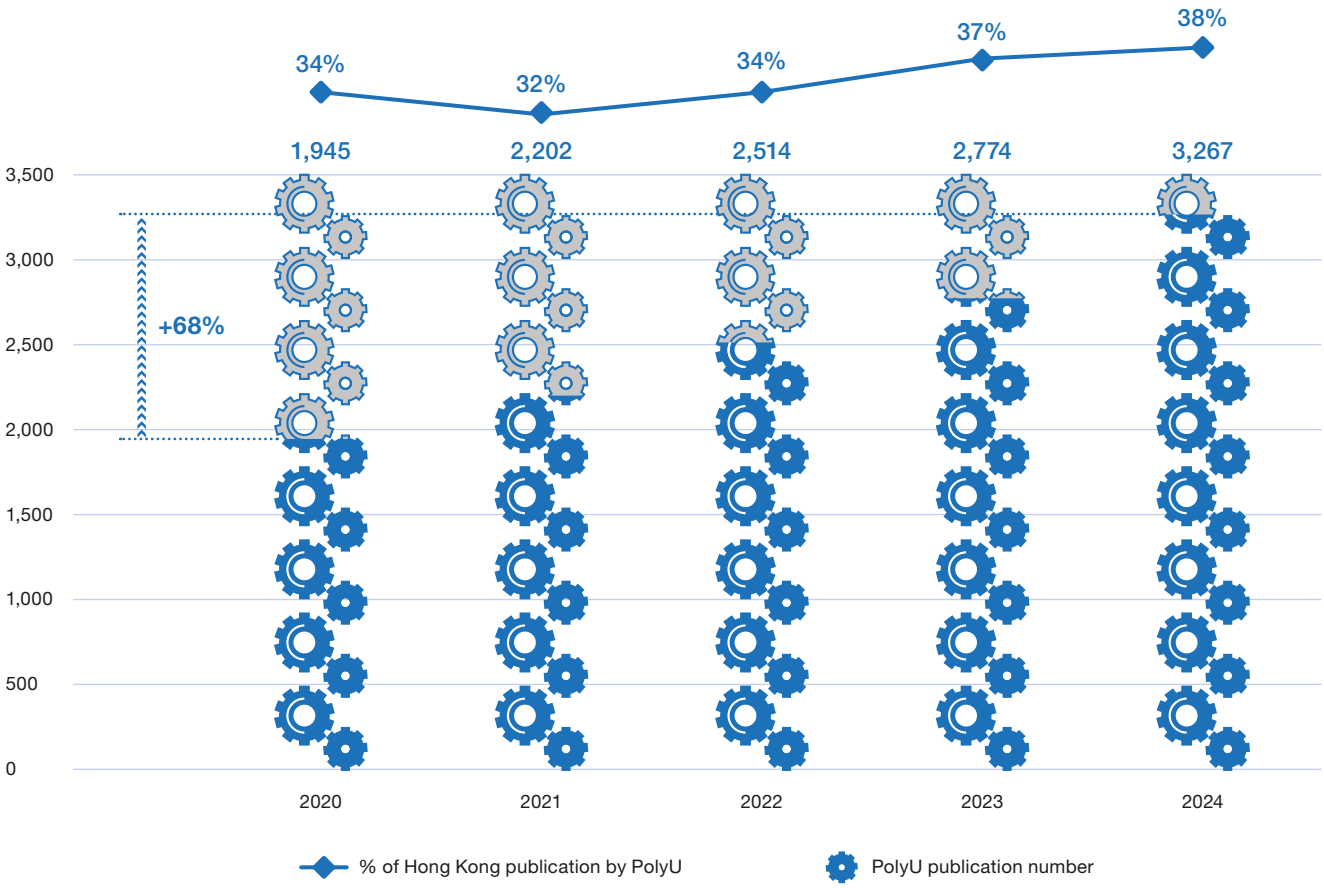


*Figure 18. PolyU publication trends in engineering*

25 U.S. News & World Report Best Global Universities Rankings 2025-2026, https://www.usnews.com/education/best-global-universities/hong-kong-polytechnic-university-500421

The University's publications in engineering have achieved excellent performance both in volume and citation impact. Category Normalized Citation Impact (CNCI) indicates how influential a publication is by comparing the citation rate with other publications in the same field.

Between 2020 and 2024, PolyU's CNCI for engineering publications slightly surpassed the overall performance of Hong Kong institutions and significantly exceeded both the APAC and global averages (Figure 19).

Highly Cited Papers are selected by Clarivate based on publications that have achieved Top 1% citations within their respective research area. Between 2020 and 2024, despite the considerable detrimental effect of the COVID-19 pandemic, the percentage of PolyU publications that met the Highly Cited Paper standard was nearly triple the global average (1%), and more than double the APAC average (Figure 20).

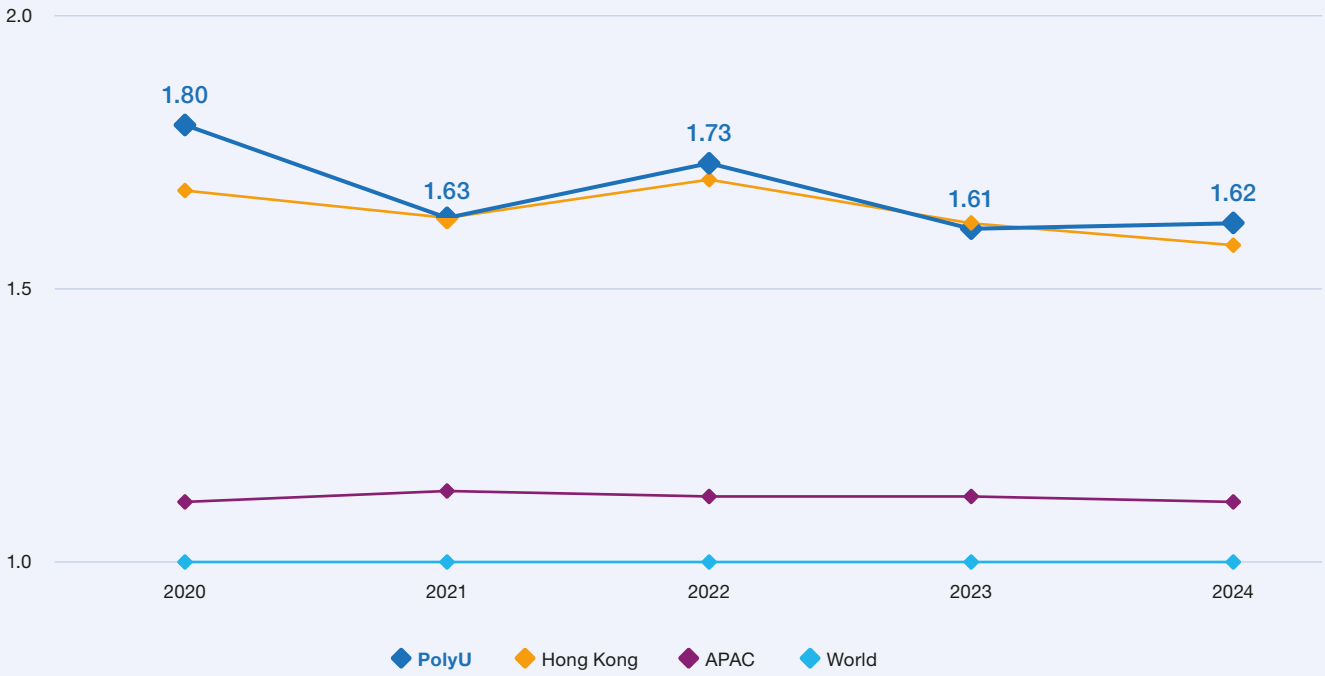


*Figure 19. Category Normalized Citation Impact for publications in engineering: PolyU, Hong Kong, APAC, and world*

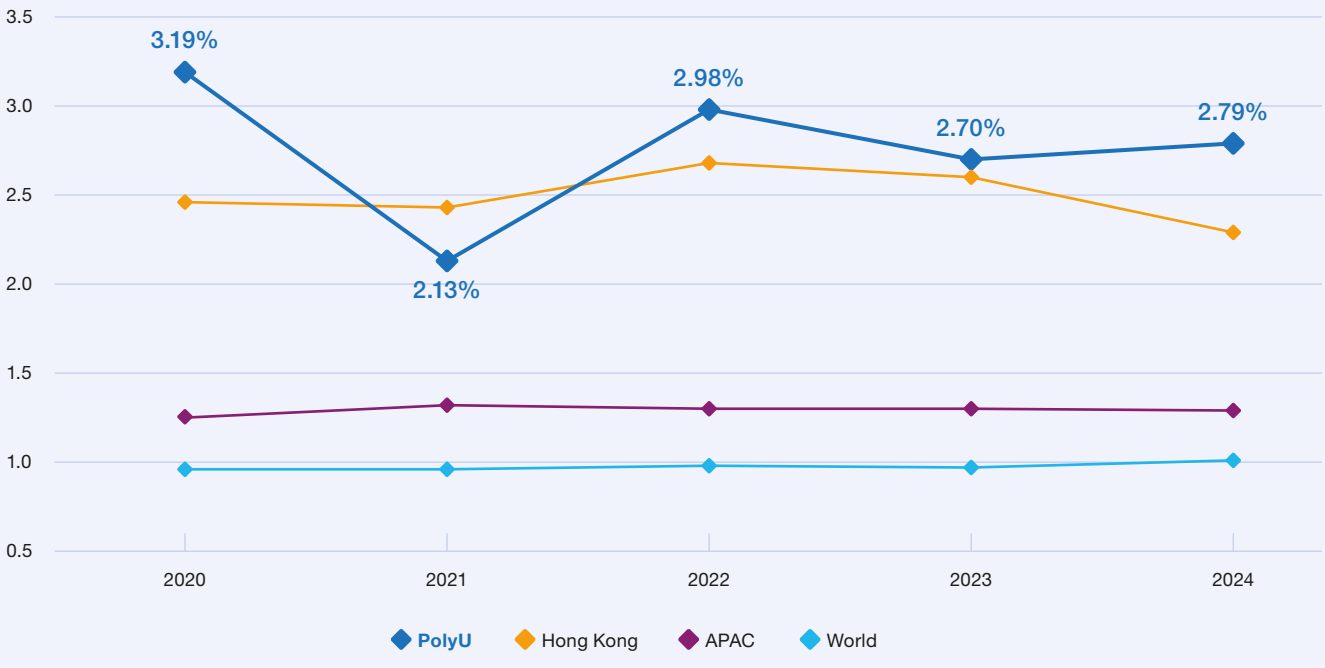


*Figure 20. Share of Highly Cited Papers in engineering: PolyU, Hong Kong, APAC, and world*

## Research collaboration

PolyU's strong performance in engineering has placed it in a prime position to collaborate with other leading institutions around the globe. The University collaborated with other academic institutions in 10,876 engineering publications, with nearly 30% of these being the result of collaborative efforts with QS Top 50 universities worldwide.

