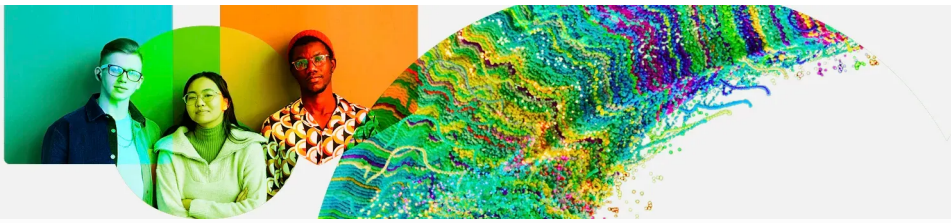
Global Innovation Index 2024



Germany ranking in the Global Innovation Index 2024

Germany ranks 9th among the 133 economies featured in the GII 2024.

The Global Innovation Index (GII) ranks world economies according to their innovation capabilities. Consisting of roughly 80 indicators, grouped into innovation inputs and outputs, the GII aims to capture the multi-dimensional facets of innovation.

Germany ranks 9th among the 51 high-income group economies.

Germany ranks 6th among the 39 economies in Europe.

Germany GII Ranking (2020-2024)

The table shows the rankings of Germany over the past four years. Data availability and changes to the GII model framework influence year-on-year comparisons of the GII rankings. The statistical confidence interval for the ranking of Germany in the GII 2024 is between ranks 8 and 10.

Year	GII Position	Innovation Inputs	Innovation Outputs
2020	9th	14th	7th
2021	10th	14th	8th
2022	8th	12th	7th
2023	8th	13th	6th
2024	9th	13th	6th

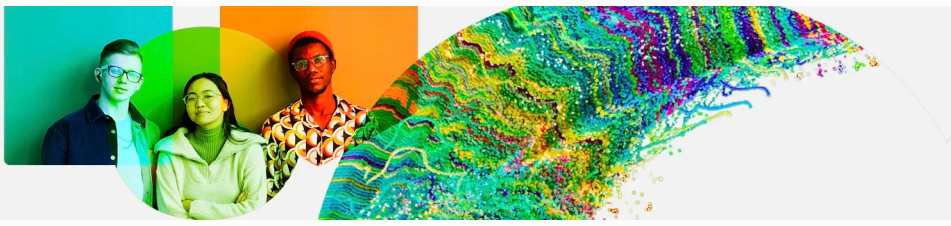
Germany performs better in innovation outputs than innovation inputs in 2024.

This year **Germany ranks 13th in innovation inputs.** This position is the same as last year.

Germany ranks 6th in innovation outputs. This position is the same as last year.

Germany has 8 clusters in the top 100 S&T clusters of the Global Innovation Index.

Global Innovation Index 2024



> Global Innovation Tracker

The Global Innovation Tracker 2024 shows what is the current state of innovation in Germany, how rapidly is technology being embraced and what are the resulting societal impacts.

For Germany, 5 indicators have improved in the short-term and 7 indicators have worsened.

Science and innovation investment

Scientific publications	R&D investments	Venture capital		International patent filings
		Deal numbers	Deal values	
▼ -6.9% 2022 - 2023	▲ 2.3% 2021 - 2022	▼ -7.9% 2022 - 2023	▼ -29.6% 2022 - 2023	▼ -3.2% 2022 - 2023
▲ 1.3% 2013 - 2023	▲ 2% 2012 - 2022	▲ 8.9% 2013 - 2023	▲ 22.3% 2013 - 2023	▼ -0.6% 2013 - 2023

Technology adoption

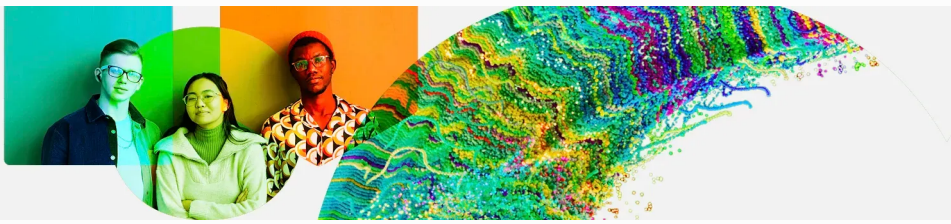
Safe sanitation	Connectivity		Robots	Electric vehicles
	Fixed broadband	5G		
0% 2021 - 2022	▲ 1.8% 2021 - 2022	▲ 4.1% 2021 - 2022	▲ 4.7% 2021 - 2022	▲ 34.4% 2022 - 2023
0% 2012 - 2022	▲ 2.8% 2012 - 2022		▲ 4.8% 2012 - 2022	▲ 70.3% 2013 - 2023
96.9 per 100 inhabitants in 2022	45 per 100 inhabitants in 2022	94.8 per 100 inhabitants in 2022		5.4 per 100 inhabitants in 2023

Socioeconomic impact

Labor productivity	Life expectancy	Temperature change
▼ -0.7% 2022 - 2023	▼ -0.1% 2021 - 2022	▲ 2.4°C 2023
▲ 0.7% 2013 - 2023	0% 2012 - 2022	n/a
120,712 USD in 2023	80.7 years in 2022	

Notes: Not all indicators of the Global Innovation Tracker are used to calculate the Global Innovation Index. Long-term annual growth refers to the compound annual growth rate (CAGR) over the indicated period. For each variable, a one-year growth rate is set for the short run, and ten-year CAGR is set for the long run; time windows might differ when gaps exist in data availability. The end period corresponds to the most recent available observation, which may differ among countries. Temperature change is an exception: it indicates the change in degrees Celsius with respect to the average temperature in the country from 1951–1980. Figures are rounded.

