

CLIMATE CHANGE, ENERGY AND ENVIRONMENT

# YOUNG ENGINEERS AND THE JUST ENERGY TRANSITION IN NORTH MACEDONIA

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This analysis is a result of the cooperation between the Friedrich-Ebert-Stiftung Skopje Office and The Club of Young Engineers which is a body of the Engineering Institution of Macedonia. The views expressed in this publication do not necessarily reflect the views of the Friedrich-Ebert-Stiftung or the organizations for which the authors work.

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# FOREWORD

In the midst of the energy transition and digital development that embark profound industrial transformation, young engineers play a crucial role in defining the future of the economy. Therefore, it is important to identify the main challenges and needs they face in the labor market of North Macedonia, starting from their educational process to their transition into appropriate jobs. Therefore, the Friedrich-Ebert-Stiftung Skopje Office and the Young Engineers Club, part of the Engineering Institution of Macedonia, have conducted this analysis, revealing important data about the current situation, challenges, and opportunities faced by young engineers in the country.

At a time when the energy transition and the so-called “eldorado” of renewable energy sources are at their peak, young engineers can play a key role in defining its direction. Whether we will have a socially just energy transition that guarantees sustainable development or one that exploits current opportunities for profit is not only a matter of social but also inter-generational justice. Therefore, young people should lead this process.

According to the results of the analysis based on field research and a survey conducted among club members, young engineers bring fresh perspectives, innovative ideas, and technical expertise essential for a successful and socially just energy transition, as well

as for an economy that develops in harmony with social and ecological needs. Therefore, retaining these talents is crucial for economic and sustainable development in general. This requires quality jobs, proper cooperation between educational institutions, the private sector, and decision-makers. In this tripartite dialogue, civil society organizations, trade unions, and organizations representing the rights and needs of young engineers and youth in general are also key to overcoming numerous challenges such as inadequate or insufficient practical training, unsatisfactory employment conditions, limited access to advanced technologies, entrepreneurial opportunities, and general inclusion in various national and local strategies, including the energy strategy, industrial policy, and other relevant documents that should define the direction of future development.

The Friedrich-Ebert-Stiftung Skopje Office strives to promote social justice, inclusiveness, and sustainable development. Support for this analysis is part of our broader strategy to empower young professionals and integrate them into decision-making processes. By identifying obstacles and proposing specific measures to overcome them, the goal is to create an environment that will enable young engineers to realize their potential and contribute to a socially just energy transformation in North Macedonia, as well as to a fairer economy and society in general.

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# ABSTRACT

The urgent global need to transition to sustainable energy systems requires the active participation and action of young engineers who have the potential to drive innovation, implement creative solutions, and lead the way for the future of energy development. Consequently, the purpose of this research is to analyze the perspectives and contributions of young engineers in our country towards the energy transition, based on a survey conducted by the Young Engineers Club. The survey was completed by 105 engineers between the ages of 19 and 32 and aims to draw conclusions about the global picture of some key issues on this topic, such as the reasons for the low interest in technical education, the need to improve practical

work and follow new trends, as well as preferences regarding employment conditions and future opportunities for young engineers. By analyzing the data obtained from the research, conclusions will be drawn about the role of young engineers in catalyzing the energy transition and promoting sustainable development. By understanding the challenges, aspirations, and opportunities facing young engineers, policymakers, educators, and industry stakeholders can devise strategies to harness the talent and potential of this group of intellectuals to accelerate the transition to a more equitable, resilient, and energy-sustainable future.

**Keywords:** *Energy transition, Sustainable development, Technical education, Young engineers*

# 1

## INTRODUCTION

The global energy landscape stands at a pivotal juncture, characterized by a pressing need for transition towards sustainable and renewable sources. In the midst of this paradigm shift, young engineers emerge as pivotal actors, wielding the tools of innovation, ingenuity, and determination to drive this transformation forward. Just like in other countries, in our country as well, where the energy transition holds profound implications for economic development, environmental sustainability, and societal well-being, the role of young engineers takes on heightened significance.

From the first group of questions, the answers to the survey conducted by the Young Engineers Club reveal a sober reality regarding youth disinterest in continuing education in secondary technical schools, which in the future has the potential to result in a deficit of young engineers. Citing reasons such as the poor reputation and inappropriate educational programs of these institutions, respondents alluded to systemic barriers that obstruct the nurturing of technical talent. Solving these challenges is imperative not only for creating a qualified workforce but also for encouraging a culture of innovation and excellence in our educational ecosystem.

The analysis of the responses to the survey also emphasizes the urgent need for the advancement of practical work and keeping pace with the trends developing in engineering education. With 71% of respondents in favor of improving it, it becomes clear that bridging the gap between theory and practice is essential to building young engineers with the skills and competencies required by the fast-evolving industry market.

In addition, the potential of study abroad programs in shaping the career path of young engineers are emphasized. With a convincing 81% believing in the positive benefits of a short study stay in foreign educational institutions, the attraction of international availability becomes a desirable option for gaining experiences and knowledge from advanced countries.

Such experiences not only broaden horizons and foster cross-cultural exchange but also provide valuable skills and perspectives critical to navigating the globalized engineering marketplace.