In addition to academic collaboration, PolyU expertise in engineering is widely recognised by industry, where it has partnered with key multinational organisations such as Google, Alibaba, Huawei and multiple state grid corporations in research and development (Figure 21).

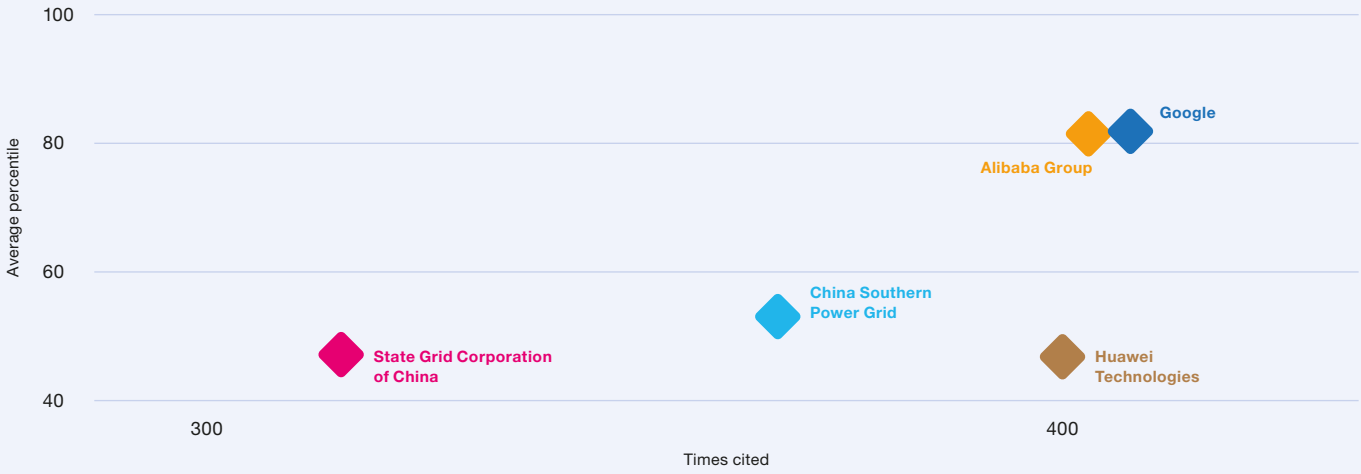


*Figure 21. Key PolyU industry collaborators in engineering*

## Knowledge transfer

Beyond direct industry partnerships, PolyU has engaged in knowledge transfer and the utilisation of intellectual property at local, regional and global levels. Between 2020 and 2024, PolyU had nearly a fourfold growth in the number of granted patents in engineering. With a total of 554 granted patents across countries in Asia, Europe, North America and the Middle East (Figure 22), PolyU is rapidly expanding its global footprint and leadership in engineering-related inventions.

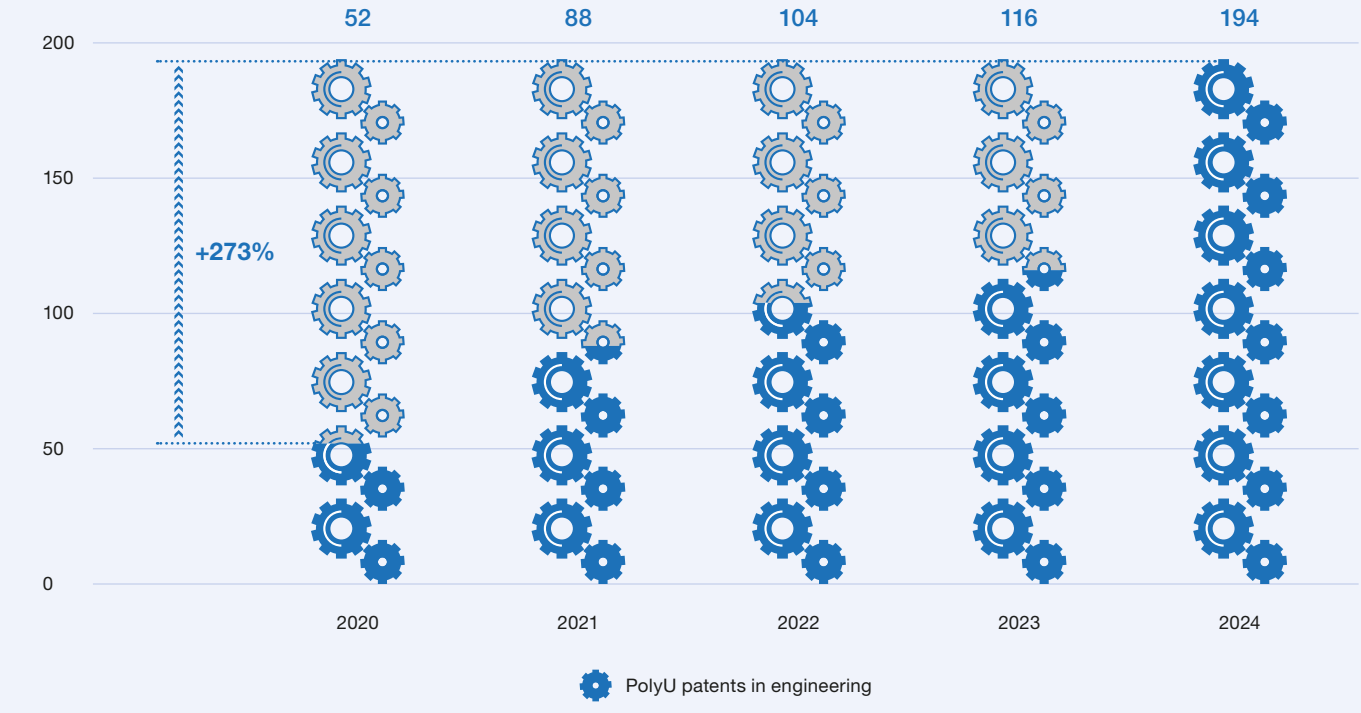


*Figure 22. PolyU granted patents in engineering*

Apart from PolyU's own inventions, its research has informed and been cited by numerous subsequent patents. PolyU's publications in engineering were cited by 195 patents across disciplines (Figure 23). The patents were developed by leading multinational companies such as International Business Machines Corporation (IBM), Toyota Motor Corporation, Nokia Corporation and Adobe Inc..

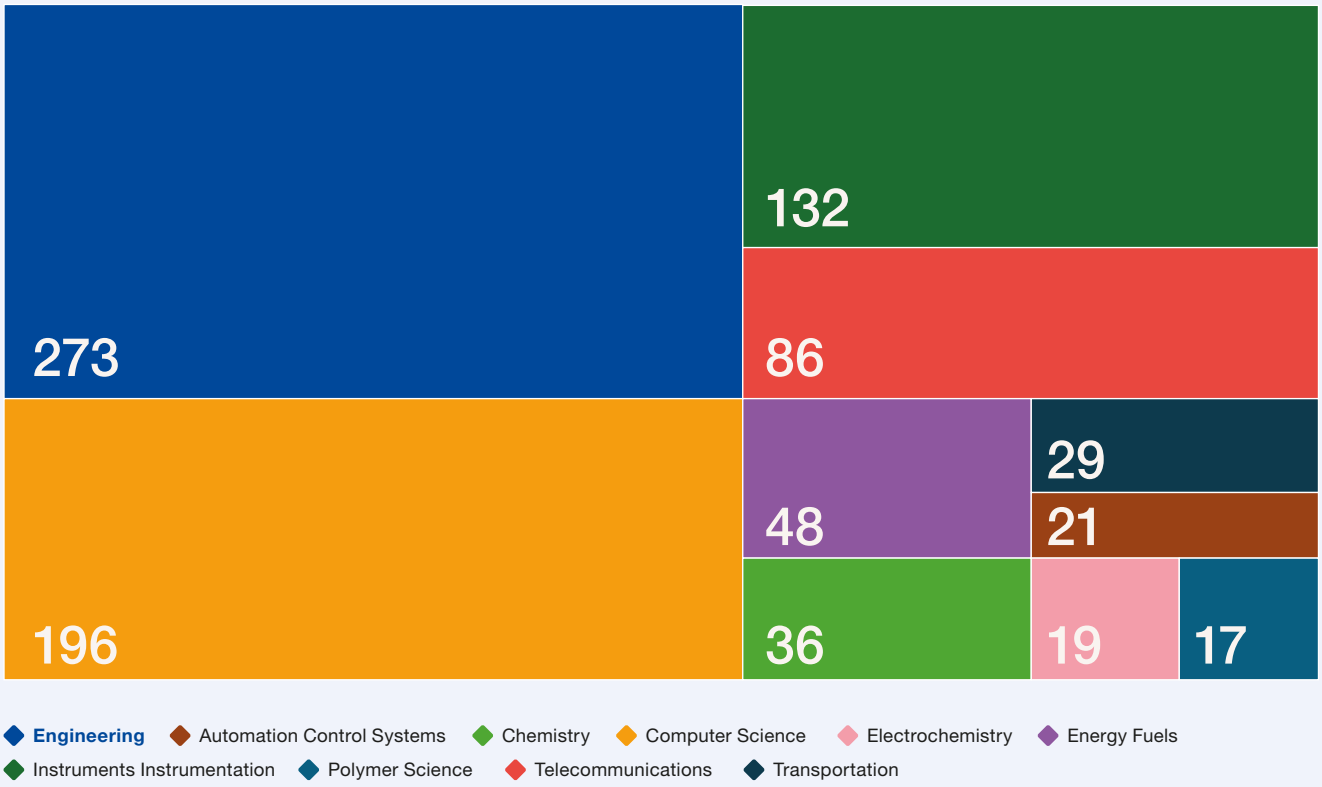


*Figure 23. Top 10 patent subject areas citing PolyU engineering publications (with times cited) (2020 - 2024)*

## Top scholars

With their high-quality research, many PolyU academic staff members are recognised for their significant and broad influence in their field of research. The Essential Science Indicators (ESI) by Clarivate identifies the number of citations required to become one of the Top 1% most cited researchers (Top 1%) within respective research fields. From 2014 to 2024, PolyU ranked first in Hong Kong for the number of Top 1% researchers in Engineering. Among the 322 Top 1% engineering researchers (by citation) in Hong Kong, over 27% were from PolyU, 6% and 7% higher than the second- and third- ranked universities.

