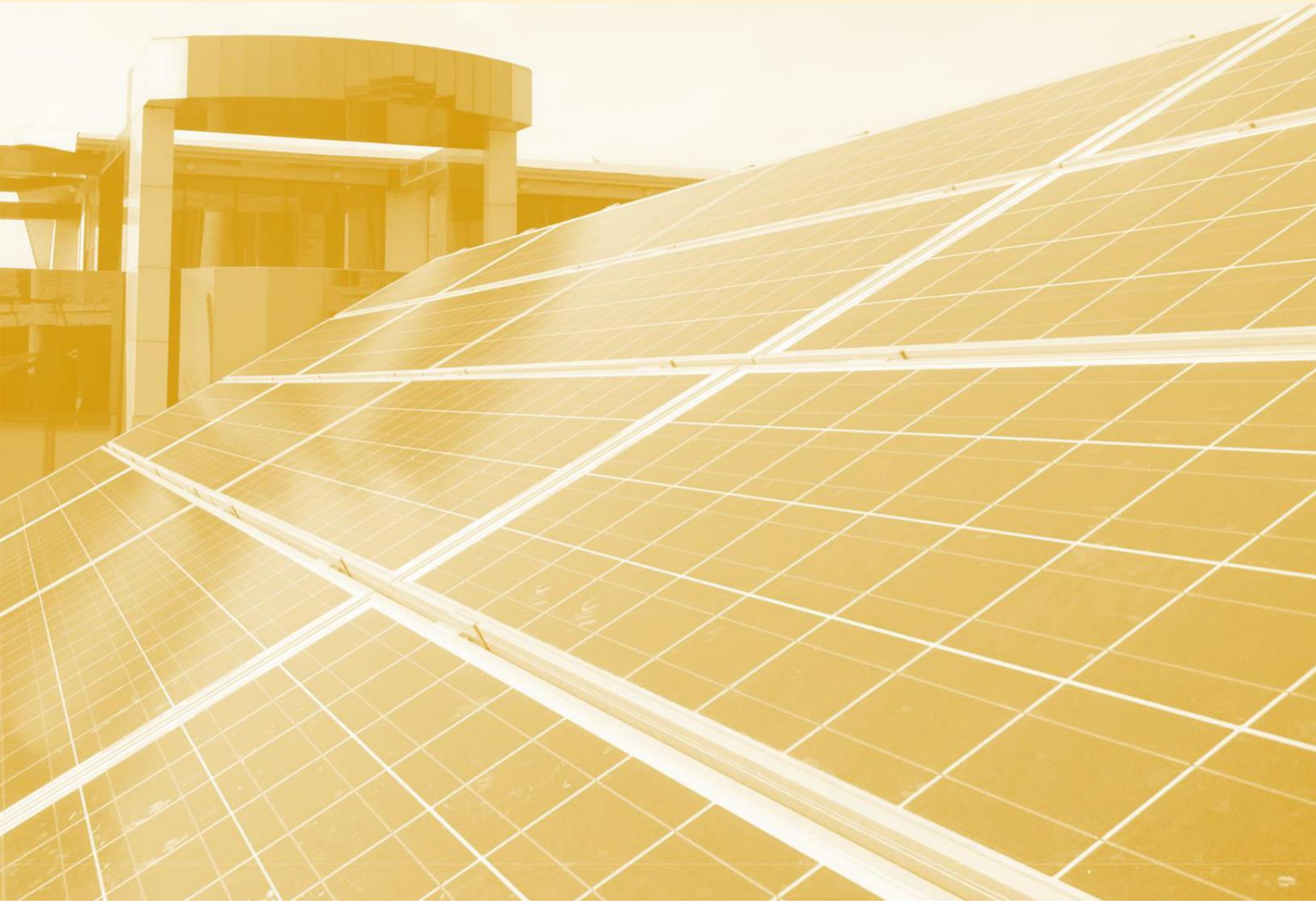
VET partnership For Green and Smart Electricity in Buildings

WP2/D2.1
Report on the Needs of the Labour Market



Project 101092256 – VET4GSEB – ERASMUS – EDU – 2022 – CB – VET

Co-funded by the European Union

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6. Survey Analysis - Ukraine

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Report on the Needs of the Labour Market

D2.1 Report on the Needs of the Labour Market

1. Executive Summary

The aim of the surveys conducted in the partner-countries (Albania, Armenia, Bulgaria, Georgia, Turkey and Ukraine) was to examine the opinions, needs and expectations of companies and professionals involved in the renewable energy market on the state of this market and in particular the issues related to the efficiency and quality of installation and maintenance of systems, and the skills needed to achieve efficiency and quality, as well as to identify the needs of theoretical knowledge and practical skills of technicians and installers of geothermal and solar installations, for the purpose of tackling the identified gaps and needs by improving training curricula for the target groups and upskilling trainers.

2. Methodology

The surveys were conducted online, on the basis of questionnaires especially developed for the survey. Two questionnaires were developed – one for stakeholders and one for VET providers, and sent to 133 companies working in the field of RES installations, and PV installations in buildings, in particular, and 39 VET providers (a university, vocational high schools, and VET Centres).

The surveys were organized so as to obtain information in several areas:

- Personal data, characteristics, education level, position, etc., of the respondent;
- Level of knowledge of the respondent about the PV sector in the respective country;
- Opinion of the surveyed of the quality and efficiency of PV facilities and the use of 'smart' applications in the respective partner-country;
- Assessment of the skills and certification levels of PV specialists;
- Opinion of the skills and certification levels of trainers of PV specialists.

First, the questionnaires were sent to the respective organizations (companies, institutions). The managers of the companies/contact persons in educational institutions were afterwards contacted by phone to offer further details of the survey, its aim, and the objectives of the Project as a whole. After the completed questionnaires were returned, meetings (online and offline) were organized with representatives of the respondent parties at which the results were presented and the identified gaps further discussed.

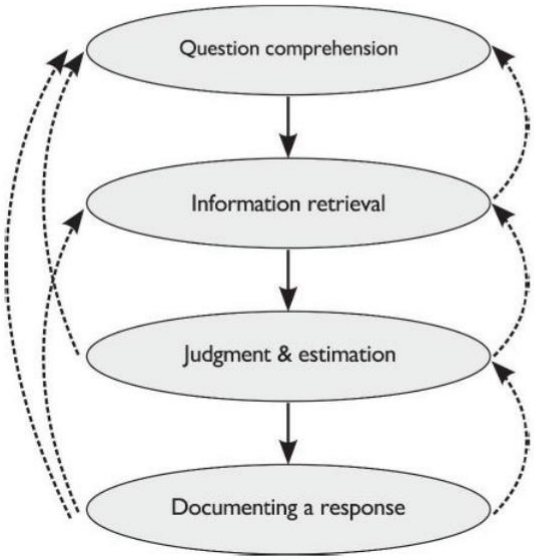


Fig.1 Survey method applied

3. Background information

According to a report recently released by the UN's Intergovernmental Panel on Climate Change (IPCC), the actions we take over the next decade will determine whether or not our planet is liveable for generations to come.
The gargantuan challenge of drastically reducing greenhouse gas emissions demands a whole-of economy shift — across industries, roles, and geographical regions. With every challenge comes opportunity: If we take the right approach, we can leverage our efforts on behalf of the environment to catalyse

As we move into 2023, the renewable energy industry continues to snowball. This industry not only offers a solution to the environmental challenges of our time but also presents a unique opportunity for professionals to contribute to the transition to a more sustainable future.

The renewable energy sector has been on the rise for years, and the latest data confirms this trend. According to the International Renewable Energy Agency (IRENA), the renewable energy sector employed 12.7 million people globally in 2021, and is expected to reach 48 million by 2050.

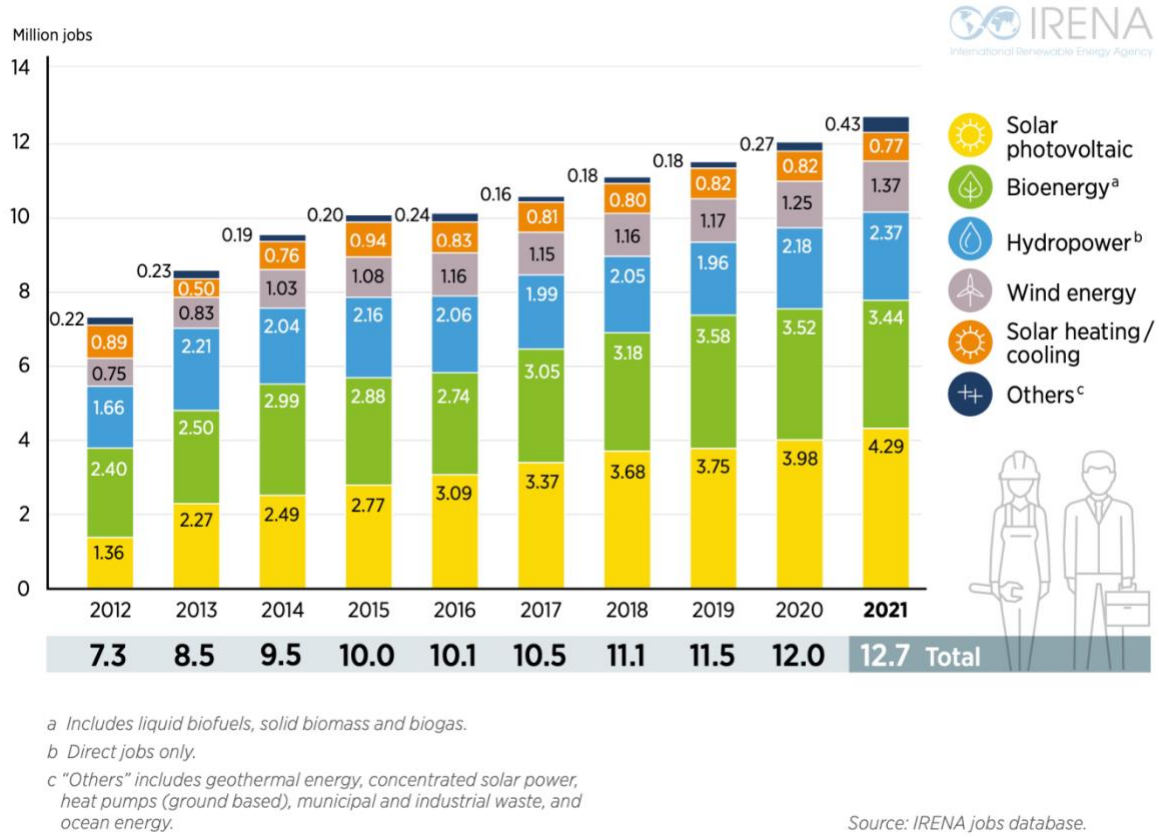


Figure 2 - Evolution of global renewable energy employment by technology (Renewable energy and jobs annual review 2021)

The global economy, however, is only as strong as the human beings who power it, and the whole of economy-green transformation that the moment demands will only take place if green skills proliferate throughout the global workforce.

Technology is critical, of course — but human workers are the ones who will develop new technologies, invest in them, and implement them on a daily basis to make every job a green job.

The goals set in the energy strategies and policies of the EU and those of the participating countries have led to changes in the labour market for installers of electrical and RES systems in buildings.

The whole European installation sector is confronted with a complex and multi-faceted shortage of both workers and skills.

The situation is getting increasingly worrying because our sector is indispensable to address the (relatively) new challenges of the green and digital transition.

Additionally, we get a lot of pressure from policymakers, but also industry (manufacturers, wholesalers etc.) to find quick solutions (short trainings, etc.) which are not always in line with our interests:

- ✓ **Skills & workforce challenges are accelerating**
- ✓ **There are so many obstacles – there is a need to prioritize**

The building and RES industry needs specialists with new skills and competences. These are related to:

- The implementation of RES in electrical systems in buildings which enhances the necessity of green skills and knowledge;
- The fact that the building sector is composed mostly of small and micro-firms that provide local employment (more than 90% are SMEs), employing 12 million workers in EU. Energy professionals from SMEs lack additional soft skills in order to solve the daily challenges they are facing regarding work management, contacts and communication with clients, marketing, etc.
- The new technologies require additional digital skills for the design, installation, maintenance and operation of the electrical installations;
- Specialists from SMEs need users-friendly, flexible training solutions that will allow them to upgrade their skills and competences in a way tailored to their needs.

At present, specialists who want to work in the field of geothermal and solar installations and equipment should have the following professional qualification: "Technician of power equipment and installations" or "Installer of power equipment and installations", and be specialized in "Renewable sources of energy".

This profession can be acquired at some Vocational High Schools (where the mode of attendance is mostly full-time), and at Vocational Training Centres. There are state requirements as to the different qualification levels but these requirements are too general, and the current curricula adopted by the said vocational high schools and vocational training centres are not harmonized, and certainly inadequate. As the aim of this Project is to address these identified gaps, improve the current curricula, and transfer knowledge to non-European countries, we surveyed 133 companies working in the target fields, and 39 educational institutions.

The aim of the survey was to examine:

- ➢ The opinions, needs and expectations of companies and professionals involved in the renewable energy market on the state of this market in 6 partner-countries;
- ➢ Identify issues related to the efficiency and quality of installation and maintenance of systems, and

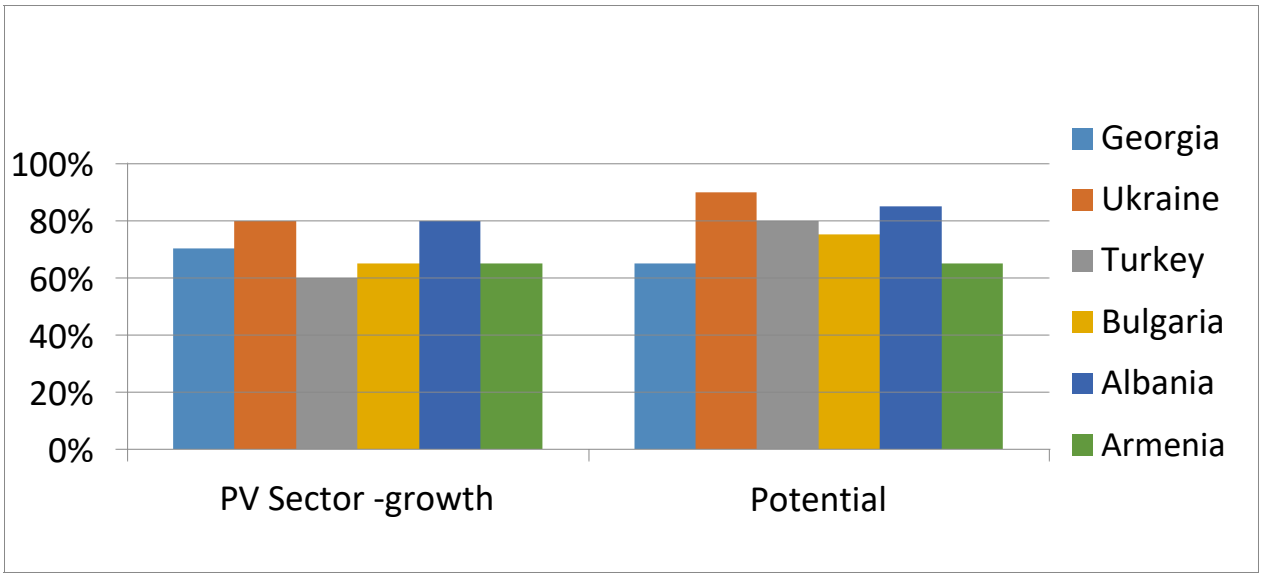
- The skills needed to achieve efficiency and quality, as well as to identify the needs of theoretical knowledge and practical skills of technicians and installers of geothermal and solar installations, for the purpose of tackling the identified gaps and needs by improving training curricula for the target groups and up-skilling trainers.

4. Results

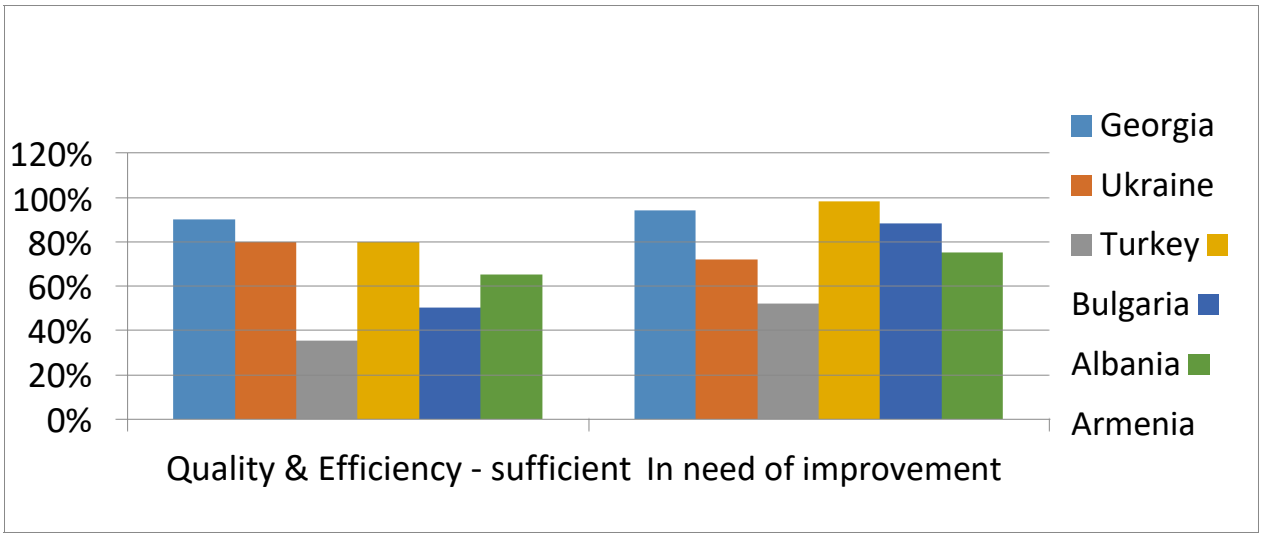
As explained above, the survey was divided in 6 sections:

- PV sector in the respective country – growth and potential;
- Quality and efficiency of PV systems and PV systems in buildings;
- Measures to improve the quality & efficiency of the said systems;
- The prospects of developing a smart grid;
- The use of smart applications in buildings;
- Measures to improve the quality of training of specialists in the field of green and smart electricity in buildings.