Global Innovation Index 2024



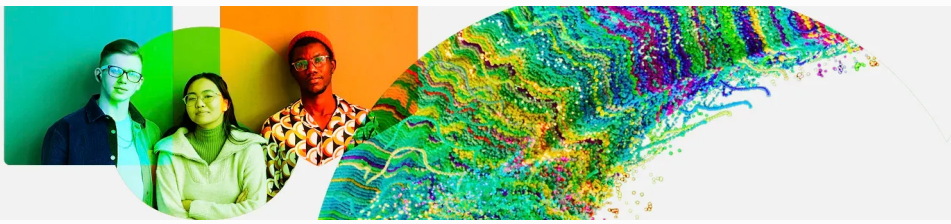
Expected vs. observed innovation performance

The bubble chart below shows the relationship between income levels (GDP per capita) and innovation performance (GII score). The trend line gives an indication of the expected innovation performance according to income level. Economies appearing above the trend line are performing better than expected and those below are performing below expectations.

Germany is an innovation leader, ranking in the top 25 of the GII.

> Innovation overperformers relative to their economic development

Global Innovation Index 2024

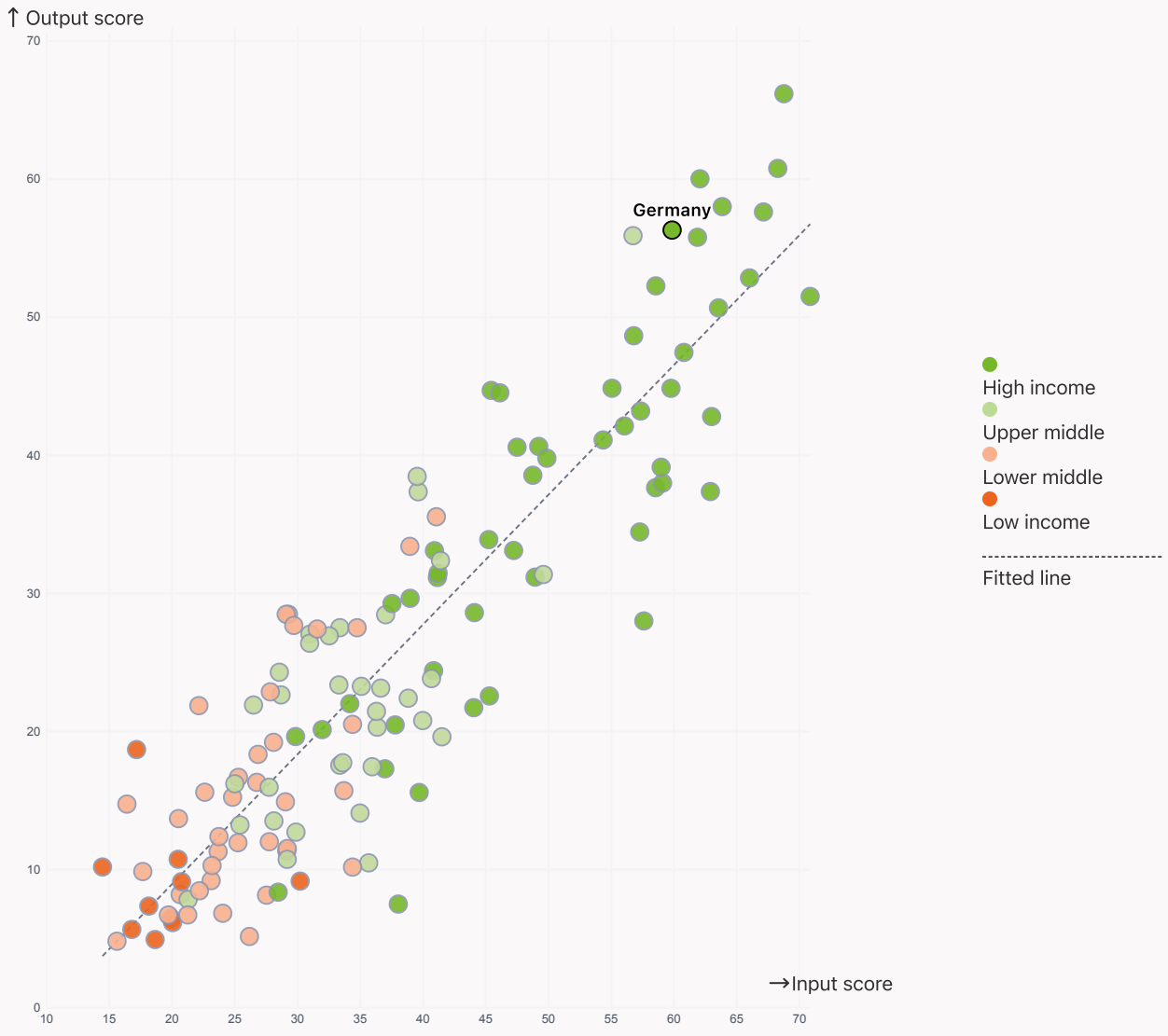


Effectively translating innovation investments into innovation outputs

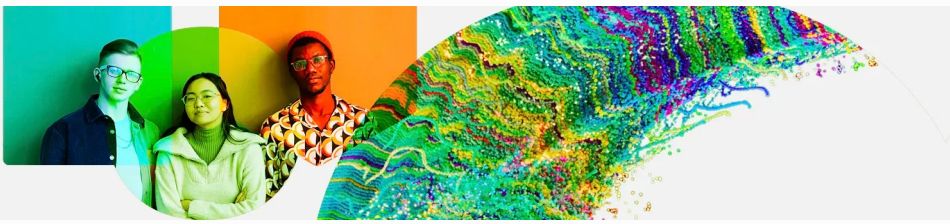
The chart below shows the relationship between innovation inputs and innovation outputs. Economies above the line are effectively translating costly innovation investments into more and higher-quality outputs.