These achievements are driven by leadership from key researchers. **Professor Jerry Jin-yue YAN**, Chair Professor of Energy and Buildings in the Department of Building Environment and Energy Engineering, has 577 publications indexed by the Web of Science, with over 24,000 citations and more than 10 patents. His world-leading research performance was recognised by Clarivate, and he was awarded the title of Highly Cited Researcher in 2025, placing him among the Top 1% of researchers worldwide based on citation metrics. His leadership has also been recognised by his peers, being elected as a Fellow of the Hong Kong Academy of Engineering in 2023.

Professor YAN's research focuses on renewable energy and the mitigation of climate change. His most recent invention, the Intelligent Humidity Control and Atmospheric Water Collection Films (IHAC films), can manage humidity and supply fresh water at net-zero cost and is both scalable and durable in various conditions.

In recent years, Professor YAN has also been leading interdisciplinary integration of renewable energy. His keynote speech, "Energy Nexus: Research and Innovations without Borders – Interdisciplinary Research on Energy Transition", delivered at an international conference in 2023, highlighted that future energy development would be driven by interdisciplinary input led by engineering.

## 2.2 CIVIL ENGINEERING

### Global ranking

PolyU's outstanding performance in civil engineering is recognised by multiple global rankings: **It ranked second globally in Civil Engineering in the U.S. News & World Report Best Global Universities Rankings 2025-2026, and third in ShanghaiRanking's Global Ranking of Academic Subjects 2025**.[26,27] It also ranked 17th in Civil and Structural Engineering in the QS World University Rankings by Subject 2025.[28]

With an interdisciplinary approach, PolyU has integrated structural, geotechnical, transportation, and environmental engineering into its civil engineering research and education. Such interdisciplinary integration has earned PolyU the ranking of **first best university for Transportation Science and Technology in the ShanghaiRanking's Global Ranking of Academic Subjects 2025**.[29]

### Scholarly output and impact

Between 2020 and 2024, PolyU doubled its publication count in civil engineering. As Hong Kong's leading civil engineering institution, PolyU has produced a substantial share of the region's publications in this field. By 2024, nearly 60% of Hong Kong's publications in civil engineering were affiliated with PolyU (Figure 24).

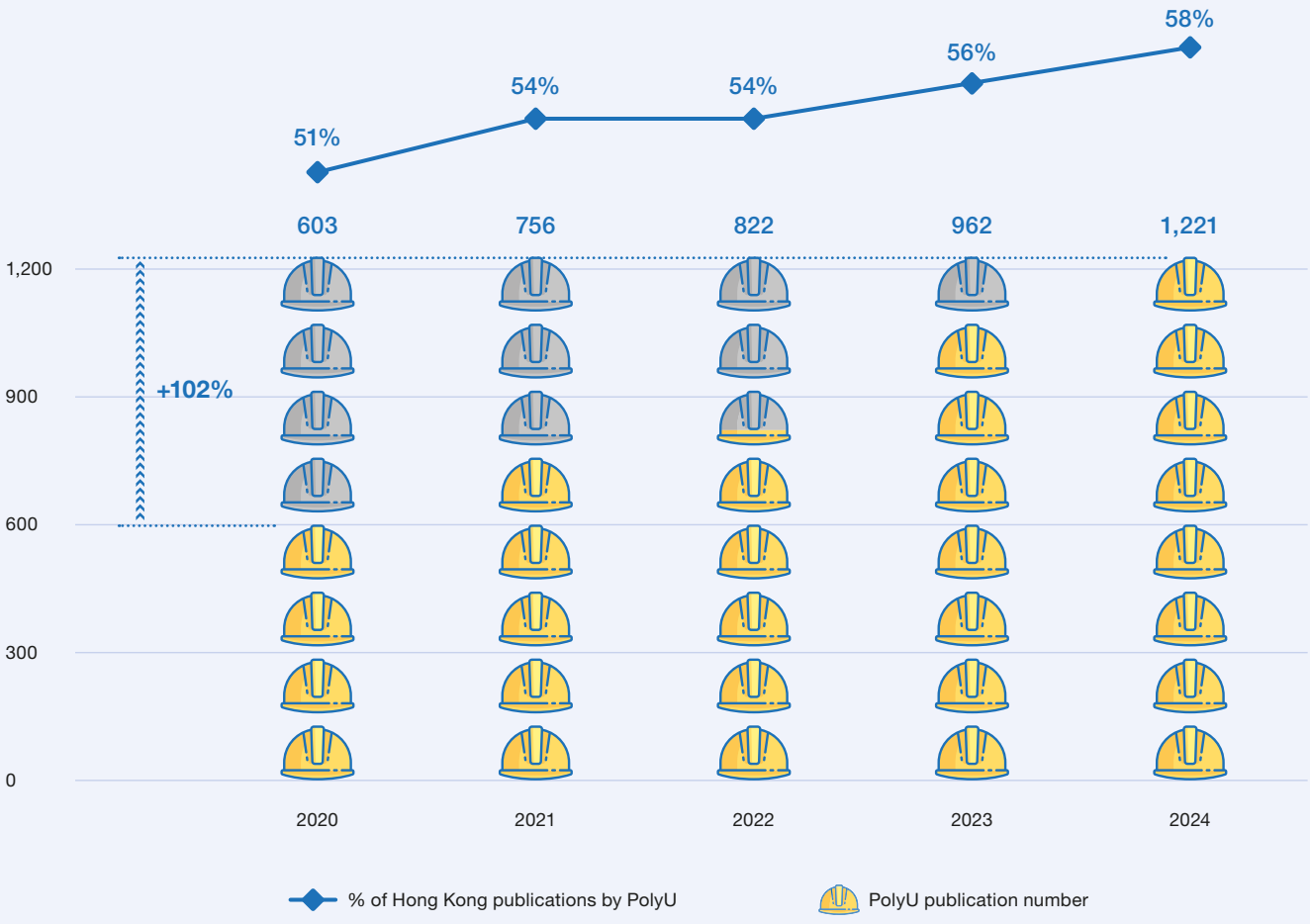


*Figure 24. PolyU publication trends in civil engineering*

26 U.S. News & World Report Best Global Universities Rankings 2025-2026, https://www.usnews.com/education/best-global-universities/hong-kong-polytechnic-university-500421
27 ShanghaiRanking's Global Ranking of Academic Subjects 2025, https://www.shanghairanking.com/institution/the-hong-kong-polytechnic-university
28 QS World University Rankings by Subject 2025, https://www.topuniversities.com/university-subject-rankings/civil-structural-engineering?search=polytechnic
29 ShanghaiRanking's Global Ranking of Academic Subjects 2025, https://www.shanghairanking.com/institution/the-hong-kong-polytechnic-university

The number of Highly Cited Papers in civil engineering has increased alongside the volume of publications (Figure 25). **The number of Highly Cited Papers increased by sixfold during this period, surpassing the rate of increase in Hong Kong, APAC and the world** (Figure 26).

The increase in Highly Cited Papers in Hong Kong was also primarily attributable to PolyU: in 2024, 79% of Hong Kong's Highly Cited Papers in civil engineering were affiliated with PolyU.

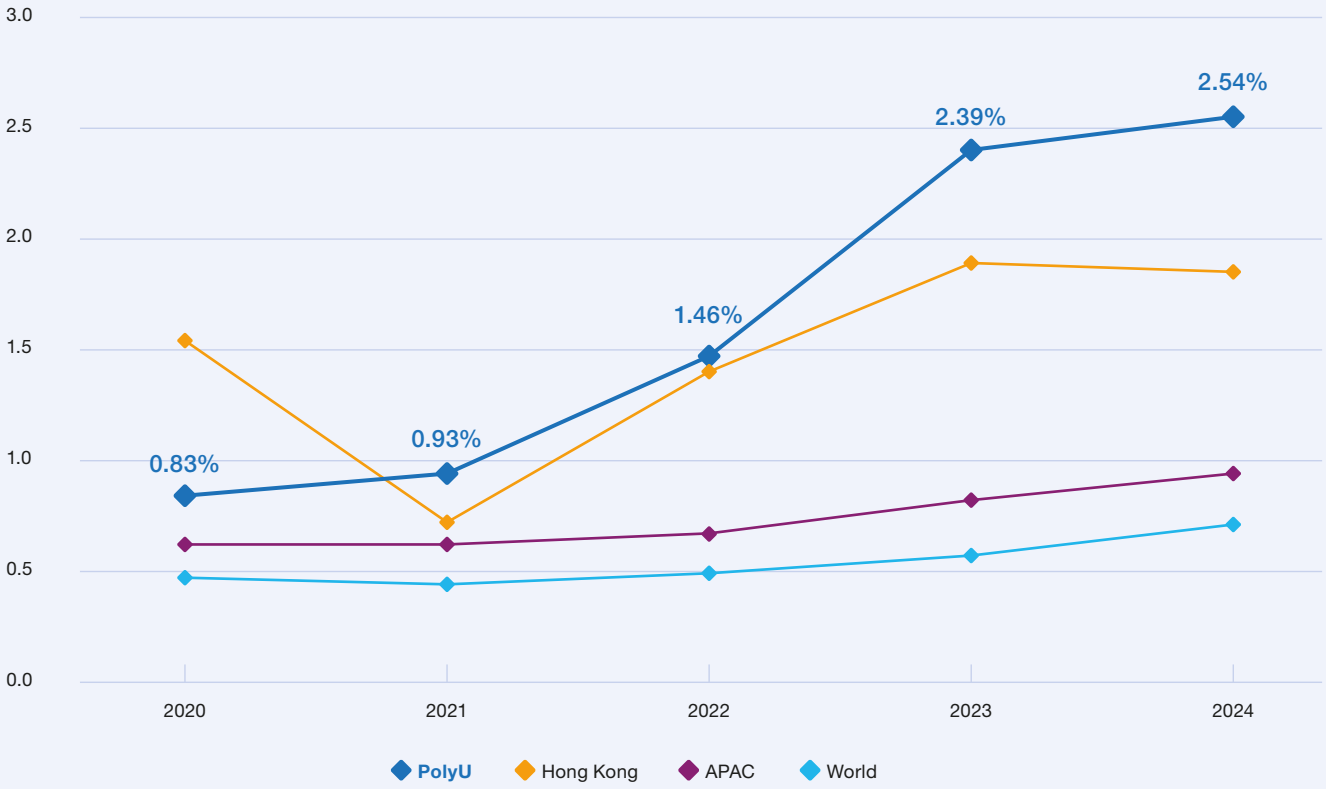


*Figure 25. Share of Highly Cited Papers in civil engineering: PolyU, Hong Kong, APAC, and world*

