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# THE FUTURE SKILL NEEDS IN THE CONSTRUCTION SECTOR IN ARMENIA

Summary note

## Disclaimer

This summary note was drafted through extracting key information from the full country report, which was prepared by Fondazione Giacomo Brodolini srl SB and Erre Quadro srl for the ETF in December 2022.

The contents of the report are the sole responsibility of the authors and do not necessarily reflect the views of ETF or of the EU institutions.

# INTRODUCTION AND METHODOLOGY

Skills can be a driver or a constraint on economic growth and societal development. When skills are well matched to demand, they can facilitate growth, but when there are mismatches (however defined) they can inhibit economic development and limit individuals' life chances. This has placed a heavy burden on skill anticipation systems to identify emerging skill needs. A task made all the more difficult by the green and digital transitions which have the potential to transform the world of work by changing skill content of existing jobs and creating new ones requiring new skills. Skills obsolescence is also a risk which, in its most abject form, results in job loss. Even in countries where there is ready access to a wide range of data on skills, skills anticipation related to the green and digital transitions proves to be difficult because of the pace of change.

With this in mind, the European Training Foundation (ETF) has developed a new approach to skills anticipation which combines quantitative approaches, including big data analysis, with qualitative methods, to provide unique and timely insights into both current and emerging sectoral skill needs. This approach has been used across a wide range of countries, both high- and middle-income ones, to provide detailed insights into the way in which new technologies create a demand for specific skill sets.

This summary here provides evidence on emerging skill needs in Armenia's construction sector using the ETF's new approach to skills anticipation. It is based on the full country study that was carried out between March and December 2022[1]. The study combined desk research, big data analysis of patents and bibliographical databases, and qualitative research (focus groups and interviews) with key stakeholders, to provide a detailed assessment of the skills that will be needed in the country's construction sector over the short- to medium-term. The study also addresses the barriers standing in the way of innovation and skill development which will need to be overcome if the sector is to take advantage of the new technologies which have become increasingly commonplace in the global construction sector. This includes those used to reduce the sector's carbon footprint.

[1] See the full report here: The future skill needs in the construction sector in Armenia. | ETF (europa.eu)

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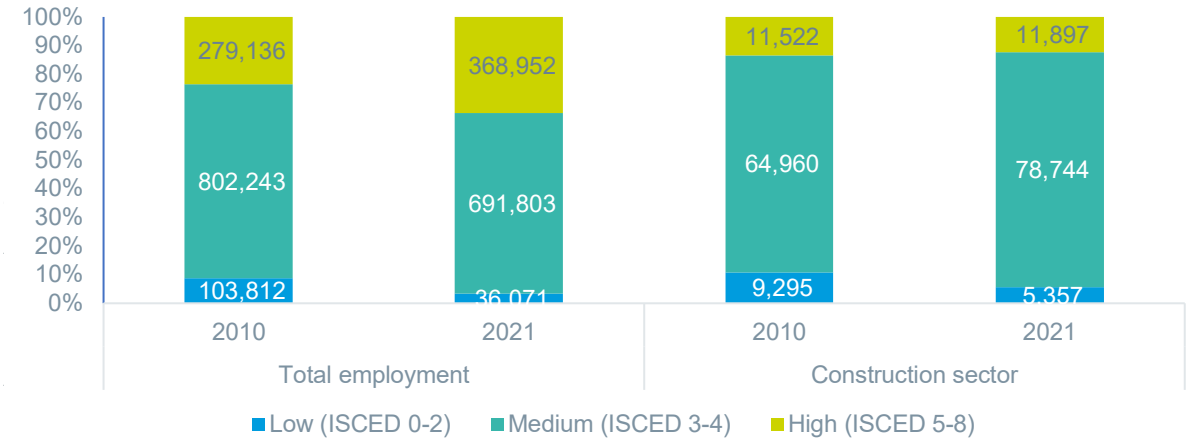
# The construction sector in Armenia

The construction sector includes a wide range of activities across its value chain: from the extraction of raw materials, to building design, construction and the manufacture of construction products, to renovation, maintenance, and eventually demolition and recycling of construction waste. The sector is an important one in Armenia. It is responsible for substantial share of the country's GDP (6.5% in 2021), and accounts for a significant share of employment. In 2021, it employed around 96 000 people which equates with 8.8% of total employment. It is also a dynamic sector, experiencing rapid growth over the 2000s as well as more recently until the pandemic pushed it into decline. There are now signs of recovery, but that recovery appears to be very much dependent upon a range of construction skills being available. Most of the sector's revenue is from the private sector, followed by the state, individuals, community funds and, finally, humanitarian aid. According to the OECD, in 2021 there were 34 major infrastructure projects planned or under construction in Armenia with a total value of USD 13.9 billion. Over half (51%) were energy projects followed by those in transport (43%) (OECD, 2021).