While young engineers are charting their professional paths, the survey also provides some insight into their views on employment conditions and advancement opportunities. With 88.6% identifying private foreign companies as offering the best employment conditions, and a significant proportion expressing a desire to develop their careers abroad, it becomes apparent that our nation must proactively address the factors driving this outflow of talent.

Against this background, as the ultimate goal of the survey, the multifaceted role of young engineers in leading the energy transition is investigated, examining the challenges they face and the opportunities that would motivate them to devote themselves to this issue. By utilizing the responses received from the survey, a direction is given towards a future where engineering power serves as a catalyst for sustainable development and social progress.

## 2

# ENERGY TRANSITION IN ENERGY COMPANIES

The energy transition is a major topic in today's world, particularly for sectors dependent on oil, gas, and renewable energy resources. To address climate change and reduce greenhouse gas emissions, an increasing number of energy companies are committing to more sustainable practices and adapting their core business to align with these goals. The role of energy companies in influencing this issue and the ways they can leverage technology, software development, and digital transformation to drive the energy transition and achieve a more sustainable future is clear.

## 2.1 THE CURRENT NEED FOR ENERGY TRANSITION

It cannot be denied that climate change is a global problem. Human activities release large amounts of greenhouse gases into the atmosphere, which trap heat and contribute to the warming of the Earth's surface. Rising temperatures, melting ice, rising sea levels, and extreme weather events are just a few examples of the consequences of climate change. In response to the global climate crisis, numerous international agreements and government regulations have been established to promote the transition to cleaner and more sustainable energy sources.

The Paris Agreement, for example, was signed by almost all countries in 2015 and aims to limit global warming to below 2 degrees Celsius above pre-industrial levels. Additionally, many governments have implemented regulations and policies to encourage the adoption of renewable energy sources and the reduction of carbon emissions. However, the energy industry finds itself in a rather contradictory position: is it part of the problem or a key actor in solving it?

The oil and gas industry faces a major strategic challenge: balancing short-term returns with long-term success. Energy companies are integral to today's energy system, but the question now is whether they can help deliver climate solutions that will allow them to continue to thrive in the long term. According to

a recent report by the International Energy Agency (IEA), oil and gas companies need to take necessary steps to ensure they contribute to reducing greenhouse gases, which necessarily includes investing in the development of low-carbon technologies.

Globally, investments by oil and gas companies outside their core business areas are less than 1%, while solar and wind energy have the highest costs. Despite the potential returns of sustainable technologies, overall investment in sustainable energy ventures remains low. Consequently, a significant change in the allocation of capital is needed to accelerate the energy transition. This also involves developing a new workforce within companies, including training young engineers and specializing them in these areas, to shift the balance towards a more sustainable future.

## 2.2 THE ROLE OF TECHNOLOGY AND SOFTWARE IN THE ENERGY TRANSITION

In the transition to cleaner and more sustainable energy, several key technologies play crucial roles:

- Renewable energy technologies, such as solar and wind power, offer viable alternatives to fossil fuels by harnessing natural resources to produce electricity.
- Energy storage systems capture and store excess energy generated by renewable sources, which can be used during periods of high demand or when renewable production is low.
- Smart grid management solutions optimize energy distribution and consumption through the integration of digital sensors, communication networks, and advanced analytics.
- Energy efficiency technologies reduce energy consumption and greenhouse gas emissions. This includes everything from energy-efficient appliances to building insulation and smart thermostats.

These are just a few of the new solutions available to consumers looking to reduce their impact on the environment. More importantly, they all represent significant investment opportunities for energy companies aiming to shift their capital towards sustainable investments.

In the digital age, software development also plays a key role in the transition of the energy sector. Custom software solutions can be tailored to meet the specific needs of energy companies, enabling them to optimize processes, improve operational efficiency, and facilitate the integration of new technologies towards sustainable practices. For example, energy management systems can be developed to automate

and streamline consumption monitoring and analysis, enabling better decision-making and resource allocation.

Algorithms can optimize energy production and distribution, predict demand patterns, and identify energy savings opportunities. As energy companies face the challenge of transitioning to sustainable business practices, it is critical that they leverage technology and software development to drive the shift towards cleaner and renewable energy sources.



