Surveying Transformed: Attracting and Educating the Next Generation in a Global Context

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Key words: surveying, workforce development, education, recruitment, demographic change, international comparison, dual study programmes, civil service training, foreign qualification recognition

SUMMARY

The challenges posed by demographic change and the shortage of skilled professionals are not limited to Germany but represent a global phenomenon. At the same time, the importance of surveying in everyday life remains largely unknown to the general public. Many students fail to associate everyday applications—such as navigation systems—with geodetic science. As a result, demographic trends and the growing skills gap are causing serious concerns regarding the future workforce in the surveying field.

Due to Germany's federal structure, official surveying and mapping services are the responsibility of the individual federal states. While there are several regional initiatives aimed at promoting young talent, these efforts are often limited to specific communication channels. The transition from digital outreach to real-world engagement has not yet been fully achieved.

By contrast, countries such as Australia, the United Kingdom, and the United States have been actively promoting surveying-related professions for many years. In these countries, surveying is frequently linked with contemporary themes such as digitalization, sustainability, climate protection, and smart cities. These examples demonstrate that strong, cross-media brand communication is essential for enhancing the visibility and attractiveness of surveying as a career choice—an approach that could also serve as a model for a nationwide recruitment campaign in Germany.

Beyond targeted recruitment, education and training pathways must also be designed to attract new talent. Many countries have adopted flexible academic and vocational models that combine theoretical education with practical experience. Dual study programmes or cooperative education schemes, such as those commonly found in Canada and the Netherlands, provide students with financial security and early connections to potential employers. International cooperation between universities is also becoming increasingly important, allowing students to gain intercultural experience and exposure to global developments in surveying.

In Germany, alongside traditional vocational training in geoinformation technology or university-based surveying studies, combined education models—such as dual study programmes—have become well established. Another attractive option is the combination of

academic study with civil service training, which offers students financial remuneration during their studies and, upon completion, a secure position within public administration.

A further key component of sustainable workforce development is the integration of foreign surveyors into the German labour market. Addressing the different barriers through transparent procedures, targeted support, and international cooperation is essential to strengthening the future of surveying in Germany and ensuring its continued contribution to society in an increasingly globalized world.

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The Demographic Time Bomb: Why Surveying Faces an Urgent Workforce Crisis

Approximately half of Germany's population is currently older than 45 years, and around one fifth is older than 66 years. At the same time, the age structure of the population has slightly rejuvenated over the past decade due to increased immigration and a temporarily higher birth rate. Since 2010, the number of people migrating to Germany has consistently exceeded the number of those leaving the country. This positive net migration balance was particularly pronounced among younger and middle-aged cohorts and contributed significantly to a comparatively younger population structure. In addition, rising birth rates during the first half of the 2010s led to an increase in the number of young people.

However, since 2017 birth numbers have initially declined slightly and, from 2022 onwards, more markedly. This downward trend counteracts the rejuvenating effects of migration and earlier birth-rate increases and, in the long term, intensifies the challenges associated with demographic change (Source: Destatis, accessed 3 January 2025).

As an example in the surveying word, a similar age structure can be observed within the field of geodesy. As of 1st April 2025, the average age of actively practicing publicly appointed surveyors (ÖbVI) was 57.6 years, indicating a pronounced ageing of the profession. Both the total membership and the group of actively practicing publicly appointed surveyors are thus significantly older than the average age of the general workforce.

DURCHSCHNITTSALTER

	01.03.24	01.04.25
Alle Mitglieder	60,9 Jahre	60,1 Jahre
Aktive ÖbVI	57,6 Jahre	57,6 Jahre

Figure 1. Average age of publicly appointed surveyors (Quelle: BDVI 2024/2025)