## Skills demand in the sector

Boosting skills supply to the sector faces several problems. Wages in Armenia tend to be relatively low compared with those available abroad. Accordingly, increasing the supply of construction-related skills runs the risk of increasing the supply of construction skills to other countries unless work in the domestic sector is made more attractive to those with construction skills. There is scope, however, to boost labour and skills supply to the sector. Increasing diversity in the sector is one way of achieving this aim. In 2021, for example, 3% of the construction workforce comprised women (whereas they accounted for 45.4% of the labour force according to the ARMSTAT data), though this was double that in 2010 when it stood at 1.3%. The vast majority of workers in the sector are aged between 25 and 49 years (63%). Those aged over 50 years comprised 32% of the workforce, whereas people aged under 25 years accounted for 5%. Evidently there is the prospect of a sizable share of the workforce retiring over the medium-term. This situation is not so different from the EU where 37% of the construction workforce is aged over 50 years. The relatively small share of the workforce aged under 25 years indicates, other things being equal, that the sector may face problems in the future replacing those exiting the sector for reasons of retirement.

**Skill distribution of employment, all sectors and construction sector (narrow definition), thousands**



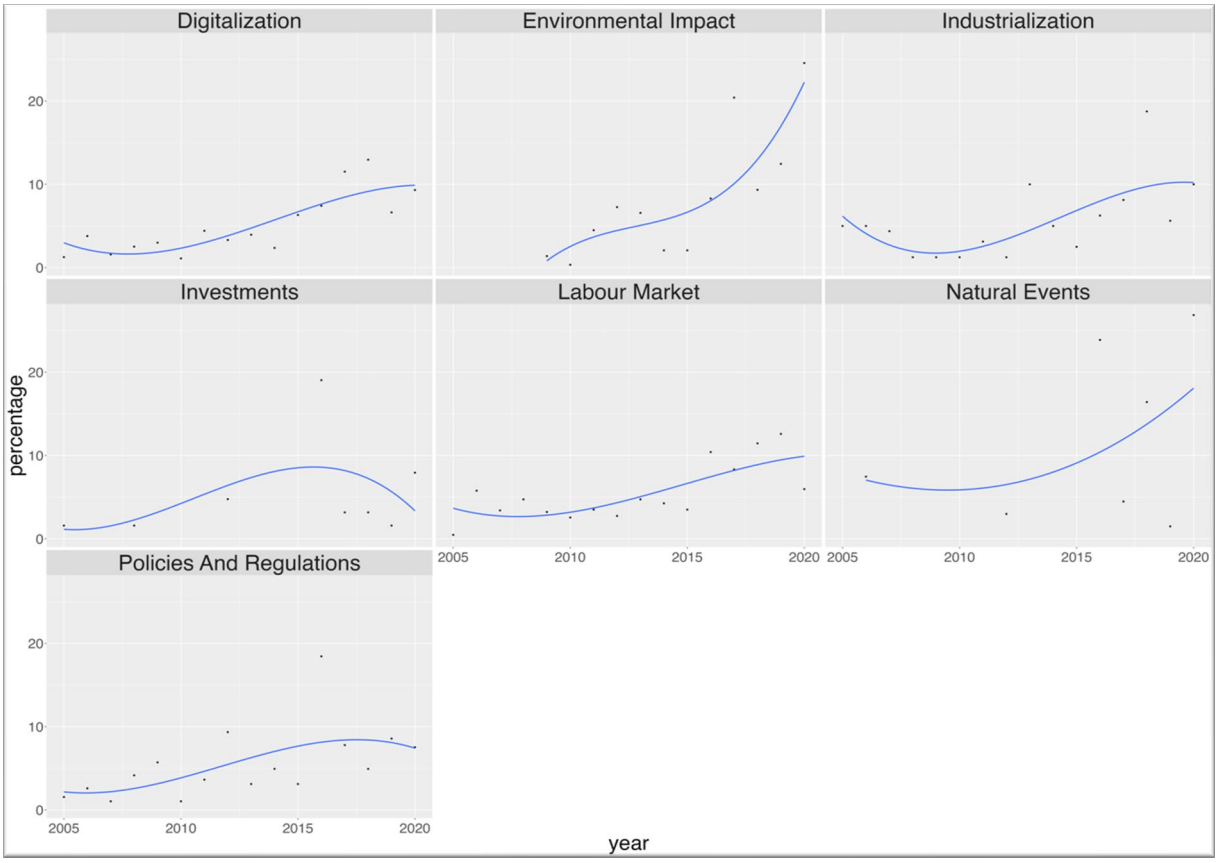

Source: ARMSTAT

## Drivers of future skills demand

The construction sector worldwide is subject to a wide range of technological advances, from digitalisation of design work to offsite pre-fabrication techniques. Local and global socio-economic dynamics also influence the sector's development (e.g. the demand for housing). All these factors have implications for skills demand. Through a combination of big data analysis, insights from desk research, and feedback from the interviews with key stakeholders, the following drivers were identified as determining the demand for skills in Armenia's construction sector.

1. **Greening.** The construction industry has responded to pressures to reduce its carbon footprint through improving the energy efficiency of buildings via better design, use of suitable materials, and renovation. **Green building activity** and sustainable construction have been driven by both environmental regulations designed to reduce carbon emissions and life-cycle environmental impact, and client demands to construct healthier and more energy efficient buildings.
2. **Digitalisation.** Digital technologies are reshaping almost every aspect of the construction sector. The design and value chain management phases have been improved through the use of Building Information Modelling (BIM) software, while Artificial Intelligence has been used to improve, for example, energy efficiency and seismic resistance (important in an area subject to earthquakes). Digital technologies are also directly embedded in buildings (smart buildings) through the adoption of Internet of Things solutions; while manufacturing and construction processes take advantage of robotics, drones, addictive manufacturing techniques, and virtual reality devices.