### 3

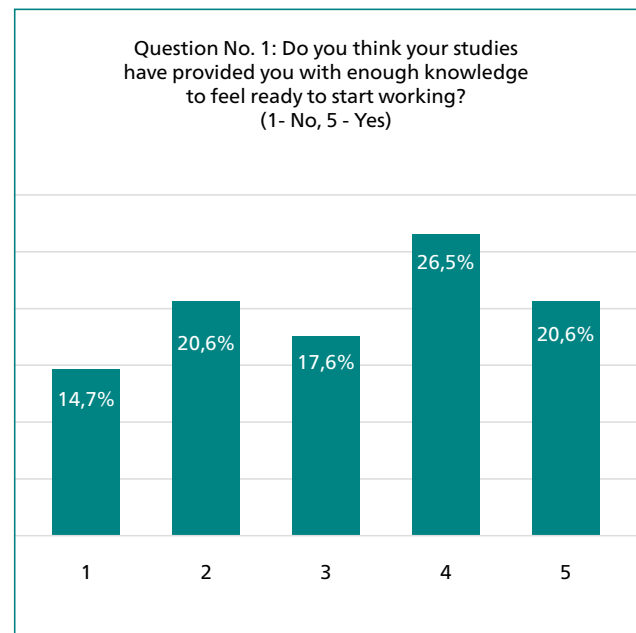
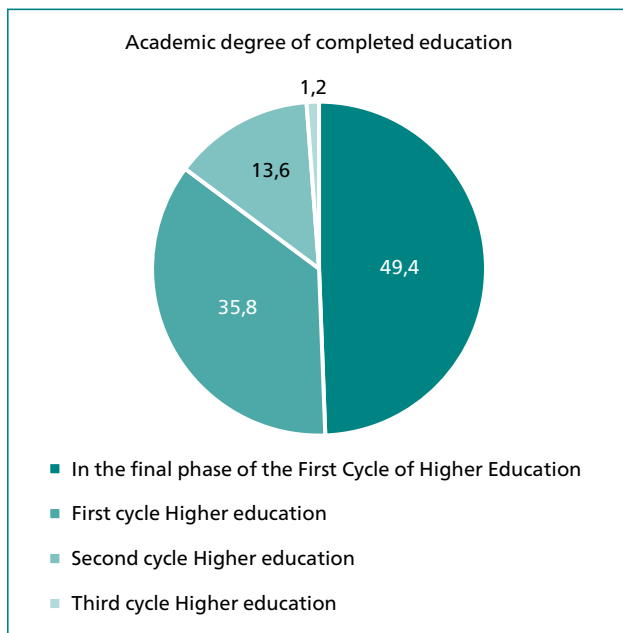
## ANALYSIS OF THE RESULTS OF THE CONDUCTED SURVEY

By analyzing responses to targeted questions from the survey, the research aims to identify key challenges, opportunities, and areas for improving the professional development and retention of young engineering talents, with a specific focus on their role in facilitating the country's transition to sustainable energy systems. This paper seeks to inform all stakeholders about the factors influencing the career trajectory of young engineers and the necessary steps to support their growth and contribution to the energy transition agenda.

The survey was completed by young engineers who are in the last year of their studies or are already graduated engineers from various engineering disci-

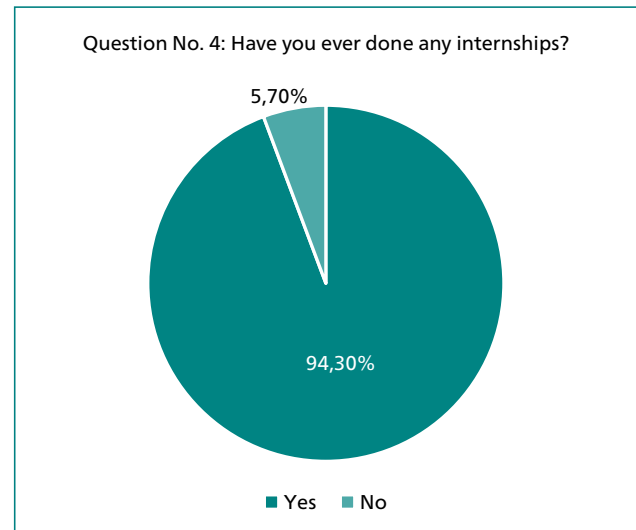
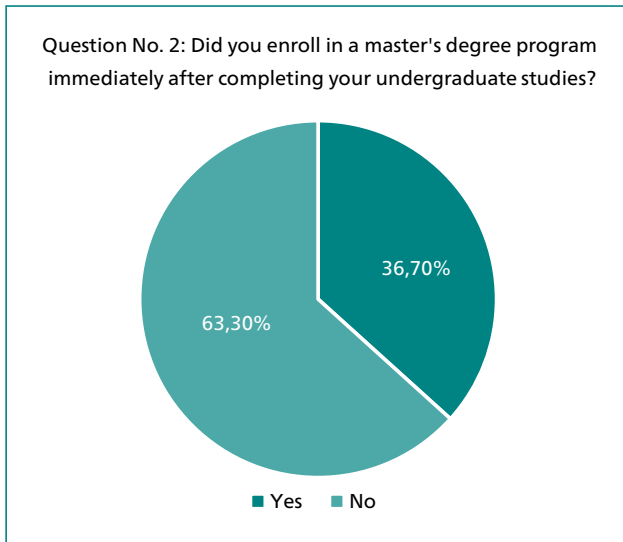
plines. This target group was chosen to ensure a comprehensive understanding of the situation faced by young engineers in various fields. By including current students and recent graduates, the aim is to capture a diverse range of experiences and insights that reflect the full spectrum of challenges and opportunities facing young professionals in the engineering sector. This approach allows for a complete picture of their perspectives on education, employment, and their role in the energy transition. The following graph shows the degree of completed education of the surveyed young engineers:

Some of the questions in the survey that provide insight into the position of young engineers in society include:



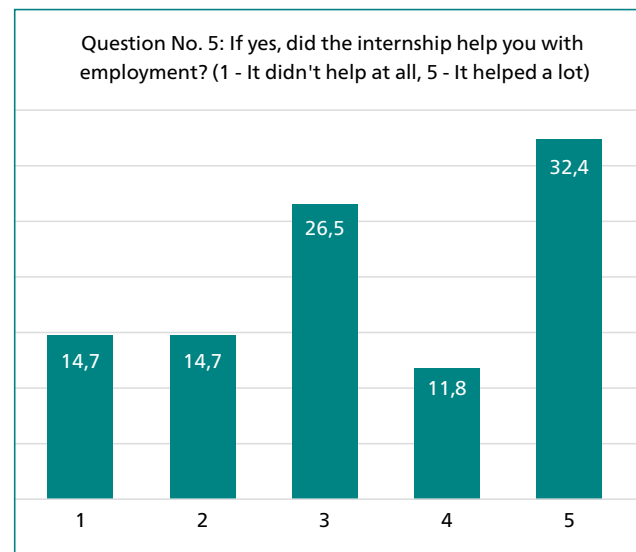
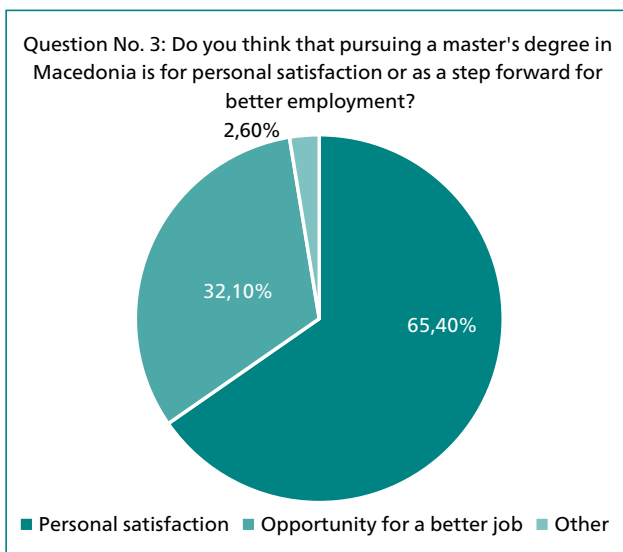
Different opinions exist among young engineers regarding their readiness to start their professional careers. Addressing gaps in practical training and providing curricula that align with industry needs will be essential for improving the readiness of future graduates. By implementing these changes, educational institutions can better support young engineers in successfully transitioning from academia to the workforce, thereby more effectively contributing to the country's energy transition and broader economic goals.

fully realize the benefits of advanced education, a concerted effort is needed to align educational outcomes with industry requirements, ensure that higher qualifications are appropriately valued in the labor market, and foster a culture that views lifelong learning as a cornerstone of professional and personal development.



The reasons for such statistics are evident from the answers and conclusions derived from the subsequent question in the text.

The high percentage of engineers who engage in internship during their studies can be attributed to the positive reforms implemented in almost all engineering higher education institutions. These reforms make internship experience a mandatory requirement for students to obtain credit for a semester.

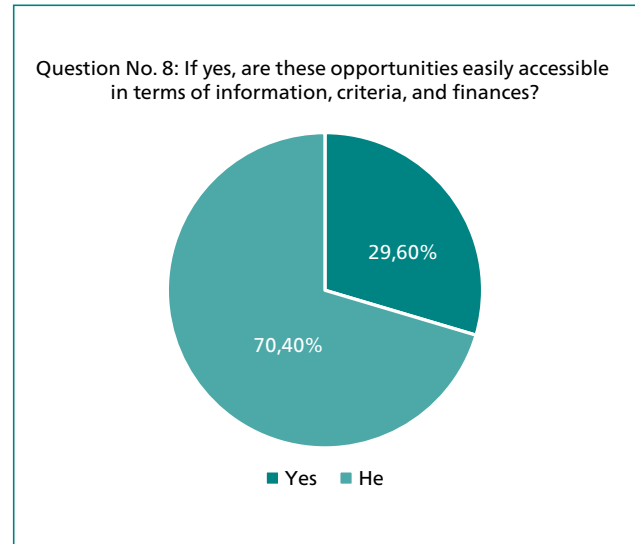
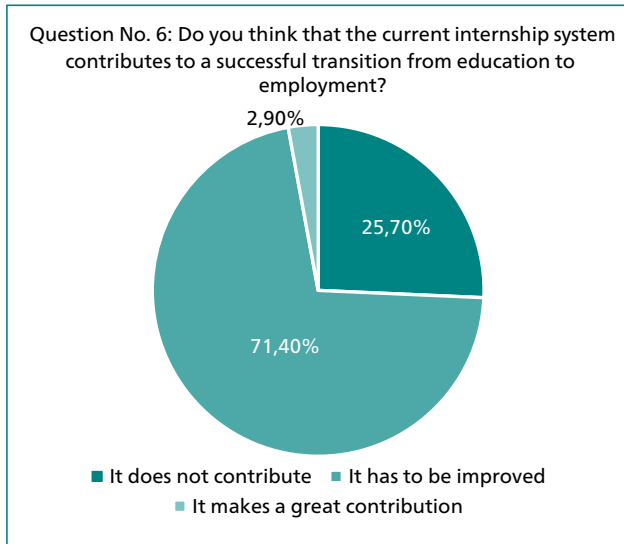