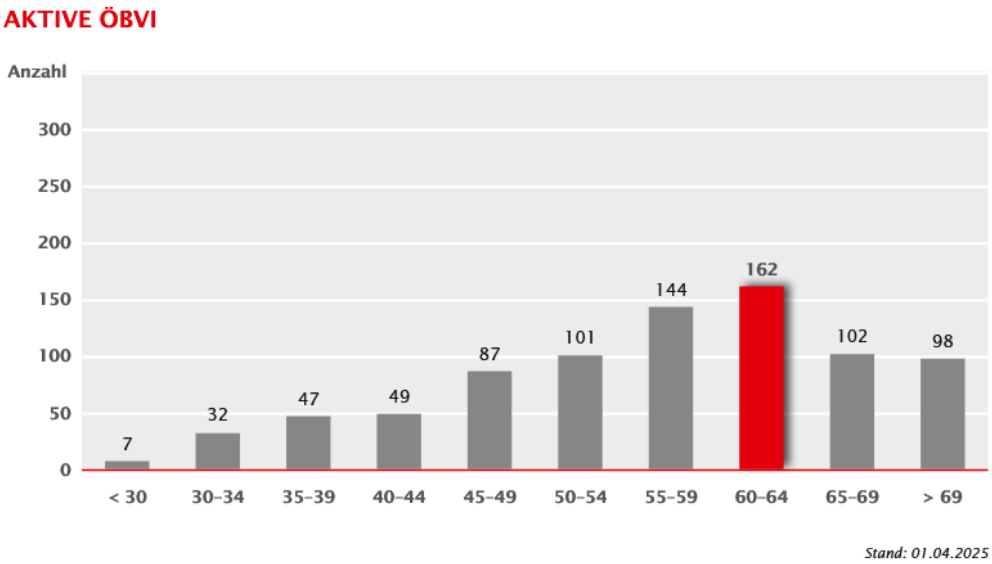


Figure 2. Age pyramide of the publicly appointed surveyors (Quelle: BDVI 2024/2025)

The professional group of publicly appointed surveyors (ÖbVI) in Germany exhibits a distinctly ageing demographic structure, reflected both in the high average age of practitioners and in the age distribution of actively practicing professionals. Statistical data indicate that early-career representation—particularly within the under-30 age group—is critically low, resulting in a substantial gap in generational renewal. Although Germany's overall population has experienced slight rejuvenation effects over the past decade—primarily driven by sustained net migration gains among younger and middle-aged cohorts and a temporary increase in birth rates during the first half of the 2010s—these developments have not yet translated into a structural renewal of the geodetic labour market. The strong concentration of professionals within the 55 to 64 age cohorts highlights a significant age-related replacement demand that is expected to intensify over the next 5 to 15 years.

A similar situation can be observed among surveying professionals more broadly (Figure 3). Despite a slight increase in the number of younger employees, the profession continues to be dominated by older age groups, while the core working-age cohort is declining. The rising number of professionals under the age of 24 suggests a modest positive trend in recruitment; however, this increase is insufficient to offset the structural ageing of the geodetic workforce. The growing proportion of professionals aged 55 and above further underscores the escalating replacement demand in the coming years, particularly as the largest active cohort is already located within the 55+ age range.

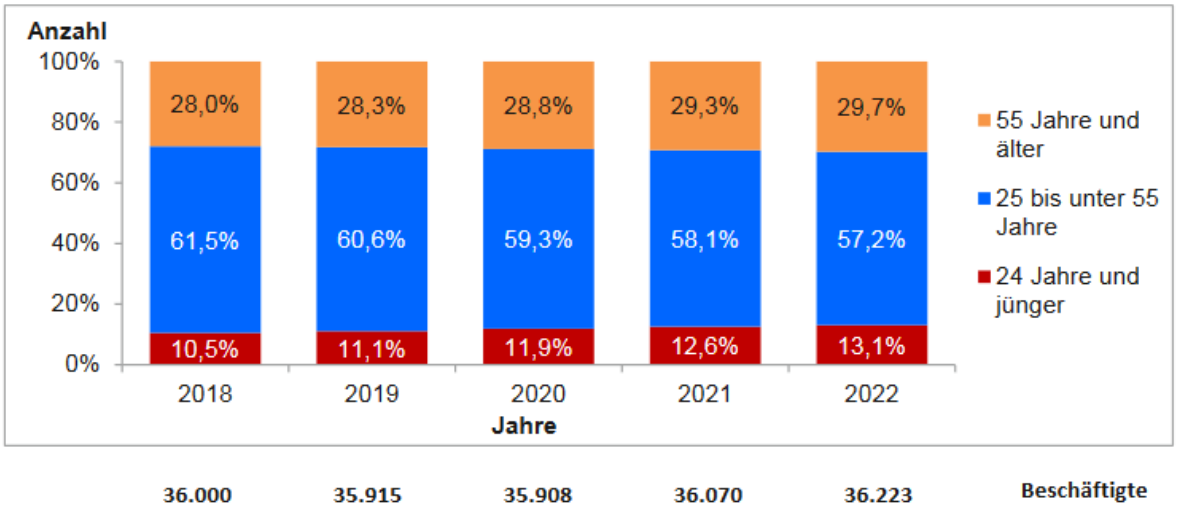


Figure 3. Age structure of the employees in the surveying world in Germany (Quelle: Federal Employment Agency (Bundesagentur für Arbeit), occupational group 312 Surveying and Cartography; Destatis – Federal Statistical Office of Germany; own calculations.)