Germany produces more innovation outputs relative to its level of innovation investments.

> Relationship between innovation inputs and outputs



Global Innovation Index 2024



Overview of Germany's rankings in the seven areas of the GII in 2024

The chart shows the ranking for each of the seven areas that the GII comprises. The strongest areas for Germany are those that rank above the GII (shown in blue) and the weakest are those that rank below.

Highest rankings

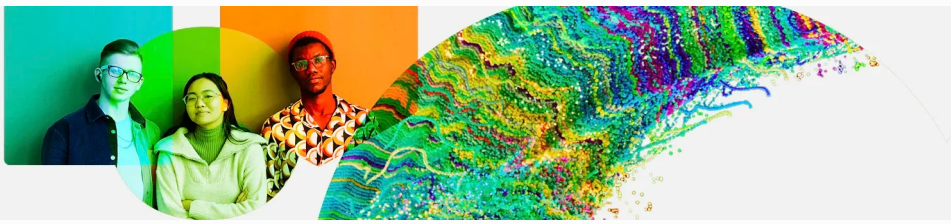
Germany ranks highest in Human capital and research, Creative outputs (5th).

Lowest rankings

Germany ranks lowest in Infrastructure (27th), Institutions (19th) and Business sophistication (18th).

The full WIPO Intellectual Property Statistics profile for Germany can be found on this link.

Global Innovation Index 2024



Benchmark of Germany against other economy groupings for each of the seven areas of the GII Index

The charts shows the relative position of Germany (blue bar) against other economy groupings (grey bars), for each of the seven areas of the GII Index.

High-Income economies

Germany performs above the high-income group average in all pillars.

Europe

Germany performs above the regional average in all pillars.

Institutions

- Top 10 | Score: 80.81
- Germany | Score: 73.53
- High income | Score: 67.41
- Europe | Score: 59.14

Human capital and research

- Germany | Score: 61.43
- Top 10 | Score: 61.30
- High income | Score: 46.99
- Europe | Score: 44.92

Infrastructure

- Top 10 | Score: 58.57
- Germany | Score: 52.93
- High income | Score: 51.96
- Europe | Score: 51.74

Market sophistication

- Top 10 | Score: 62.12
- Germany | Score: 56.40
- High income | Score: 44.90
- Europe | Score: 42.79

Business sophistication

- Top 10 | Score: 63.64
- Germany | Score: 55.28
- High income | Score: 44.71
- Europe | Score: 42.68

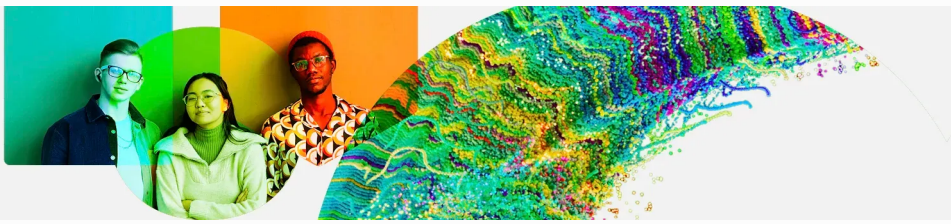
Knowledge and technology outputs

- Top 10 | Score: 57.29
- Germany | Score: 53.90
- Europe | Score: 36.30
- High income | Score: 35.79

Creative outputs

- Germany | Score: 58.60
- Top 10 | Score: 56.54
- High income | Score: 39.44
- Europe | Score: 39.15

Global Innovation Index 2024



Innovation strengths and weaknesses in Germany

The table below gives an overview of the indicator strengths and weaknesses of Germany in the GII 2024.

Germany's main innovation strengths are **Domestic market scale, bn PPP$** (rank 1), **Citable documents H-index** (rank 3) and **Logistics performance*** (rank 3).

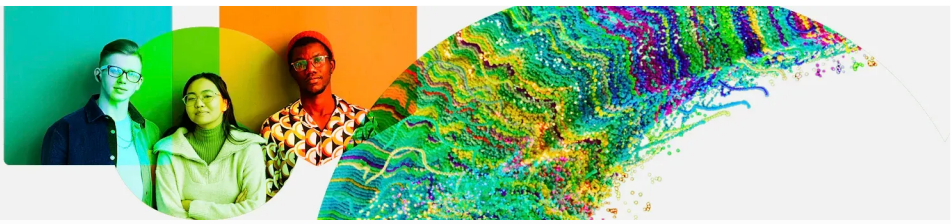
Strengths

Rank	Code	Indicator name
1	4.3.3	Domestic market scale, bn PPP$
3	6.1.5	Citable documents H-index
3	3.2.2	Logistics performance*
3	2.3.3	Global corporate R&D investors, top 3, mn USD
4	6.3.2	Production and export complexity
5	6.2.4	High-tech manufacturing, %
6	6.1.1	Patents by origin/bn PPP$ GDP
6	5.2.1	Public Research-Industry co-publications, %
7	2.2.2	Graduates in science and engineering, %
7	7.3.1	Top-level domains (TLDs)/th pop. 15–69
8	5.2.5	Patent families/bn PPP$ GDP

Weaknesses

Rank	Code	Indicator name
97	6.2.1	Labor productivity growth, %
64	5.3.4	FDI net inflows, % GDP
61	3.2.3	Gross capital formation, % GDP
56	3.3.2	Low-carbon energy use, %
55	2.1.1	Expenditure on education, % GDP
55	6.3.4	ICT services exports, % total trade
52	3.1.2	ICT use*
34	4.2.1	Market capitalization, % GDP
33	1.3.2	Entrepreneurship policies and culture†
33	7.2.2	National feature films/mn pop. 15–69

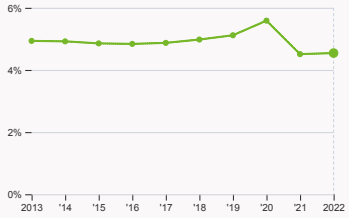
Global Innovation Index 2024



Germany's innovation system

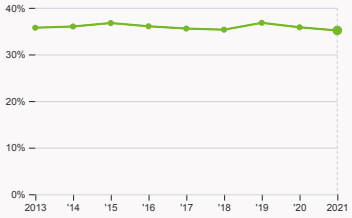
As far as practicable, the plots below present unscaled indicator data.