The survey responses suggest that while personal satisfaction is a significant motivator for pursuing a master's degree among young engineers in North Macedonia, there is also notable recognition of its potential to improve employment opportunities. To

There are different perceptions of the effectiveness of practical work in employment among young engineers. Although a significant proportion find practical work useful, there is a clear need for improvements in the quality, relevance and alignment of these experiences with industry requirements. Strengthening

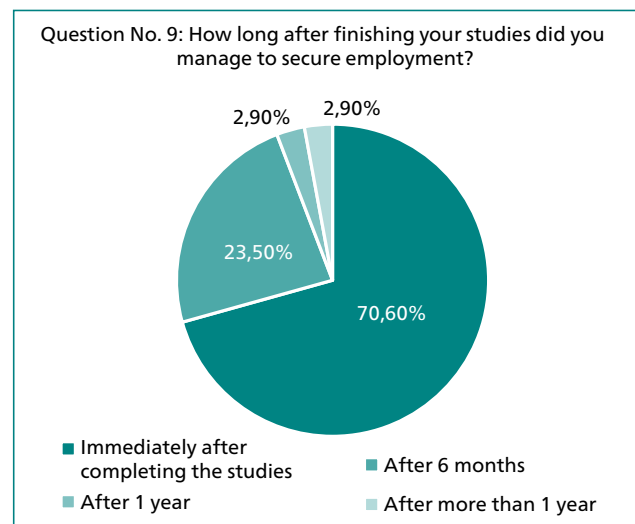
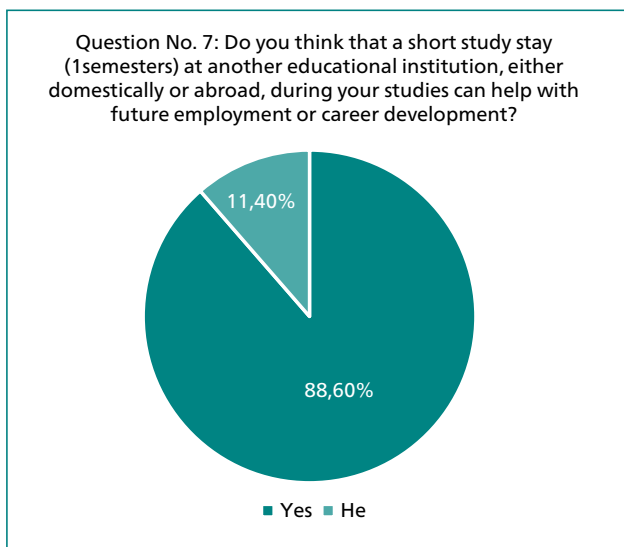
practical work programs through improved industry collaboration, ensuring relevance and quality and providing comprehensive support can significantly improve the employability of young engineers. By addressing these segments, educational institutions can better prepare students for a successful career and contribute to the overall development and sustainability of the engineering workforce in North Macedonia.

pact on employment and career development, it is evident that such experiences play a key role in preparing students for the global labor market. Educational institutions and policymakers should prioritize and facilitate study stays, ensuring that students have the opportunity to gain diverse, enriching experiences that will enhance their professional readiness and success in the ever-evolving field of engineering.



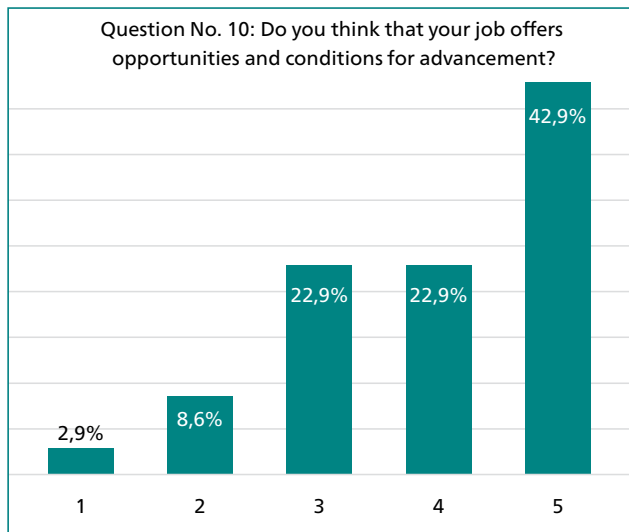
The current system of internship activities for engineering students in North Macedonia does not meet their expectations, indicating a strong need for improvement to align these activities with industry needs. By addressing these challenges, educational institutions can better prepare young engineers for a successful transition from education to the workforce, ultimately contributing to the nation's broader goals of innovation and sustainable development.