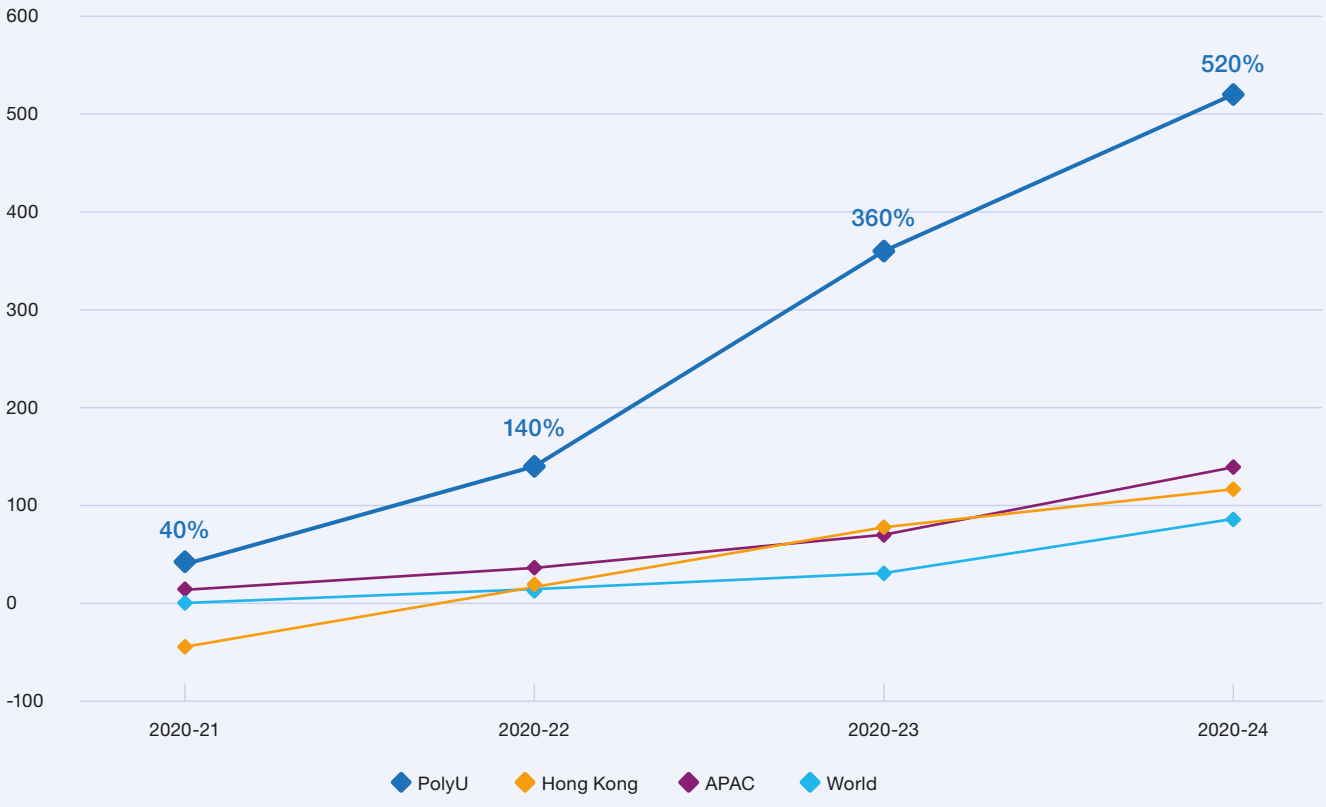


*Figure 26. Cumulative growth of Highly Cited Papers in civil engineering: PolyU, Hong Kong, APAC, and world*

## Societal impact

Recognising PolyU's research excellence and successful technology transfer experiences in civil engineering, in 2015 the State Ministry of Science and Technology approved the establishment by PolyU of two Hong Kong branches of Chinese National Engineering Research Centres (CNERCs): the Hong Kong Branch of the National Rail Transit Electrification and Automation Engineering Technology Research Center (CNERC-Rail), and the Hong Kong Branch of the National Engineering Research Centre for Steel Construction (CNERC-Steel).

Marking 10 years since their establishment in 2025, these two research centres have promoted sustainable infrastructure development and advancements in structural engineering for modern steel constructions. By September 2025, CNERC-Rail alone had been awarded 26 patents.[30] The implementation of this translational research has brought significant benefits to society.

With the rapid expansion of the Chinese Mainland's high-speed rail network, CNERC-Rail focuses its research on developing cutting-edge rail technologies to enhance the safety, reliability and comfort of high-speed rail. Facilitating knowledge translation, CNERC-Rail has formed collaborations with various enterprises, research institutions and universities. In 2022, CNERC-Rail was granted a patent for a noise reduction method in steel rail operation, the implementation of which is being further explored by the PolyU-Hangzhou Technology and Innovation Research Institute. This technology is key in supporting railway development as part of the Chinese Mainland's Belt and Road Initiative.

During the construction of the Cross Bay Link between 2018 and 2022, CNERC-Steel's expertise in high strength S690 steel contributed significantly to achieving a high level of structural adequacy combined with a high level of welding productivity. The innovative engineering solution was record-breaking in Hong Kong and the Chinese Mainland, shortening construction time and saving approximately HKD 100 million in overall costs. The advanced construction process also resulted in lowering carbon emissions by 12,000 tons.[31]

Beyond infrastructure construction, PolyU's civil engineering research also encompasses environmental studies. **Professor Tao WANG**, Chair Professor of Atmospheric Environment in the Department of Civil and Environmental Engineering, has led efforts to improve air quality by targeting ozone pollution — a threat to both human health and crop production that also significantly contributes to global warming. His team's research informed the development of a regional ozone mitigation strategy, which was outlined in the Clean Air Plan for Hong Kong 2035. The advanced modelling techniques and diverse datasets developed from this research have facilitated measures that control key ozone-producing chemicals in more than 10 cities across the Chinese Mainland, with a total population exceeding 92 million.

30 National Rail Transit Electrification and Automation Engineering Technology Research Center (Hong Kong Branch), Awards & Patents, https://www.polyu.edu.hk/cnerc-rail/achievements/awards-and-patents/

31 High strength S690 steel in construction, https://www.polyu.edu.hk/cnercsteel/achievements/research-societal-impact/engineering-applications-of-high-strength-s690-steel-in-construction/

## 2.3 BUILT ENVIRONMENT

Expanded urbanisation has highlighted the need for a more sustainable, high-quality living environment. PolyU has made significant contributions to promoting smart urban design through technological advancements in building energy, environmental sustainability and building resilience.

### Global ranking

PolyU's strong commitment to sustainability, demonstrated through its innovative research and impactful initiatives, has earned it international recognition. The University ranked **11th globally in Green and Sustainable Science and Technology and 18th globally for Environmental Engineering in the U.S. News & World Report Best Global Universities Rankings 2025-2026;**[32] **17th globally for Architecture and Built Environment, 27th globally for Environmental Sciences in the QS World University Rankings by Subject 2025;**[33] **and eighth globally for Energy Science and Engineering in ShanghaiRanking's Global Ranking of Academic Subjects 2025.**[34]

### Scholarly output and impact

With a 60% increase in the number of publications in built environment, PolyU contributed to over 30% of Hong Kong's publications in this field between 2020 and 2024. This growth also elevated PolyU's global presence, where it had a 49% increase in its share of global publication in built environment (Figure 27) in the same period.