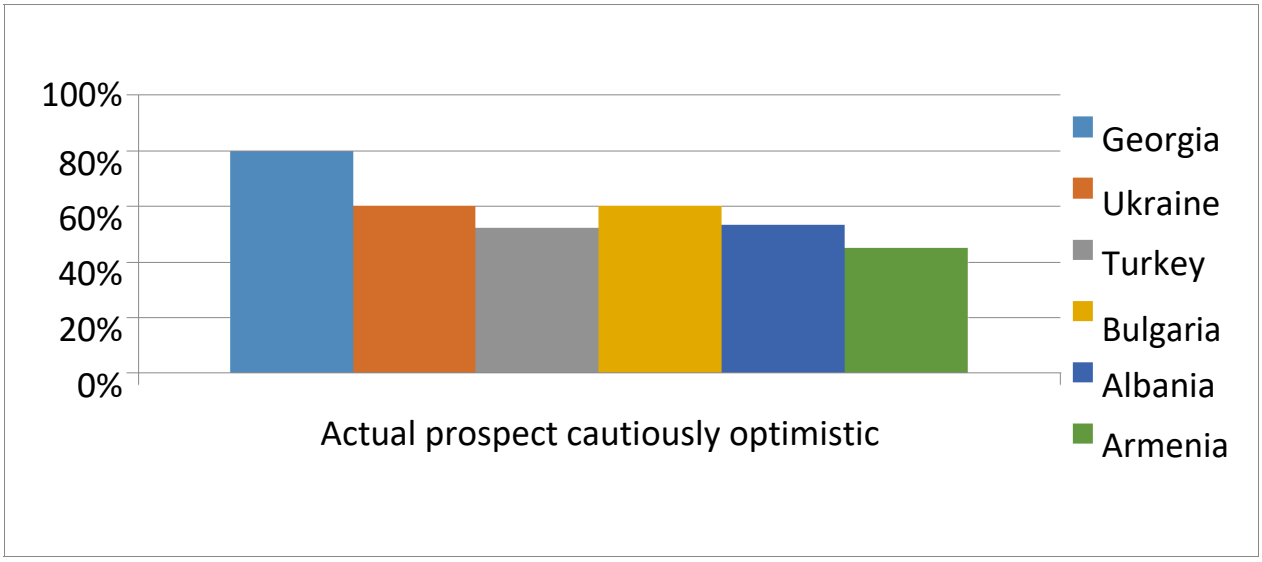
4.1. PV Sector in the Partner Countries



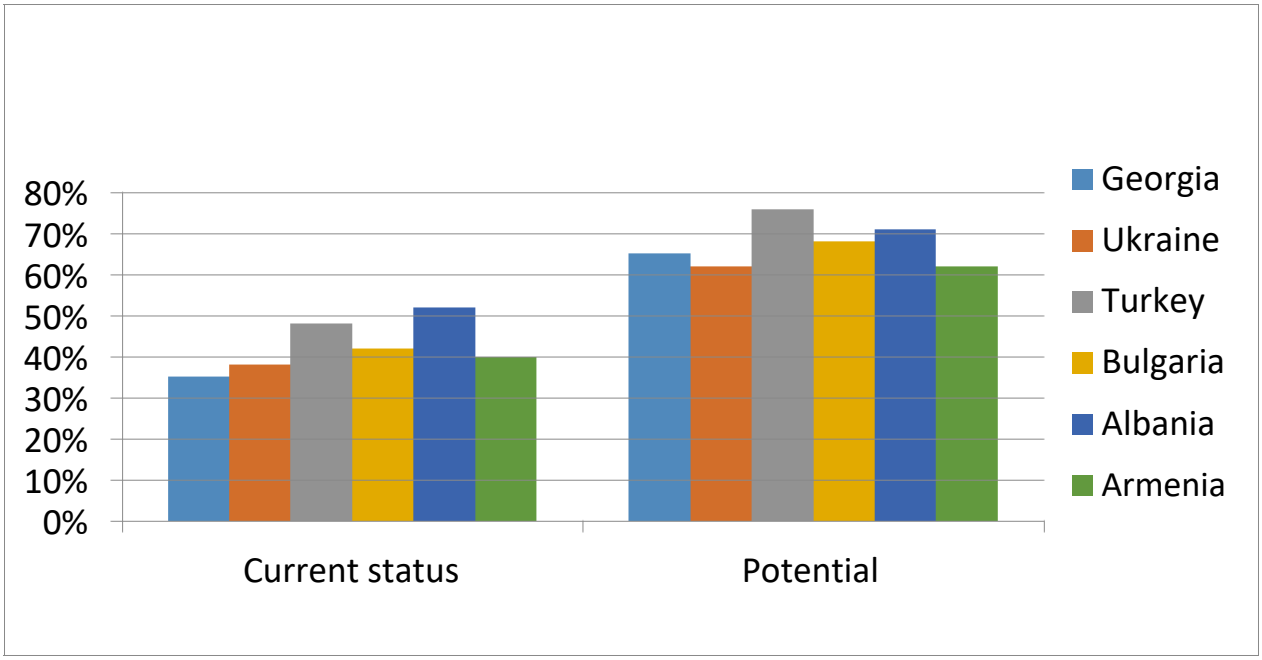
4.2. Quality & Efficiency of PV Systems in the Partner Countries



4.3. Prospects of Building a Smart Grid in the Partner Country:

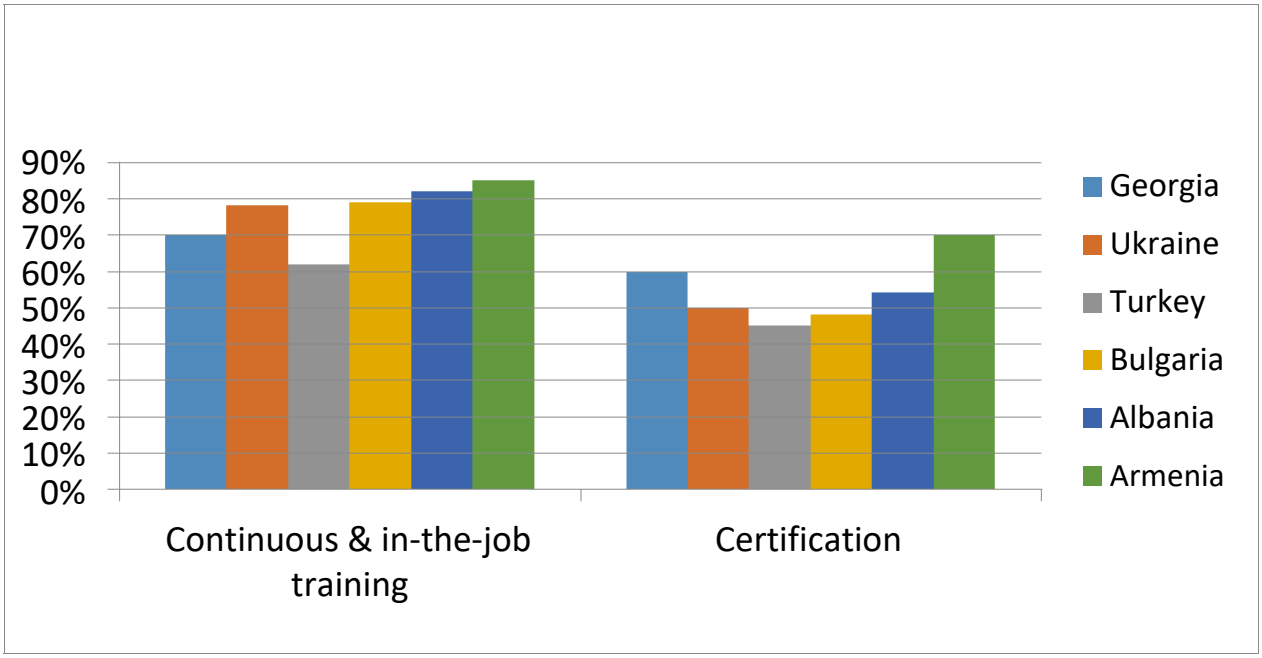


4.4. Use of Smart Electricity Systems in Buildings:



4.5. Level of Competences of Specialists & Trainers

4.6. Measures to Improve the Competences of Specialists & Trainers



Brief summary of the results:

1. **Views on the current status of the PV & RES sector in the partner countries: Between 60 and 80-% of the respondents acknowledge the growth of the RES sector in the last 3 years, and 65 - 85 % are optimistic on the PV market development in the near future. Considering current state of PV market in the partner countries, 60 to 80 % of respondents are fine with the number of the installed PV systems in buildings and between 62 and 85% are convinced in its potential for increase.**
2. **In terms of quality and efficiency of PV installations 38 – 82 % of the respondents think that it is necessary to improve the quality of PV installations and more than 90% of respondents mentioned such measures for the qualitative development as: a good project, selection of location, selection of equipment, training of technical staff, implementation of quality/certification standards.**
3. **Between 48 and 80 % of respondents are optimistic about prospects of building "a smart grid" in 5 years outlook. As a whole, most of the respondents are cautiously optimistic.**
4. **As for the use of smart systems in buildings, between 32 and 56% are satisfied with the situation, whereas between 65 and 75% believe such smart electricity systems should become more widely used.**
5. **With regards to the level of training of technical staff for PV more than half of respondents are neutral, which calls for further trainings between 60 and 82% consider that in-the-job technical training of installers and certification of**

installers have to be in place, and between 60 and 82% consider that continuous training and reassessment of the technical competence of PV system installers are prerequisites for ensuring good quality systems.

6. **With regards to the measures that will contribute to the improvement of the quality of training of trainers, the results are similar. The majority of the surveyed believe that trainers should be certified in accordance with international standards as well as continuous training for trainers shall be introduced. Most respondents also mention the importance of upgrading and improving the training facilities.**

5. Conclusions

The survey study developed for labour market analysis and identification of needs in the partner countries provided important insights.

a. The need for trained manpower,

b. Layout problems in assembly and applications,

c. Lack of technical procedures and implementation standard,

d. Certification and legislation problems and field adequacy were seen as the main deficiencies.

Conclusions:

Stakeholders and VET providers are both aware of how vital it is for the future qualitative growth of the RES industry that trainers and trainees obtain proper, ongoing training. The VET4GSEB project is anticipated to address the noted needs.

The findings are consistent with the findings of a more comprehensive survey conducted by GCP Europe and EuropeOn, which are as follows:

Shortage of skilled specialists mainly due to:

- Unclear education paths and bad image of technical education, lack of information
- Students dropping out of school
- Lack of companies willing to take on apprentices
- Workers leaving the sector
- Integrating foreign workers is difficult

Lack of needed skills due mainly to:

- Lack of up-to-date trainings
- Reluctance of companies & workers to up-skill (mainly due to lack of free time)
- Lack of tools to certify/check workers' skills

The detailed findings of the survey under the VET4GSEB Project will be discussed and further analysed, as they will serve as the basis for the development of the training programme and materials in WP3.

Co-funded by the European Union

VET4GSEB Partners:

The Project is realised by a consortium of 9 partners from: Bulgaria, Albania, Armenia, Georgia, Turkey and Ukraine

Sofia Energy Centre, coordinator

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VET Partnership for Green and Smart Electricity in Buildings
Project 101092256

Summary report on the survey, based on the response of 19 companies working in the field of Renewable Energy Sources (RES) installations and 17 Vocational Education Training (VET) providers in Albania.

Executive Summary

The aim of the survey was to examine the opinions, needs and expectations of companies and professionals involved in the renewable energy market on the state of this market in Albania and in particular the issues related to the efficiency and quality of installation and maintenance of systems, and the skills needed to achieve efficiency and quality, as well as to identify the needs of theoretical knowledge and practical skills of technicians and installers of solar installations, for the purpose of tackling the identified gaps and needs by improving training curricula for the target groups and upskilling trainers.

Methodology

The progression of creating a methodological approach mainly involved primary data processing and analysis. Primary research aimed to give responses to respective questions addressing frequently the issues and opportunities related to green and smart electricity (renewable energy sources) for Albanian market.
A survey was conducted using well-designed, semi- structured questionnaires that were available for the participants on a web based and paper and pencil based. Two semi-structured questionnaires were created and designed to elicit specific information from respondents that could yield answers to above mentioned questions. The target audience of the study are stakeholders such as companies, engineers, technicians, or installers that work in the field of RES installations and VET providers.
Convenience sampling, one of the non-probability sampling techniques, was selected to be employed. Both questionnaires were created in the Albanian language and for its construction it is used the platform of Google Forms. This online platform preserves all the privacy conditions and gives access to data gathered only to the researchers. The channels used to send questionnaires are via e-mail or social media.
The questionnaires content is divided into 4 (four) different sections: Photovoltaic (PV) sector in Albania, quality and efficiency of PV installations in Albania, competencies and certification of installers, and demographic data. The questionnaires contain both open-ended and closed-ended questions, mainly multiple-choice, developed using an itemized rating scale, such as the *Likert Scale*, with five response categories. There are also questions where the respondents have the freedom to choose multiple answers, as well as add other answers not mentioned in the list. The necessary terms of privacy were explained to respondents before they completed the respective questionnaire, and their anonymity was guaranteed. The first questionnaire was sent to 25 companies working in the field of RES installations, in particular PV installations in buildings, and the second one was distributed to 20 VET providers (Vocational high schools and VET

centers). The findings provide insights on the topic based on data analysis and interpretation.

Background

The goals set in the energy strategies and policies of the EU and those of the participating countries have lead to changes in the labour market for installers of electrical and RES systems in buildings.

The building and RES industry needs specialists with new skills and competences. These are related to:

- The implementation of RES in electrical systems in buildings which enhances the necessity of green skills and knowledge;
- The fact that the building and construction sector is composed mostly of small and micro-firms that provide local employment (more than 90% are SMEs), employing 12 million workers in EU. Energy professionals from SMEs lack additional soft skills in order to solve the daily challenges they are facing regarding work management, contacts and communication with clients, marketing, etc.
- The new technologies require additional digital skills for the design, installation, maintenance and operation of the electrical installations;
- Specialists from SMEs need users-friendly, flexible training solutions that will allow them to upgrade their skills and competences in a way tailored to their needs.

At present, specialists who want to work in the field of geothermal and solar installations and equipment should have the following professional qualification: "Technician of power equipment and installations" or "Installer of power equipment and installations", and be specialized in "Renewable sources of energy".

This profession can be acquired at some Vocational High Schools (where the mode of attendance is mostly full-time), and at Vocational Training Centres. There are requirements as to the different qualification levels but these requirements are too general, and the current curricula adopted by the said vocational training centres are not harmonized, and certainly lack of practical skills. As the aim of this Project is to address these identified gaps, improve the current curricula, and transfer knowledge to non-European countries, we surveyed 19 companies working in the target fields, and 17 trainers of several educational institutions.

Results:

The data collected from the both questionnaires are presented at the tables below.

A. Surveys of Stakeholders & VET Providers

PV sector in Albania

1. What is your opinion on the growth of the renewable energy market in Albania in the last 3 years?	**Considerable growth**				**Insignificant growth**
	5	**4**	**3**	**2**	**1**
Responses:	**9**	**10**	**12**	**5**	**0**

2. How, in your opinion, do the legal framework and incentives affect the use of renewable energy systems in Albania?	**Positively**				**Poorly**
	5	**4**	**3**	**2**	**1**
Responses:	**11**	**8**	**11**	**5**	**1**

3. What are the most important measures for the qualitative development of the renewable energy systems market?	The most important important			The least	
a) Simplified licensing procedures	5	4	3	2	1
Responses:	**12**	**2**	**9**	**7**	**0**
b) Financial incentives	5	4	3	2	1
Responses:	**10**	**8**	**9**	**3**	**0**
c) Further development of the Albanian PV industry	5	4	3	2	1
Responses:	**11**	**4**	**12**	**5**	**2**
d) Continuous training of technicians/installers	5	4	3	2	1
Responses:	**11**	**7**	**10**	**3**	**1**
e) System/Installation certification	5	4	3	2	1
Responses:	**10**	**4**	**11**	**4**	**0**
f) Increased energy efficiency requirements for buildings	5	4	3	2	1
Responses:	**11**	**8**	**7**	**2**	**2**
g) Campaigns aimed at raising awareness	5	4	3	2	1
Responses:	**13**	**3**	**8**	**3**	**3**

4. How do you assess the prospect of building a "smart grid" in Albania in the next 5 years?	**Very optimistic**				**Pessimistic**
	5	**4**	**3**	**2**	**1**
Responses:	**5**	**14**	**11**	**5**	**1**
5. How do you assess the prospects for the renewable energy/PV market in Albania in the next 2 years?					
Responses:	**5**	**16**	**6**	**7**	**0**
6a. What is your opinion on the number of installed PV systems in Albania, considering the state of the market?	**Very good**				**Very bad**
	5	**4**	**3**	**2**	**1**
Responses:	**4**	**10**	**9**	**8**	**3**
6b. What is your opinion on the	**Very good**				**Inadequate**

number of installed PV systems in buildings in Albania, considering the state of the market?	**5**	**4**	**3**	**2**	**1**
Responses:	**2**	**2**	**6**	**6**	**3**
6c. What is your opinion about installed integrated/built-in PV systems in buildings in Albania?					
Responses:	**1**	**1**	**11**	**4**	**1**

Quality & Efficiency of PV installations in Albania

7. How do you evaluate the quality of the current PV installations in Albania?	**Very good**				**Very poor**
	5	**4**	**3**	**2**	**1**
Responses:	**3**	**12**	**15**	**6**	**0**
8. Do you think it is necessary to improve the quality of PV installations (with regard to design, implementation and maintenance)?	**Definitely**				**No**
	Yes	**No**	**No opinion**		
Responses:	**28**	**2**	**3**		
9. How often, during the operation of PV Systems, do problems related to technical deficiencies in the installation arise?	**Very often**				**Never**
	5	**4**	**3**	**2**	**1**
Responses:	**1**	**7**	**5**	**4**	**1**
10. In your opinion, how important are the following parameters for the quality and efficiency of a PV installation?	**Very important**				**Insignificant**
	5	**4**	**3**	**2**	**1**
a) a good project					
Responses:	**12**	**9**	**7**	**2**	**0**
b) careful selection of the location of the installation					
Responses:	**13**	**7**	**10**	**3**	**1**
c) Selection of equipment					
Responses:	**11**	**11**	**6**	**4**	**2**
d) Training/experience of the technical staff					
Responses:	**14**	**9**	**9**	**0**	**2**
e) Implementation of Quality/Certification standards					

Responses:	**14**	**6**	**10**	**2**	**2**
11. Do you think there is adequately qualified technical staff in Albania for the installation and maintenance of PV systems?	**Definitely**				**No**
	Yes	**No**	**No opinion**		
Responses:	**6**	**10**	**2**		
12. Do you think there is adequately qualified technical staff in Albania for the installation and maintenance of integrated PV systems in buildings?	**Definitely**			**No**	
	Yes	**No**	**No opinion**		
Responses:	**8**	**7**	**3**		
13. How do you assess the level of training of technical staff for PV installations in Albania?	**Very high**			**Very low**	
	5	**4**	**3**	**2**	**1**
a) Designing / calculating					
Responses:	**4**	**3**	**15**	**6**	**2**
b) Designing the electrical part					
Responses:	**4**	**8**	**13**	**4**	**1**
c) Designing the mechanical part					
Responses:	**3**	**5**	**11**	**7**	**4**
d) Safety rules					
Responses:	**4**	**4**	**11**	**8**	**4**
e) Integrating in buildings					
Responses:	**3**	**3**	**16**	**4**	**4**
f) Maintenance of PV systems					
Responses:	**2**	**8**	**11**	**9**	**1**
14. Which of the following measures could, in your opinion, improve the quality of PV installations in Albania?	**Very important**			**Insignificant**	
	5	**4**	**3**	**2**	**1**
a) certification of the equipment					
Responses:	**7**	**3**	**0**	**4**	**3**
b) certification systems meeting international standards					
Responses:	**7**	**3**	**5**	**2**	**1**
c) in-the-job technical training of installers					
Responses:	**8**	**2**	**5**	**2**	**0**
d) certified training of					

technicians/installers					
Responses:	7	2	7	0	0
e) methods of assessment and certification of the knowledge and skills of installers					
Responses:	7	5	1	3	0
f) approved qualification framework					
Responses:	8	1	4	2	0
15. State whether you agree or not with the following statements:	Fully agree	Agree	Cannot say	Disagree	Strongly disagree
The efficiency of an operating PV system usually corresponds to that stated in the design parameters	8	3	2	1	2
There are enough qualified and experienced PV system installers in Albania	2	3	7	5	1
There is no risk for PV systems being installed by technicians without special training and expertise	0	7	2	3	5
The efficiency of a PV system does not depend on circumstances relating to technical installation and maintenance procedures, provided that the system is built according to the design	1	5	5	1	5
No training certification is required for PV system installers	1	3	5	1	6
Certification of PV installations will not improve the quality of the systems	2	1	6	2	5
Continuous training and reassessment of the technical competence of PV system installers are prerequisites for ensuring good quality systems	4	3	4	2	2
16. **Are there adequate opportunities for proper technical training of PV installers?**	**Many opportunities**				**None**
	5	**4**	**3**	**2**	**1**
Responses:	5	8	10	9	3

17. To what extent do you think the technical training and technical skills of PV installers meet the needs of the Albanian market?	**Definitely**				**No**
	5	**4**	**3**	**2**	**1**

Responses:	**4**	**5**	**19**	**6**	**1**
18. Would you support the introduction of specific quality standards for PV installations?	**Definitely**				**No**
Responses:	**16**	**4**	**8**	**3**	**1**
19. Do you think that the certification of installers and PV installations will contribute to the growth of the PV market in Albania?	**Definitely**				**No**
	5	**4**	**3**	**2**	**1**
Responses:	**11**	**10**	**12**	**1**	**1**
20. How do you evaluate the use of "smart home" applications in building installations in Albania?	**Very good**				**Inadequate**
	5	**4**	**3**	**2**	**1**
Responses:	**4**	**6**	**1**	**3**	**4**
21. What contributes or would contribute to the wider application of "smart" / "smart home" applications in building installations?	**a**	**b**	**c**		
Raising awareness campaign	**3**	**5**	**7**		
Relevant competences of installers and technicians	**5**	**10**	**2**		
Financial incentives	**7**	**1**	**3**		
Other:					

B. Surveys of VET Providers only

22. How do you assess the level of training and qualification of the trainers in the field of PV installations, and green and smart buildings in Albania?	**Very high**				**Very low**
	5	**4**	**3**	**2**	**1**
a) Knowledgeability and training materials on the latest green building technologies?					
Responses:	**2**	**7**	**6**	**0**	**0**
b) Designing/calculating					
Responses:	**4**	**1**	**7**	**2**	**0**
c) Designing the electrical part					
Responses:	**4**	**5**	**6**	**1**	**0**
d) Designing the mechanical part					
Responses:	**3**	**2**	**6**	**2**	**0**

e) Safety rules					
Responses:	**4**	**2**	**5**	**2**	**0**
f) Integrating in buildings					
Responses:	**3**	**2**	**7**	**2**	**0**
g) Maintenance of PV systems					
Responses:	**2**	**7**	**4**	**2**	**0**
h) Hydrogen technologies in 'green' systems					
Responses:	**2**	**4**	**8**	**1**	**0**
i) Energy communities					
Responses:	**2**	**5**	**6**	**1**	**0**
23. Which of the following measures could, in your opinion, improve the quality of training of specialists in the field of renewable energy systems in Albania?	**Very important**				**Insignificant**
	5	**4**	**3**	**2**	**1**
a) trainer certification					
Responses:	**2**	**4**	**5**	**2**	**0**
b) certification systems in accordance with international standards					
Responses:	**8**	**3**	**4**	**1**	**0**
c) practical training of trainers					
Responses:	**8**	**5**	**2**	**0**	**0**
d) organizing seminars and continuous training for trainers					
Responses:	**5**	**4**	**2**	**4**	**0**
e) continuous training of trainers in the field of new methodologies in the field of VET					
Responses:	**8**	**4**	**3**	**0**	**0**
f) upgrading and improving the training facilities					
Responses:	**5**	**3**	**5**	**1**	**0**
g) the opportunity to conduct more practical sessions on sites					
Responses:	**7**	**4**	**2**	**2**	**0**

Brief summary of the results:

Views on the current situation of the Photovoltaic (PV) & Renewable Energy Sources (RES) sector in Albania:

In summary, the analysis of the data collected reveals the following key findings:

Question 1 Analysis

More than half of respondents (53%) recognize the considerable growth of the RES sector during the last three years.