Innovation inputs in Germany



2.1.1 Expenditure on education

was equal to 4.54 % GDP in 2022, up by 0.03 percentage points from the year prior – and equivalent to an indicator rank of 55.

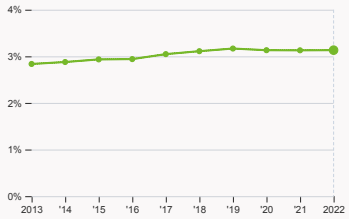


2.2.2 Graduates in science and engineering

was equal to 35.14 % of total graduates in 2021, down by 0.68 percentage points from the year prior – and equivalent to an indicator rank of 7.

2.3.1 Researchers

was equal to 5824.6 FTE per million population in 2022, up by 4.92% from the year prior – and equivalent to an indicator rank of 12.



2.3.2 Gross expenditure on R&D

was equal to 3.13 % GDP in 2022, up by 0.004 percentage points from the year prior – and equivalent to an indicator rank of 9.

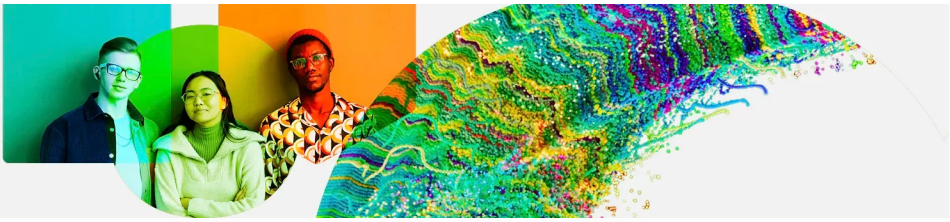
2.3.4 QS university ranking

was equal to an average score of 71.57 for the top three universities in 2023, down by 0.5% from the year prior – and equivalent to an indicator rank of 11.

4.2.4 VC received, value

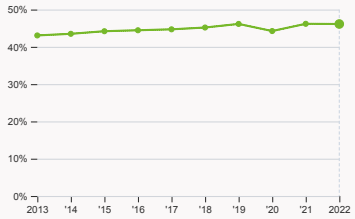
was equal to 7.05 million USD in 2023, down by 29.64% from the year prior – and equivalent to an indicator rank of 26.

Global Innovation Index 2024



4.3.2 Domestic industry diversification

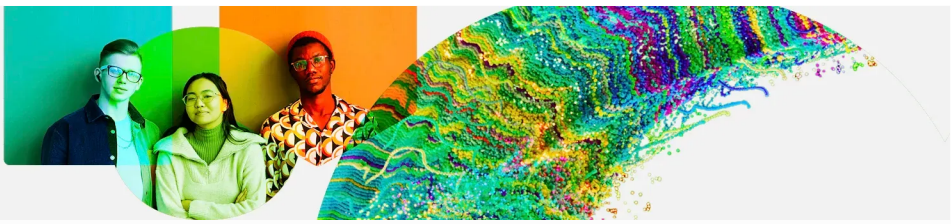
was equal to an index score of 0.09 in 2021, down by 9.3% from the year prior – and equivalent to an indicator rank of 19.



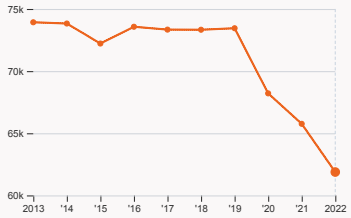
5.1.1 Knowledge-intensive employment

was equal to 46.13 % in 2022, down by 0.05 percentage points from the year prior – and equivalent to an indicator rank of 20.

Global Innovation Index 2024

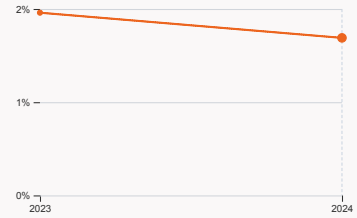


Innovation outputs in Germany



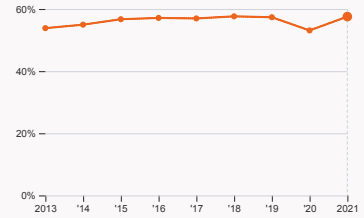
6.1.1 Patents by origin

was equal to 61.88 thousand patents in 2022, down by 5.9% from the year prior – and equivalent to an indicator rank of 6.



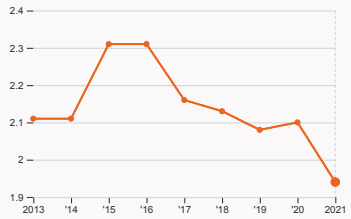
6.2.2 Unicorn valuation

was equal to 1.69 % GDP in 2024, down by 0.27 percentage points from the year prior – and equivalent to an indicator rank of 23.



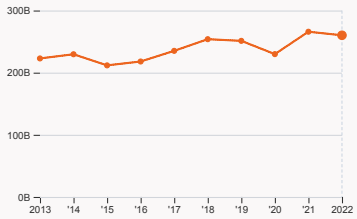
6.2.4 High-tech manufacturing

was equal to 57.54 % of total manufacturing output in 2021, up by 4.44 percentage points from the year prior – and equivalent to an indicator rank of 5.