The results indicate a significant problem in the flow of information regarding professional study stays abroad, with 70% of young engineers feeling uninformed. Addressing this gap is essential to ensure more students can take advantage of these valuable opportunities. By improving communication, increasing consultation support, simplifying access to financial information, and fostering institutional partnerships, educational institutions can better support their students in pursuing study abroad. This, in turn, can enhance their educational experience, broaden their professional horizons, and ultimately contribute to a more qualified and globally aware engineering workforce in North Macedonia.

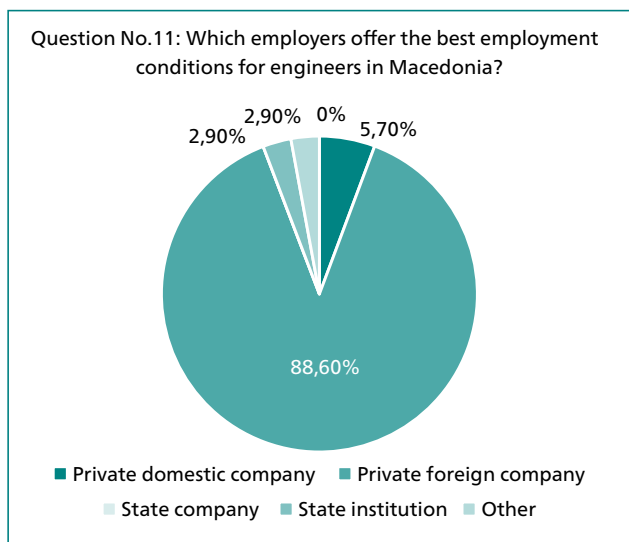


There is strong support for short study stays as a valuable component of engineering education. With 89% of young engineers recognizing its positive im-

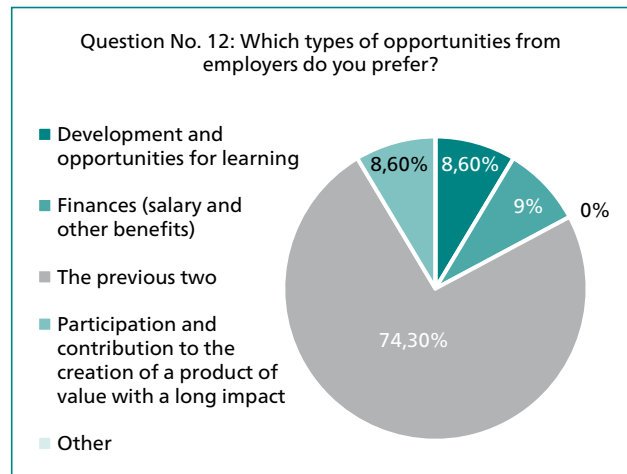
The results of the research show a generally positive perspective on the employment of young engineers in North Macedonia, with the majority finding a job immediately after graduation. However, there remains a need for support for those who face obstacles and delays in this process.



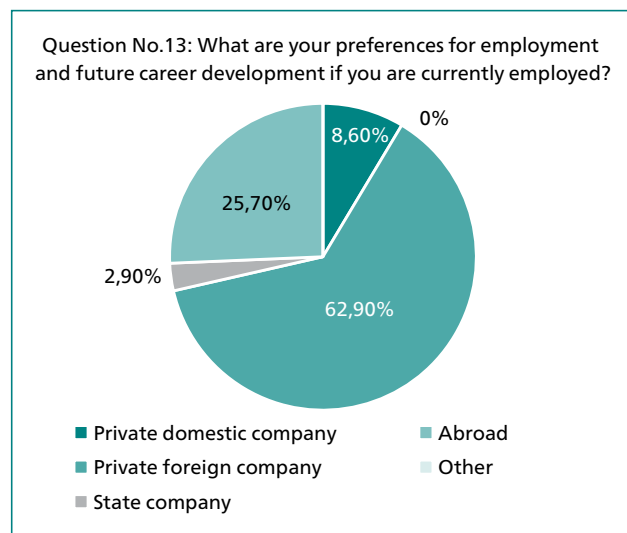
The results of the survey reveal a generally positive perception of advancement opportunities among young engineers, with 65.8% indicating agreement or strong agreement that their workplaces offer favorable conditions for career advancement. However, 11.5% who perceive limited opportunities emphasize the need for organizations to improve support and transparency regarding opportunities for advancement. This is particularly crucial in the context of the energy transition, where qualified engineers with a vision for change, progress, and global trends are essential for fostering sustainable development and technological innovation.



The responses emphasize a strong preference for private foreign companies among young engineers in North Macedonia, influenced by factors such as competitive compensation, advanced technologies, and opportunities for professional development. To attract and retain top engineering talent, domestic companies and government institutions must enhance their employment conditions.

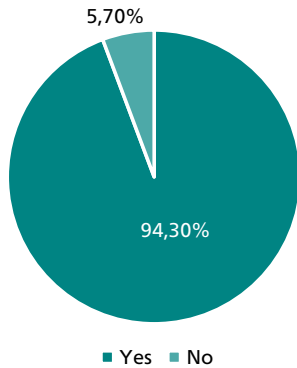


In summary, engineers in North Macedonia greatly value opportunities for development and training, especially when coupled with competitive financial incentives. Employers who prioritize these aspects will be better positioned to attract and retain top engineering talent.”