In a global comparison, it becomes evident that Germany—despite experiencing slight demographic rejuvenation effects over the past decade due to increased immigration and a temporary rise in birth rates—has so far reflected these impulses within the geodetic labour market only with delay and to a quantitatively limited extent. Many countries respond to comparable developments earlier and more strategically by positioning the geodetic profession with strong public visibility, systematically integrating geodetic and spatial competencies into school-based STEM education, and establishing internationally standardised and efficient recognition procedures for foreign educational qualifications.

The available data on the age structure of employees in surveying and cartography support this assessment and simultaneously highlight the growing generational replacement demand expected in the coming years. Against this backdrop, it becomes clear that consolidating existing recruitment initiatives into a nationwide, cross-channel and cross-media workforce and image campaign, as well as the targeted integration of internationally trained surveying professionals, does not represent optional supplementary measures but rather constitutes a strategic necessity. These actions are essential to securing the long-term workforce base and sustaining the performance capacity of both public and private surveying services within an increasingly globalised, digitalised, and societally relevant geodetic environment.

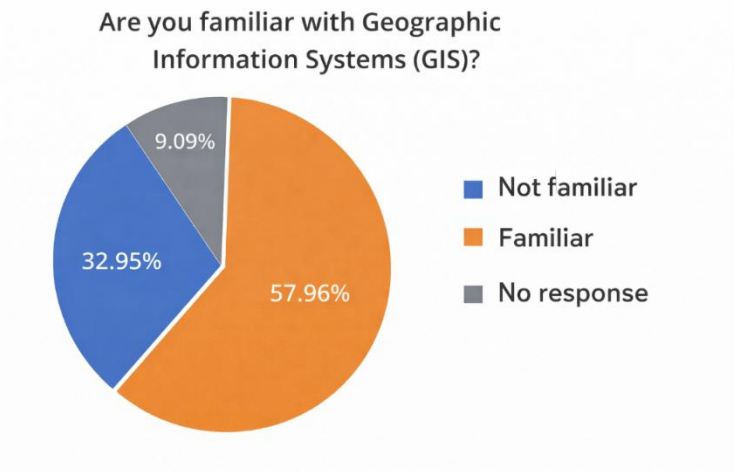
Invisible but Indispensable: Why Society Hardly Notices Surveying

Several academic publications and professional position papers emphasise that the services and applications of geodesy are often perceived as self-evident within society, resulting in limited awareness of the underlying technologies and professional fields. The German Association of Cities (Deutscher Städtetag) and its expert committees, for example, point out that the tasks of

geoinformation, surveying, and land management are frequently not recognised by the public, despite being indispensable for municipal infrastructure and public services (Deutscher Städtetag, 2019). This suggests that fundamental geodetic applications—such as the provision of precise geospatial data or spatial decision support—largely remain unnoticed outside specialist circles, a circumstance that further complicates the recruitment of young professionals.

An exploratory study on the awareness and perceived relevance of Geographic Information Systems (GIS) among professionals in the construction industry (general contractors) in the United States supports this assessment. Based on a quantitative survey, the study shows that a substantial proportion of respondents reported either being unfamiliar with GIS or having insufficient understanding of its relevance, despite its widespread application in planning and construction processes.

Figure 4. General Contractors' familiarity with GIS as a geospatial technology (Arendt et al. (2019))



Corresponding career-profile brochures from the geodetic professional environment likewise indicate a clear need for targeted information in order to familiarise pupils and students with the field of geodesy in the first place. Such publications explicitly note that many pupils have little or no understanding of the diverse professional activities within geodesy, making effective career orientation difficult to initiate (DVW NRW, 2020). These statements from professional associations and representatives highlight that even the basic awareness of the technical and scientific core of geodesy remains low among prospective students, which in turn negatively affects subsequent study and career choices.

Another key factor contributing to the limited public perception of geodesy is the integration of geodetic content within school education. Research on the use of spatial technologies such as remote sensing or Geographic Information Systems (GIS) in classroom teaching demonstrates that, although these topics offer high didactic value, they are not yet systematically embedded in many school curricula worldwide. As a result, students have few opportunities to develop a deeper understanding of spatial processes or geodetic methods (Kholoshyn et al., 2019; Kholoshyn et al., 2022). These analyses indicate that the lack of early and structured integration of geodesy-related content within education systems constitutes a significant factor contributing to the low level of public awareness of the discipline.