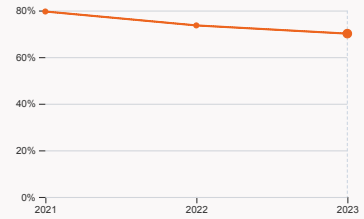
6.3.2 Production and export complexity

was equal to a score of 1.94 in 2021, down by 7.62% from the year prior – and equivalent to an indicator rank of 4.



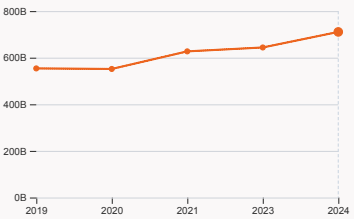
6.3.3 High-tech exports

was equal to 260.17 billion USD in 2022, down by 2.15% from the year prior – and equivalent to an indicator rank of 13.



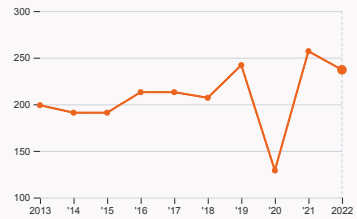
7.1.1 Intangible asset intensity

was equal to 70.09 % for the top 15 companies in 2023, down by 3.52 percentage points from the year prior – and equivalent to an indicator rank of 16.



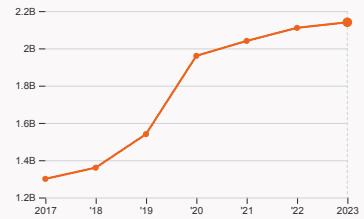
7.1.3 Global brand value

was equal to 710.55 billion USD for the brands in the top 5,000 in 2024, up by 10.36% from the year prior – and equivalent to an indicator rank of 8.



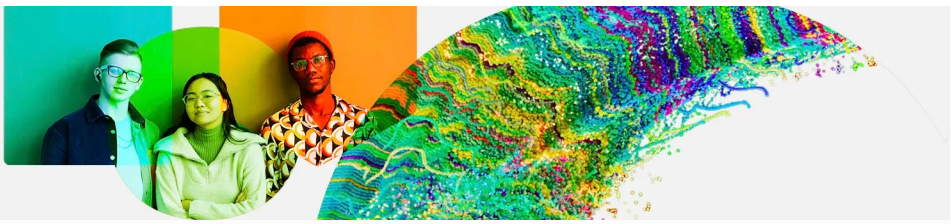
7.2.2 National feature films

was equal to 237 films in 2022, down by 7.78% from the year prior – and equivalent to an indicator rank of 33.



7.3.3 Mobile app creation

was equal to 2.14 billion global downloads of mobile apps in 2023, up by 1.42% from the year prior – and equivalent to an indicator rank of 48.



Germany's innovation top performers

2.3.3 Global corporate R&D investors from Germany

Rank	Firm	Industry	R&D	R&D Growth	R&D Intensity
			[mn EUR]	[%]	[%]
6	VOLKSWAGEN	Automobiles & Parts	18,908	21	7
18	MERCEDES-BENZ	Automobiles & Parts	8,509	-5	6
23	ROBERT BOSCH	Automobiles & Parts	7,483	18	8
25	BMW	Automobiles & Parts	7,178	4	5

Source: European Commission's Joint Research Centre (https://iri.jrc.ec.europa.eu/scoreboard/2022-eu-industrial-rd-investment-scoreboard).
Note: European Commission's Joint Research Centre ranks the top 2,500 firms by R&D investment annually.

2.3.4 QS university ranking of Germany's top universities

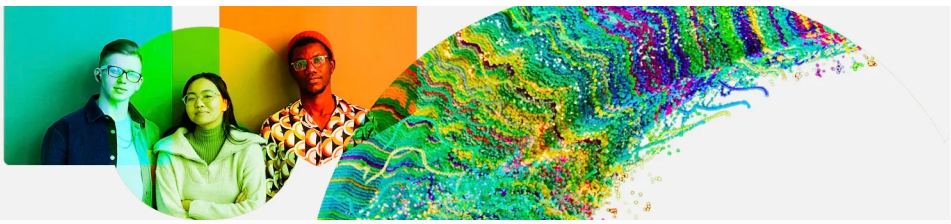
Rank	University	Score
37	TECHNISCHE UNIVERSITAT MUNCHEN	80.00
54	LUDWIG-MAXIMILIANS-UNIVERSITAT MUNCHEN	72.50
87	RUPRECHT-KARLS-UNIVERSITAT HEIDELBERG	62.20

Source: QS Quacquarelli Symonds Ltd (https://www.topuniversities.com/university-rankings/world-university-rankings/2023).
Note: QS Quacquarelli Symonds Ltd annually assesses over 1,200 universities across the globe and scores them between [0,100].
Ranks can represent a single value "x", a tie "x=" or a range "x-y".

6.2.2 Top Unicorn Companies in Germany

Rank	Unicorn Company	Industry	City	Valuation, bn USD
1	CELONIS	Enterprise Tech	Munich	13
2	N26	Financial Services	Berlin	9
3	PERSONIO	Enterprise Tech	Munich	9

Source: CBInsights, Tracker – The Complete List of Unicorn Companies: https://www.cbinsights.com/research-unicorn-companies



7.1.1 Top 15 intangible-asset intensive companies in Germany

Rank	Firm	Intensity, %
1	DEUTSCHE TELEKOM AG	68.66
2	SAP SE	95.50
3	SIEMENS AKTIENGESELLSCHAFT	69.28

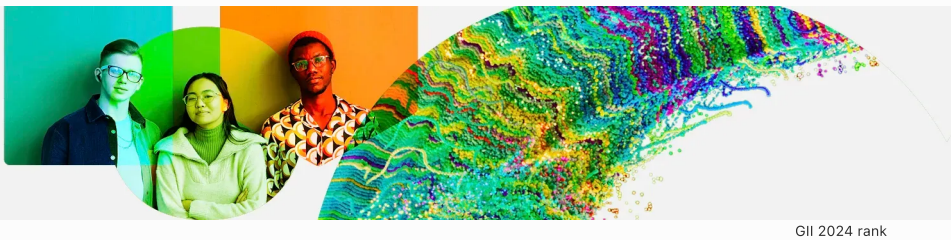
Source: Brand Finance (https://brandirectory.com/reports/gift-2022).
Note: Brand Finance only provides within economy ranks.