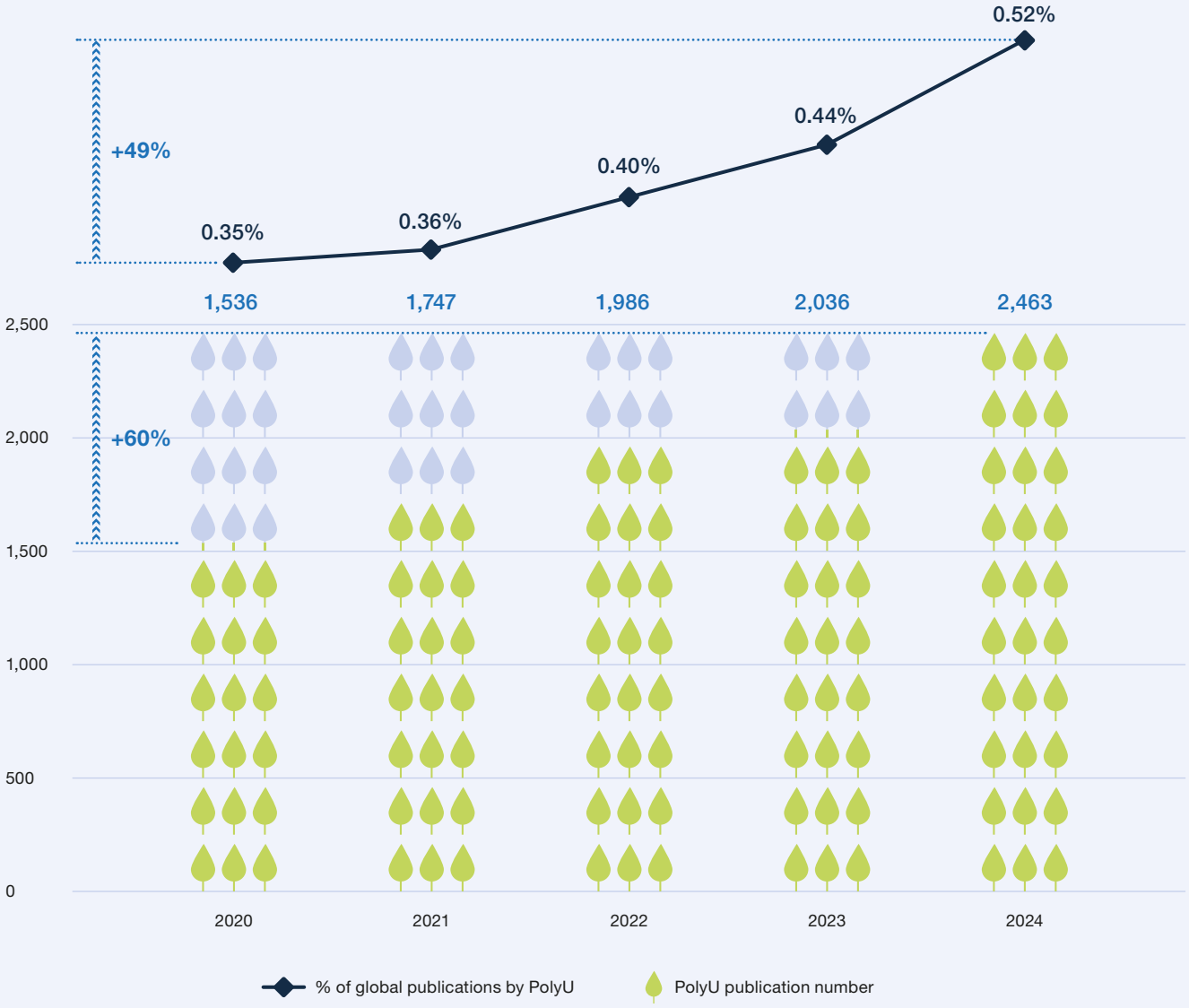


*Figure 27. PolyU publication trends in built environment*

32 U.S. News & World Report Best Global Universities Rankings 2025-2026, https://www.usnews.com/education/best-global-universities/hong-kong-polytechnic-university-500421
33 QS World University Rankings by Subject 2025, https://www.topuniversities.com/subject-rankings
34 ShanghaiRanking's Global Ranking of Academic Subjects 2025, https://www.shanghairanking.com/institution/the-hong-kong-polytechnic-university

Alongside PolyU's increasing global presence, the CNCI for PolyU's publications in built environment is also nearly double the average for APAC and the world (Figure 28), indicating the high global prestige the publications have earned.

PolyU contributed over 40% of Hong Kong's Highly Cited Papers in the built environment and outperformed both the APAC and global averages in the share of publications that are Highly Cited Papers (Figure 29).

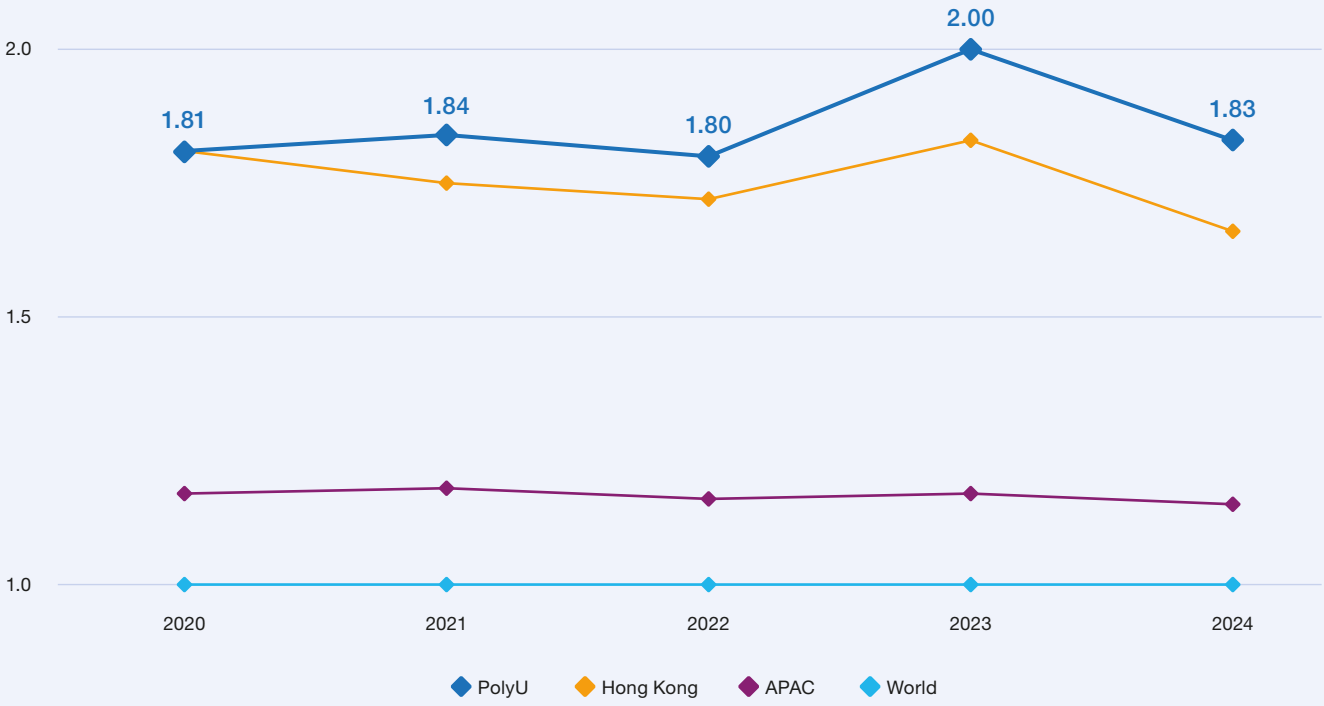


*Figure 28. Category Normalized Citation Impact for publications in built environment: PolyU, Hong Kong, APAC, and world*

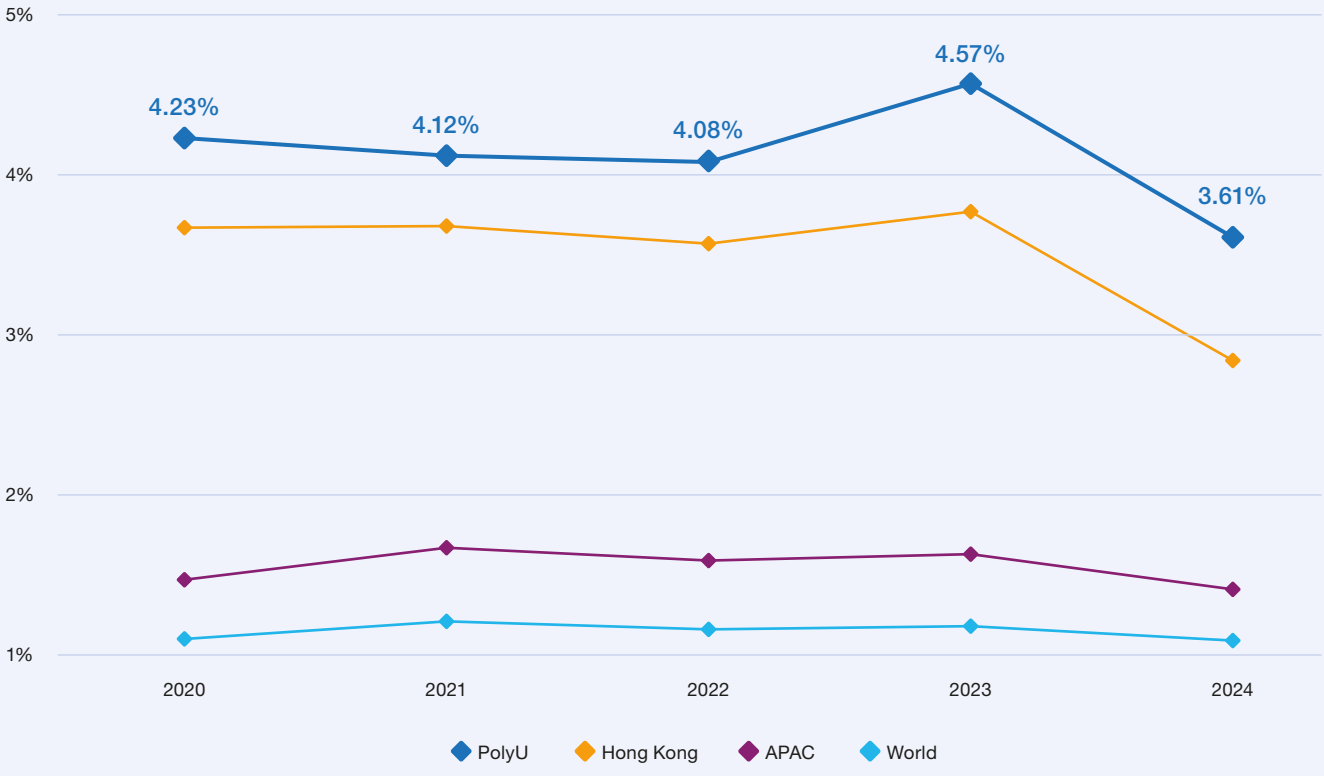


*Figure 29. Share of Highly Cited Papers in built environment: PolyU, Hong Kong, APAC, and world*

## Societal impact

Accelerating research translation to make a positive impact in people's daily lives, PolyU and SenseTime Group Inc. formed the Colour, Imaging, and Metaverse Research Centre, led by **Professor Tommy Min-chen WEI**, Professor and Associate Head of the Department of Building Environment and Energy Engineering. The Centre's focus is on developing metaverse technologies and autonomous driving applications. In 2023, Professor WEI won the Hong Kong Engineering Science and Technology Award from the Hong Kong Academy of Engineering for his contribution to colour and imaging science. Many of his research findings have been incorporated into commercially available products, and his research recommendations have been adopted as international and national standards.

One of Professor WEI's inventions is a six-channel RGBACL (red, green, blue, amber, cyan and lime) lighting module and control algorithm, which enhances the colour presentation of LED lighting systems. By investigating the underlying mechanisms of the human visual system, the technology boosted display calibration and colour management for imaging systems, and it has been commercially utilised by cinema lighting manufacturers and in the production of Hollywood movies and TV series. His other artificial intelligence-powered inventions enhance the colours captured in photos and videos taken by digital cameras under various environments. These technologies have been adopted by world-class smartphone and XR device manufacturers.