An international example further demonstrates that even the widespread use of technologies such as virtual globes (e.g. Google Earth) does not automatically result in a deeper understanding of geodetic concepts. Users tend to engage with such applications in a predominantly superficial manner, without actively perceiving or applying spatial thinking or geodetic principles (Schöning et al., 2019). This finding supports the assertion that the mere availability of geodetic applications is not synonymous with societal awareness or understanding of geodesy. Instead, targeted information and educational initiatives are required to foster sustained awareness, comprehension, and acceptance of geodetic principles and their relevance.

Federal Diversity, Fragmented Visibility: Surveying in Germany's Federal System

The official surveying and mapping system in Germany is decentralised as a result of the federal structure and falls within the responsibility of the individual federal states. Each state maintains its own administrative structures as well as distinct surveying, cadastral, and geoinformation legislation. While this heterogeneity allows regional requirements to be addressed appropriately, it simultaneously leads to a highly fragmented system landscape within a unified professional field of geodesy.

The recruitment of young professionals is likewise largely organised at the state level, resulting in considerable variation in the orientation, reach, and methods of recruitment strategies. Whereas some federal states implement practice-oriented school activities and career fair formats, others focus primarily on digital or selective measures. To date, a systematic nationwide exchange of knowledge and a cross-media, coordinated professional and image campaign exist only to a limited extent.

This decentralisation generates challenges in terms of efficiency and visibility. Recruitment approaches are frequently developed in parallel rather than building on existing experiences from other states, resulting in repeated reinvention of similar solutions. Consequently, resources are used inefficiently, economies of scale are not realised, and national recognition of the profession remains limited. From a strategic perspective, it is therefore increasingly evident that stronger nationwide consolidation of campaigns, best practices, and transfer structures is required in order to secure the long-term geodetic workforce—without calling into question the legislative sovereignty of the federal states.

In response to the shortage of skilled professionals and the low public awareness of the profession, several state-specific and nationwide recruitment initiatives have already been established. The social media campaign "Weltvermesserer", initiated by the InteressenGemeinschaft Geodäsie (IGG)—a joint initiative of the professional associations DVW, VDV, and BDVI—aims to attract young

Figure 6. Logo of the champagne Geodäsie.NRW from
Figure 7. Logo of the champagne Geodäsie Sachsen

people aged approximately 14 to 19 through Instagram and other platforms by providing authentic insights into the diversity of geodetic professions using images, videos, and personal stories. At the federal state level, regional initiatives such as geodäsie.nrw focus on strengthening the geodesy brand in North Rhine-Westphalia through information stands at student fairs, the integration of geodetic topics in schools, and experiential formats such as the "Geodesy Experience Day." In Saxony, the portal "Geodäsie Sachsen – Die Zukunft vermessen" was established as a digital recruitment platform offering pupils, students, and prospective professionals detailed information on education and study pathways as well as practical insights through hands-on activities and trade fair appearances.

Another initiative with nationwide scope is the "Day of Geodesy", which has been held regularly since 2016 and aims to raise public awareness of geodesy and geomatics by presenting professional fields, tasks, and study options, with a particular focus on attracting pupils and students. Complementing this, the joint information platform "Arbeitsplatz Erde" serves as a central digital hub providing comprehensive information on career profiles, training routes, and academic programmes in geodesy and related fields. Despite the diversity of these initiatives, initial findings from cross-state surveys indicate that systematic evaluation of individual measures is still lacking, further highlighting the need for stronger coordination and nationwide consolidation of recruitment activities.

International Best Practices in Surveying Outreach

By contrast, Australia, the United Kingdom, and the United States have been actively promoting surveying and geospatial professions for many years through coordinated, target-group-oriented outreach strategies. A common feature across these countries is the deliberate positioning of surveying as a future-oriented profession closely linked to digital transformation, sustainability, climate resilience, and smart urban development. Rather than presenting surveying solely as a technical discipline, outreach campaigns emphasize its societal relevance and its contribution to solving global challenges, thereby increasing its appeal to younger generations.

In the United Kingdom, several professional bodies and industry organizations run long-term school-oriented initiatives aimed at introducing surveying at an early age. Campaigns such as *"Get Kids into Survey"* focus on primary and lower secondary school pupils and use age-appropriate formats including illustrated learning materials, interactive workshops, and simplified explanations of surveying tasks. Coloring books, classroom toolkits, and teacher resources are used to familiarize children with basic spatial concepts and to associate surveying with creativity, problem-solving, and real-world impact. This early exposure strategy is intended to counteract stereotypical or outdated perceptions of the profession before career choices are formed.