7.1.3 Top 5,000 companies in Germany with highest global brand value

Rank	Brand	Industry	Brand Value, mn USD
1	DEUTSCHE TELEKOM	Telecoms	73,320.7
2	MERCEDES-BENZ	Automobiles	59,436.1
3	ALLIANZ GROUP	Insurance	46,888.8

Source: Brand Finance (https://brandirectory.com).
Note: Rank corresponds to within economy ranks.

Global Innovation Index 2024



Germany

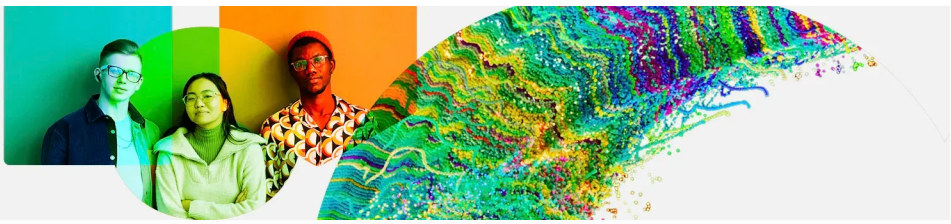
GII 2024 rank **9**

Output rank	Input rank	Income	Region	Population (mn)	GDP, PPP$ (bn)	GDP per capita, PPP$
6	13	High	EUR	84.5	5,538	66,037.8

	Score / Value	Rank	
Institutions	**73.5**	**19**	
1.1 Institutional environment	**78.5**	**20**	
1.1.1 Operational stability for businesses*	79.3	24	
1.1.2 Government effectiveness*	77.7	21	
1.2 Regulatory environment	**84.8**	**13**	
1.2.1 Regulatory quality*	81.8	15	
1.2.2 Rule of law*	87.8	14	
1.3 Business environment	**57.3**	**37**	
1.3.1 Policy stability for doing business†	67.1	31	
1.3.2 Entrepreneurship policies and culture†	47.4	33	○
Human capital and research	**61.4**	**5**	●◆
2.1 Education	**62**	**30**	
2.1.1 Expenditure on education, % GDP	4.5	55	○
2.1.2 Government funding/pupil, secondary, % GDP/cap	26.4	16	
2.1.3 School life expectancy, years	17.3	18	
2.1.4 PISA scales in reading, maths and science	482.3	23	
2.1.5 Pupil–teacher ratio, secondary	11.4	44	
2.2 Tertiary education	**53.9**	**9**	
2.2.1 Tertiary enrolment, % gross	75.7	29	
2.2.2 Graduates in science and engineering, %	35.1	7	●◆
2.2.3 Tertiary inbound mobility, %	11.2	22	
2.3 Research and development (R&D)	**68.4**	**7**	●◆
2.3.1 Researchers, FTE/mn pop.	5,824.6	12	
2.3.2 Gross expenditure on R&D, % GDP	3.1	9	
2.3.3 Global corporate R&D investors, top 3, mn USD	90.5	3	●◆
2.3.4 QS university ranking, top 3*	72.4	11	
Infrastructure	**52.9**	**27**	
3.1 Information and communication technologies (ICTs)	**81.6**	**41**	◇
3.1.1 ICT access*	97.5	32	
3.1.2 ICT use*	80.2	52	○ ◇
3.1.3 Government's online service*	76.8	44	◇
3.1.4 E-participation*	72.1	32	
3.2 General infrastructure	**49.4**	**18**	
3.2.1 Electricity output, GWh/mn pop.	6,963.3	24	
3.2.2 Logistics performance*	90.9	3	●◆
3.2.3 Gross capital formation, % GDP	24	61	○
3.3 Ecological sustainability	**27.8**	**44**	
3.3.1 GDP/unit of energy use	15.6	25	
3.3.2 Low-carbon energy use, %	22.8	56	○
3.3.3 ISO 14001 environment/bn PPP$ GDP	2.7	36	
Market sophistication	**56.4**	**13**	
4.1 Credit	**46.7**	**28**	
4.1.1 Finance for startups and scaleups†	64	20	
4.1.2 Domestic credit to private sector, % GDP	83.4	35	
4.1.3 Loans from microfinance institutions, % GDP	n/a	n/a	
4.2 Investment	**27.2**	**30**	
4.2.1 Market capitalization, % GDP	54.5	34	○
4.2.2 Venture capital (VC) investors, deals/bn PPP$ GDP	0.3	26	
4.2.3 VC recipients, deals/bn PPP$ GDP	0.1	24	
4.2.4 VC received, value, % GDP	0.003	26	
4.3 Trade, diversification and market scale	**95.3**	**2**	●◆
4.3.1 Applied tariff rate, weighted avg., %	1.1	21	
4.3.2 Domestic industry diversification	94.8	19	
4.3.3 Domestic market scale, bn PPP$	5,538	1	●◆