Question 2

Participants had mixed opinions regarding the impact of the legal framework and incentives on the use of renewable energy systems in Albania. The responses indicate that the majority of them (53%) believe that the legal framework and incentives have a positive effect on the adoption of renewable energy systems in Albania. However, a significant percentage of participants (31%) perceived the impact to be very high, while some others (17%) expressed a belief that the legal framework and incentives have a poor or negative impact on the use of renewable energy systems.

Question 3 Analysis

According to participants, some of the most important measures for the qualitative development of the renewable energy systems market that should be taken are as follows:

- Increased energy efficiency requirements for buildings (63%)
- Financial Incentives (60%)
- Continuous training of technicians/installers (56%)
- Campaigns aimed at raising awareness (53%)

Question 4&5 Analysis

About (62%) are optimistic for the renewable energy/PV market in Albania in the next 2 years and (53%) are optimistic about prospects of building “a smart grid” in Albania in the next 5 years.

Question 6b Analysis

Considering the current situation of Albanian PV market only 21% of respondents are fine with the number of the installed PV systems in buildings, about (47%) of them find it inadequate.

Question 7&8 Analysis

Although some of the respondents (42%) think that the quality of the current PV installations in Albania is good, (20%) find it very poor. Moreover, the majority (85%) believe that there is still room for further improvement in terms of quality of PV installations relate to design,

implementation, and maintenance.

Question 10 Analysis

In order to increase the quality and efficiency of PV installation, they find important the following parameters:

- A good project (70%)
- Training/experience of the technical staff (68%)
- Selection of equipment (65%)
- Careful selection of the location of the installation (59%)
- Implementation of Quality/Certification standards (59%)

Question 16:

Participants held diverse views on the availability of opportunities for proper technical training of PV installers in Albania. A substantial/sizable portion (37%) believe that there are many opportunities available for proper technical training of PV installers (rated 4 or 5 on the scale). However, a significant number of participants (34%) felt that there are few to no opportunities for proper technical training.

Question 17:

The majority of participants (54%) expressed the opinion that the technical training and skills of PV installers in Albania only meet the needs of the market to a moderate extent (rated 3 on the scale). Some participants (20%) had concerns about the technical training and skills falling short of market needs (rated 2 or 1 on the scale). However, a smaller percentage (11%) believed that the technical training and skills of PV installers definitely meet market needs.

Question 19:

More than the half of participants (60%) believed that the certification of installers and PV installations will definitely contribute to the growth of the PV market in Albania. There was also a considerable group (34%) who perceived that certification would somewhat contribute to market growth. However, a smaller number of participants (6%) expressed doubts about the positive impact of certification, rating it as 2 or 1 on the scale.

B. Surveys of VET Providers only

Question 22 Analysis:

Overall, the assessment of trainers' level of training and qualification in various aspects of renewable energy systems shows a range of responses.

The highest-rated areas where trainers were assessed to have a good level of training and qualification include maintenance of PV systems (60%) and designing the electrical part (60%), with several respondents rating them as "high" or "very high." The knowledgeability of trainers regarding the latest green building technologies and integrating renewable energy systems in buildings had also a positive assessment, with (60%) of respondents rating them as "high" or "very high", and no one rated as "low". Areas such as designing/calculating and designing the mechanical part received more varied responses, with a mix of ratings across the scale.

Question 23 Analysis:

When asked about measures to improve the quality of training in the field of renewable energy systems, respondents provided valuable insights. Overall, the analysis highlights the areas where trainers are perceived to have strong expertise and those where improvements are desired. The respondents highly emphasized the importance of practical training of trainers (87%), continuous training of trainers in the field of new methodologies in the field of VET (80%), the opportunity to conduct more practical sessions on sites (73%), and certification systems in accordance with international standards (69%).
Trainer certification, organizing seminars and continuous training for trainers, and upgrading and improving the training facilities received more varied responses, with some respondents expressing their importance, while others considered them less significant.

Conclusions:

Overall, the analysis indicates that participants perceive the legal framework and incentives to have a mixed impact on the use of renewable energy systems in Albania. While some view it positively, others consider it to have a poor influence. However, there is a generally positive sentiment towards the legal framework and incentives, the findings provide insights and can guide efforts to improve regulations, incentives, training opportunities, and certification programs in order to foster the adoption and growth of renewable energy in the country.

There is a perceived lack of adequate opportunities for technical training of PV installers, as expressed by a notable number of participants, highlighting a need for increased training initiatives. The assessment of the technical training and skills of PV installers suggests that there is room for improvement to better align with market needs. Nonetheless, there is overall support for the certification of installers and PV installations, with participants believing it will contribute to the growth of the PV market in Albania.

Regarding measures to improve training, the results underscore the significance of practical training, continuous learning, international standards, and hands-on experience. These findings can help guide efforts to enhance the quality of training programs and address the identified gaps in renewable energy systems in Albania.

These insights can inform policymakers, training providers, and stakeholders in their efforts to enhance the legal framework, incentives, training opportunities, and certification programs for renewable energy systems in Albania, fostering their adoption and contributing to the growth of the PV market in the country.

Stakeholders and VET providers are both aware of how vital it is for the future qualitative growth of the RES industry that trainers and trainees obtain proper, ongoing training. The VET4GSEB project is anticipated to address the noted needs.

VET Partnership for Green and Smart Electricity in Buildings
Project 101092256

Summary report on the survey, based on the responses of stakeholders working in the field of RES installations and VET providers in Armenia

The opinions of the surveyed educational organizations are presented below (in red is the opinion of "Taniq" NGO)

RES Sector in Armenia

1. **What is your opinion on the growth of the renewable energy market in Armenia in the last 3 years?**

The development of the renewable energy sector in RA is estimated to be average or sufficient. (*the opinions of the surveyed educational organizations)*

The result of the study of "Taniq" NGO is as follows.

a. Certain branches of the industry, such as the furnishing of buildings and structures with FV stations and solar collectors, are developing quite well.

b. Thermal insulation of buildings, reduction of energy costs and other benefits related to the green economy are at a low level and do not match the rate at which solar plants are being installed.

c. There are no practical eco-education courses in educational institutions, which would not only connect the growing generation with nature, but also develop among them the acquisition of skills aimed at preserving the environment.

2. **How, in your opinion, do the legal framework and incentives affect the use of renewable energy systems in Armenia?**

The impact of the legislative framework was assessed as insufficient or poor/bad (*the opinions of the surveyed educational organizations)*

The result of the study of "Taniq" NGO is as follows.

a. The instability of the legislative framework and the frequent changes in laws create an atmosphere of distrust among Investors, Suppliers and beneficiaries. As a result, many businessmen are wary of investing in renewable energy.

b. The next problem is the monopolization of the energy sector. This has led to the fact that, in the interests of a structure in a monopoly position, laws are being developed that extend the cost recovery periods of RE plants.

c. In the case of the implementation of RE plants with large capacities, obstacles are created to protect the interests of monopolistic structures, which make it impossible to implement the projects.

d. In addition, the Monopoly position of Power Producers and Energizers makes pricing and billing unmanageable.

3. **What are the most important measures for the qualitative development of the renewable energy systems market?**

The measures presented in the sent questionnaire were considered the most important measures for the qualitative development of the renewable energy systems market. (*the opinions of the surveyed educational organizations)*

As a result of the "Taniq" NGO study, the measures presented in the questionnaire were also considered the most important measures for the qualitative development of the market.

4. **How do you assess the prospect of building a "smart grid" in Armenia in the next 5 years?**

The question of the prospect of creating a smart grid in Armenia in the next 5 years was not answered. (*the opinions of the surveyed educational organizations)*

"Taniq" NGO considers such prospect unreal.

1. **How do you assess the prospects for the renewable energy/PV market in Armenia in the next 2 years?**

The prospects of the renewable energy systems market in Armenia in the next 2 years have been assessed as satisfactory. (*the opinions of the surveyed educational organizations)*

"Taniq NGO also considers such a perspective realistic

Quality and Efficiency of RES installations

7. How do you evaluate the quality of the current PV installations in Armenia?

The quality of PV installations currently installed in RA was considered satisfactory. (*the opinions of the surveyed educational organizations)*

"Taniq" NGO considers that estimate realistic

8. Do you think it is necessary to improve the quality of PV installations (with regard to design, implementation and maintenance)?

The quality of PV installations (in terms of design, implementation and maintenance) needs improvement. (*the opinions of the surveyed educational organizations)*

According to the specialists of "Taniq" NGO, following measures aimed at improvement should become mandatory.

a. preparation and presentation of the project by the client.

b. Certification of the delivered station.

9. In your opinion, how important are the following parameters for the quality and efficiency of a PV installation?

The measures presented in the table were considered important by the respondents to the questionnaire. (*the opinions of the surveyed educational organizations)*

"Taniq" NGO also considers them important.

10. Do you think there is adequately qualified technical staff in Armenia for the installation and maintenance of PV systems?

The answers to the question - Are there any qualified technical personnel in RA for the installation and maintenance of PV systems? - were positive.

"Taniq" NGO believes that the answer to the question is negative, because the installers are mostly self-taught and do not have appropriate qualifications.

11. How do you assess the level of training of technical staff for PV installations in Armenia a?

The level of training of the technical personnel installing PV installations in RA was assessed as medium-satisfactory for questions a, b, c, and poor for questions d, e, f poor/bad. (*the opinions of the surveyed educational organizations)*

"Taniq" NGO believes that the answer to all questions should be negative.

12. How do you assess the level of training and qualification of the trainers in the field of PV installations, and green and smart buildings in Armenia?

The level of preparation and qualification of trainers in the field of PV installations, green and smart buildings in RA was assessed as mostly satisfactory, and in some cases poor. (*the opinions of the surveyed educational organizations)*

"Taniq" NGO believes that the answer to all questions should be negative.

13. In which areas do trainers need additional training and competences?

Fields of training necessary for trainers In the answer to the question, all the fields presented in the table were mentioned. (*the opinions of the surveyed educational organizations)*

"Taniq" NGO believes that regarding the first column of the table, specialists have sufficient training. In other matters, they need training.

14. Which of the following measures could, in your opinion, improve the quality of training of specialists in the field of renewable energy systems in Armenia?

All issues proposed for improving the quality of training of specialists in the field of renewable energy systems in RA were considered important. (*the opinions of the surveyed educational organizations)*

Specialists of "Taniq" NGO also consider the presented issues important.

We would not like to consider these measures on a scale of most important or least important. They are all important.

Competences and certification of specialists working in the RES sector

16. Is there a clear professional structure of RES installation specialists and does it meet the needs of the market?

There is no clear professional structure of renewable energy installation specialists in RA. (*the opinions of the surveyed educational organizations)*

"Taniq" NGO agrees with that assessment.

17. Are there sufficient opportunities for appropriate technical training of these professionals?

In RA, there are sufficient opportunities for appropriate technical training of these specialists. (*the opinions of the surveyed educational organizations)*

"Taniq" NGO agrees with that assessment.

18. To what extent do you think that the technical training and the technical skills of the RES installation specialists meet the needs of the market?

The answers to the question were negative if the technical training and technical skills of the specialists in the installation of renewable energy installations in RA correspond to the market requirements. (*the opinions of the surveyed educational organizations)*

"Taniq" NGO believes that this assessment is wrong. It meets the requirements of the Armenian market.

19. Would you support the introduction of specific quality standards for renewable energy installations?

All answered positively to the question of support for the introduction of special quality standards for renewable energy installations in RA

20. Do you think that the certification of the specialists will contribute to the growth of the renewable energy market in Armenia?

Will the certification of renewable energy specialists in RA contribute to the growth of the renewable energy market in RA? The answers to the question were positive.

"Taniq" NGO believes that this assessment is wrong. Market growth is driven by other factors.

21. Do you think that the certification of trainers of installers of renewable energy systems will contribute to the growth of the renewable energy market in Armenia?

Will the certification of trainers of renewable energy system installers in RA contribute to the growth of the renewable energy market in RA? The answers to the question were positive.

"Taniq" NGO believes that this assessment is wrong. Market growth is driven by other factors.

Statistical Data

Questionnaire questions were answered by;

a. National Polytechnic University,

b. Research Institute of Communications of the Republic of Armenia,

c. Educational organizations included in the Union of RA Employers.

d. "Taniq" NGO.

VET Partnership For Green and Smart Electricity in Buildings
Project 101092256

Summary report on the survey, based on the response of 35 companies working in the field of RES installations and 5 VET providers in Bulgaria

Executive Summary
The aim of the survey was to examine the opinions, needs and expectations of companies and professionals involved in the renewable energy market on the state of this market in Bulgaria and in particular the issues related to the efficiency and quality of installation and maintenance of systems, and the skills needed to achieve efficiency and quality, as well as to identify the needs of theoretical knowledge and practical skills of technicians and installers of geothermal and solar installations, for the purpose of tackling the identified gaps and needs by improving training curricula for the target groups and upskilling trainers.

Methodology
The survey was conducted online, on the basis of questionnaires especially developed for the survey. Two questionnaires were developed – one for stakeholders and one for VET providers, and sent to 35 companies working in the field of RES installations, and PV installations in buildings, in particular, and 5 VET providers (a university, two vocational high schools, and two VET Centres). First, the questionnaires were sent to the respective organizations (companies, institutions). The managers of the companies/contact persons in educational institutions were afterwards contacted by phone to offer further details of the survey, its aim, and the objectives of the Project as a whole. After the completed questionnaires were returned, we organized a meeting with representatives of the respondent parties at which the results were presented and the identified gaps further discussed.

Background
The goals set in the energy strategies and policies of the EU and those of the participating countries have lead to changes in the labour market for installers of electrical and RES systems in buildings.
The building and RES industry needs specialists with new skills and competences. These are related to:

- The implementation of RES in electrical systems in buildings which enhances the necessity of green skills and knowledge;
- The fact that the building sector is composed mostly of small and micro-firms that provide local employment (more than 90% are SMEs), employing 12 million workers in EU. Energy professionals from SMEs lack additional soft skills in order to solve the daily challenges they are facing regarding work management, contacts and communication with clients, marketing, etc.
- The new technologies require additional digital skills for the design, installation, maintenance and operation of the electrical installations;
- Specialists from SMEs need users-friendly, flexible training solutions that will allow them to upgrade their skills and competences in a way tailored to their needs.

At present, specialists who want to work in the field of geothermal and solar installations and equipment should have the following professional qualification: "Technician of power equipment and installations" or "Installer of power equipment and installations", and be specialized in "Renewable sources of energy".
This profession can be acquired at some Vocational High Schools (where the mode of attendance is mostly full-time), and at over 45 Vocational Training Centres. There are state requirements as to the different qualification levels but these requirements are too general, and the current curricula adopted by the said vocational high schools and vocational training centres are not harmonized, and certainly inadequate. As the aim of this Project is to address these identified gaps, improve the current curricula, and transfer knowledge to non-European countries, we surveyed 35 companies working in the target fields, and 5 educational institutions

Results:
Below, we have provided the data gathered from the surveys:

A. Surveys of Stakeholders & VET Providers

PV sector in Bulgaria

1. What is your opinion on the growth of the renewable energy market in Bulgaria in the last 3 years?	**Considerable growth**				**Insignificant growth**
	5	**4**	**3**	**2**	**1**
Responses:	**20**	**8**	**5**		
2. How, in your opinion, do the legal framework and incentives affect the use of renewable energy systems in Bulgaria?	**Positively**				**Poorly**
	5	**4**	**3**	**2**	**1**
Responses:		**17**	**14**	**5**	
3. What are the most important measures for the qualitative development of the renewable energy systems market?	The most important important				The least
a) Simplified licensing procedures	5	4	3	2	1
Responses:	**25**	**5**	**5**		
b) Financial incentives	5	4	3	2	1
Responses:	**20**	**5**	**5**	**5**	
c) Further development of the Bulgarian PV industry	5	4	3	2	1
Responses:	**28**	**4**	**3**		
d) Continuous training of technicians/installers	5	4	3	2	1
Responses:	**29**		**6**		
e) System/Installation certification	5	4	3	2	1

3. What are the most important measures for the qualitative development of the renewable energy systems market?	The most important important			The least	
Responses:	**17**	**9**	**9**		
f) Increased energy efficiency requirements for buildings	5	4	3	2	1
Responses:	**30**		**3**	**2**	
g) Campaigns aimed at raising awareness	5	4	3	2	1
Responses:	**29**		**3**	**3**	
4. How do you assess the prospect of building a "smart grid" in Bulgaria in the next 5 years?	**Very optimistic**				**Pessimistic**
	5	**4**	**3**	**2**	**1**
Responses:		**15**	**15**	**5**	
5. How do you assess the prospects for the renewable energy/PV market in Bulgaria in the next 2 years?					
Responses:		**16**	**14**	**5**	
6a. What is your opinion on the number of installed PV systems in Bulgaria, considering the state of the market?	**Very good**				**Very bad**
	5	**4**	**3**	**2**	**1**
Responses:		**6**	**15**	**14**	
6b. What is your opinion on the number of installed PV systems in buildings in Bulgaria, considering the state of the market?	**Very good**				**Inadequate**
	5	**4**	**3**	**2**	**1**
Responses:		**3**	**29**	**3**	
6c. What is your opinion about installed integrated/built-in PV systems in buildings in Bulgaria?					
Responses:			**32**	**3**	