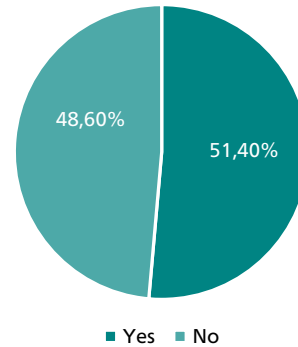
There is a strong preference among young engineers in North Macedonia for employment in private foreign companies and opportunities abroad. To change this, employers need to focus on providing competitive compensation, advanced technologies, professional development, and opportunities for international experience. By addressing these preferences, the country can better leverage the potential of its engineering workforce to drive innovation and economic growth.

Question No. 14: Do you think international companies with a presence in Macedonia would be attractive for employing engineers and providing opportunities to contribute to the creation of valuable innovations, products, and services?



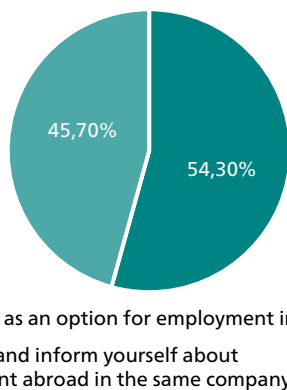
It is clear that young engineers in North Macedonia recognize the potential for significant contribution in representative international companies, with 94.3% expressing a positive perspective. This enthusiasm underscores the importance of fostering a conducive environment where engineers can engage in entrepreneurial endeavors and keep up with the most successful peers from around the world. By strengthening cooperation, promoting an entrepreneurial mindset, and facilitating networking opportunities, North Macedonia can retain and better utilize the talents of its young engineers.

Question No. 16: Do you think that completing higher technical education in Macedonia prepares graduates to be competitive with their colleagues worldwide?



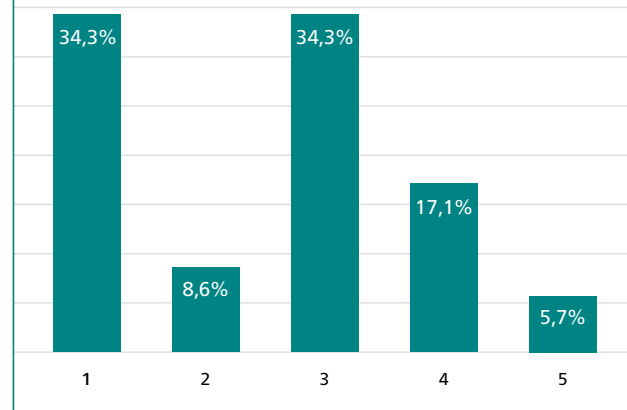
The close division in perceptions of the suitability of higher technical education in North Macedonia for global competitiveness highlights both strengths and areas for improvement. While some acknowledge a solid foundation, others point to significant gaps, particularly in practical training and industry alignment. Addressing these issues through curriculum updates, improved practical experiences, investments in advanced technologies, and stronger industry partnerships will help ensure that North Macedonian engineering graduates are well-prepared to compete globally.

Question No. 15: If there is an international company in your field of interest with a representative office in N.Macedonia, would you prefer:

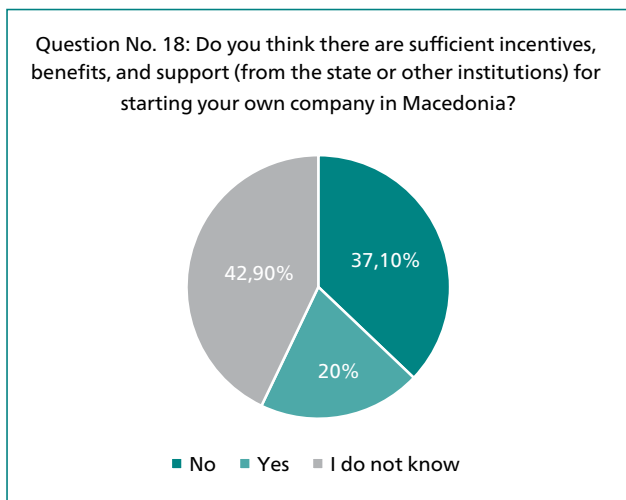


The almost equal division in preferences emphasizes the double attractiveness of international companies as employment opportunities among young engineers in North Macedonia. While a small majority prefer to stay and work locally, a significant number are eager to explore opportunities abroad.

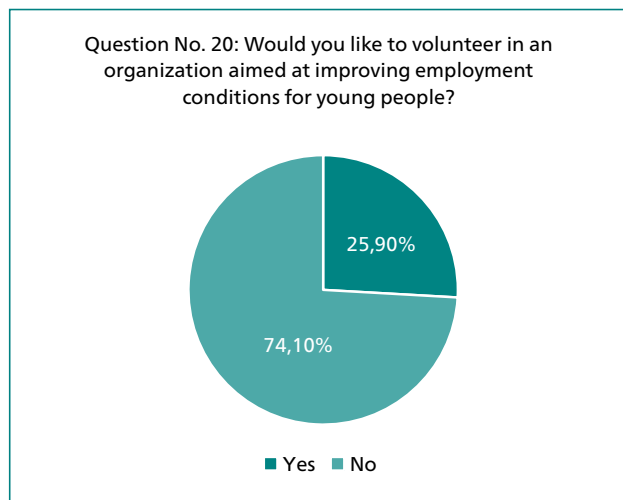
Question No. 17: Does the industry in Macedonia offer good employment conditions for young engineers?