3. **Extreme natural events** (e.g., avalanches, earthquakes, wildfires, flooding, and drought). Armenia is subject to frequent and often destructive earthquakes. The last major earthquake, in Spitak in 1988, killed over 25 000 people. Other natural disasters, in particular floods, are relatively common. This has resulted in a demand for buildings, reinforced in national regulations, that adopt technological solutions to reduce the risk posed by the types of natural disaster to which the country is prone.
4. **New construction materials and new industrial production approaches.** The introduction of new approaches to production, including the use of advanced materials, increases the level of industrialisation in the sector. Innovative processes such as modularisation, automated off-site production, and automated on-site assembly are becoming increasingly commonplace across the world. The rising cost of materials has acted as a catalyst for building companies to adopt more automated production processes to contain construction costs.
5. **Increasing specialisation.** As production techniques become more sophisticated, there is an increasingly wide range of companies operating in specialist niches. This has implications for skill demands and the extent to which increasingly specialist skills are required.
6. **Sector specific policies and regulations.** National regulations address, amongst other things, minimum energy performance requirements for new and renovated buildings, meeting housing demand, health and safety measures, the mitigation of seismic risk, and so on. These all have an impact on skill requirements.
7. **Availability of national/international investment** is recognised as a major factor which influences the scale and type of construction activity undertaken. The Government, for example, is committed to improving access to housing through making long-term, affordable mortgages available which, in turn, affects the demand for house / apartment building.
8. **Limited investments in human capital.** Construction is still a largely manual activity in many countries with modest take-up of new technologies and limited investments in the skills required to make use of such new technologies. Armenia is no exception. There remains a need to invest in the sector's human resources and acquire the types of skills required to meet the country's specific construction needs.

**Main drivers of change found in scientific papers related to the construction sector**




*Note: values in the last year in the plots are not final (due to the referee and publication process). It therefore might not represent the real number of articles related to that specific topic.*
Source: Big Data analysis of scientific papers on construction sector in Armenia.

## Adoption of construction technologies

Patent analysis provides a means of anticipating technological changes as they tend to be filed to protect innovations that are likely to come on stream over the next few years. Patents thereby provides an indication of likely impending technological change.

Patents across all Armenian sectors, including construction, have been in decline since 2011. Overall, the country filed 311 patents in all sectors over the last 20 years, 55 of which were in construction. The main sub-sectors of construction activity for which patents have been filed in Armenia are the following (in order of significance):

- anti-seismic construction, and other safety/protection measures (e.g. shelters);
- structural elements and building blocks, in particular, to speed up construction times;
- heat and sound insulation;
- pre-fabricated buildings;
- road surfacing and reduction of the environmental impact of roads;
- automated parking.