To enhance energy efficiency, PolyU established the Otto Poon Charitable Foundation Research Institute for Smart Energy (RISE) in 2020 and the Research Centre for Resources Engineering towards Carbon Neutrality (RCRE) in 2021. These centres foster multidisciplinary research to develop innovative technologies and solutions to meet the worldwide challenges in energy efficiency and environmental sustainability.

Researchers from RISE have achieved a significant impact in their research fields: 11 RISE members were recognised by Clarivate as Highly Cited Researchers in 2025. This prestigious recognition is awarded to researchers who achieve a Top 1% citation among their peers in their respective research areas. **Professor Sheng-wei WANG**, Director of RISE and Chair Professor of Building Energy and Automation of the Department of Building Environment and Energy Engineering, was recently awarded the ASHRAE Hong Kong Chapter Technology Award 2025. Professor WANG led the collaboration with the International Commerce Centre management team and implemented lifecycle retro-commissioning technologies that upgrade energy performance for large and complex air-conditioning systems in buildings. This technology enabled the International Commerce Centre (ICC) to gain approximately 39% in energy savings within one year of implementation.[35]

## Top scholars

RCRE has excelled both in academic research and in driving innovation. Two of its researchers, **Professor Hai-tao HUANG**, Professor of the Department of Applied Physics, and **Professor Xiao ZHANG**, Assistant Professor of the Department of Mechanical Engineering, were recognised as Highly Cited Researchers by Clarivate Analytics, ranking in the Top 1% globally by citations in their fields. This also means that Professor ZHANG has been recognised as a Highly Cited Researcher for six consecutive years. In addition to achievements in scientific publications, RCRE has been awarded 17 patents since its inception in 2021, demonstrating its research translation.[36]

PolyU's continuous efforts in technological advancement have attracted globally leading talent to join its workforce. **Professor Lian-zhou WANG**, who was recognised as a Highly Cited Researcher for seven consecutive years between 2019 and 2025, recently joined PolyU as the Chair Professor of Energy Materials in the Department of Applied Biology and Chemical Technology. With over 670 publications indexed by Web of Science and more than 54,000 citations, Professor WANG's pioneering research focuses on the synthesis and application of semiconductor nanomaterials for renewable energy conversion and storage systems, including long-life rechargeable batteries and eco-friendly low-cost solar cells. His expertise will significantly advance the University's technological progress in building a greener future through engineering.

35 Prof. Shengwei WANG, Director of RISE has been awarded the "ASHRAE Hong Kong Chapter Technology Award 2025 in the category of "Commercial Buildings (Existing)", https://www.polyu.edu.hk/rise/news-and-events/news/2025/ashrae-hong-kong-chapter-technology-award-2025/

36 Research Centre for Resources Engineering Towards Carbon Neutrality, Knowledge Transfer Activities, https://www.polyu.edu.hk/rcre/publications/knowledge-transfer-activities/

## 2.4 ADVANCED MANUFACTURING

As part of its efforts to develop eco-friendly solutions in engineering, PolyU has been leading the technology transformation in the often pollution-heavy traditional manufacturing sector. By developing and implementing advanced technologies and digital solutions, the advanced manufacturing industry will continue to support economic growth while becoming increasingly environmentally friendly.

PolyU has Hong Kong's strongest team in advanced manufacturing. Experts are drawn from multiple departments and research laboratories, including Department of Industrial and Systems Engineering, Department of Mechanical Engineering, Department of Aeronautical and Aviation Engineering, Department of Electrical and Electronic Engineering, State Key Laboratory of Ultra-precision Machining Technology (SKL-UPMT), Research Institute for Advanced Manufacturing (RIAM), and the University Research Facility in 3D Printing.

### Scholarly output and impact

From 2020 to 2024, despite the significant impact of the COVID-19 pandemic and the disruption to advanced manufacturing research globally, PolyU maintained steady growth in the number of publications in advanced manufacturing, surpassing the growth rates for Hong Kong, APAC and the world (Figure 30). By 2023, over 30% of Hong Kong's publications in advanced manufacturing were affiliated with PolyU.

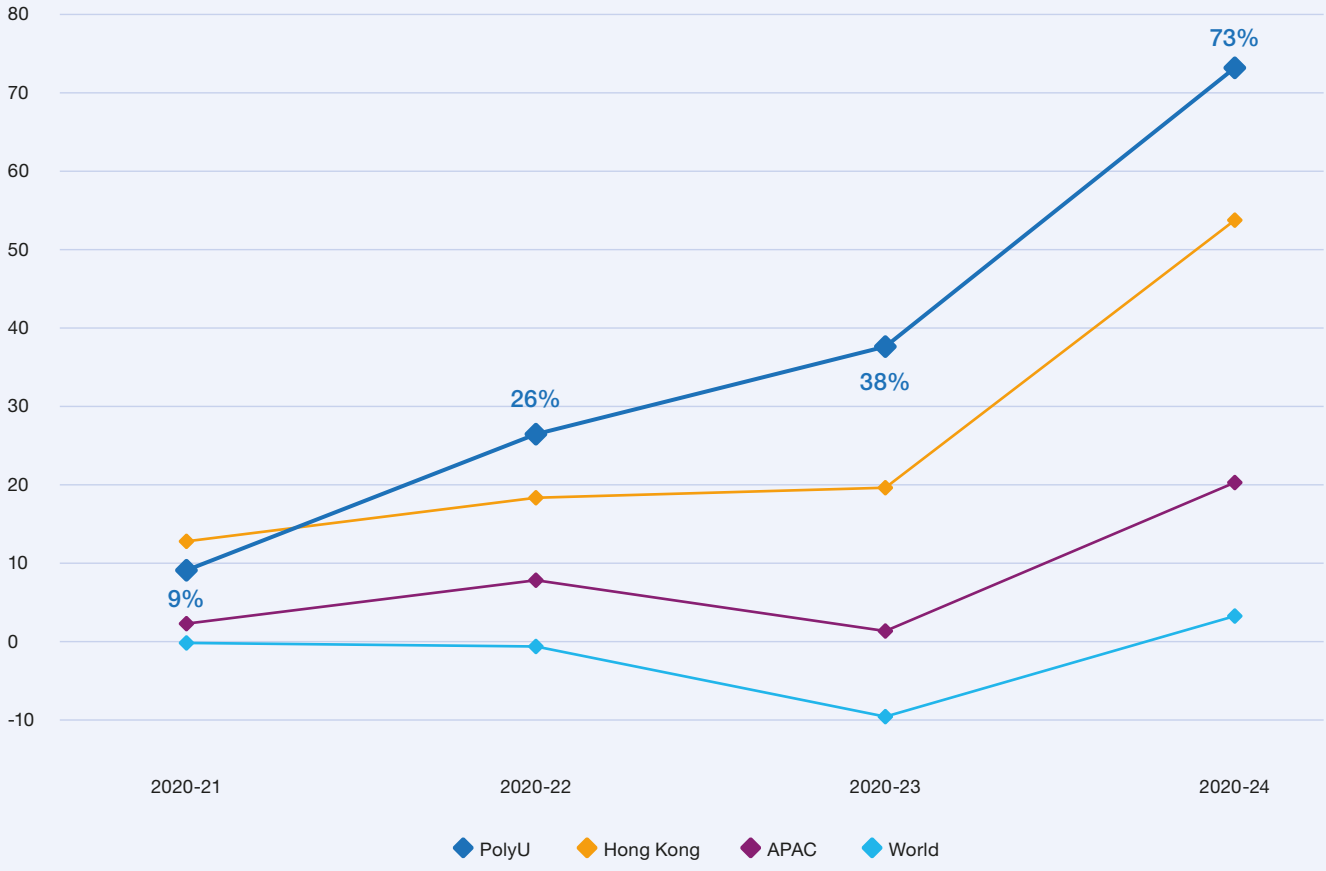


*Figure 30. Cumulative growth of publications in advanced manufacturing: PolyU, Hong Kong, APAC, and world*

Alongside rapid growth in the number of publications, PolyU has also seen an increase in its share of the world's Top 1% publications in advanced manufacturing (Figure 31). While the world average saw a decrease in the number of Top 1% publications in advanced manufacturing, PolyU's global share grew by 63% between 2020 and 2024. High-quality research has yielded a significant number of patents, with PolyU being granted 108 patents in the advanced manufacturing field.

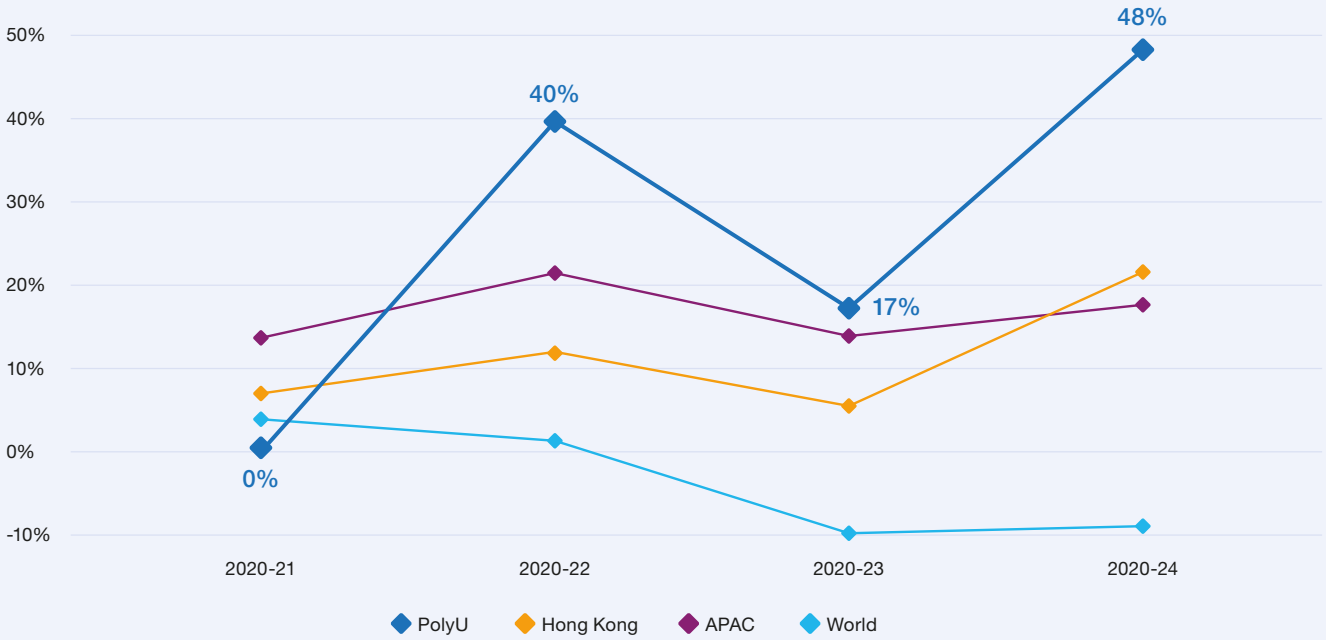


*Figure 31. Cumulative growth of Top 1% publications in advanced manufacturing: PolyU, Hong Kong, APAC, and world*

## Societal impact

A key driver in the University's development in advanced manufacturing is bringing interdisciplinary talent together. PolyU's SKL-UPMT and RIAM not only rely on world-leading researchers with diverse academic backgrounds but also bring in industrial leaders and policy makers to facilitate the translation of research into real-world implementation.