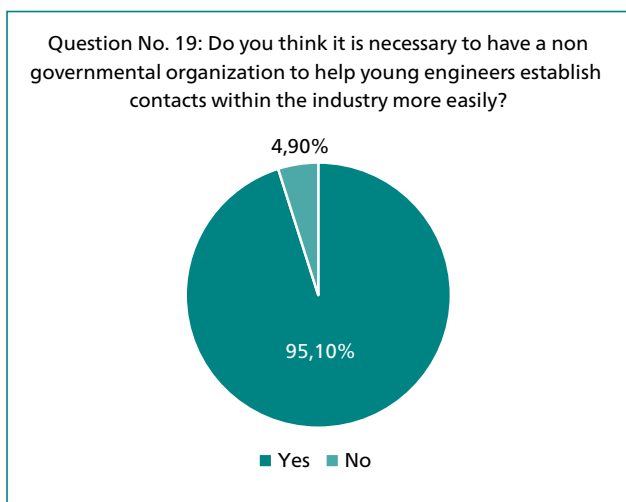
The answers indicate the need to improve the employment conditions of young engineers in North Macedonia. While some of the industries offer favorable conditions, the overall perception is towards dissatisfaction. By addressing key areas such as compensation, career growth, and work environments, the industry can better meet the expectations of young engineers, fostering a stronger and more dynamic engineering workforce in our country.



There is a mixed perception of the support available for starting a company in North Macedonia, with considerable lack of information and noticeable dissatisfaction among young engineers. By raising awareness, improving and expanding support programs, and fostering a supportive entrepreneurial ecosystem, government and other institutions can better encourage and facilitate entrepreneurship among young engineers, driving innovation and economic growth in the country.



While a significant proportion of respondents express a willingness to volunteer to improve employment conditions for young people, a larger majority indicate a lack of interest or willingness to commit to volunteer work. By addressing barriers, highlighting the impact and benefits of volunteering, and offering tailored opportunities, organizations can engage more young engineers in volunteer initiatives aimed at creating positive change in employment conditions.



Young people see a significant need for an NGO dedicated to helping them connect with the economy. Such an organization can play a key role in bridging the gap between education and employment, providing networking opportunities, career development services and access to valuable resources. By establishing and supporting this NGO, stakeholders can help young engineers navigate the labor market, advance their careers and contribute to the country’s economic development.

# 4

## CONCLUSION

The insights gleaned from the research conducted by the Young Engineers Club offer a clear understanding of the current challenges and aspirations of young engineers in North Macedonia. The analysis of responses provides valuable insights into areas where improvements are needed.

The research reveals a concerning gap between the education system and industry needs. A majority of respondents express dissatisfaction with the practical work activities provided during their education, indicating a shortfall in preparing young engineers for the transition from academia to the workforce. Moreover, there is limited awareness of entrepreneurship support systems and dissatisfaction with current employment conditions, particularly regarding wages and benefits.

These findings underscore the urgent need for reforms in education, industry practices, and support mechanisms to better cater to the needs of young engineers. Enhancing practical training, updating curricula to align with industry trends, and bolstering support for entrepreneurship are imperative. Addressing factors contributing to dissatisfaction with employment conditions, such as low wages and limited career growth opportunities, is essential for retaining young talent in the country.

Retaining young engineers is pivotal for facilitating and propelling the energy transition in North Macedonia. As the country endeavors to transition to sustainable energy systems, a skilled workforce capable of driving innovation, implementing new technologies, and tackling complex challenges is indispen-

sable. Young engineers bring fresh perspectives and innovative ideas necessary to propel this transition forward. Thus, efforts should focus on identifying and overcoming obstacles hindering young engineers, thereby enhancing their satisfaction.

Investing in the development and retention of young engineers will enable North Macedonia to navigate a smoother and more successful energy transition. This entails not only improving education and employment conditions but also fostering an environment conducive to innovation and entrepreneurship. Offering opportunities for professional growth, access to advanced technologies, and supportive ecosystems will incentivize young engineers to contribute meaningfully to the country's energy objectives.

Moreover, retaining young talent benefits the economy by reducing brain drain and fostering local innovation and economic development. By nurturing and retaining its young engineers, North Macedonia can cultivate a sustainable pool of skilled professionals committed to driving positive change and advancing the country's long-term progress.

The findings of the research underscore the challenges and opportunities confronting young engineers in the country. Addressing these challenges, including enhancing education, employment conditions, and support for entrepreneurship, is crucial for retaining and empowering young talent. Through these efforts, North Macedonia can harness the potential of its young engineers to facilitate a smoother and more efficient energy transition, fostering sustainable development and prosperity for the country.





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