Quality & Efficiency of PV installations in Bulgaria

7. How do you evaluate the quality of the current PV installations in Bulgaria?	**Very good**				**Very poor**
	5	**4**	**3**	**2**	**1**
Responses:	**7**	**14**	**14**		
8. Do you think it is necessary to improve the quality of PV installations (with regard to design,	**Definitely**				**No**
	5	**4**	**3**	**2**	**1**

implementation and maintenance)?					
Responses:	35				
9. How often, during the operation of PV Systems, do problems related to technical deficiencies in the installation arise?	**Very often**				**Never**
	5	**4**	**3**	**2**	**1**
Responses:		13	10	12	
10. In your opinion, how important are the following parameters for the quality and efficiency of a PV installation?	**Very important**			**Insignificant**	
	5	**4**	**3**	**2**	**1**
a) a good project					
Responses:	31	4			
b) careful selection of the location of the installation					
Responses:	35				
c) Selection of equipment					
Responses:	30	5			
d) Training/experience of the technical staff					
Responses:	35				
e) Implementation of Quality/Certification standards					
Responses:	19	16			
11. Do you think there is adequately qualified technical staff in Bulgaria for the installation and maintenance of PV systems?	**Definitely**				**No**
	5	**4**	**3**	**2**	**1**
Responses:	27	5	3		
12. Do you think there is adequately qualified technical staff in Bulgaria for the installation and maintenance of integrated PV systems in buildings?	**Definitely**				**No**
	5	**4**	**3**	**2**	**1**
Responses:	22	5	8		
13. How do you assess the level of training of technical staff for PV installations in Bulgaria?	**Very high**			**Very low**	
	5	**4**	**3**	**2**	**1**
a) Designing / calculating					
Responses:	27	8			

b) Designing the electrical part					
Responses:	35				
c) Designing the mechanical part					
Responses:	30	5			
d) Safety rules					
Responses:	15	16	1	3	
e) Integrating in buildings					
Responses:		11	24		
f) Maintenance of PV systems					
Responses:	6	7	22		
14. Which of the following measures could, in your opinion, improve the quality of PV installations in Bulgaria?	**Very important**			**Insignificant**	
	5	**4**	**3**	**2**	**1**
a) certification of the equipment					
Responses:	8	18	9		
b) certification systems meeting international standards					
Responses:	18	9	8		
c) in-the-job technical training of installers					
Responses:	17	9	9		
d) certified training of technicians/installers					
Responses:	17	9	9		
e) methods of assessment and certification of the knowledge and skills of installers					
Responses:	18	17			
f) approved qualification framework					
Responses:	20	15			
15. State whether you agree or not with the following statements:	Fully agree	Agree	Cannot say	Disagree	Strongly disagree
The efficiency of an operating PV system usually corresponds to that stated in the design parameters	5	30			
There are enough qualified and experienced PV system installers in Bulgaria	5	22	4	4	
There is no risk for PV systems being installed by technicians without				29	6

special training and expertise					
The efficiency of a PV system does not depend on circumstances relating to technical installation and maintenance procedures, provided that the system is built according to the design				29	6
No training certification is required for PV system installers		8	8	8	11
Certification of PV installations will not improve the quality of the systems				22	13
Continuous training and reassessment of the technical competence of PV system installers are prerequisites for ensuring good quality systems	15	8	8	4	
The efficiency of an operating PV system usually corresponds to that stated in the design parameters	7	24	4		
16. **Are there adequate opportunities for proper technical training of PV installers?**	**Many opportunities**				**None**
	5	**4**	**3**	**2**	**1**
Responses:	11	2	14	8	

17. To what extent do you think the technical training and technical skills of PV installers meet the needs of the Bulgarian market?	**Definitely**				**No**
	5	**4**	**3**	**2**	**1**
Responses:		14	21		
18. Would you support the introduction of specific quality standards for PV installations?	**Definitely**				**No**
	5	**4**	**3**	**2**	**1**
Responses:	8	23	4		
19. Do you think that the certification of installers and PV installations will contribute to the growth of the PV market in Bulgaria?	**Definitely**				**No**
	5	**4**	**3**	**2**	**1**
Responses:	5	17	7	6	
20. How do you evaluate the use of "smart home" applications in building installations in Bulgaria?	**Very good**				**Inadequate**
	5	**4**	**3**	**2**	**1**
Responses:	7	19	9		
21. What contributes or would contribute to the wider application of "smart" / "smart home" applications in building installations?	**5**	**4**	**3**	**2**	**1**

Raising awareness campaign		**8**			
Relevant competences of installers and technicians	**7**	**3**			
Financial incentives	**32**				
Other:					

B. Surveys of VET Providers only

22. How do you assess the level of training and qualification of the trainers in the field of PV installations, and green and smart buildings in Bulgaria?	**Very high**				**Very low**
	5	**4**	**3**	**2**	**1**
a) Knowledgeability and training materials on the latest green building technologies?					
Responses:		**2**	**3**		
b) Designing/calculating					
Responses:	**4**	**1**			
c) Designing the electrical part					
Responses:	**4**	**1**			
d) Designing the mechanical part					
Responses:	**5**				
e) Safety rules					
Responses:	**5**				
f) Integrating in buildings					
Responses:	**3**	**2**	**2**		
g) Maintenance of PV systems					
Responses:	**4**	**1**			
h) Hydrogen technologies in 'green' systems					
Responses:	**1**	**1**	**3**		
i) Energy communities					
Responses:		**3**	**2**		
23. Which of the following measures could, in your opinion, improve the quality of training of specialists in the field of renewable energy systems in Bulgaria?	**Very important**				**Insignificant**
	5	**4**	**3**	**2**	**1**

a) trainer certification					
Responses:	**1**	**2**	**3**		
b) certification systems in accordance with international standards					
Responses:	**3**	**2**	**1**		
c) practical training of trainers					
Responses:	**4**	**1**			
d) organizing seminars and continuous training for trainers					
Responses:	**5**				
e) continuous training of trainers in the field of new methodologies in the field of VET					
Responses:	**5**				
f) upgrading and improving the training facilities					
Responses:	**1**	**4**			
g) the opportunity to conduct more practical sessions on sites					
Responses:	**1**	**4**			

Brief summary of the results:

1. **Views on the current status of the PV & RES sector in Bulgaria:**
   Over 50% of the respondents acknowledge the considerable growth of the sector, and believe it has a great potential for development, especially in buildings and smart homes (54%).
2. **In terms of measures for the qualitative development, over 70% believe the most important is the continuous training of technical staff, followed by simplified licensing procedures, approved qualification frame (52%), certification system and awareness-raising campaigns.**
3. **As regards the implementation of a smart grid in Bulgaria, most of the respondents are cautiously optimistic**
4. **Concerning the competences of trainers, 100% of the respondents believe continuous training will be greatly beneficial,, and 90% support further practical training.**

Conclusions:

Both stakeholders and VET providers are aware of the vital role of appropriate, continuous training of trainers and trainees for the future qualitative development of the RES sector. We expect that the VET4GSEB project will tackle the identified needs.

VET Partnership for Green and Smart Electricity in Buildings
Project 101092256

Summary report on the survey, based on the responses of stakeholders working in the field of RES installations and VET providers in Georgia

Executive Summary
The aim of the survey was to examine the opinions, needs and expectations of companies and professionals involved in the renewable energy market on the state of this market in Georgia and in particular the issues related to the efficiency and quality of installation and maintenance of systems, and the skills needed to achieve efficiency and quality, as well as to identify the needs of theoretical knowledge and practical skills of technicians and installers of geothermal and solar installations, for the purpose of tackling the identified gaps and needs by improving training curricula for the target groups and upskilling trainers.

Methodology
The survey was conducted online, on the basis of questionnaires especially developed for the survey. Two questionnaires were developed – one for stakeholders and one for VET providers, and sent to 10 companies working in the field of RES installations, 7 specialists working on installation of solar PV systems in buildings, Department of Energy Efficiency & Renewable Energy Policy & Sustainable Development at the Ministry of Economy and Sustainable Development of Georgia and 5 VET providers (three universities and two VET colleges. Prior to sending the questionnaires each company/contact person in educational institutions were contacted and briefed on the project, its goals and objectives, aim of the survey. A total of 9 completed questionnaires from stakeholders and 8 completed questionnaires from VET providers were received.
Following the receipt of the completed questionnaires, we set up a stakeholders' meeting with at which the findings were presented and the gaps that had been identified were further explored.

Background
In accordance with the requirements of the Law of Georgia on Promoting the Generation and Consumption of Energy from Renewable Sources to set up of training / information distribution to the public on RE, setting up of certification programmes for RE installers and have lists of certified installers. In 2022 the government approved the 4 training programs in the following directions: installation of small-scale biomass boilers and furnaces; installation of solar photovoltaic systems; installation of solar thermal systems and installation of surface geothermal systems and heat pumps.

VET training programs for installers of small-scale renewable energy installations, in particular short term 5-week programs (75 hours) training and certification of installers of solar photovoltaic (PVS) was developed at the Faculty of Power Engineering and initiated by the Ministry of Economy and Sustainable Development of Georgia and supported by the German Society for International Cooperation (GIZ).

The first training and certification of installers of solar PV systems for group of 10 specialists was conducted in Dec.2022-Jan.2023. Other VET colleges and training providers plan to introduce government approved the certification and training program for installers of solar

PV systems as in coming years as stated in the "Survey of Business Demand on Skills" 20221 carried out by Labour Market Information System (LMIS) under Ministry of Economy and Sustainable Development of Georgia2 "within the framework of the planned solar and wind power plant development plan in Georgia, approximately 300 people will be employed in the construction and after-operation process from 2023 of which 250 people will be employed in construction. During the course of the work, 50 will be constantly employed during the operation of the project" the demand for such specialist will be increasing.

The goals set in the energy strategies and policies of the EU and those of the participating countries have lead to changes in the labour market for installers of electrical and RES systems in buildings.
The building and RES industry needs specialists with new skills and competences. These are related to:

- The implementation of RES in electrical systems in buildings which enhances the necessity of green skills and knowledge;
- The fact that the building sector is composed mostly of small and micro-firms that provide local employment (more than 90% are SMEs), employing 12 million workers in EU. Energy professionals from SMEs lack additional soft skills in order to solve the daily challenges they are facing regarding work management, contacts and communication with clients, marketing, etc.
- The new technologies require additional digital skills for the design, installation, maintenance and operation of the electrical installations;
- Specialists from SMEs need user-friendly, flexible training solutions that will allow them to upgrade their skills and competences in a way tailored to their needs.

There are state requirements as to the different qualification levels but these requirements are too general, and the current curricula adopted by the said vocational high schools and vocational training centres are not harmonized, and certainly inadequate. As the aim of this Project is to address these identified gaps, improve the current curricula, and transfer knowledge to non-European countries, we surveyed companies/stakeholders working in the target field, and educational institutions engaged in training of installers of RES systems

Results:
Below, the data gathered from the questionnaires is provided:

A. Surveys of Stakeholders & VET Providers

PV sector in Georgia

1. What is your opinion on the growth of the renewable energy market in Georgia in the last 3 years?	**Considerable growth**				**Insignificant growth**
	5	**4**	**3**	**2**	**1**
Responses:	3	6	6	2	
2. How, in your opinion, do the legal framework and incentives	**Positively**				**Poorly**
	5	**4**	**3**	**2**	**1**

[2] http://www.lmis.gov.ge/Lmis/Lmis.Portal.Web/Handlers/GetFile.ashx?Type=UserReport&ID=6d62d354-2f42-4614-9038-fdaea4c0d13d p.26

affect the use of renewable energy systems in Georgia?					
Responses:	**2**	**5**	**5**	**4**	**1**

3. What are the most important measures for the qualitative development of the renewable energy systems market?	The most important important				The least
a) Simplified licensing procedures	5	4	3	2	1
Responses:	**10**	**4**			**1**
b) Financial incentives	5	4	3	2	1
Responses:	**13**	**4**			
c) Further development of the Georgian PV industry	5	4	3	2	1
Responses:	**6**	**7**	**2**		
d) Continuous training of technicians/installers	5	4	3	2	1
Responses:	**10**	**6**	**1**		
e) System/Installation certification	5	4	3	2	1
Responses:	**5**	**4**	**6**		
f) Increased energy efficiency requirements for buildings	5	4	3	2	1
Responses:	**7**	**7**	**1**	**1**	
g) Campaigns aimed at raising awareness	5	4	3	2	1
Responses:	**8**	**8**	**1**		

4. How do you assess the prospect of building a "smart grid" in Georgia in the next 5 years?	**Very optimistic**				**Pessimistic**
	5	**4**	**3**	**2**	**1**
Responses:	**4**	**7**	**4**		**1**
5. How do you assess the prospects for the renewable energy/PV market in Georgia in the next 2 years?					
Responses:	**6**	**5**	**5**	**1**	
6a. What is your opinion on the number of installed PV systems in Georgia, considering the state of the market?	**Very good**				**Very bad**
	5	**4**	**3**	**2**	**1**
Responses:		**4**	**2**	**2**	**1**
6b. What is your opinion on the number of installed PV systems in buildings in Georgia, considering the state of the market?	**Very good**				**Inadequate**
	5	**4**	**3**	**2**	**1**
Responses:		**1**	**5**	**1**	**2**
6c. What is your opinion about					

installed integrated/built-in PV systems in buildings in Georgia?					
Responses:	**1**	**2**	**3**		

Quality & Efficiency of PV installations in Georgia

7. How do you evaluate the quality of the current PV installations in Georgia?	**Very good**				**Very poor**
	5	**4**	**3**	**2**	**1**
Responses:	**2**	**6**	**7**	**1**	
8. Do you think it is necessary to improve the quality of PV installations (with regard to design, implementation and maintenance)?	**Definitely**				**No**
	yes	**no**	**Can't say**		
Responses:	**16**		**1**		
9. How often, during the operation of PV Systems, do problems related to technical deficiencies in the installation arise?	**Very often**				**Never**
	5	**4**	**3**	**2**	**1**
Responses:		**1**	**6**	**2**	
10. In your opinion, how important are the following parameters for the quality and efficiency of a PV installation?	**Very important**				**Insignificant**
	5	**4**	**3**	**2**	**1**
a) a good project					
Responses:	**16**				
b) careful selection of the location of the installation					
Responses:	**15**				**1**
c) Selection of equipment					
Responses:	**15**	**1**			
d) Training/experience of the technical staff					
Responses:	**15**	**1**			
e) Implementation of Quality/Certification standards					
Responses:	**14**	**3**			
11. Do you think there is adequately qualified technical staff in Georgia for the installation and maintenance of PV systems?	**Definitely**				**No**
	5	**4**	**3**	**2**	**1**
Responses:	**8**	**3**	**6**		
12. Do you think there is adequately qualified technical staff in Georgia for the installation and maintenance	**Definitely**				**No**
	Yes	**No**	**Can't**		

of integrated PV systems in buildings?			**say**		
Responses:	**2**	**1**	**6**		
13. How do you assess the level of training of technical staff for PV installations in Georgia?	**Very high**				**Very low**
	5	**4**	**3**	**2**	**1**
a) Designing / calculating					
Responses:	**1**	**4**	**10**	**2**	
b) Designing the electrical part					
Responses:	**1**	**5**	**9**	**1**	
c) Designing the mechanical part					
Responses:	**1**	**7**	**9**		
d) Safety rules					
Responses:	**1**	**4**	**9**	**3**	
e) Integrating in buildings					
Responses:		**3**	**10**	**1**	**1**
f) Maintenance of PV systems					
Responses:		**5**	**11**	**1**	
14. Which of the following measures could, in your opinion, improve the quality of PV installations in Georgia?	**Very important**				**Insignificant**
	5	**4**	**3**	**2**	**1**
a) certification of the equipment					
Responses:	**3**	**4**	**1**		
b) certification systems meeting international standards					
Responses:	**5**	**2**	**1**		
c) in-the-job technical training of installers					
Responses:	**5**	**2**	**1**		
d) certified training of technicians/installers					
Responses:	**6**	**2**			
e) methods of assessment and certification of the knowledge and skills of installers					
Responses:	**5**	**3**			
f) approved qualification framework					
Responses:	**4**	**4**			
15. State whether you agree or not with the following statements:	Fully agree	Agree	Cannot say	Disagree	Strongly disagree
The efficiency of an operating PV system usually corresponds to that	**2**	**2**	**4**	**1**	

stated in the design parameters					
There are enough qualified and experienced PV system installers in Georgia.			3	6	
There is no risk for PV systems being installed by technicians without special training and expertise			1	6	2
The efficiency of a PV system does not depend on circumstances relating to technical installation and maintenance procedures, provided that the system is built according to the design	1		1	6	1
No training certification is required for PV system installers	1			6	2
Certification of PV installations will not improve the quality of the systems			2	4	3
Continuous training and reassessment of the technical competence of PV system installers are prerequisites for ensuring good quality systems	7	2			
The efficiency of an operating PV system usually corresponds to that stated in the design parameters					
16. **Are there adequate opportunities for proper technical training of PV installers?**	**Many opportunities**				**None**
	5	**4**	**3**	**2**	**1**
Responses:	1	7	5	3	1

17. To what extent do you think the technical training and technical skills of PV installers meet the needs of the Georgian market?	**Definitely**				**No**
	5	**4**	**3**	**2**	**1**
Responses:		2	8	5	2
18. Would you support the introduction of specific quality standards for PV installations?	**Definitely**				**No**
	5	**4**	**3**	**2**	**1**
Responses:	7	2			
19. Do you think that the certification of installers and PV installations will contribute to the growth of the PV market in Georgia?	**Definitely**				**No**
	5	**4**	**3**	**2**	**1**
Responses:	8	5	2	1	
20. How do you evaluate the use of "smart home" applications in building installations in Georgia?	**Very good**				**Inadequate**
	5	**4**	**3**	**2**	**1**
Responses:	2	5	2		
21. What contributes or would	**5**	**4**	**3**	**2**	**1**

contribute to the wider application of "smart" / "smart home" applications in building installations?					
Raising awareness campaign			**3**	**2**	**3**
Relevant competences of installers and technicians			**1**	**1**	**4**
Financial incentives				**2**	**5**
Other:					

B. Surveys of VET Providers only

22. How do you assess the level of training and qualification of the trainers in the field of PV installations, and green and smart buildings in Georgia?	**Very high**				**Very low**
	5	**4**	**3**	**2**	**1**
a) Knowledgeability and training materials on the latest green building technologies?					
Responses:	**0**	**1**	**5**	**2**	
b) Designing/calculating					
Responses:	**1**	**1**	**5**	**1**	
c) Designing the electrical part					
Responses:	**1**	**2**	**3**	**1**	
d) Designing the mechanical part					
Responses:	**1**	**3**	**3**	**1**	
e) Safety rules					
Responses:	**1**	**1**	**3**	**3**	
f) Integrating in buildings					
Responses:	**0**	**2**	**4**	**2**	
g) Maintenance of PV systems					
Responses:					
h) Hydrogen technologies in 'green' systems					
Responses:			**2**	**3**	**3**
i) Energy communities					
Responses:	**2**	**0**	**3**	**2**	**0**
23. Which of the following measures could, in your opinion, improve the quality of training of specialists in the field of renewable energy	**Very important**				**Insignificant**
	5	**4**	**3**	**2**	**1**

systems in Georgia?					
a) trainer certification					
Responses:	**3**	**4**	**1**		
b) certification systems in accordance with international standards					
Responses:	**5**	**2**	**1**		
c) practical training of trainers					
Responses:	**5**	**2**			
d) organizing seminars and continuous training for trainers					
Responses:	**5**	**2**	**1**		
e) continuous training of trainers in the field of new methodologies in the field of VET					
Responses:	**3**	**4**			
f) upgrading and improving the training facilities					
Responses:	**7**	**1**			
g) the opportunity to conduct more practical sessions on sites					
Responses:	**4**	**3**			

Brief summary of the results:

1. **Views on the current status of the PV & RES sector in Georgia:**
   More than 70-% of the respondents acknowledge the growth of the RES sector in the last 3 years, and more than 65 % are optimistic on the PV market development in the near future. More than 40 % of respondents are optimistic about prospects of building "a smart grid" in Georgia in 5 years outlook. Considering current state of PV market in the country about 60% of respondents are fine with the number of the installed PV systems in buildings.
2. **In terms of quality and efficiency of PV installations 94% of respondents think that it is necessary to improve the quality of PV installations and more than 90% of respondents mentioned such measures for the qualitative development as: a good project, selection of location, selection of equipment, training of technical staff, implementation of quality/certification standards.**
3. **As regards the implementation of a smart grid in Georgia, most of the respondents are cautious.**
4. **With regards to the level of training of technical staff for PV more than half of respondents are neutral, which calls for further trainings as more than 60% consider that in-the-job technical training of installers and certification of installers shall be in place, moreover about 80% considers that**

continuous training and reassessment of the technical competence of PV system installers are prerequisites for ensuring good quality systems.