Figure 8. Logo of the champagne Get Kids into Survey

Similarly, Australia places strong emphasis on early engagement and visibility. National and regional initiatives

promote surveying through school visits, open days, and hands-on activities that allow pupils to experience modern surveying technologies such as GNSS, drones, and 3D mapping. Campaigns often frame surveying as a key profession for sustainable land management, infrastructure development, and environmental monitoring. By embedding surveying topics within broader STEM education programmes, Australian initiatives ensure that geospatial skills are perceived as an integral part of future-oriented technical education rather than as a niche specialization.

In the United States, awareness-building efforts are frequently coordinated through national campaigns such as *Geospatial Awareness Weeks* and outreach programmes led by professional associations and universities. These initiatives target not only students but also teachers, parents, and career counselors, recognizing their influence on educational pathways. Educational materials, short videos, social media campaigns, and project-based school modules highlight how surveying underpins everyday technologies such as navigation, disaster response, and smart infrastructure. The use of cross-media communication ensures consistent messaging across digital platforms, schools, and public events.

Taken together, these international examples demonstrate that successful recruitment into surveying relies on long-term, multi-level communication strategies rather than isolated measures. Early engagement in schools, child-friendly educational materials, strong links to societal challenges, and consistent cross-media branding significantly enhance the visibility and attractiveness of surveying professions. These approaches provide valuable reference models for Germany, where a nationwide, coordinated recruitment strategy could build on similar principles while adapting them to the federal education and administrative context.

Many Pathways, One Profession: Dual Surveying Education Across Federal States

A particularly illustrative example of the close integration of vocational training and academic qualification is the Cooperative Engineering Education (KIA) in surveying. In Germany, this study model is currently offered formally only at Bochum University of Applied Sciences in Nordrhein-Westphalen, where it is embedded in the Bachelor's degree programme in surveying (Bochum University of Applied Sciences, 2024). The KIA combines company-based vocational training—such as qualification as a surveying technician or geomatics specialist—with a parallel engineering-oriented academic programme, which is typically completed over a period of approximately nine semesters. Graduates obtain both a recognised vocational qualification and the academic degree of Bachelor of Engineering (Bochum University of Applied Sciences, 2014). Although the academic structure of the KIA programme is centrally organised in Bochum, training companies and public authorities from various federal states participate as cooperation partners, allowing the practical training component to be carried out on a regional basis (Bochum University of Applied Sciences, 2024). While other universities in Germany offer regular degree programmes in geodesy or geomatics, none currently provide a comparable, formally established KIA structure in the field of surveying (DVW, 2023). Consequently, Bochum University of Applied Sciences currently occupies a distinctive position

in implementing this integrative education model, which holds considerable potential for the long-term securing of skilled professionals in both public and private surveying sectors.

Comparable cooperative and integrated education models to the Cooperative Engineering Education (KIA) also exist in other fields and therefore do not represent a unique feature of geodesy. In particular, classical engineering disciplines such as mechanical engineering, electrical engineering, or civil engineering have long established training-integrated or practice-integrated dual study programmes that combine a recognised vocational qualification with a Bachelor's degree and provide continuous financial remuneration (Wissenschaftsrat, 2013; BIBB, 2022). These models are primarily designed to secure skilled labour for industry and are characterised by a close linkage between practical training in companies and academic education.

Similar structures are also widespread in computer science and related IT professions, for example through the combination of vocational training as an IT specialist with a subsequent or parallel university degree. Such programmes are regarded as effective instruments for recruiting young professionals and for establishing early ties between students and employers (BIBB, 2022). In contrast to geodesy, however, these education pathways generally lack a connection to sovereign tasks or to subsequent civil service careers, resulting in a significantly lower degree of institutional integration into public administration (Federal Ministry of the Interior, 2020).

A closer structural resemblance can be found in career-integrated degree programmes within the public service, such as those in general administration, financial authorities, or the police. These programmes combine academic study with practical training, provide trainee remuneration, and offer a clear perspective on permanent employment in the public sector (BMI, 2020). The distinctive feature of geodesy lies in its combination of engineering qualifications with legal and sovereign responsibilities. Against this background, the KIA in surveying does not represent a singular phenomenon but rather a particularly well-adapted form of cooperative education for a profession situated at the interface of technology, law, and public responsibility.