	Score / Value	Rank	
Business sophistication	**55.3**	**18**	
5.1 Knowledge workers	**61.9**	**20**	
5.1.1 Knowledge-intensive employment, %	46.1	20	
5.1.2 Firms offering formal training, %	44.1	26	
5.1.3 GERD performed by business, % GDP	2.1	9	
5.1.4 GERD financed by business, %	62.8	10	
5.1.5 Females employed w/advanced degrees, %	16.1	48	◇
5.2 Innovation linkages	**58.5**	**12**	
5.2.1 Public Research-Industry co-publications, %	6.1	6	●◆
5.2.2 University-industry R&D collaboration†	79.1	15	
5.2.3 State of cluster development†	85	13	
5.2.4 Joint venture/strategic alliance deals/bn PPP$ GDP	0.04	29	◇
5.2.5 Patent families/bn PPP$ GDP	5	8	●◆
5.3 Knowledge absorption	**45.5**	**20**	
5.3.1 Intellectual property payments, % total trade	1.1	32	
5.3.2 High-tech imports, % total trade	12	22	
5.3.3 ICT services imports, % total trade	2.7	19	
5.3.4 FDI net inflows, % GDP	2.5	64	○
5.3.5 Research talent, % in businesses	61.5	12	
Knowledge and technology outputs	**53.9**	**11**	
6.1 Knowledge creation	**57**	**9**	
6.1.1 Patents by origin/bn PPP$ GDP	11.5	6	●◆
6.1.2 PCT patents by origin/bn PPP$ GDP	3.1	11	
6.1.3 Utility models by origin/bn PPP$ GDP	1	18	
6.1.4 Scientific and technical articles/bn PPP$ GDP	18.9	36	
6.1.5 Citable documents H-index	87.3	3	●◆
6.2 Knowledge impact	**50.6**	**11**	
6.2.1 Labor productivity growth, %	-0.1	97	○
6.2.2 Unicorn valuation, % GDP	1.7	23	
6.2.3 Software spending, % GDP	0.5	19	
6.2.4 High-tech manufacturing, %	57.5	5	●◆
6.3 Knowledge diffusion	**54.1**	**10**	
6.3.1 Intellectual property receipts, % total trade	2.7	10	
6.3.2 Production and export complexity	91.8	4	●◆
6.3.3 High-tech exports, % total trade	12.8	13	
6.3.4 ICT services exports, % total trade	2.1	55	○
6.3.5 ISO 9001 quality/bn PPP$ GDP	10.3	26	
Creative outputs	**58.6**	**5**	●◆
7.1 Intangible assets	**68.6**	**5**	●◆
7.1.1 Intangible asset intensity, top 15, %	70.1	16	
7.1.2 Trademarks by origin/bn PPP$ GDP	53.9	28	
7.1.3 Global brand value, top 5,000, % GDP	15.1	8	
7.1.4 Industrial designs by origin/bn PPP$ GDP	8.9	8	◆
7.2 Creative goods and services	**31.9**	**30**	
7.2.1 Cultural and creative services exports, % total trade	1	30	
7.2.2 National feature films/mn pop. 15–69	4	33	○
7.2.3 Entertainment and media market/th pop. 15–69	50.6	12	
7.2.4 Creative goods exports, % total trade	2	26	
7.3 Online creativity	**65.3**	**11**	
7.3.1 Top-level domains (TLDs)/th pop. 15–69	63.1	7	●◆
7.3.2 GitHub commits/mn pop. 15–69	62.6	15	
7.3.3 Mobile app creation/bn PPP$ GDP	70.3	48	

NOTES: ● indicates a strength; ○ a weakness; ◆ an income group strength; ◇ an income group weakness; * an index; † a survey question, ◔ that the economy's data is outdated. Square brackets [ ] indicate the the data minimum coverage (DMC) requirements were not met at the sub-pillar or pillar level; n/a represents missing values; a dash - indicates an indicator which is not relevant to this economy and thus not considered for DMC thresholds.



Data availability

The following tables list indicators that are either missing or outdated for Germany.

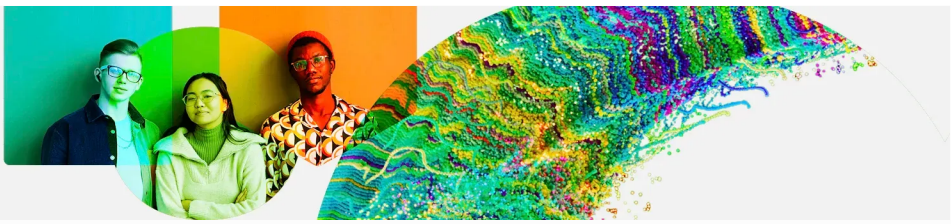
Germany has missing data for one indicator and outdated data for five indicators.

Missing data for Germany

Code	Indicator name	Economy Year	Model Year	Source
4.1.3	Loans from microfinance institutions, % GDP	n/a	2022	International Monetary Fund, Financial Access Survey (FAS)

Outdated data for Germany

Code	Indicator name	Economy Year	Model Year	Source
2.1.3	School life expectancy, years	2021	2022	UNESCO Institute for Statistics
2.1.5	Pupil–teacher ratio, secondary	2021	2022	UNESCO Institute for Statistics
2.2.1	Tertiary enrolment, % gross	2021	2022	UNESCO Institute for Statistics
2.2.3	Tertiary inbound mobility, %	2021	2022	UNESCO Institute for Statistics
5.1.2	Firms offering formal training, %	2021	2023	World Bank Enterprise Surveys



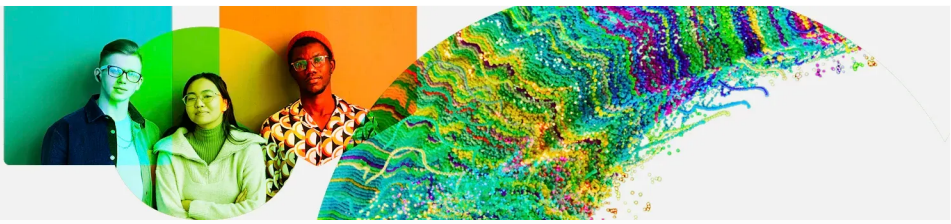
Top science and technology clusters in Germany

Germany has 8 clusters in the top 100 S&T clusters of the Global Innovation Index, 1 less than in 2023.