5. **With regards to the measures that will contribute to the improvement of the quality of training of specialists more than 60% of respondents considers that trainers shall be certified in accordance with international standards as well as continuous training for trainers shall be introduced. Majority of respondents also mentioned the importance of upgrading and improving the training facilities.**

Conclusions:

Stakeholders and VET providers are both aware of how vital it is for the future qualitative growth of the RES industry that trainers and trainees obtain proper, ongoing training. The VET4GSEB project is anticipated to address the noted needs.

Survey of Solar PV System Market Situation in Türkiye and Needs Analysis

VET4GSEB

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Sedat VATANDAŞ
Şadi KARAMANOĞLU

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1. Introduction

The project developed within the scope of Erasmus+ primarily aims at individual development, with the help of the links it will form with sectoral stakeholders, while prioritizing the National VET providers to develop the skills needs of the labor market in the construction and RES sector. Photovoltaic solar technologies, which are the main component of the renewable energy sector, are the most common sector that has found application today. Although there are many application differences, sectoral application capabilities have an advanced structure. Despite this, it needs improvement in terms of needs and it needs the development of implementation procedures. However, in this context, it will be possible to develop and manage a common language union with sectoral stakeholders, and a framework needs to be established in the sector first. Thus, the development of the right manpower in the sector will be ensured, together with possible improvement effects. In this context, this project firstly put forward a sectoral needs analysis.

The main objective of the VET4GSEB project is to transfer the experience and good practices in the field of VET from the EU countries to 4 third countries participating in the project. It intends to provide the national VET providers with adapted solutions, training materials, case studies, tools, and guidelines, which will allow them to update their training practices and programs in order to meet the skills needs of the labour market in the building and RES sector.

This research is the definition of the sectoral situation in PV technology on a national basis and the development of determinations that will contribute to the development of possible improvement strategies together with public authorities in terms of sectoral stakeholders. It is also the development of a needs analysis to evaluate possible inputs to the development processes of energy policies, to prepare national energy plans, and to identify improvement opportunities in the sector.

PV markets are a dynamic industry with significant growth all over the world. While the market is stabilizing globally, the PV industry is unfortunately under heavy cost pressure for many countries. Although support costs are developed for national strategies, the price reduction of PV modules and system will create new opportunities in both on-grid and off-grid applications. Although policy support for PV applications is important, developing a comprehensive analysis of the PV market development is valuable work.

Today, PV applications have found application areas for all sectoral components. Especially within social structures, the relative share of the four market segments (residential, commercial, utility scale and non-network) has been significantly influenced over time and this effect is constantly changing. In particular, the capacity of cumulatively loaded

residential PV systems is expected to decrease from almost 60% today to less than 40% by 2050. According to the research of the International Energy Agency, a possible development path for electricity generation of PV systems has emerged, as can be seen in Figure 1.

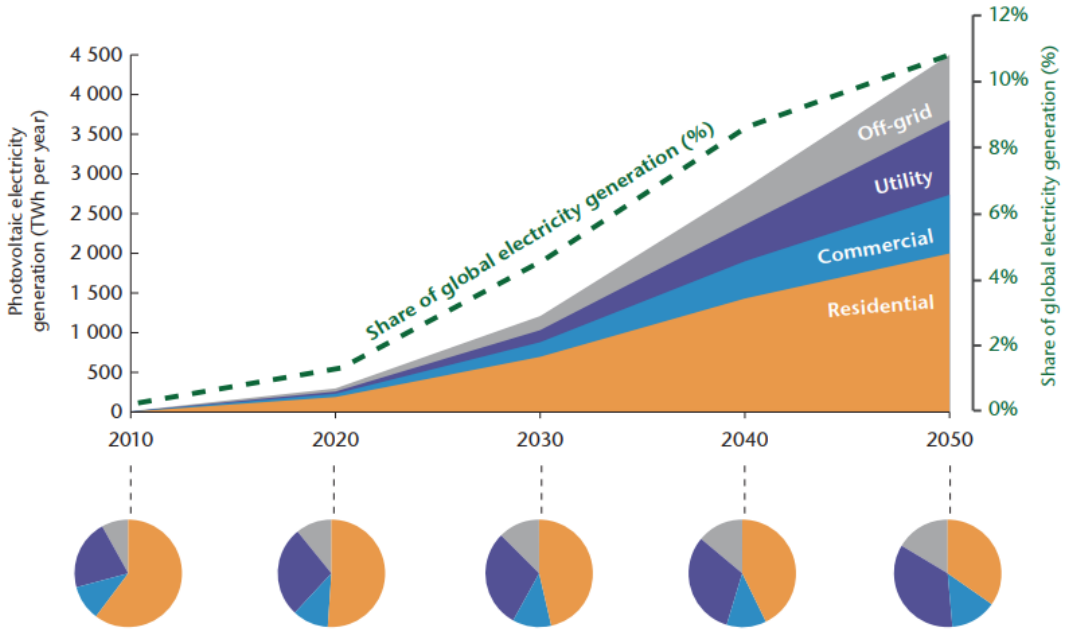


Figure 1. Evolution of photovoltaic electricity generation by end-use sector

Dünyadaki toplam kurulu GES kapasitesi 2000 yılında yaklaşık 1 GW'den, 2020 yılında 710 GW'ye yükselmiştir. Dünya GES Kurulu gücünde Çin lider konumdadır. 2020 yılına gelindiğinde ise Çinli üreticilerin toplam paylarının %85 seviyesine çıktığı görülmektedir. Net Sıfır Karbon hedefleri dâhilinde, 2030 yılında küresel GES kurulu gücünün yaklaşık 3.000 GW seviyesinde olacağı tahmin edilmektedir.

According to the sectoral expectations according to the IEA report, Tables 1,2 and 3 can also see their distribution by global electricity generation sectors, total installed power capacities and annual market, respectively.

Table 1. Annual PV power generation (TWh) by end-use sector

Annual electricity generation (TWh)	2010	2020	2030	2040	2050
Residential	23	153	581	1244	1794
Commercial	4	32	144	353	585
Utility	8	81	368	910	1498
Off-grid	3	32	154	401	695
Total	***37***	***298***	***1247***	***2907***	***4572***

Table 2. Cumulative installed PV capacity (GW) by end-use sector

PV capacity (GW)	2010	2020	2030	2040	2050
Residential	17	118	447	957	1380
Commercial	3	22	99	243	404
Utility	5	49	223	551	908
Off-grid	2	21	103	267	463
Total	***27***	***210***	***872***	***2019***	***3155***

Table 3. Annual global PV market volume (GW) by end-use sector

PV market (GW)	2010	2020	2030	2040	2050
Residential	4.1	18	50	55	53
Commercial	0.7	4	13	17	20
Utility	1.6	8	28	37	44
Off-grid	0.6	4	14	19	24
Market	***7***	***34***	***105***	***127***	***141***

PV is already competitive for a range of off-grid standalone products, services and applications. However, the majority of PV industry output is grid dependent; therefore, the grid-connected market will continue to be the main market segment in the future. Therefore, commercial objectives for PV are focused on achieving competitiveness with electricity grid retail prices for residential and commercial PV systems, and electricity generation costs for grid-scale systems, respectively. As electricity prices and solar irradiance vary from one market place to another, it is only possible to set timeframes for PV competitiveness on a global basis. Three main stages have been envisioned for the commercial development of PV (Figure 2).

In the first decade, the annual PV market of new installations is expected to increase from 6 GW to 34 GW, and PV industry to ramp-up into massscale industrial production, and to reduce system and generation costs by more than 50%. This will allow PV residential and commercial systems to achieve parity with the distribution grid electricity retail prices in a number of countries characterised by a good solar resource and high conventional electricity retail prices. In a few cases, this is likely to occur before 2015. By 2020 PV generation costs are expected to range from USD 13-26 cents/kWh (commercial systems) to USD 16-31 cents/kWh (residential systems), depending on the sitespecific solar irradiation level. These costs are expected to be lower than electricity retail prices in several countries. In the same timeframe, utility PV system will achieve USD 10 cents/kWh, arriving at the edge of

competitiveness with wholesale electricity costs in some countries. To achieve these goals, PV will require sustained and consistent policy frameworks and support incentives in many countries during this period.

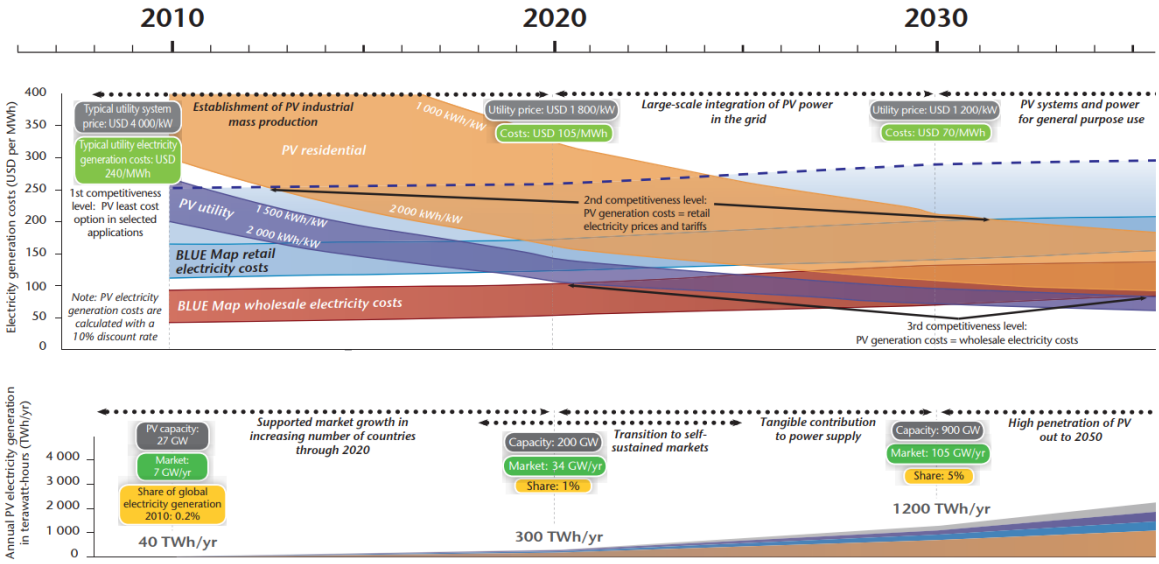


Figure 2. PV market deployment and competitiveness levels

From 2020 to 2030, this roadmap envisions that PV will advance toward large-scale grid integration, and start to become competitive at a much broader scale. Towards the end of the decade, typical utility PV system generation costs are expected to decrease down to USD 7-13 cent/kWh and PV will become competitive at utilityscale with wholesale electricity prices in some world regions. By that time, commercial and residential systems will become cost-competitive in almost all world regions with reasonable solar irradiation. The annual market/shipment volume will have increased by another factor of three over this decade (hitting the benchmark of 100 GW by 2030), leading to a cumulative installed capacity of almost 900 GW worldwide. During this period, economic incentives should begin to gradually be phased-out while maintaining grid access guarantees and sustained R&D support.

2. Materials and Method

This study includes a survey developed to evaluate the sectoral situation and needs analysis of the PV market in Turkey. The study participants were evaluated very comprehensively as sectoral stakeholders and it was tried to reach all stakeholders. In this survey study, in which the sectoral framework will be evaluated, the data related to the sectoral structures will be collected and evaluated, and the administrative relations of the related evaluations have been examined. As can be seen in Figure 3, this is considered together with cyclical relationships.

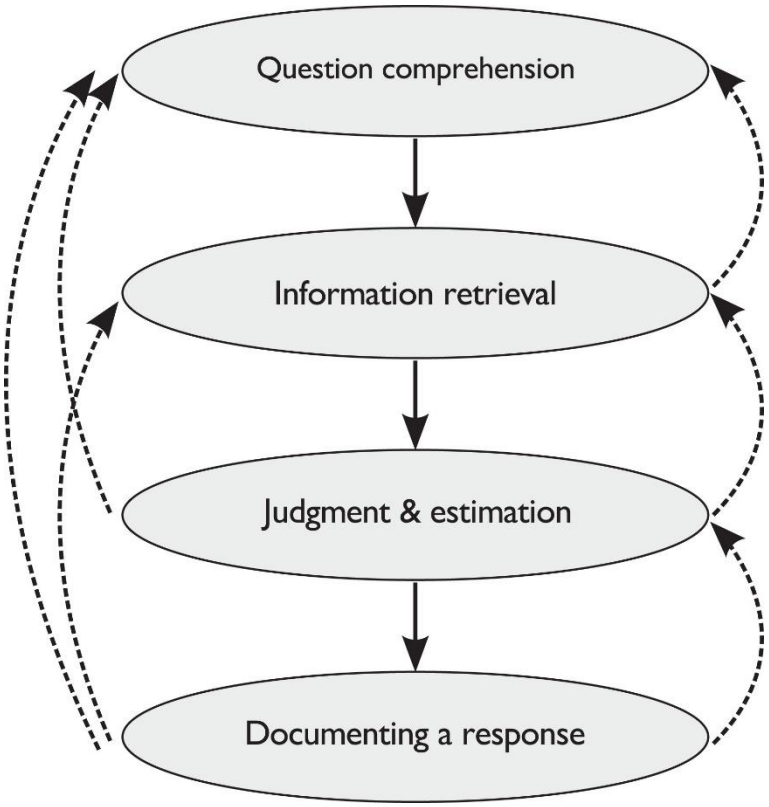


Figure 3. Survey framework and relationships structure

The questions developed by considering the structure of the sectoral stakeholders and the market are gathered in six sections. These;

- Personal information of the survey participants
- Türkiye Photovoltaic Industry
- Quality and Efficiency of Photovoltaic Installations in Turkey
- Skills and Certification of Installers
- Use of 'smart' applications in building installations
- Statistical Data

The institutional distribution of 57 interviewees participating in the program for the survey questions consisting of 67 questions in total is given in Figure 4.

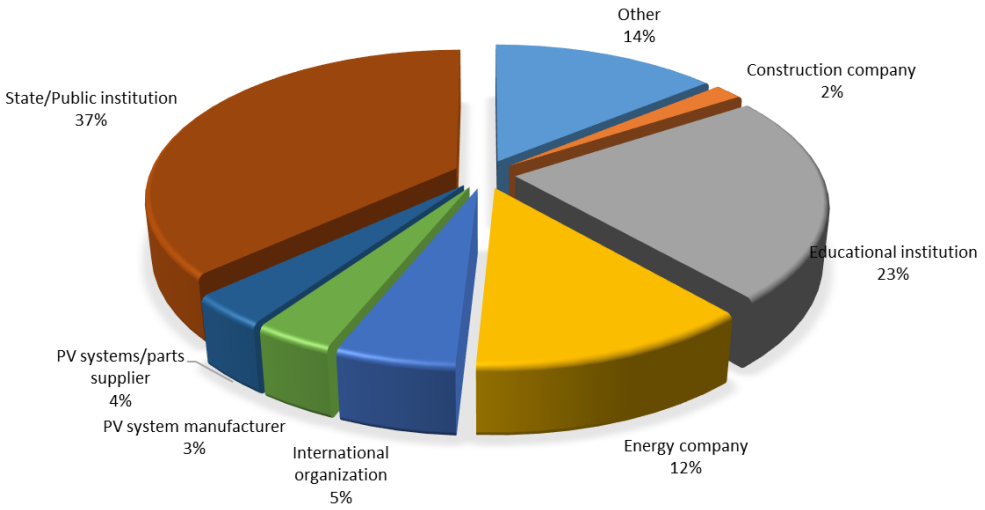


Figure 4. Survey participant profiles

The survey was conducted directly on the online platform through numerical evaluation. The professional qualifications of the stakeholders participating in the survey can be seen in Figure 5.

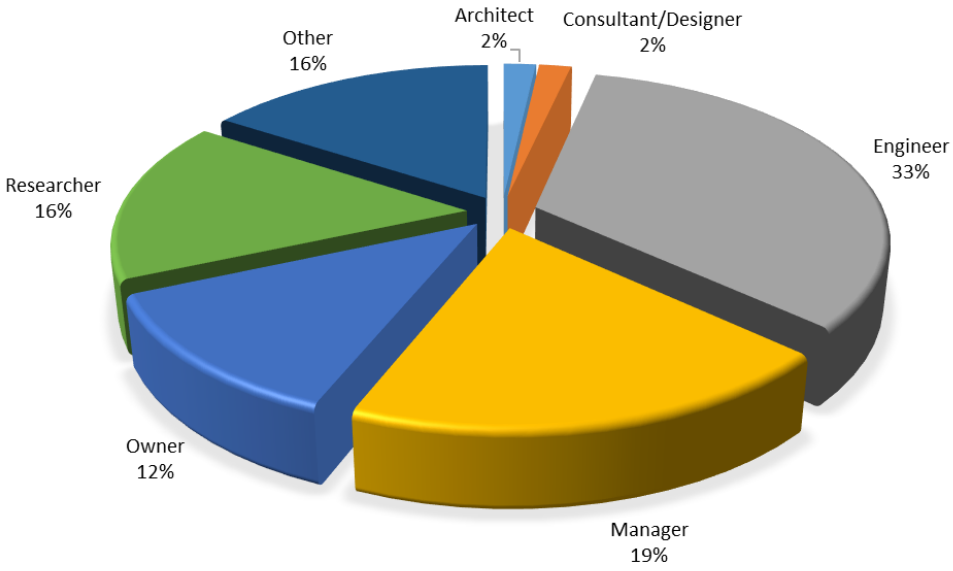


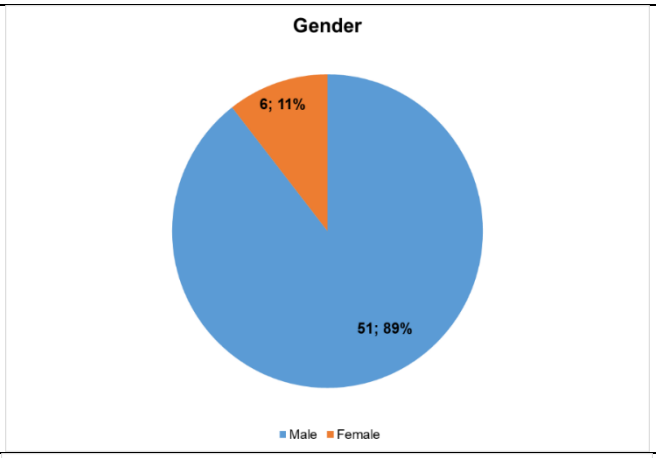
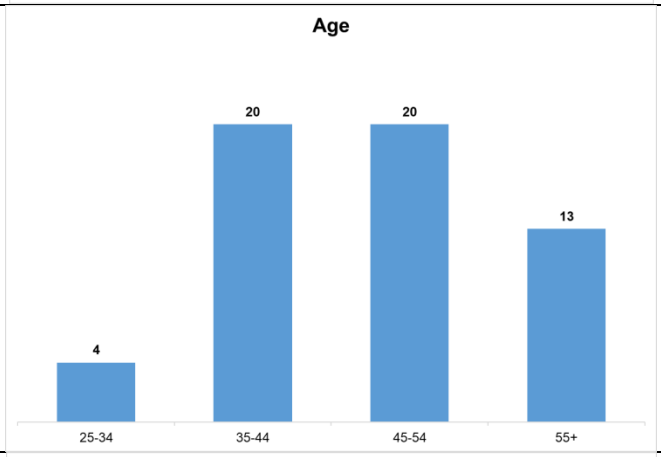
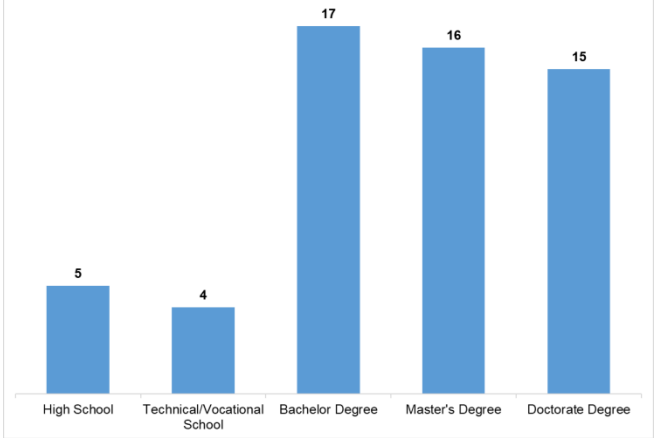
Figure 5. Distribution of survey participants vocational qualifications