In addition to the Cooperative Engineering Education (KIA), several other dual and combined study programmes in geodesy and surveying exist in Germany, reflecting the federal organisation of education and public service career systems. One prominent model is the combination of academic study and civil service career training implemented in Rhineland-Palatinate, where surveying students are trained in cooperation with Mainz University of Applied Sciences. This programme integrates a geodesy degree with structured training for the upper-level technical civil service. A similar model has been adopted by North Rhine-Westphalia, largely based on the Rhineland-Palatinate approach. However, a key difference lies in the legal status of the trainees: while students in North Rhine-Westphalia are appointed as civil servants on probation (Beamte auf Widerruf) from the beginning of their training, participants in Rhineland-Palatinate are employed under private-law training contracts during the qualification phase. Despite these differences, both models aim to secure long-term

professional staff for public surveying authorities through early institutional binding (Hochschule Mainz, 2024; Ministry of the Interior NRW, 2023).

Other federal states apply alternative dual or sequential qualification models in geodesy. In Bavaria, a classical dual study programme in surveying is offered, characterised by alternating academic study phases and practical placements within public authorities or engineering offices. In contrast, Hesse and Lower Saxony implement a sequential combination model, in which students first complete a recognised vocational qualification—typically as a surveying technician or geomatics specialist—before progressing to a Bachelor's degree in geodesy or surveying. The total duration of this pathway is usually around five years, with approximately the first two years dedicated to vocational training followed by academic study. These models offer strong practical grounding and financial stability but require a high level of coordination between vocational training providers, universities, and public employers. Overall, the diversity of dual study models illustrates both the strong commitment of German federal states to workforce development in geodesy and the challenge of achieving transparency and comparability across the national education landscape (Bayerisches Staatsministerium der Finanzen, 2023; LGL Niedersachsen, 2024; Hessisches Ministerium des Innern, 2023).

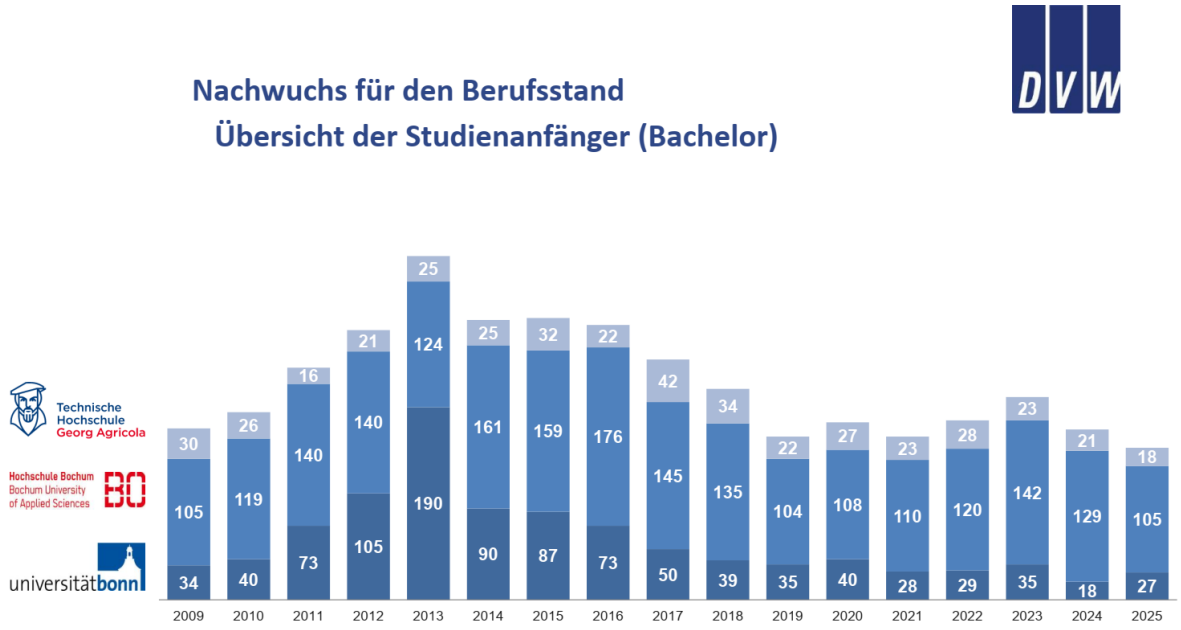


Figure 9. The number of Bachelor entrants three German universities (Quelle: DVW, Jerome Dutell 2026)

Figure 10. The number of Bachelor graduates in three German universities (Quelle: DVW, Jerome Dutell 2026)

The two figures illustrate the development of Bachelor-level student enrolments and graduates in geodesy-related programmes in Germany since 2012, with a particular focus on the contribution of Bochum University of Applied Sciences in comparison to other university locations. The data, provided by Jerome Dutell, Head of Working Group 1 of the DVW, offer valuable insight into long-term trends in academic recruitment and graduate output within the geodetic education landscape.