With the booming expansion in telecommunications over the past decades, PolyU has established a successful track record of research excellence in optical communications. Among the leading researchers, **Professor Chao LU**, Chair Professor of Fiber Optics of the Department of Electrical and Electronic Engineering, leads the Photonics Research Institute (PRI) in advancing photonic technology. Under his leadership, PRI has driven developments in optical communications, sensing, energy, imaging and other biomedical applications.

Collaborating with tech giants such as Huawei and Alibaba, PolyU's research groups have developed solutions that enhance the competitiveness of Huawei and Alibaba in the rapidly evolving 5G market. In collaboration since 2007, PolyU and Huawei have jointly invested in areas such as telecommunications, big data, mobile networks, algorithms and materials. PolyU's discoveries in optical networks have also supported Alibaba Cloud data centres and cloud services worldwide. **Professor Alan Pak-tao LAU** of the Department of Electrical and Electronic Engineering, and his team developed a scheme that improves the estimation accuracy of signal-to-noise ratio (SNR) for optical signals travelling through a network. This research has increased fibre-optic network connection speeds and allowed them to be deployed more flexibly, with no loss of reliability. It has created economic benefits, helped to improve the operational efficiency of its clients' services and enhanced the end-user experience. With five million corporate customers including around 190 Fortune Global 500 companies, Alibaba Cloud has deployed the technique in their data centres across 15 countries/regions, benefiting billions of end-users worldwide and making a positive impact in supporting increasingly diverse and demanding customer connection requests.

Other breakthroughs by PolyU researchers in technology infrastructure include the research led by **Professor Zuan-kai WANG**, Associate Vice President (Research) and Chair Professor of Nature-Inspired Engineering in the Department of Mechanical Engineering. His prominent discoveries of the structured thermal armour and a new way of steering directional liquid flow have led to his new project being awarded funding under the National Key Programme by the National Natural Science Foundation of China in 2023. The Project "Flow Boiling Technology under Extremely High-Temperature Environment: from Fundamental Mechanisms to Vital Materials" aims at addressing one of the key limitations for advanced manufacturing in aviation engines, the nuclear industry, and defence technologies.[37]

Another project, "Energy-efficient Liquid Cooling System for Data Centres", was among the first to receive funding from the prestigious RAISe+ Scheme in 2024,[38] demonstrating its significance and recognition by the Government of the HKSAR and the industry. In addition to making a global impact, many PolyU inventions have driven local economic growth. **Professor Yuen-hong TSANG** of the Department of Applied Physics, led two industry-funded projects that developed high-power ultrafast laser stabilising technology and beam quality control, which revolutionised the laser industry. This technology enhances the safety, productivity and efficiency of battery production and has been adopted by the industry.

During the COVID-19 pandemic, cutting-edge PolyU manufacturing technology played a crucial role in the timely development of infection control measures. Supported by the University Research Facility in 3D Printing and with funding of HKD 2 million from the Innovation and Technology Fund, **Professor Chris Kwan-yu LO** of the Department of Logistics and Maritime Studies, developed an antiviral 3D printing technology to combat operational disruption due to a lack of effective long-lasting infection control during the pandemic. The technology was commercialised via Immune Materials Limited and has since expanded to nine materials (e.g., artificial leathers and plastics) applications used by hospitals (e.g., Intensive Care Unit), homes for the elderly and shopping malls in Hong Kong, the Chinese Mainland and Japan.

A research team led by **Professor Pei LI** of the Department of Applied Biology and Chemical Technology has developed CareCoatex™, a non-toxic, eco-friendly antimicrobial and antiviral coating. This innovative product, made from chitosan derived from food waste, is based on Professor LI's patented core-shell particle technology, ensuring safety, effectiveness and environmental sustainability. CareCoatex™ can eliminate 99% of common pathogens on various surfaces for up to six months, making it a significant advancement for public health. As the first eco-friendly anti-COVID-19 coating, CareCoatex™ has been adopted by ISI, a leading public facility management company, and is now used in major public locations such as museums, the MTR, and commercial buildings, as well as extensively across the PolyU campus. Professor LI's start-up, established to commercialise this technology, has created 10 jobs and generated nearly HKD 1.8 million in sales.

## 2.5 GEOMATICS

PolyU's Department of Land Surveying and Geo-Informatics has experienced fast and extensive development in the past decade. With this development, the Department has expanded beyond traditional land surveying into the advanced spatial information sciences and technologies space. This progress has positioned the Department as a key partner contributing to multiple national space explorations, including the BeiDou and lunar exploration missions. In addition to its contributions to the Nation's programme, the Department's research outcomes have positively impacted society's daily life, such as through the design of smart cities and the development of improved in-car navigation systems.

37 Three PolyU scholars awarded funding under national key programme and 52 young scientists honoured by NSFC, https://www.polyu.edu.hk/media/media-releases/2023/0915_3-polyu-scholars-awarded-under-national-key-programme-and-52-young-scientists-honoured-by-nsfc/
38 Energy-Efficient Liquid Cooling System for Data Centres, https://www.polyu.edu.hk/me/knowledge-transfer/energy-efficient-liquid-cooling-system-for-data-centres/

### Global ranking

The advancements have helped establish PolyU as a leading institution in geomatics, **ranking 31st globally for Remote Sensing in the ShanghaiRanking's Global Ranking of Academic Subjects 2025,[39] and 37th for Geography in the QS World University Rankings by Subject 2025.[40]**

### Scholarly output and impact

The Department's strong growth correlates with an increase in PolyU's publications in surveying, specifically an 84% rise between 2020 and 2024. PolyU has contributed to 30-40% of Hong Kong's publications in surveying in this period. This also represents a 56% growth in the share of global publications in surveying, indicating a growing global presence (Figure 32).

While increasing in number, PolyU's publications in surveying have also achieved high citation impact in their respective research areas. PolyU not only doubled its number of Top 1% most-cited papers, but also more than doubled its global share of such papers (Figure 33).