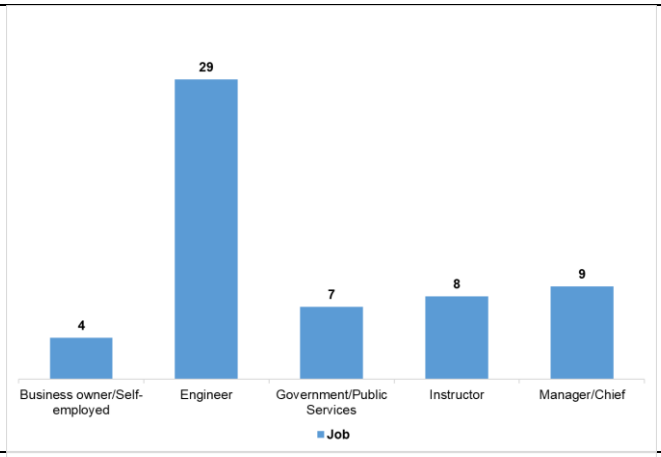
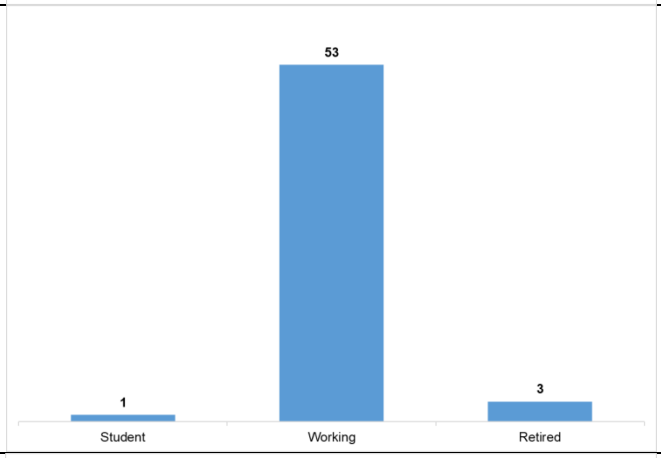
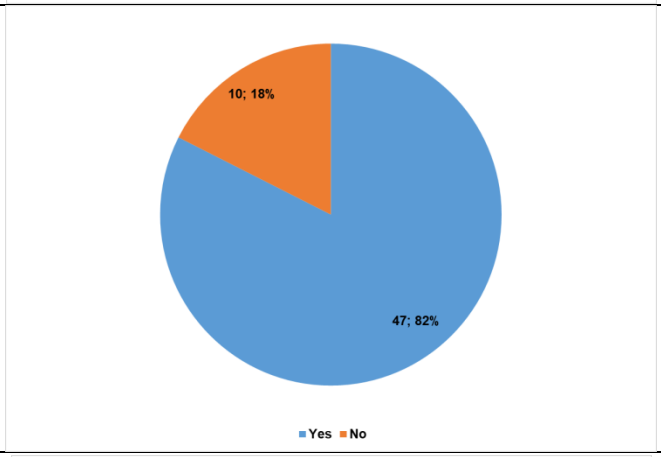
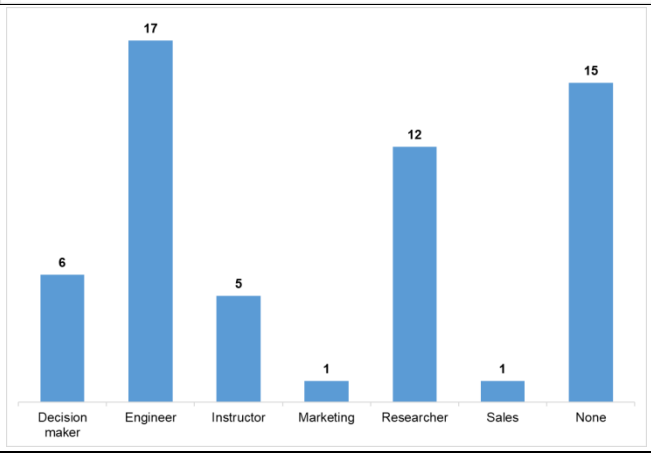
3. Results And Discussion

In the survey study developed to evaluate the sectoral situation and needs analysis of the PV market in Turkey, the question-based answers and distributions of the answers given by the participants are given below.

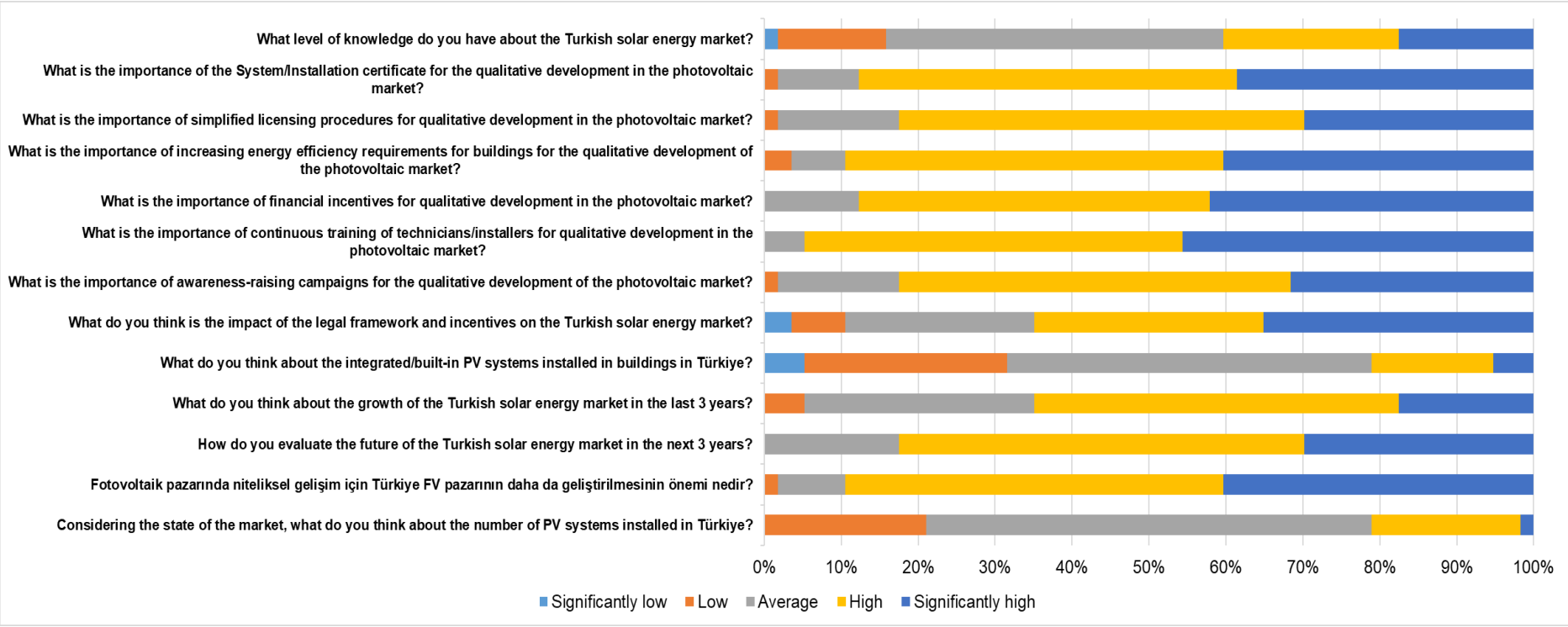
The survey study has been handled in 6 sections;

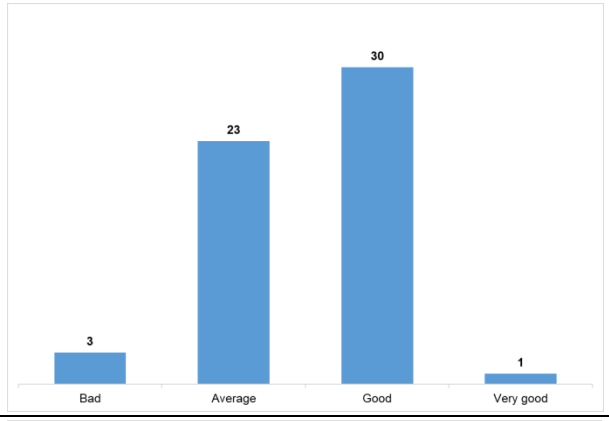
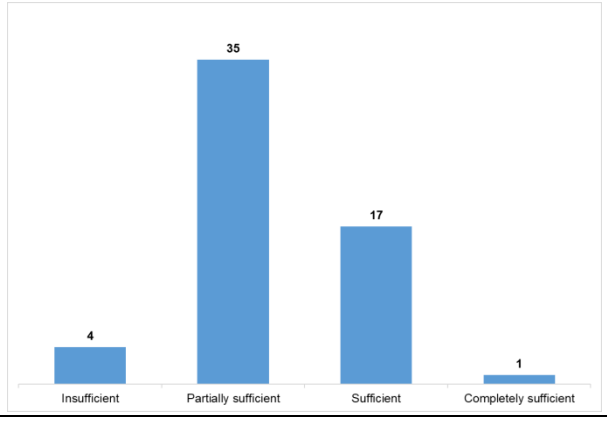
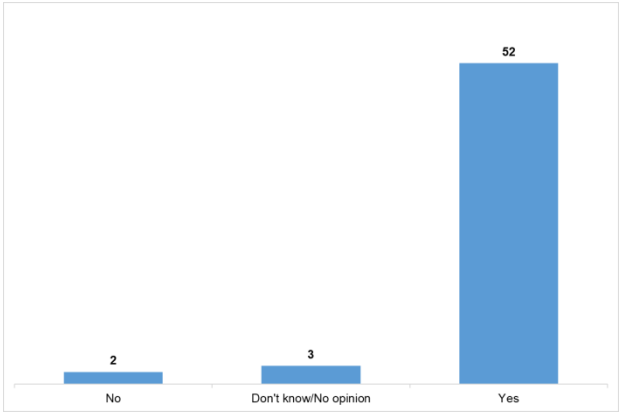
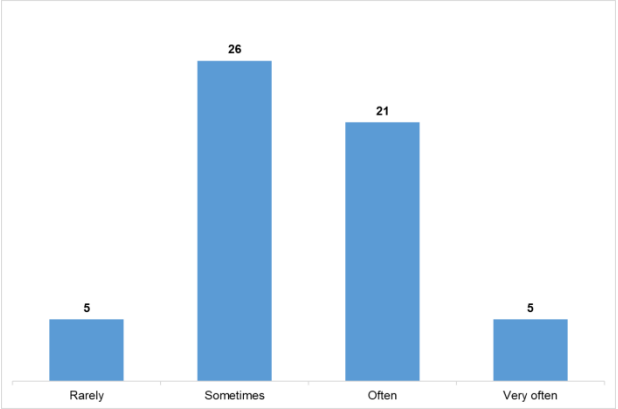
- In the first part, the personal characteristics of the participants were evaluated.
- In the second part, the level of knowledge of the participants about the Photovoltaic sector in Turkey was taken into account.
- In the third part, their thoughts on the quality and efficiency of photovoltaic facilities in Turkey were evaluated.
- In the fourth section, the opinions of the survey participants on the assessment of the skills and certification levels of the photovoltaic plant installers are given.
- In the fifth part, the opinions of the survey participants on the use of 'smart' applications in building installations in terms of photovoltaic plant applications are given.
- In the sixth and last part, the competency-based statistical data of the survey participants are included.

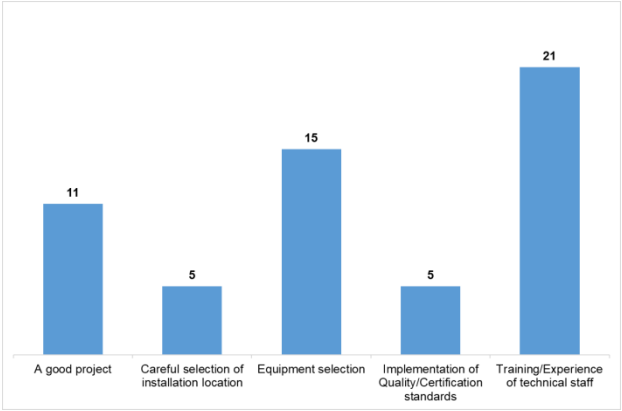
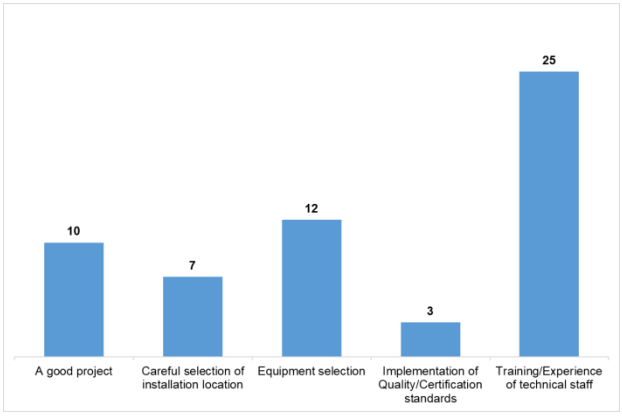
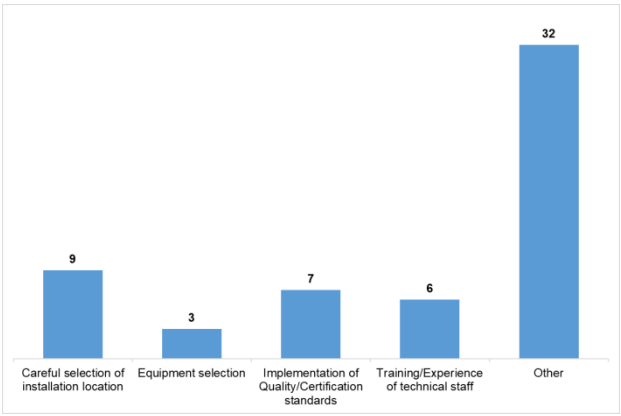
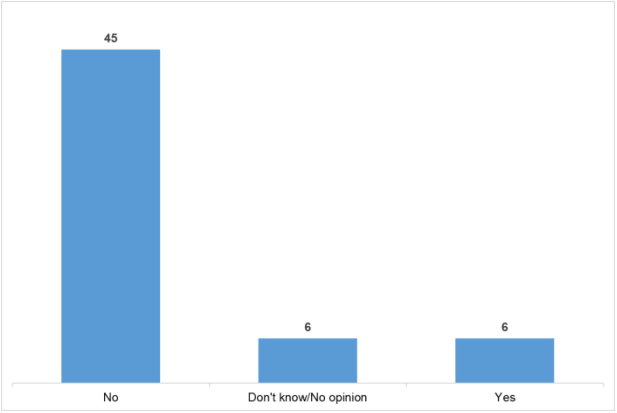
Section 1	Personal information of the survey participants
1.1 Gender	
1.2 Age	
1.3 Level of education	

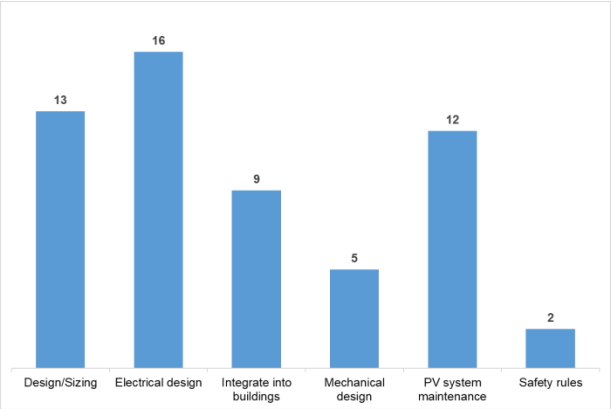
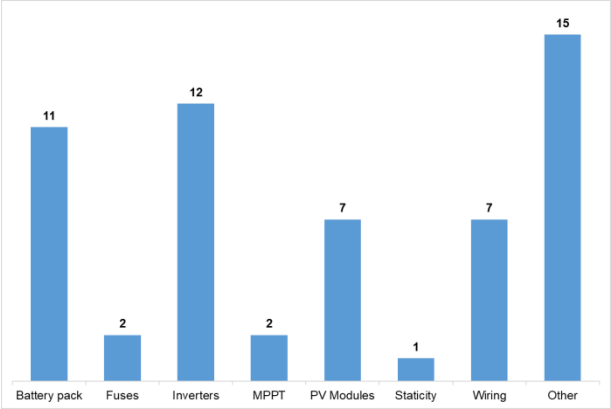
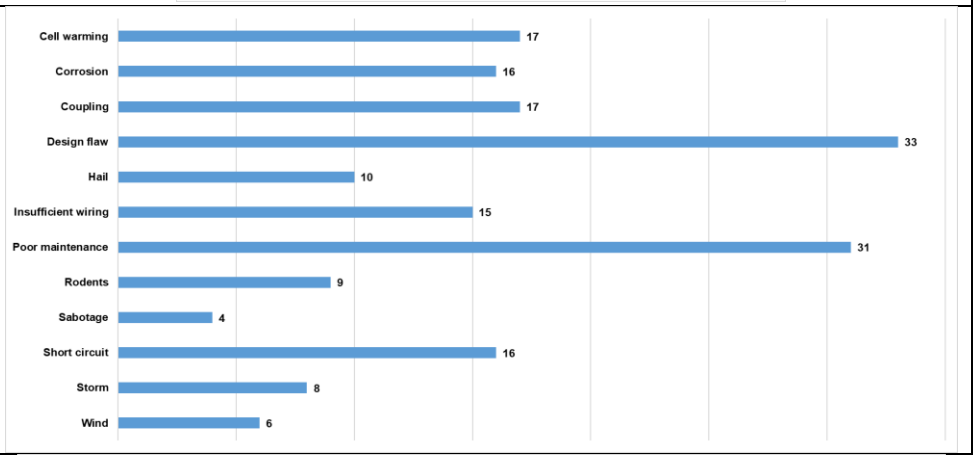
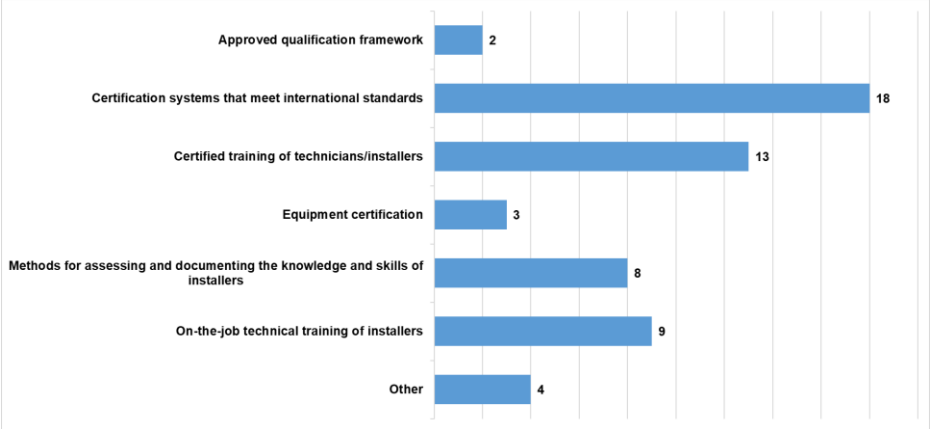
1.4 Job	
1.5 Status	
1.6 Have you been interested in the solar energy sector before?	
1.7 What is your role in the solar industry?	