The first graph, depicting Bachelor programme entrants, further underlines the attractiveness of the Bochum study location. Particularly during periods in which overall enrolment numbers at other institutions declined, Bochum continued to attract a significant number of first-year students. This resilience suggests that the study programme in Bochum benefits from a strong regional and national reputation, effective recruitment strategies, and a clear professional profile. The long-term data also indicate that Bochum has played a stabilising role within the German geodetic education system, compensating in part for declining enrolments at other locations.

The second graph, showing the number of Bachelor graduates, demonstrates that Bochum has consistently contributed a substantial share of graduates to the overall output of geodetic degree programmes. Despite fluctuations in total graduate numbers over time—reflecting broader demographic trends and varying cohort sizes—the number of graduates from Bochum remains comparatively stable and, in several years, among the highest of all represented institutions. This indicates not only sustained student demand but also a comparatively high completion rate, which can be interpreted as a sign of programme quality, student support structures, and successful integration of academic and practical components.

Taken together, both figures demonstrate that Bochum University of Applied Sciences occupies a central and structurally important position in the education of future geodetic professionals in Germany. The consistently high numbers of entrants and graduates support the assessment that Bochum offers an attractive and practice-oriented academic environment. In combination with integrative training models such as the Cooperative Engineering Education (KIA) and close cooperation with public authorities and industry partners, the data underline the relevance of Bochum as a key pillar for the long-term recruitment and qualification of geodetic professionals in Germany.

Dual Models Beyond Germany

Internationally, various models exist within surveying and geodesy degree programmes that combine academic education with practical training. These programmes pursue objectives similar to those of the German Cooperative Engineering Education (KIA), particularly with regard to employability and early professional integration. However, they differ considerably in their structural design, legal depth, and degree of institutional embedding.

In Austria and Switzerland, surveying and geoinformation programmes are predominantly offered by universities of applied sciences and are strongly practice-oriented. Students typically complete practice-integrated Bachelor's programmes, combining academic coursework with parallel or block-based employment in surveying offices, engineering companies, or public authorities. In Switzerland, in particular, the combination of paid employment and part-time study at a university of applied sciences is well established. Unlike the German KIA model, however, these programmes do not include a formally recognised vocational qualification; practical training is considered an integral component of the academic curriculum rather than a separate professional certification (FHNW, 2023; TU Wien, 2024).

In Canada and the United States, Co-operative Education (Co-op) programmes are widely established in surveying, geomatics, and geospatial engineering. These degree programmes integrate multiple extended, paid work placements within companies or public agencies into the course of study. Students alternate between academic study and professional practice but do not obtain an additional vocational qualification. While these programmes are strongly labour-market oriented and promote early professional experience, they are considerably less regulated than the German dual education system. Direct links to sovereign tasks or formal public-service career pathways are generally absent (ABET, 2023; University of Calgary, 2024).

In the Netherlands and Scandinavian countries such as Sweden and Finland, surveying and geospatial degree programmes are primarily project- and practice-based. Students are involved at an early stage in real-world surveying and geodata projects in cooperation with public authorities or private-sector partners. These models strengthen applied competencies and problem-solving skills but do not replace structured dual education systems. Formal linkages between academic degrees, professional certification, and subsequent state-authorised practice are generally lacking (University of Twente, 2023; KTH Royal Institute of Technology, 2024).

In comparison, the KIA surveying programme in Germany occupies a distinctive position. It combines a recognised vocational qualification, an engineering-oriented university degree, and—depending on the employer—access to sovereign tasks and public-service career pathways within a single, formally regulated framework. This level of institutional and legal integration is relatively uncommon internationally in surveying education. While many countries rely on practice-integrated study models, the German KIA provides a particularly structured instrument for long-term workforce development in a highly regulated professional field.

Surveying Without Borders: Mobility and International Academic Cooperation

International cooperation between universities is becoming increasingly important in surveying and geospatial education, as it enables students to gain intercultural competence and first-hand exposure to global professional standards, technologies, and regulatory frameworks. In Europe, structured mobility is strongly supported through programmes such as Erasmus+, which facilitates student and staff exchanges, joint curricula, and international internships. Within surveying and geomatics, Erasmus+ has enabled long-standing partnerships between universities, harmonisation of curricula, and the development of double-degree and joint-degree programmes. These exchanges contribute not only to academic enrichment but also to a shared European understanding of geodetic reference systems, land administration, and spatial data infrastructures.