The limited number of patents filed over the recent past reveals that the country is dependent upon the use of technologies developed outside of the country. It is a user, not an innovator in construction technologies.

Given the low number of Armenian patents, it is likely that many of the new technologies needed to advance the Armenian construction sector will be imported from abroad. In order to control for this, the analysis of patents was extended to global patents filled in the construction sector over the period of 2000-2021. Based on the analysis of 190 653 global patent applications over this period, the results reveal twelve technical areas as being relevant for the future of the sector in Armenia (in order of importance):

1. building materials;
2. structural elements;
3. finishing elements;
4. green construction;
5. hydraulic engineering;
6. construction site processes;
7. street construction;
8. railways construction;
9. digital solutions;
10. bridge construction;
11. additive manufacturing;
12. robotics in construction.

It is anticipated that the technological changes associated with filing of patents in the areas listed above will have implications for construction processes in Armenia and thereby the skills the sector will increasingly require in the future. Or, to put it another way, unless the sector is able to put these types of technological change into practice, which will be dependent upon having the skills available to implement and use each of them, then there is every danger that the sector will fall behind in taking up those developments increasingly in use by the global construction sector.

## Emerging skill needs

The inputs derived from the analysis of the various drivers of change in the sector have been correlated with the skills required to use the new technologies associated with those drivers. This was undertaken using bespoke semantic software. This analysis makes use of the European skills, competences and occupations (ESCO) database to identify the occupational profiles associated with the various kinds of technological change affecting the sector.

The key occupations which are likely to be in higher demand in the future include the following:

| | |
|---|---|
| 1. Mechanical engineer | 11. Industrial engineer |
| 2. Concrete finisher | 12. Robotics engineering technician |
| 3. Civil engineer | 13. Digital printer |
| 4. Concrete pump operator | 14. Roofer |
| 5. Energy engineer | 15. 3D printing technician |
| 6. Building construction worker | 16. Laser making machine operator |
| 7. Crane technician | 17. Rigger |
| 8. Prepress technician | 18. Solar energy engineer |
| 9. Concrete finisher supervisor | 19. Bricklayer |
| 10. Mobile crane operator | 20. Plate glass installer |

Looking more closely at the types of skill needs which are likely to arise in the future fall into three broad types:

1. high skilled technical occupations (e.g. civil engineers);
2. medium and low skilled technical occupations (e.g. crane technicians); and
3. business services-related occupations (e.g. energy managers, sales personnel, etc.).

Not all of these jobs are construction specific. There is a strong crossover from the energy sector – bearing in mind that many construction projects in Armenia are energy related – with job profiles such *energy engineer*, *solar energy engineer*, and *energy manager* figuring prominently in the list of key job profiles likely to be in demand in the future. This reflects the importance of sustainability, energy efficiency and environmental impact within construction design processes.

Digitalisation and automation are evident too in the types of jobs increasingly likely to be in demand. This reflects the importance of software solutions, often linked to sustainability and environmental impact, in the construction process. This is reflected in the emergence of new job profiles such as *3D printing technician*, *3D modeller*, *data analyst,* and *laser marking machine operator*.

The emergence of new professions is an important finding, but it needs to be borne in mind that the sector will continue to be dependent upon what might be considered to be traditional construction skills practised within traditional construction jobs. These will, however, not be untouched by the types of change affecting the sector described in the previous section. These jobs too will be affected by digitalisation (e.g. an increasing need to use software applications) or the need to work with new materials or processes (for instance where modular construction or additive construction processes are in use). In turn this may have implications for health and safety and how this will be implemented and monitored. This suggests a substantial need for reskilling and upskilling of those currently working in traditional construction jobs.

## Factors inhibiting sectoral innovation

It has been possible to identify the key technologies which shape the future of the construction sector in Armenia, and elsewhere, and the skill needs which are likely to consequently arise. There are, however, manifold factors which will potentially inhibit the take up of new technologies and new construction processes. Insights from workshops and bilateral interviews with companies and stakeholders identified the following as impediments to innovation in the sector.