Section 2: Türkiye Photovoltaic Industry

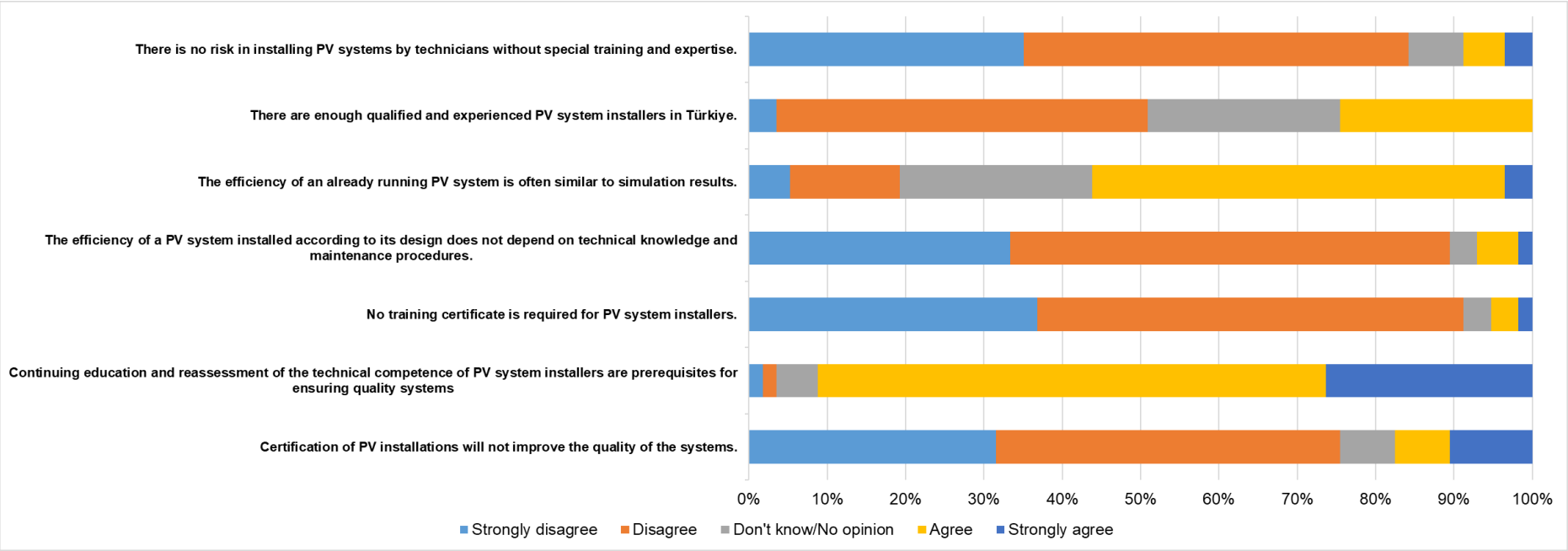


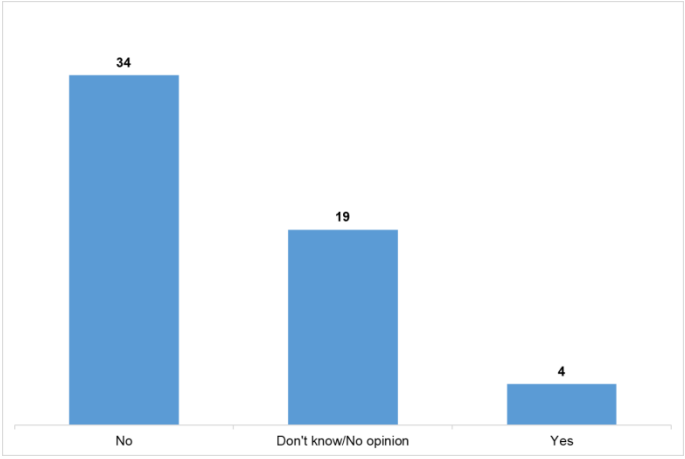
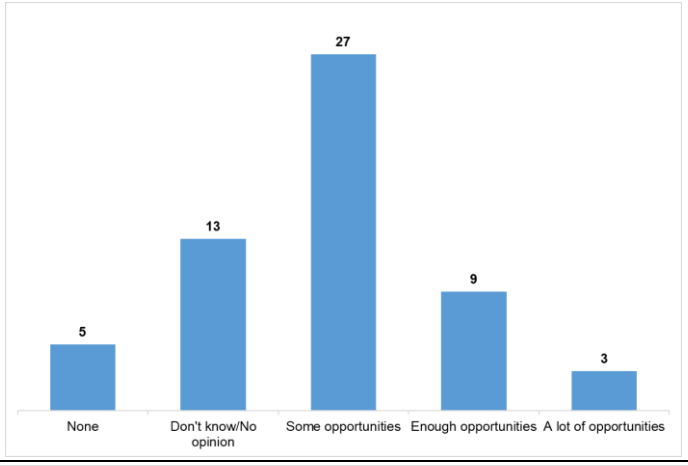
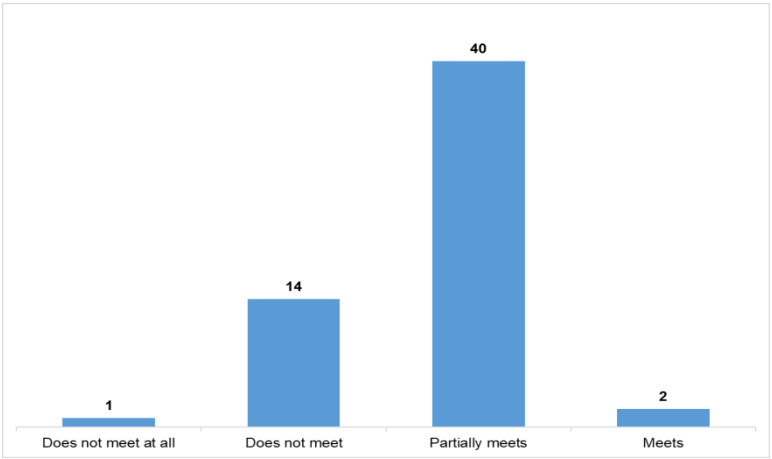
Section 3	Quality and Efficiency of Photovoltaic Installations in Turkey
3.1 How do you evaluate the quality of solar energy system components used in Türkiye today?	
3.2 How do you evaluate the quality of PV system applications in Türkiye today?	
3.3 Do you think the quality of PV installations (in terms of design, implementation and maintenance) needs to be improved?	
3.4 How often do problems related to technical deficiencies in the installation arise during the operation of PV Systems?	

3.5 During the operation of PV systems, which one comes to the fore in the problems related to the technical deficiencies in the installation?	
3.6 Which are important in the problems related to the technical deficiencies in the installation during the operation of the PV Systems?	
3.7 Which are unimportant in the problems related to the technical deficiencies in the installation during the operation of the PV Systems?	
3.8 Do you think there are enough technical staff for the installation and maintenance of PV systems in Türkiye?	

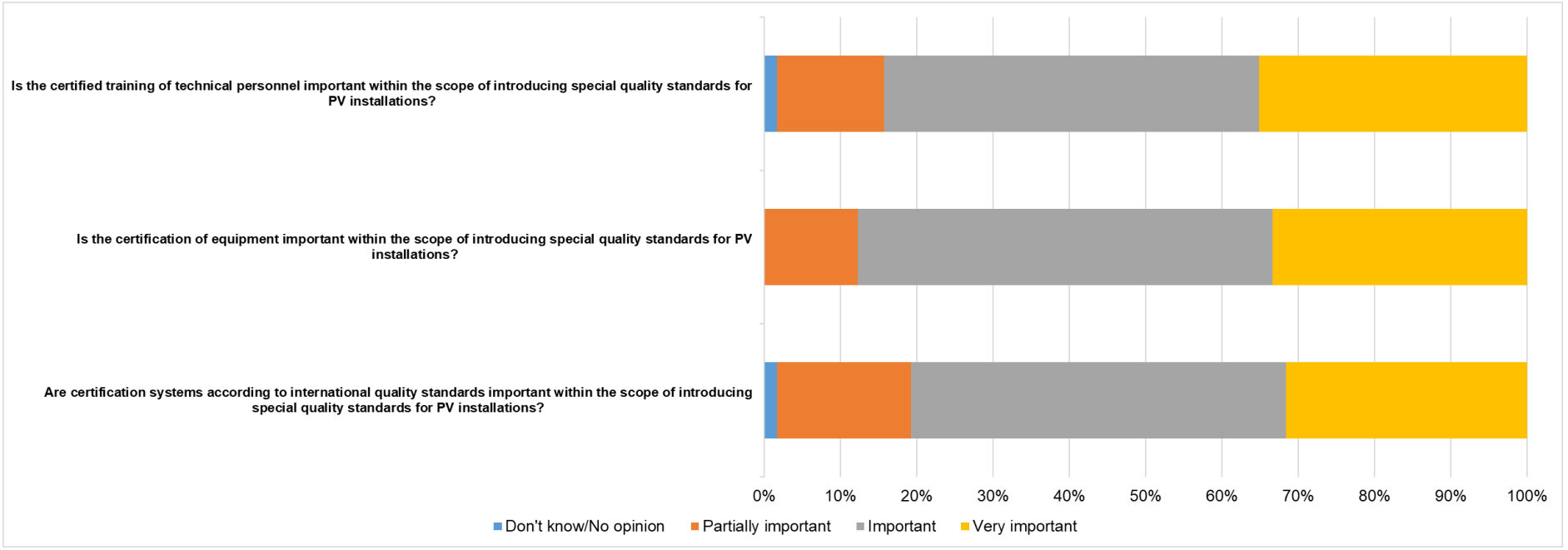
3.9 How do you evaluate the education level of PV installation technical personnel in Türkiye?	
3.10 In which parts of a PV system have you noticed that faults are more frequent?	
3.11: Which of the following factors do you think will cause system failure?	
3.12: Which of the following measures do you think can improve the quality of PV installations in Türkiye?	

3.13:

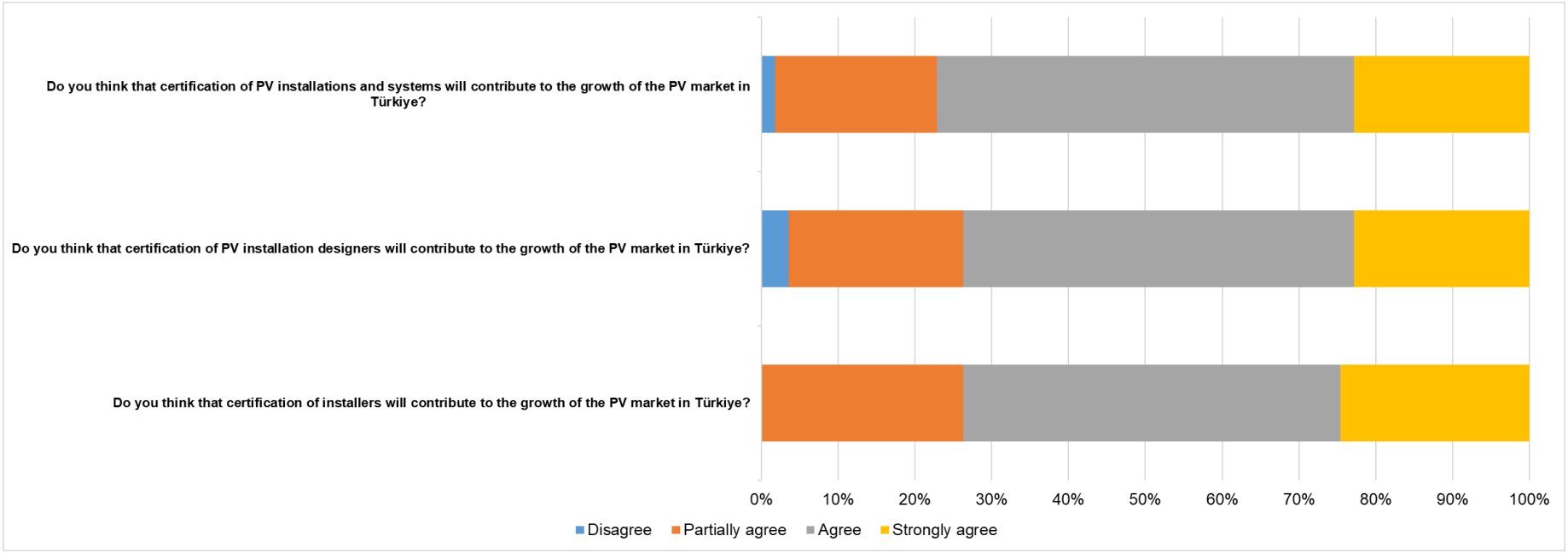

There is no risk in installing PV systems by technicians without special training and expertise.
There are enough qualified and experienced PV system installers in Türkiye.
The efficiency of an already running PV system is often similar to simulation results.
The efficiency of a PV system installed according to its design does not depend on technical knowledge and maintenance procedures.
No training certificate is required for PV system installers.
Continuing education and reassessment of the technical competence of PV system installers are prerequisites for ensuring quality systems
Certification of PV installations will not improve the quality of the systems.
0%
10%
20%
30%
40%
50%
60%
70%
80%
90%
100%
Strongly disagree
Disagree
Don't know/No opinion
Agree
Strongly agree

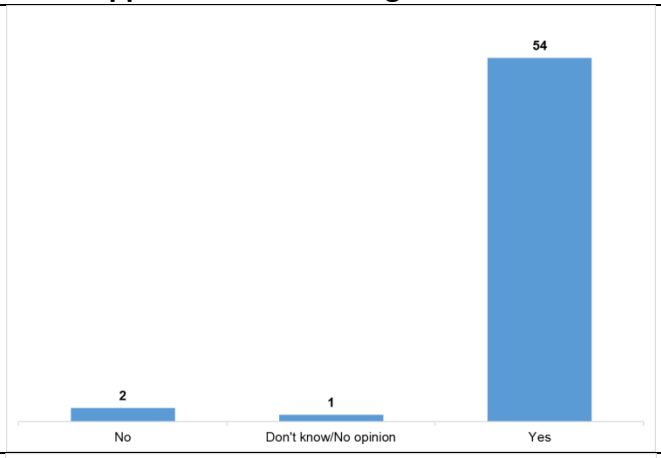
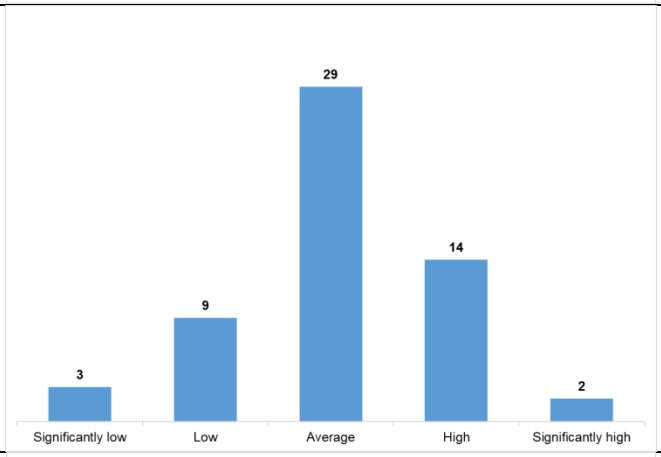
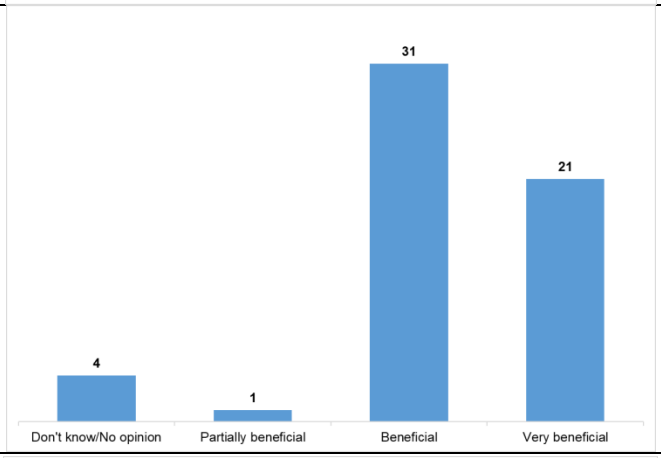
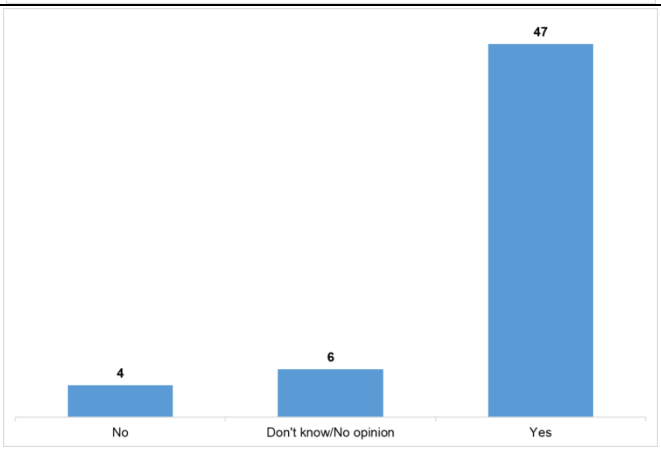
Section 4	Skills and Certification of Installers
4.1 Is there a clear professional structure for PV installers and does it meet the needs of the Turkish market?	
4.2 Are there sufficient opportunities for technical training of PV installers?	
4.3 To what extent do you think the technical training and skills of current PV installers meet the needs of the Turkish market?	