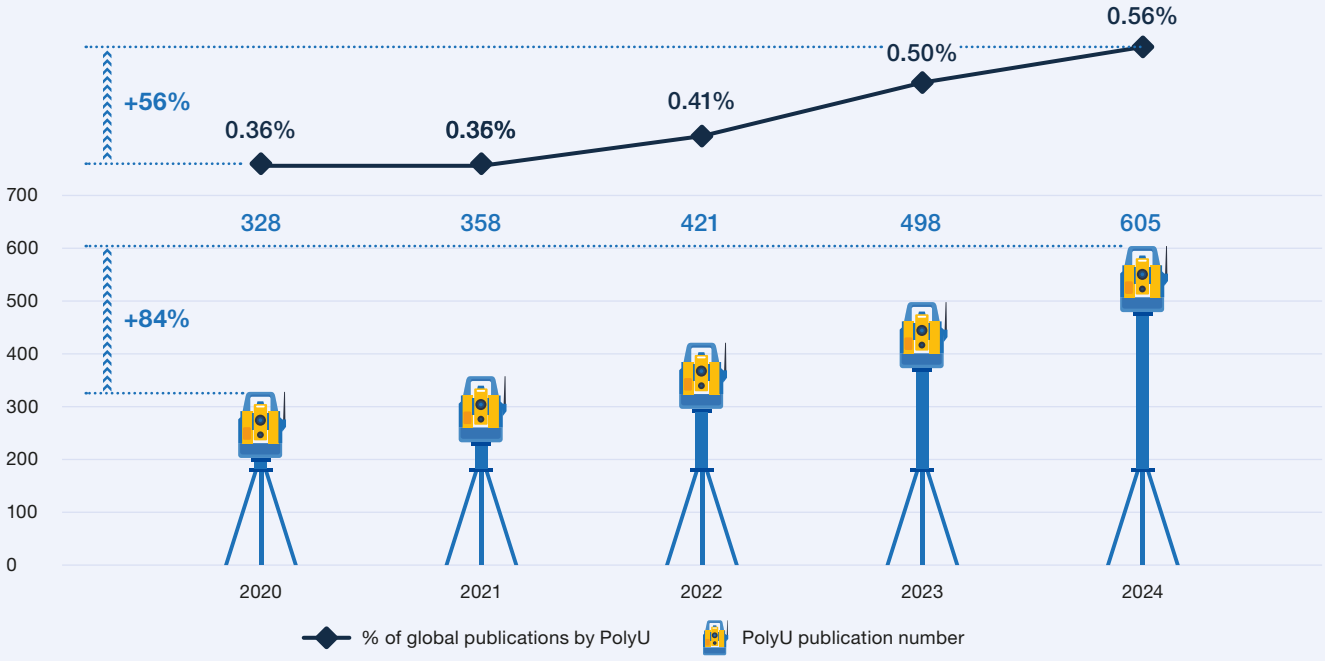


*Figure 32. PolyU publication trends in surveying*

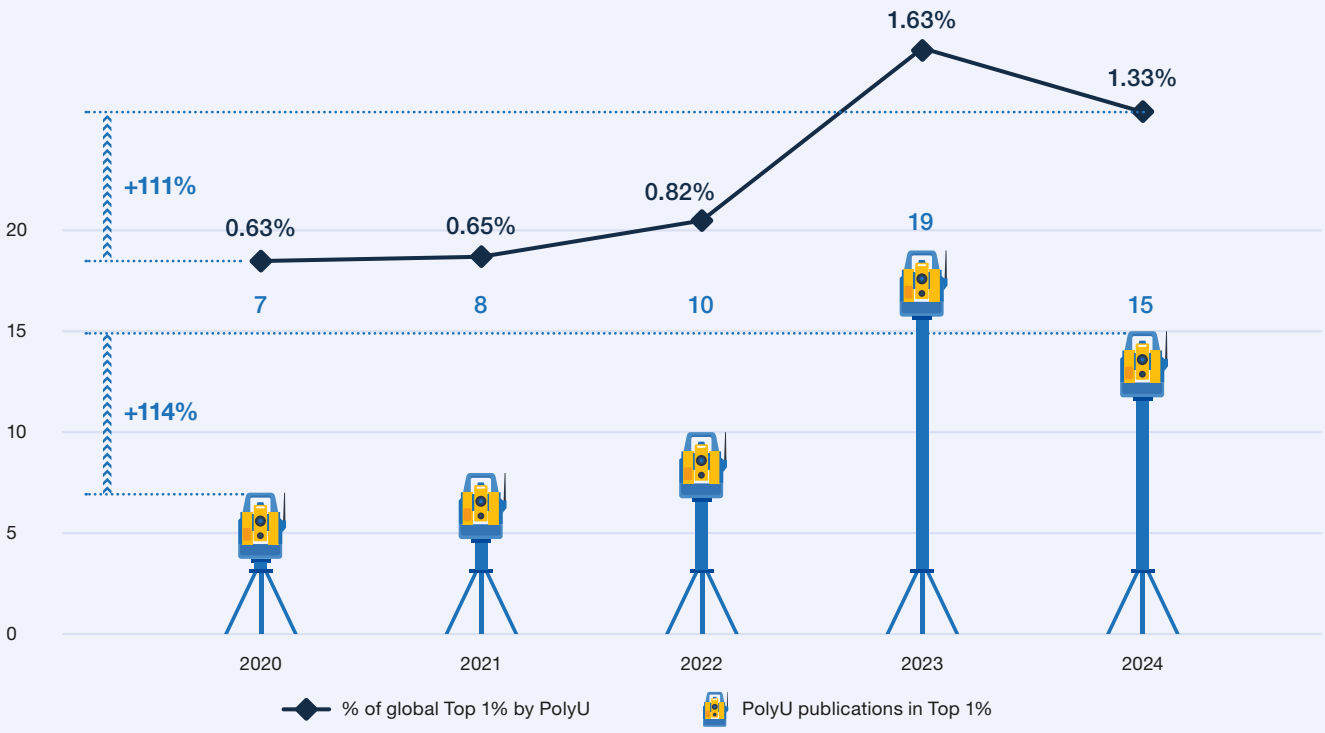


*Figure 33. PolyU Top 1% publications in surveying*

39 ShanghaiRanking's Global Ranking of Academic Subjects 2025, https://www.shanghairanking.com/institution/the-hong-kong-polytechnic-university
40 QS World University Rankings by Subject 2025: Geography, https://www.topuniversities.com/university-subject-rankings/geography

This increase has been accompanied by a rapid growth in the percentage of PolyU's publications in surveying, achieving the Highly Cited Papers status (Figure 34). The growth rate far exceeded that of Hong Kong, APAC, and the world. With nearly triple the number of Highly Cited Papers, in 2023 and 2024, over 40% of Hong Kong's Highly Cited Papers in surveying were affiliated with PolyU.

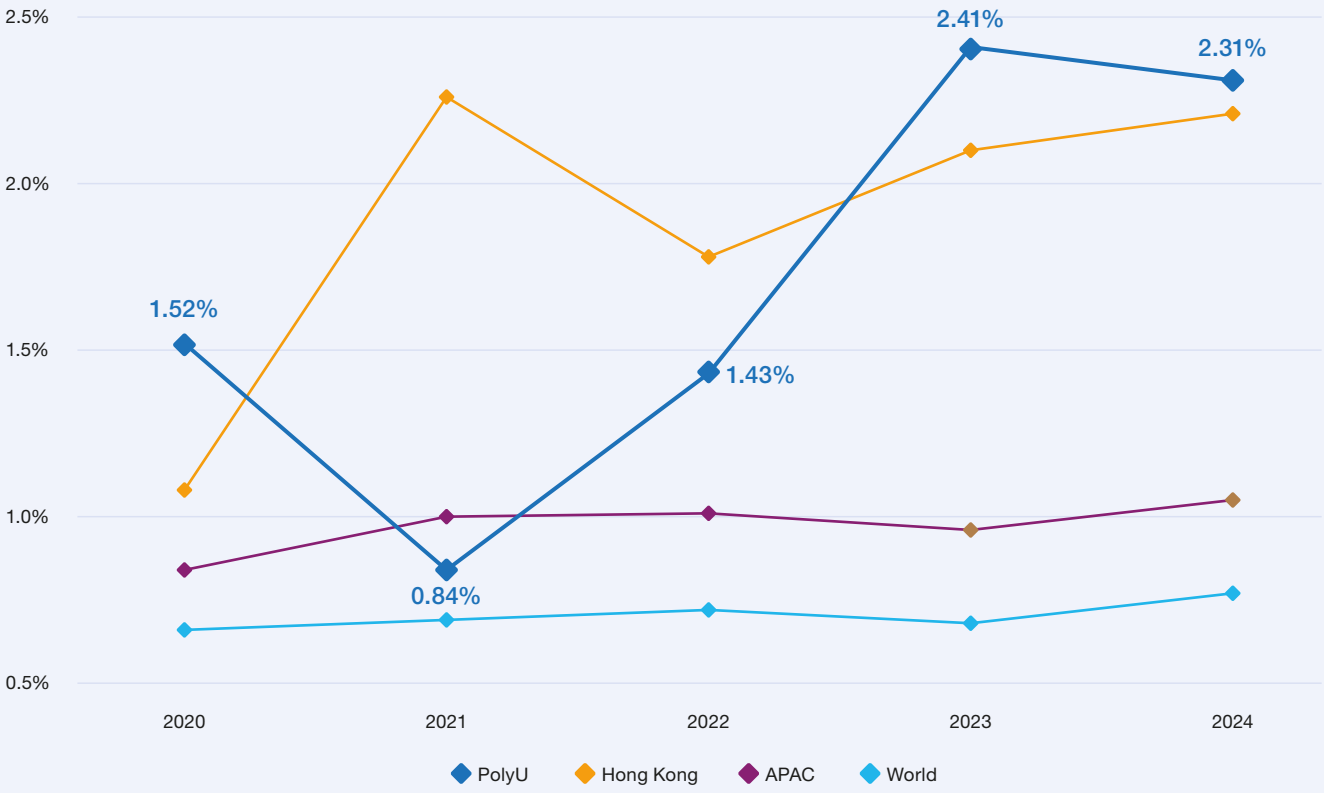


*Figure 34. Share of Highly Cited Papers in surveying: PolyU, Hong Kong, APAC, and world*

## Societal impact

Over the past 30 years, PolyU has built cutting-edge research and engineering capabilities in deep space research, making it the only tertiary institution in Hong Kong to have participated in multiple national space missions. Established in 2021, PolyU's Research Centre for Deep Space Explorations (RCDSE) is a leading interdisciplinary research centre that supports the Nation's space exploration missions.

**Professor Bo WU**, Associate Director of RCDSE and Professor of the Department of Land Surveying and Geo-Informatics, has led the PolyU research group in systematically investigating planetary remote sensing and mapping over the past decades. Their integrated 3D topographic mapping model and AI-powered geomorphological mapping techniques have advanced state-of-the-art planetary mapping, contributing to the landing site mapping and selection for the Chang'e-4 lunar far-side landing mission and the Tianwen-1 Mars mission. The "Surface Sampling and Packing System", developed and manufactured by **Ir Professor Kai-leung YUNG**, Director of RCDSE, Chair Professor of Precision Engineering of the Department of Industrial and Systems Engineering, assisted the Nation in completing its first lunar sample return mission, Chang'e-5, in 2020, and the world's first lunar far-side sampling for the Chang'e-6 lunar exploration mission in 2024. These successes safeguarded the RMB 4 billion investment by the China National Space Administration for these missions. The returned sample showed volcanic activity on the lunar far-side more than 2.8 billion years ago and has been recognised as one of the 2024 Top 10 Scientific Advances in China.

The topographic and geomorphological mapping technologies developed by Professor WU along with the sophisticated "Mars Landing Surveillance Camera" developed by Professor YUNG contributed significantly to the Nation's first Mars exploration mission, Tianwen-1 in 2021. Professor WU's novel mapping technologies helped identify critical landing regions for the safe landing of the Zhurong Mars rover, earning recognition through an Outstanding Award from the China National Space Administration. The Mars camera's ultra-wide-angle images and its strong durability in tough conditions provided critical information for the successful movement of the Zhurong rover on the surface of Mars.

In November 2024, Professor WU and his research team published the article “A Probable Ancient Nearshore Zone in Southern Utopia on Mars Unveiled from Observations at the Zhurong Landing Area”. It was recognised as one of the most downloaded physics papers of 2024 and included in the “Physics Top 100 of 2024” collection. This highlights the significance of this research and its contribution to a discussion on the probable evolutionary scenario on Mars for the first time.

Professor WU and his research team are now actively engaged in the Chang’e-7 and Tianwen-2 missions and will continue to collaborate with institutions across the Nation to drive advancement in space exploration.

While advancing remote sensing technologies and supporting national space exploration, PolyU has also established various research centres that support urban development using advanced technology. The Research Institute for Land and Space (RILS), established in 2021, has a research focus on creating economical and environmentally friendly land and space in Hong Kong, the Greater Bay Area and beyond. **Professor Qi-hao WENG**, Associate Director of RILS, and Chair Professor of Geomatics and Artificial Intelligence of the Department of Land Surveying and Geo-Informatics was awarded the Lifetime Achievement Honor Award and the Wilbanks Prize for Transformational Research in Geography award by the American Association of Geographers in 2024. His recent groundbreaking study, published in the journal Nexus of Cell Press, addressed the need for developing global heatwave frameworks to effectively identify dangerous outdoor conditions across diverse climatic and geographic regions.

**Through world-class research, industry-leading scholars, impactful collaboration, and a strong emphasis on translational outcomes, PolyU is regarded as a global leader in engineering by both research community and industry partners. By integrating advanced technologies with practical application, PolyU’s research has made a meaningful impact on society and people’s daily lives. The strong research and translation capability in its engineering disciplines also drives innovation and application in other disciplines.**