Outside Europe, comparable—though less centralised—mobility frameworks exist. In North America, international exchange is commonly organised through bilateral university agreements, co-operative education programmes, and international internships embedded in surveying or geomatics degrees. Universities in the United States and Canada often combine academic exchange with paid industry placements, allowing students to gain professional experience alongside their studies. In Asia, regional initiatives such as the ASEAN International Mobility for Students (AIMS) programme and bilateral schemes between East Asian universities promote student exchange in engineering and geospatial disciplines, while Japan and South Korea support targeted inbound and outbound mobility through government-funded scholarship programmes. In Oceania, Australia's New Colombo Plan plays a role similar to Erasmus+ by funding study and internship stays for Australian students in the Indo-Pacific region, including in surveying and geospatial sciences.

Taken together, these international mobility schemes demonstrate that surveying education is increasingly embedded in a global academic network. While the degree of institutionalisation varies by region, all

models share the objective of strengthening practical skills, cultural awareness, and international employability. For Germany, expanding participation in such global exchange frameworks—beyond Europe—offers an opportunity to further internationalise surveying education, enhance the attractiveness of study programmes, and position geodesy as a globally connected profession.

Opening the Door: Why International Surveyors Matter for Germany

Against the backdrop of demographic ageing and declining domestic recruitment, the integration of foreign-trained surveyors represents a further key component of sustainable workforce development in Germany. International mobility of skilled professionals has become an essential mechanism for maintaining the operational capacity of technical professions, particularly in highly specialised fields such as geodesy and surveying. Given the increasingly global nature of geodetic reference systems, satellite-based positioning, and geospatial data infrastructures, the professional competencies of internationally trained surveyors are, in principle, highly transferable. However, translating this potential into effective labour market integration requires targeted institutional, educational, and regulatory support.

In this context, dual and cooperative study programmes offer a particularly attractive entry pathway for international students and early-career professionals. From an international perspective, dual study models combine several advantages that are rarely available in such a structured form elsewhere: early and continuous integration into the labour market, practical work experience aligned with academic study, and financial security through remuneration during the qualification phase. For foreign students, this model significantly reduces economic barriers to studying in Germany and facilitates early immersion in professional, administrative, and cultural contexts. Moreover, dual study programmes support the acquisition of occupation-specific language skills and provide direct exposure to German technical standards, legal frameworks, and workplace practices—key factors for successful long-term integration (DAAD, 2023; BIBB, 2022).

Beyond individual benefits, dual study programmes also create advantages for employers and public authorities by enabling early talent identification and long-term workforce retention. International students who complete a dual or cooperative degree are already familiar with organisational structures, professional regulations, and local administrative procedures upon graduation, reducing onboarding time and increasing retention likelihood. International experience shows that structured work-study pathways are particularly effective in retaining foreign graduates within the host country's labour market (OECD, 2023). Consequently, expanding access to dual study programmes for international participants—combined with transparent admission criteria, recognition pathways, and targeted language support—represents a strategic lever for Germany to strengthen the geodetic workforce and ensure the continued delivery of surveying services in an increasingly globalised environment.

Conclusion

The analysis demonstrates that, despite significant demographic and structural challenges, a major strength of the surveying profession in Germany lies in the diversity of existing recruitment strategies and education pathways. The broad spectrum of outreach initiatives, dual and cooperative study models, and career-entry routes reflects a high degree of flexibility within the geodetic community. Rather than relying on a single, uniform pathway, surveying in Germany offers multiple points of entry tailored to different talents, life situations, and professional aspirations. This diversity increases the likelihood that individuals with varying backgrounds—whether practice-oriented, academically focused, nationally or internationally educated—can identify a suitable and attractive place within the geodetic profession.

At the same time, this plurality of approaches reveals a structural weakness: the lack of a central coordinating framework for recruitment and public outreach. Currently, many initiatives are developed in parallel at federal, state, and institutional levels, leading to duplicated efforts, fragmented messaging, and inefficient use of limited resources. Establishing a central national coordination body for recruitment and public communication would allow existing initiatives to be bundled, aligned, and amplified without undermining federal responsibilities. Such a structure could provide shared communication materials, coordinated campaigns, and systematic evaluation of recruitment measures, ensuring that resources are invested once but generate nationwide impact.

In combination, flexibility at the programme level and coordination at the strategic level represent a promising path forward. By embracing the diversity of educational and career models while strengthening national coordination and visibility, surveying in Germany can position itself as an inclusive, efficient, and future-oriented profession—one in which every individual can find a role that aligns with their skills, interests, and ambitions, and in which limited resources are used sustainably to secure the profession's long-term workforce base.

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