The table and map below give an overview of the top science and technology clusters in Germany.

Rank	Cluster name	Top patent field	Top academic subject
22	Munich	Transport	Physics
27	Cologne	Basic materials chemistry	Chemistry
29	Stuttgart	Electrical machinery, apparatus, energy	Chemistry
43	Frankfurt am Main	Medical technology	Physics
45	Berlin	Medical technology	Chemistry

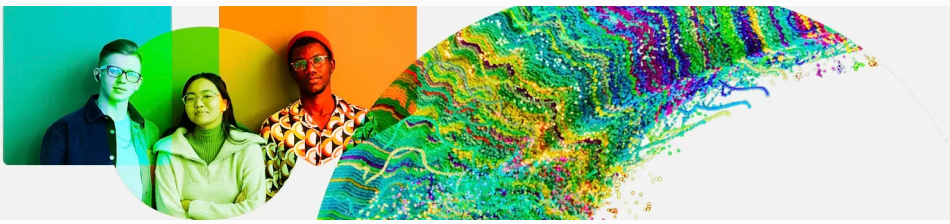
Global Innovation Index 2024



The table and map below give an overview of the top science and technology clusters by intensity in Germany.

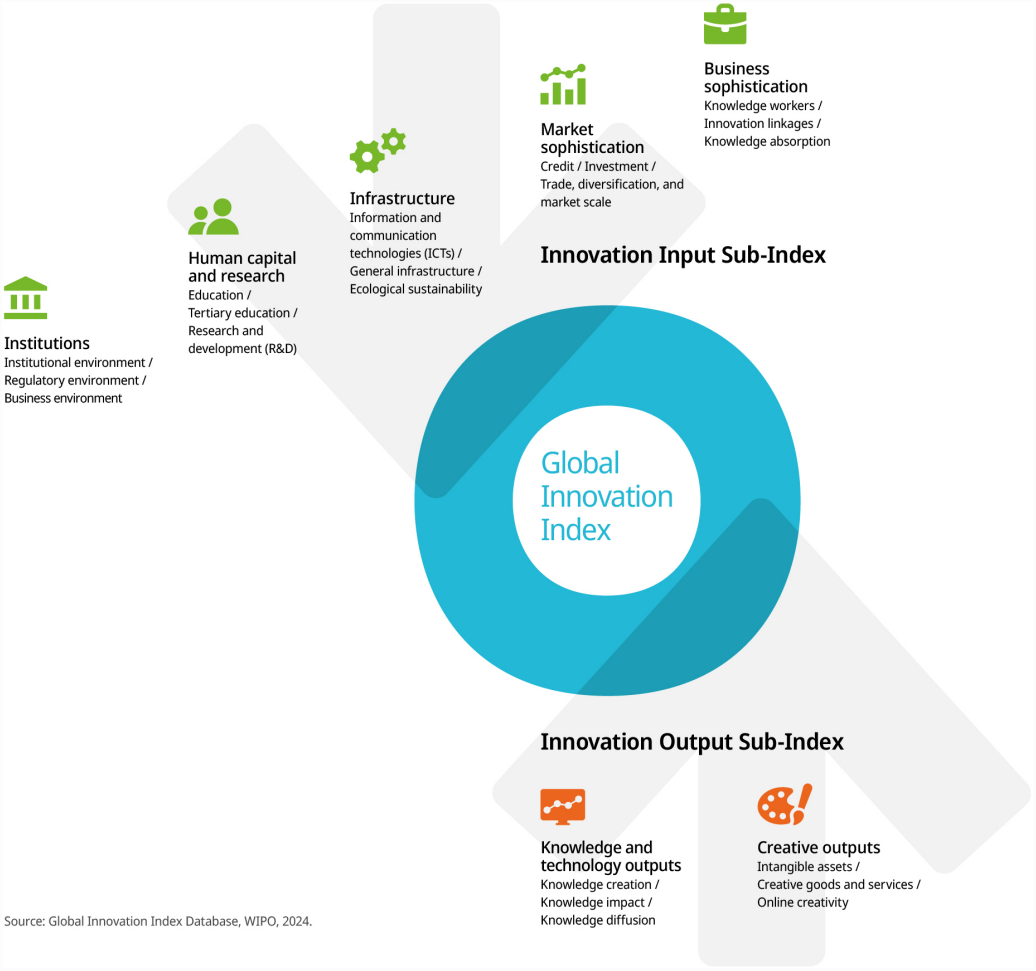
Rank	Cluster name	Top patent field	Top academic subject
10	Munich	Transport	Physics
19	Basel	Pharmaceuticals	Chemistry
20	Stuttgart	Electrical machinery, apparatus, energy	Chemistry
21	Nuremberg–Erlangen	Electrical machinery, apparatus, energy	Chemistry
28	Heidelberg–Mannheim	Basic materials chemistry	Oncology

Global Innovation Index 2024



About the Global Innovation Index

- The Global Innovation Index (GII) is published by the World Intellectual Property Organization (WIPO), a specialized agency of the United Nations.
- Recognizing that innovation is a key driver of economic development, the GII aims to provide an innovation ranking and rich analysis referencing around 130 economies. Over the last decade, the GII has established itself as both a leading reference on innovation and a "tool for action" for economies that incorporate the GII into their innovation agendas.



Source: Global Innovation Index Database, WIPO, 2024.

The Index is a ranking of the innovation capabilities and results of world economies. It measures innovation based on criteria that include institutions, human capital and research, infrastructure, credit, investment, linkages; the creation, absorption and diffusion of knowledge; and creative outputs.

The GII has two sub-indices: the Innovation Input Sub-Index and the Innovation Output Sub-Index, and seven pillars, each consisting of three sub-pillars.