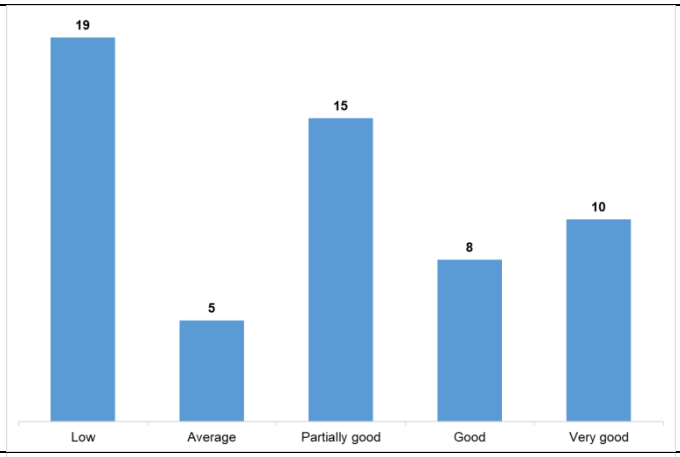
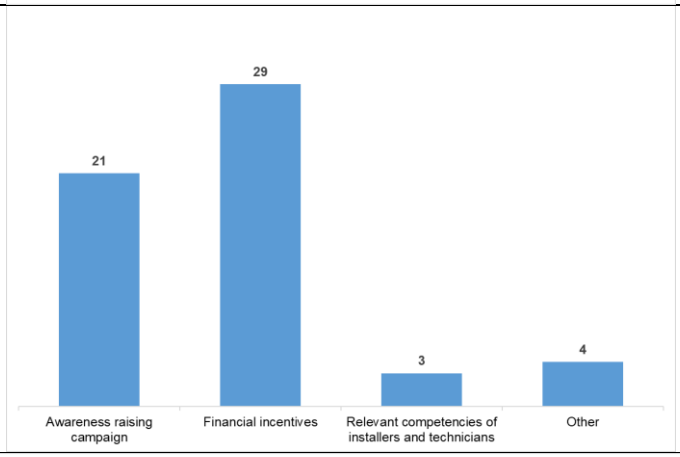
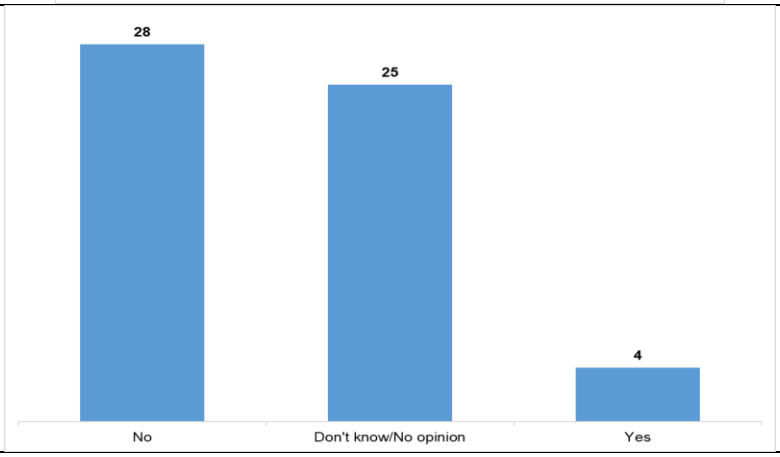
4.4

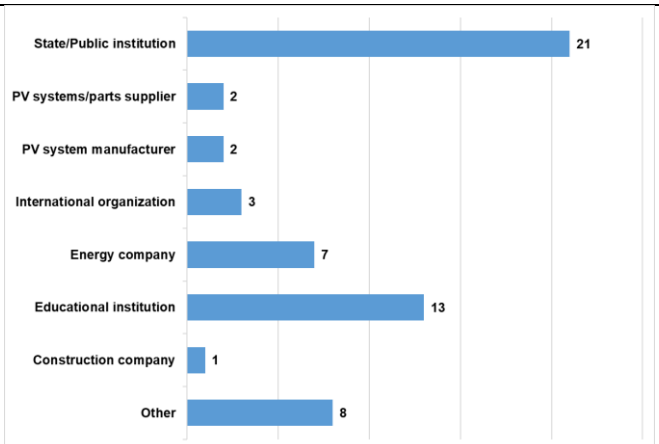
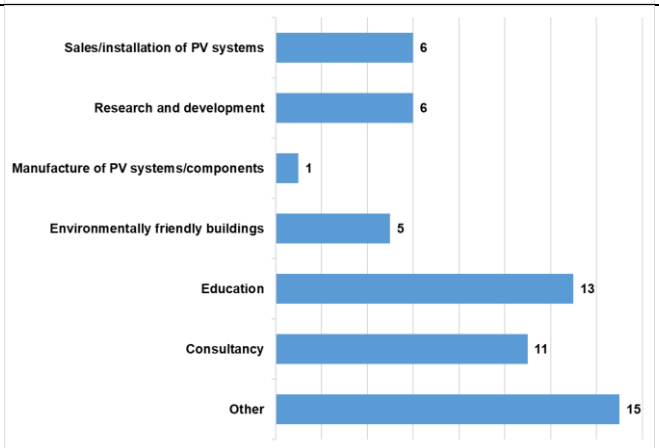
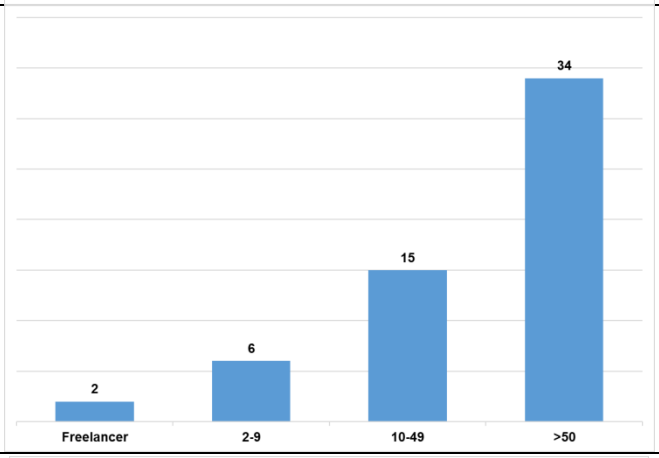
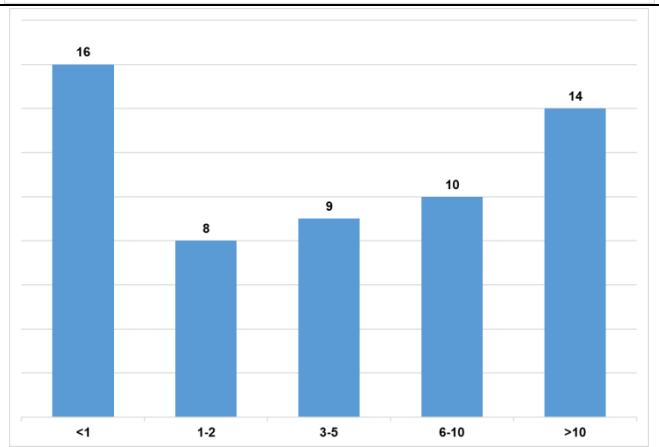

Is the certified training of technical personnel important within the scope of introducing special quality standards for PV installations?
Is the certification of equipment important within the scope of introducing special quality standards for PV installations?
Are certification systems according to international quality standards important within the scope of introducing special quality standards for PV installations?
0%
10%
20%
30%
40%
50%
60%
70%
80%
90%
100%
Don't know/No opinion
Partially important
Important
Very important

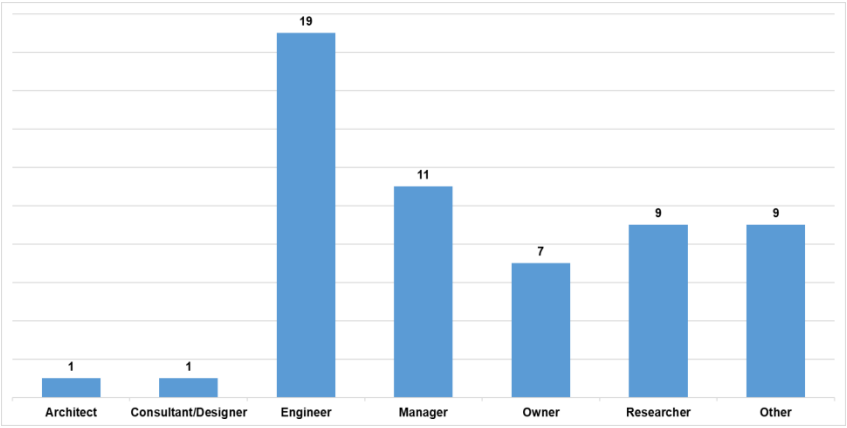
4.5


Do you think that certification of PV installations and systems will contribute to the growth of the PV market in Türkiye?
Do you think that certification of PV installation designers will contribute to the growth of the PV market in Türkiye?
Do you think that certification of installers will contribute to the growth of the PV market in Türkiye?
0%
10%
20%
30%
40%
50%
60%
70%
80%
90%
100%
Disagree
Partially agree
Agree
Strongly agree

Section 5	Use of 'smart' applications in building installations
5.1 Have you heard of smart grids before?	
5.2 What is your level of knowledge about smart grids?	
5.3 How would you define the smart grid?	
5.4 Do you think smart grids have the potential to transform the electricity industry?	

5.5 How do you evaluate the use of "smart home" applications in building installations in Türkiye?	
5.6 What contributes to the wider application of "smart"/"smart home" practices in building installations?	
5.7 Do you think the adoption of smart grids is widespread right now?	

Section 6	Statistical Data
6.1 Organization/ Company	
6.2 Fields of activity of the organization/ company	
6.3Number of employees in the organization/company	
6.4 Years of experience in the field of PV installations	

6.5 Position in the organization/company	

4. Targets and Opportunities For Improvement

This study was carried out in six sections and presented a framework that would contribute to sectoral market research. In this context, many issues such as the development of the market for the sectoral structure, materials, personnel and quality have been pointed out. In particular, the needs of the sector were researched by sharing information to support sectoral awareness and the development of the market. The problems that arise in this respect are briefly as follows.

- Market development criteria and roadmap
- Legal frameworks and requirements
- The sector's need for qualified personnel
- Requirements for building applications
- Personnel and material certificates
- Personnel qualifications, training and needs
- Quality and standards in all processes
- Compatibility of all systems with smart buildings

It increases the role of PV technologies introduced by the market in this whole structure. As a matter of fact, according to the 2021 report of the International Energy Agency (IEA); Although the increase in commodity prices affects solar energy investments, the installed power is expected to exceed 200 GW in 2026, with an increase of 17% in 2021. This indicates a 60% increase in the sectoral framework. As a matter of fact, as given in Figure 6, this effect was also given in the PWC's "Turkey and the World Solar Energy Sector Report."

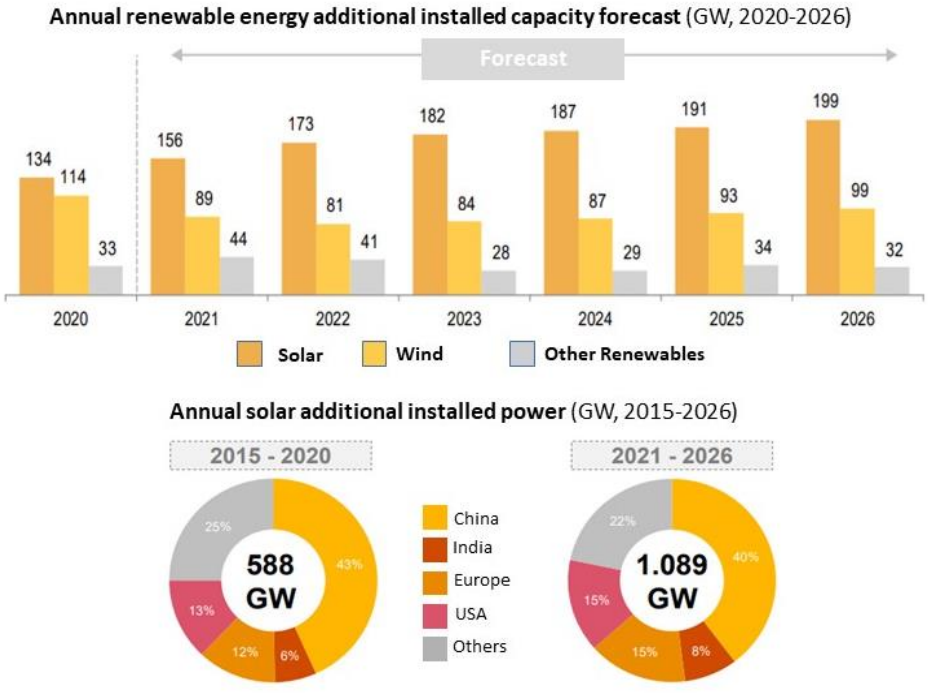


Figure 6. Solar energy sector development forecast (PWC 2021)

As a result of the survey evaluation, the strengths of the sector as the Turkish market can be evaluated as follows. These;

a. The high solar energy potential
b. Effective incentive mechanisms of the public in Turkey
c. Supporting the installed power with tenders supporting sectoral development such as YEKA SPP tenders
d. Institutional investors support growth as a sectoral player
e. Having manpower to support sectoral development
f. The Contribution rate of sectoral stakeholders and the power of the steel sector
g. Current change of sectoral policies and development of support tools
h. Technology development and development of new models and applications
i. The impact of energy efficiency studies in zero energy buildings and public buildings
j. It is the development of hybrid and new solution points for solar energy system applications.

Possible opportunities in sectoral research are;

a. Emerging carbon limitations for developed countries such as the USA and EU
b. International problem areas such as the pandemic and the Russian crisis trigger the return to electricity in energy.
c. Cheap labour costs of the industry
d. Solar power plants as a solution for energy continuity in electric vehicles and alternative resource management
e. The primary choice of PV applications in smart building solutions and different application options
f. Developing and managing training options that will increase manpower in the sector
g. Production of assembly malxeme and ease of assembly
h. PV options play a key role in the development of environmental impact in legal regulations
i. Increasing and managing sectoral sharing through corporate collaborations

When the sectoral outputs are evaluated together with the survey study, new expectations that are compatible with new building technologies and applications have come to the fore. On the other hand, for the sustainability of energy, the development of storage technologies as an alternative in building energy solutions is an important effect. In this context, increasing the effective manpower related to the systems and the development of related training tools can be seen as a need.

5. Conclusion

The survey study developed for market analysis and identification of needs in Turkey provided important outputs. In this context, first of all, as a result of market analysis;

a. The need for trained manpower,
b. Layout problems in assembly and applications,
c. Lack of technical procedures and implementation standard,
d. Certification and legislation problems and field adequacy were seen as the main deficiencies.

The survey evaluation will be shaped together with stakeholder evaluations and needs related to national targets in order to gain sectoral value. The study will be discussed together with the needs and requirements.

References

1. IEA (2023) Technology RoadmapSolar photovoltaic Energy, International Energy Agency, https://iea.blob.core.windows.net/assets/3a99654f-ffff-469f-b83c-bf0386ed8537/pv_roadmap.pdf
2. Ryan et al. Improving Survey Methods With Cognitive Interviews in Small- and Medium-Scale Evaluations, https://journals.sagepub.com/doi/pdf/10.1177/1098214012441499
3. PWC (2021) turkiye-ve-dunyada-gunes-enerjisi-sektoru-raporu.pdf (pwc.com.tr)
4. GMKA (2021) Renewable Energy Resarch Report Yenilenebilir-Enerji-Arastirmasi.pdf (gmka.gov.tr)
5. Banerjee, R. (2008), "Renewable Power generation in India: Establishing Feasible Targets," IIASA presentation, 4 June 2008; access at www.me.iitb.ac.in/~rangan/professional_activity/Renpower.pdf. Bank Sarasin (2008), Solarstudie.
6. Business Council for Sustainable Energy (BCSE) (2004), The Australian Photovoltaic Industry Roadmap. Chinese Renewable Energy Industry Association (CREIA) (2009), data accessed via website at http://en.creia.net/.
7. European Photovoltaic Industry Association (EPIA) (2004), Roadmap.
8. European Commission (EC) (2007), Energy for a Changing World – An Energy Policy for Europe – the Need for Action.
9. European Photovoltaic Technology Platform (2007), A Strategic Research Agenda for Photovoltaic Solar Energy Technology.
10. European Photovoltaic Technology Platform (2009), Implementation Plan for a Strategic Research Agenda for Photovoltaic Solar Energy Technology.
11. Varella, F.K.O.M, Cavaliero, C.K.N. and Silva, E.P. (2009), "A survey of the current photovoltaic equipment industry in Brazil," Renewable Energy, pp. 1801-1805.
12. World Bank (2010), 2010 World Development Report, Washington, DC; viewed December 8, 2009 at http://siteresources.worldbank.org/INTWDR2010/Resources/WDR10-Main-Messages.pdf.
13. Frounhofer (2023) Photovoltaics Report, https://www.ise.fraunhofer.de/content/dam/ise/de/documents/publications/studies/Photovoltaics-Report.pdf
14. IEA, (2023) Electricity Market Report 2023, https://www.apren.pt/contents/publicationsothers/iea-electricitymarketreport2023.pdf
15. Bussinewire (2023) Global PV Inverter Market Report 2023: Growing Investments in Renewable Energy Generation Bolster Sector, https://www.businesswire.com/news/home/20230508005373/en/Global-PV-Inverter-Market-Report-2023-Growing-Investments-in-Renewable-Energy-Generation-Bolster-Sector---ResearchAndMarkets.com
16. BP, Energy Outlook 2023 editionbp Energy Outlook 2023

17. Hipólito Carbajal-Morán, Javier F. Márquez-Camarena, and Carlos A. Galván-Maldonado, "Evaluation of Energy Efficiency in Photovoltaic Panels with Solar Tracker Based on Diffuse Control," International Journal of Electrical and Electronic Engineering & Telecommunications, Vol. 12, No. 3, pp. 177-185, May 2023. Doi: 10.18178/ijeetc.12.3.177-185

VET Partnership For Green and Smart Electricity in Buildings
Project 101092256

Summary report on the survey, based on the response of 8 companies working in the field of RES installations and 5 VET providers in Ukraine

Executive Summary
The purpose of the survey was to study the opinions, needs and expectations of companies and professionals working in the renewable energy market regarding the state of this market in Ukraine and, in particular, issues related to the efficiency and quality of installation and maintenance of photovoltaic systems, and skills necessary to achieve this goal, as well as to identify the needs for theoretical knowledge and practical skills of technicians and installers of solar installations in order to eliminate the identified gaps by improving training programs for target groups and training trainers for professional development.

Methodology
The survey was conducted online, based on specially developed questionnaires. Two questionnaires were developed, one for stakeholders and one for VET providers, and sent to 8 companies working in the field of RES installations and PV in buildings, in particular, and 5 VET providers (university, four vocational colleges). Managers/contact persons of companies and educational institutions were contacted by phone and e-mail to provide more detailed information about the survey, its purpose and the goals of the Project as a whole, after which they were given access to the questionnaires. After completing the questionnaire, we additionally discussed its results with the interviewed respondents both face-to-face and at online meetings.

Background
The goals set in the energy strategies and policies of the EU and those of the participating countries have lead to changes in the labour market for installers of electrical and RES systems in buildings.

The building and RES industry needs specialists with new skills and competences. These are related to:

- The implementation of RES in electrical systems in buildings which enhances the necessity of green skills and knowledge;
- The fact that the building sector is composed mostly of small and micro-firms that provide local employment (more than 90% are SMEs), employing 12 million workers in EU. Energy professionals from SMEs lack additional soft skills in order to solve the daily challenges they are facing regarding work management, contacts and communication with clients, marketing, etc.
- The new technologies require additional digital skills for the design, installation, maintenance and operation of the electrical installations;
- Specialists from SMEs need users-friendly, flexible training solutions that will allow them to upgrade their skills and competences in a way tailored to their needs.

At the moment, specialists who want to work in the field of photovoltaic installations must have the following professional qualifications: "Master of installation and maintenance of renewable energy systems" or "Technician electrician", specializing in "Maintenance and repair of renewable energy installations".
This profession can be acquired in Ukraine in some vocational colleges, as well as in individual vocational training centers. The professional standard "Master of installation and maintenance of renewable energy systems" was approved and entered into the Register of Professional Standards of Ukraine only on January 26, 2022, and the current training programs adopted by the specified VET providers are not aligned with the requirements of employers.
Since the goal of this project is to eliminate the gap between the requirements of companies related to the implementation of RES in the energy and construction sector and the competencies that can be obtained through traditional training practices, we interviewed specialists of 8 companies working in the target industries (20 people) , among them, the majority (more than 58%) are companies with more than 50 employees, but with little work experience (37% have been working in the RES sector for less than 1 year). Representatives of 5 educational institutions (50 people) were also interviewed, and both teachers and students of graduation courses took part in the survey.

Results:
Below, we have provided the data gathered from the surveys:

ANNEX A Surveys of Stakeholders
ANNEX B Surveys of VET Providers

Conclusions:
RES sector in Ukraine
According to the survey data, both representatives of stakeholders and VET providers believe that the growth of the RES market in Ukraine over the past 3 years is quite significant - more than 80% of respondents gave this answer. Respondents consider financial incentives (about 90% of respondents), as well as constant training of specialists (80%) and information campaigns aimed at raising public awareness of these issues (more than 70% of responses), to be the main factors for the further development of this segment of the energy industry. About 20% of VET providers are very optimistic about the prospects for the development of the renewable energy market; while reserved optimism prevails among specialists (42% of respondents consider these prospects to be good). Among their opinions, the following should be highlighted: that the demand for photovoltaic installations increases during the period of martial law in Ukraine due to the decrease in electricity generation at thermal and nuclear plants, and that the increase in the number of renewable energy installations is a guarantee of the country's energy independence.

Quality & Efficiency of PV installations in Ukraine
According to the results of the survey, the vast majority of respondents (80% of stakeholders and almost 90% of VET providers) positively assess the quality of existing photovoltaic installations in Ukraine, while more than 72% of RES workers consider it necessary to increase this quality. Among the most important parameters for the quality and efficiency of such installations,

respondents singled out: quality design (more than 80% of respondents), choice of installation location (more than 78%) and experience of technical staff (more than 85%). At the same time, stakeholders (more than 57% of respondents) believe that there are not enough qualified workers in the field of installation and maintenance of photovoltaic installations in Ukraine. The same number of interviewees noted that the technical training and professional skills of the staff do not fully meet the needs of the market. Therefore, more than 78% of respondents support the implementation of certified training of technical personnel.

Regarding the qualifications of teachers in the field of photovoltaic installations - almost 90% of VET providers consider it sufficient or very high. At the same time, according to respondents, trainers need additional training in the following areas: the latest technologies (78% of respondents), "smart" programs (56% of respondents), design and maintenance of installations (48% of respondents).

Both stakeholders and representatives of VET institutions (more than 70% of respondents) unanimously support the certification of both equipment and certified training of installation technicians as measures that can improve the quality of photovoltaic installations in Ukraine.