- **Limited opportunities for training to be into practice.** Much vocational training is conducted in classrooms. Students do not have the opportunity to gain on-site experience prior to working in construction. In most cases, education providers have outdated training infrastructures that do not allow students to effectively put theory into practice. Although the higher education system has laboratories where high level practical skills can be developed, students have relatively little opportunity to put their knowledge into practice because there is a lack of private sector companies using the latest technologies.
- **Transversal skill gaps**. Companies often report gaps in transversal skills such as those related to, respectively, digital and project management skills. There is a need to increase the supply of these key enabling skills.
- **An unattractive sector to younger people.** The general perception of the sector is one that requires hard, arduous labour for relatively modest wages. Consequently, it has proved difficult to attract young people to work in the construction sector or remain within it. A relatively large share of the workforce is aged 50 years and over which suggests that there may be substantial replacement demands in the not too distant future.
- **Insufficient supply of intermediate and higher-level skills.** As noted above, new construction processes require people with new skills often at intermediate or higher levels. If one looks at the stock of reserve labour potentially available to the sector, it comprises people with relatively low-

level skills. For example, around 65% of unemployed people in Armenia do not possess any formal qualifications.

- **Weak interaction between public and private sectors**. There appears to be a generally weak interaction between the public and private sectors, and between education providers and employers. There are many SMEs in the sector. Keeping them engaged with the VET system is no easy task. Even with tripartite commissions that include employers and trade unions, the degree of collaboration and co-operation between private and public sectors remains modest.

## Recommendations to stakeholders

As observed from the big data analysis, the construction sector is faced a need to adapt to new construction processes which harness the latest technological developments, and meet the challenges posed by the greening of the economy. These, in turn, create a demand for new skills. The education and training system, including VET, cannot achieve a high-tech, high productivity construction sector alone. It requires the support of government to drive growth in construction and create partnerships between education and training providers and construction sector companies. All findings from the current study point to the need to increase skill provision in Armenia's construction sector. This encompasses increasing the provision of both initial and continuing training.

Meeting the future skills of the sector in Armenia will require the following to be undertaken.

- Expand the training infrastructure in the sector, including the number of training institutions, so that access to training in different construction professions and specialisms is widely available across the country.
- Assess the existing skills of the workforce given that the sector's workforce largely lacks formal qualifications. This will necessitate recognition of acquired prior learning for those workers who obtained their construction-related skills by learning on-the job.
- Develop stringent quality criteria to be met by training providers licensed to deliver accredited training. All training provision must lead to the award of a qualification which is recognised in the wider labour market.
- Upgrade existing training programmes and courses so that they better meet the needs of the sector. This will require the updating and/or new design of programmes for upskilling and/or reskilling existing workers. Programmes and courses will need to reflect the use of the latest technologies being used globally to improve the quality of the built environment. This has the potential to increase the attractiveness of the sector to would-be employees.
- Provide incentives and extra measures to increase the participation of companies and individuals in construction training. Grants and subsidies can be provided to ensure that training in new technologies includes those not commonly in use today but are likely to come on stream in the near future. Public procurement can be used to ensure that the construction workforce is appropriately trained by, for example, introducing training clauses into contracts.
- Strengthen the institutional partnerships between employers, training providers, and policy makers and promote the sharing of resources between education providers and employers to increase effective skill provision in the sector. For instance, personnel from construction companies can be used by training providers to deliver training. Construction companies can also make equipment available to training providers.
- Learn from international best practice in the training of construction workers and use tools and measures to deliver training which are seen to work well in other countries, e.g. the use of work-based training such as apprenticeships, or the use of micro-credentials for accrediting the skills acquired from short-duration training or on-the-job learning.

- Provide improved career guidance and effective incentives to increase the attractiveness of construction sector jobs to young people – and potentially adults who are looking for a career change – so that they are fully informed of the relative merits of working in construction.
- Consider reviewing the current system of occupational licensing given to the companies carrying out construction work by the Urban Development Committee. Stricter requirements could be asked of skilled personnel and licensing could be time-limited rather than being granted in perpetuity. Training in occupational health and safety could be made compulsory for all construction work.

The evidence collected in this report suggests that some progress has been made in moving towards achieving the above goals, but there is also a sense that progress has been slow and is hampered because large parts of the construction sector are characterised by relatively low-skilled, low-waged employment. This in turn discourages young skilled people from pursuing careers in the construction sector. Looking to the future, the sector needs to break-out of the relatively low-skill equilibrium which characterises its current position.

This will require concerted actions to simultaneously stimulate hi-tech growth in sector and the supply of high skilled professionals, associate professionals, and skilled craft workers. The big data analysis presented above clearly indicates the technologies which will increasingly characterise construction in the future. It is important that Armenia is able to adopt these technologies and acquire the skills associated with their use. Increasing the take-up of new technologies and providing training need to happen concurrently, in order that they feed-off one another and push for the construction sector towards being the high-tech, high productivity one that will serve the country well and facilitate the twin digital and green transitions.